Bundesanstalt für Geowissenschaften und Rohstoffe

Government Revenues from the Extractive Sector in Sub-Saharan Africa –

A Potential for Funding the United Nations Millennium Development Goals?

Report

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Hannover, June 2009
Federal Institute for Geosciences and Natural Resources

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Acknowledgments

This report has benefited greatly from many people who have helped with queries, provided data, and shared their knowledge and experience with us. We are very grateful to Rainer Ellmies, Dr. Roland Bäumle, Dr. Harald Elsner, Dr. Wolfgang Hirdes for their thoughtful comments on the case studies. We would like to thank Britta Pfeiffer, Gisa Roesen, Dr. Gudrun Franken, Anna Stetter, and Dr. Ulrich Ranke who have supported the report through thoughtful comments, data, and by making possible visits to the World Bank, the International Monetary Fund (IMF), the United Nations Development Programme (UNDP) and to Columbia University through the technical cooperation project “Policy Advice Mineral and Energy Resources”.

Furthermore, we are very grateful to Craig Andrews, Clive Armstrong, and Dr. Michael Hofmann at the World Bank, to Peter Allum, Jan Mikkelsen, Dr. Thomas Helbling, Diego Mesa Puyo, Dr. Klaus Stein, Christoph Denk, and Charles McPherson at the International Monetary Fund , Gonzalo Pizarro, Shantanu Mukherjee, Casper Sonesson, John Karlsrud, Giske Charlotte at the United Nations Development Programme, and Prof. Macartan Humphreys at Columbia University, for their thoughtful comments on preliminary results and policy options.

Special thanks go to Wolfgang Neumann, Dr. Klaus Brinkmann, Dr. Dieter Huy, Bernard Wehenpohl, Dr. Sandro Schmidt, Hans Georg Babies, and Dr. Jürgen Vasters for their great support on collecting data and their outstanding comments. We are very grateful to Doris Homberg for providing data and proof-reading, and to Elke Westphale for providing country information, proof reading and excellent copy editing. Finally, we would like to thank Dr. Markus Wagner, who initiated this study, and Prof. Dr. Dr. Friedrich-Wilhelm Wellmer who both provided thoughtful advice and shared their experience with us.

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Acronyms and Abbreviations

AfDB	African Development Bank
BGR	Federal Institute for Geosciences and Natural Resources
CIA	Central Intelligence Agency
DR Congo	Democratic Republic of Congo
ECOWAS	Economic Community of West African States
EITI	Extractive Industries Transparency Initiative
G8	Group of Eight
GDP	Gross Domestic Product
HDI	Human Development Index
IMF	International Monetary Fund
KfW	KfW Bankengruppe
LDC	Least Developed Country
MDGs	Millennium Development Goals
MSSP	Mining Sector Support Programme of the European Union
MW	Megawatt
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
TI	Transparency International
UNDP	United Nations Development Programme
Vale	Companhia Vale do Rio Doce

Abstract

The past boom in mineral commodity prices has raised the awareness that revenues from the mining sector could enable resource-rich countries in Africa to mobilize additional domestic funds towards achieving the Millennium Development Goals (MDGs). The MDGs – agreed in 2000 by the Millennium Summit of the United Nations are eight international development goals. They include reducing extreme poverty and hunger, achieve universal primary education, fighting epidemics such as AIDS, and developing a global partnership for development. However, there is still a lack of medium and long-term projections to what extent the extractive sector can make a difference in funding the MDGs, especially for non-major oil producing sub-Saharan countries. This is especially true with respect to the current turmoil in the world economy and mineral commodity markets.

The study by the German Federal Institute for Geosciences and Natural Resources (BGR) estimates potential revenues from the extractive sector in different scenarios up to 2015 using assumptions such as baseline world market prices, fiscal regimes, and the development of additional production capacity. The four case study countries include Ghana, Namibia, Mozambique and Zambia and cover different mineral commodities such as copper, diamonds, gold, oil and others.

Even for the worst-case scenario the results of the BGR-study demonstrate that by strengthening resource governance and revenue management significant revenues from mining provide a window of opportunity for many African countries though the contributions to achieve the MDGs vary significantly.

In Zambia government revenues from the extractive sector, which is basically dominated by copper and cobalt production, had been negligible for a long time. “Development agreements” with mining companies were negotiated at the end of the nineties when copper prices were very low and the Zambian government was trying to reactivate the depressed copper sector by privatizing and reforming state owned mining companies. In order to attract foreign investors the “development agreements” reduced royalty rates to 0.6 per cent. As a result, mining taxes from the sector were only about US$10m in 2005 at a time when world copper prices had already doubled and Zambia exported copper worth US$1.5 bn. Even in 2007, when world market prices had risen six-fold in comparison to the 1990s and copper exports went up to US$3.4 bn mining taxes totaled only around US$160 m. However, from April 2008, the government introduced a new tax regime with applied royalty rates of 3 per cent, a corporate income tax of 35 per cent, and a variable windfall tax at 25 to 75 per cent. Even under a pessimistic scenario, based on low world market prices and low production increases, new revenues could provide around 15 per cent of the total MDG financing and more than 30 per cent of the finance gap that is left to the national government. The construction of infrastructure, especially with regard to electricity, is an important factor for the further development of the sector.

In contrast to long standing mining countries such as Zambia, the outlook for financing the MDGs through the extractive sector in Mozambique is quite low.

In Namibia the situation is more advantageous. The MDG costs are moderate and government revenues from the extractive sector have been high for the last few years. Diamonds, which make up about 30 per cent of Namibian export revenues, contribute clearly to most of the government revenues. At the same time, uranium and zinc resources have become the focus of international mining companies and could generate extra government revenues up to 2015. Overall, potential revenues could outweigh the MDG gap to be filled by the government in all three scenarios for the period 2008 to 2015. However, environmental standards especially for uranium mining are important for a sustainable development of this sector.

Ghana is a stronghold of gold mining in West Africa and is the second largest producer of this metal in Africa. There is also high potential for extracting hydrocarbons offshore. Ghana shows that oil production really makes a difference for government revenues. Past revenues from corporate taxes on mining companies are moderate due to accelerated depreciation and the carry forward of loss making concessions. Most companies pay only a minimum of 3 per cent in royalties. According to the Ghana Chamber of Mines, corporate income tax revenues from mining companies amounted to about US$2.8m and about US$18m of royalties in 2002. These incomes increased to US$11m and US$24m respectively in 2004. Under the current tax regime, the potential government revenues from the oil sector would make up about 75 per cent of the total government revenues from the extractive sector. The extraction of oil could alone add US$ 1.6 bn to government coffers in the period 2008-2015 for the medium scenario. Ghana could thus finance about one sixth of its MDG needs from the extractive sector.

As a result, government revenues from the extractive sector are obviously “no easy money”. Generating these revenues depends on the respective geology of a country, investment conditions and infrastructure for production, the fiscal regime, tax collection and administration, and finally world market prices. Short-term contributions to government revenues should not be overestimated.

Generating government revenues and the sound development of the extractive sector are long term exercises. There is clearly no “one size fits it all” recipe. Dealing with the fluctuations of world market prices is a key challenge to governments. “Good governance” is not only a prerequisite for sustainable mining, for the reduction of corruption, and for increasing transparent financial flows, but also directly linked to the country’s risk rating, an important parameter for investment decisions. The tax regime and investment conditions, which benefit both, investors and the government, are keys for using opportunities in the long run.

1. Introduction

Many resource-rich sub-Saharan countries have experienced rising export revenues from the extractive sector due to high world market prices for mineral commodities in the past years.

This boom has taken the extractive sector high on the development agenda as it could provide these countries with the opportunity to raise domestic funds for achieving the Millennium Development Goals (MDGs) and to finance public goods such as infrastructure, education and basic health.[1]

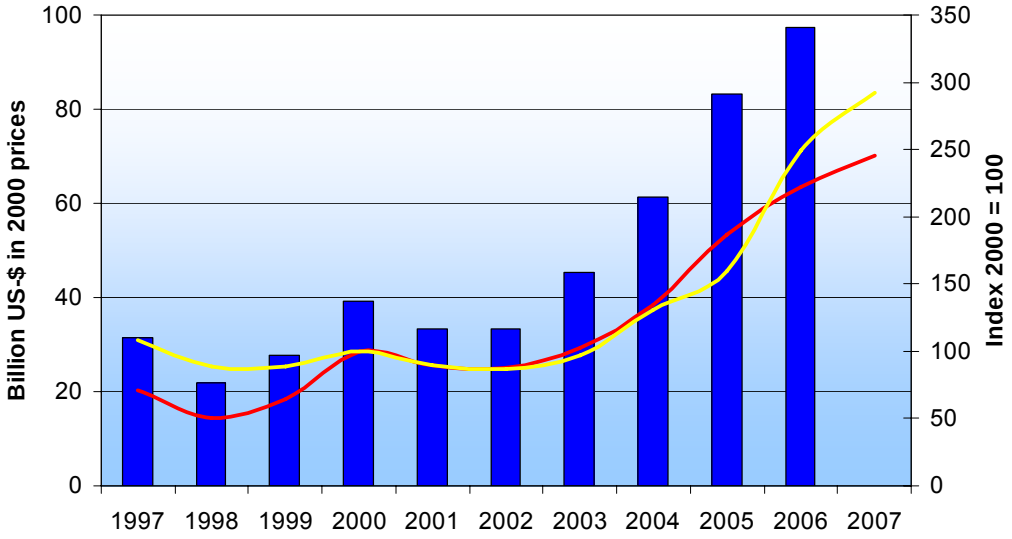


Figure 1: Export revenues from the extractive sector in Sub-Saharan Africa (38 countries) (blue) and world mineral (yellow) and energy commodity prices (red). (1997-2006; in real 2000 US-$ prices) (Sources: World Bank, 2008; WTO, 2008)

At the G8-summit in Heiligendamm, Germany, 2007 the Heads of State and Government therefore reiterated their support for increased transparency in the extractive sector, notably through the Extractive Industries Transparency Initiative (EITI). Furthermore, the World Bank and the United Nations Development Programme (UNDP) focus on establishing "Good Governance" all along the value chains of the extractive sector and provide capacity building in negotiating contracts. Other initiatives comprise the Kimberley Process, Norway's Oil for Development Fund, The Revenue Watch Institute and Publish What You Pay.

However, there is still a lack of estimations to what extent the extractive sector can make a difference in funding the MDGs.[2] This is especially true with respect to the current turmoil in the

[1] See Humphreys/Sachs/Stieglitz, 2007; World Bank, 2006; Collier, 2007; OECD, 2006; Sachs, 2007, 179.
[2] OECD, 2006, 74.

world economy and mineral commodity markets. A report by the Overseas Development Institute (ODI) has estimated the windfalls from the oil sector for the eight major oil exporters in sub-Saharan Africa and found out that they could finance around half of the total MDG financing gap for the region.[3]

This report focuses on sub-Saharan countries with a broader range of mineral commodities and it bases on different world market prices scenarios. It extends the work previously done by the Federal Institute for Geosciences and Natural Resources (BGR) and the Kreditanstalt für Wiederaufbau (KfW) on the DR Congo.[4] The study estimates the potential government revenues from the extractive sector up to 2015 under different assumptions of world market prices, production levels and tax regimes. It then compares these revenues to the financial needs for funding the MDGs.

The report serves as a starting point. It can only provide rough estimates and bases on strong assumptions. More specific data on the mining operations in each case study country would be necessary for more exact outcomes. Furthermore, secondary effects of the mining industry on government revenues from the construction and service sector are not included in this study due to a lack of data. For the same reason, it was also not possible to consider indirect taxes such as payroll taxes. Further studies should be done in close cooperation with the respective country officials and local research institutions.

The choice of the case study countries includes Namibia, Ghana, Mozambique and Zambia. It tries to cover different mineral resources and economic importances of the extractive sector. The study also aims to bring into focus the potential of the non-energy minerals sector. Furthermore, the case study countries cover different stages of the Human Development Index (HDI).

Namibia, the first case study, is a classical diamond mining country that has a high potential for increased production especially in Uranium mining. It has also good indicators on corruption and aims to achieve middle-income status in the next decade.

Ghana is a stronghold of gold mining in West Africa and is the second largest producer of this metal in Africa. There is also potential for extracting hydrocarbons offshore. It is at the forefront of EITI countries and possesses relatively good indicators on corruption and transparency.

[3] ODI, 2005.
[4] BGR/KfW, 2007.

Country	Main Mineral Commodities	Human Development Index (Ranking of 177)[5]	EITI-candidate country	Fraser Index (Ranking of 68)[6]	TI-Corruption Perception Index (Ranking of 179)[7]	Exploration activities
Namibia	Diamonds, Gold, Uranium, Copper, Manganese ore, Zinc, Silver	125.	No	33.	57.	High
Ghana	Gold, Diamonds, Bauxite, Silver, Oil	135.	Yes	23.	69.	High
Mozambique	Metallurgical coal, Titanium sands, Tantalum, Gold, Bauxite, Natural Gas	172.	No, but intention to join	-	111.	Medium
Zambia	Copper, Cobalt, Manganese ore	165.	No, but intention to join	34.	123.	High

Table 1: Overview of the four case study countries.

Mozambique is not a classical mining country but is widely perceived as having a medium to good potential for developing this sector. With respect to HDI indices it is at the end of the list and also the TI-Corruption Perception Index is quite low.

Zambia is a long standing mining country, especially in the copper and cobalt sector. It aims to join the EITI as a candidate country and it scores in the middle range of corruption indices. It has also a relatively low HDI.

Exploration activities in all countries are medium to high. The Fraser index, which provides information on the attractiveness of a country to mining and exploration investments, ranks Namibia and Zambia on a moderate level, Ghana does relatively well, whereas Mozambique is not included.

This study is organized into nine chapters. After the introduction, Chapter 2 describes the major determinants for government revenues from the extractive sector such as the tax regime,

[5] UNDP, 2007a, 230-232.
[6] Fraser Institute, 2008, 11.
[7] Transparency International, 2008, 297-303.

investment framework, world market prices and the production level. Chapter 3 introduces the methodology and the underlying assumptions in the three scenarios. Chapters 4 to 7 present the respective case studies on Namibia, Ghana, Mozambique and Zambia. Chapter 8 outlines policy options and Chapter 9 concludes by summarizing the results and by outlining open questions for further research.

The case studies are organized as follows: First, they give a short overview of the political and economic development. Then, they describe the geological potential, the existing extractive sector as well as potential future projects. They outline the mining tax regime and give an overview of past government revenues from the extractive sector. Afterwards, they present the different scenarios for future government revenues, which finally are compared to the costs of achieving the MDGs.

2. Generating government revenues from the extractive sector

Government revenues from the extractive sector are “no quick money”. Generating these revenues depends on a couple of significant determinants, which are at the same time important assumptions for the modeling of potential government revenues. This chapter will explain these determinants more in depth to illustrate the complexity to achieve these government revenues. Important determinants are the respective geology of a country, investment conditions and infrastructure for production, the fiscal regime, tax collection and administration, and finally world market prices.

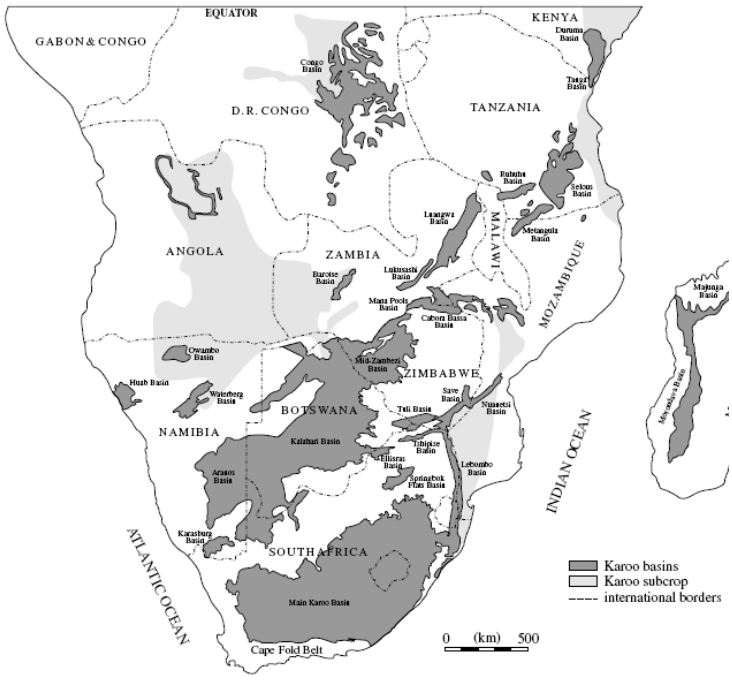
2.1 What defines the geological potential of a country?

The geological endowments of a country are described by its reserves and resources. This chapter explains how a mineralization becomes an officially declared reserve or resource.

The rock formations of a country have their own geological characteristics due to plate tectonic movements, volcanic activity and environmental change such as sea level rise along different periods in earth history. For example, the “Karoo group” is a rock formation that is found throughout south-central Africa. It is known for the coal deposits found in this rock formation due to extensive biomass production and sedimentation in earth’s history. For all mineral commodities, the rule applies that there is a large quantity of occurrences and deposits and very few large or giant deposits.

So what does make an occurrence to appear as a deposit with respective reserves and resources in official statistics? Reserves are largely defined as the known mineral occurrences that can be mined economically with today’s technology. This means that - in contrast to intuition - reserves are no stock but a flow variable. Economical costs and technological progress are its major determinants. For example, the trend of haul truck size leads to rationalization effects through economics of scale in large open pits. This results in a growth of reserves.[8] I

[8] See Tilton, 2002, 3-7.



Map 1: The coal bearing "Karoo Group". (Source: Catuneanu et al, 2005, 212)

Resources are defined as a mineral occurrence of intrinsic economic interest in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. Increasing prices or technology progress in mining and processing leads to the conversion of resources into reserves. Infrastructure programs in remote areas might also transfer formerly marginal resources into reserves as mining these ore deposits becomes profitable.

Reserves and resources do not fully describe the geological potential of a country as there might still be many minable deposits that are simply unknown. Mining companies only explore new deposits to extent production or to replace reserves they have already been mined. Overall, Africa is far less explored in terms of geology than for example Canada. An average of US-$16 per km^2 was spent on exploration in Africa whereas the corresponding figure for Canada was US-$55 per km^2. Accessible basic geological data is often not adequate.

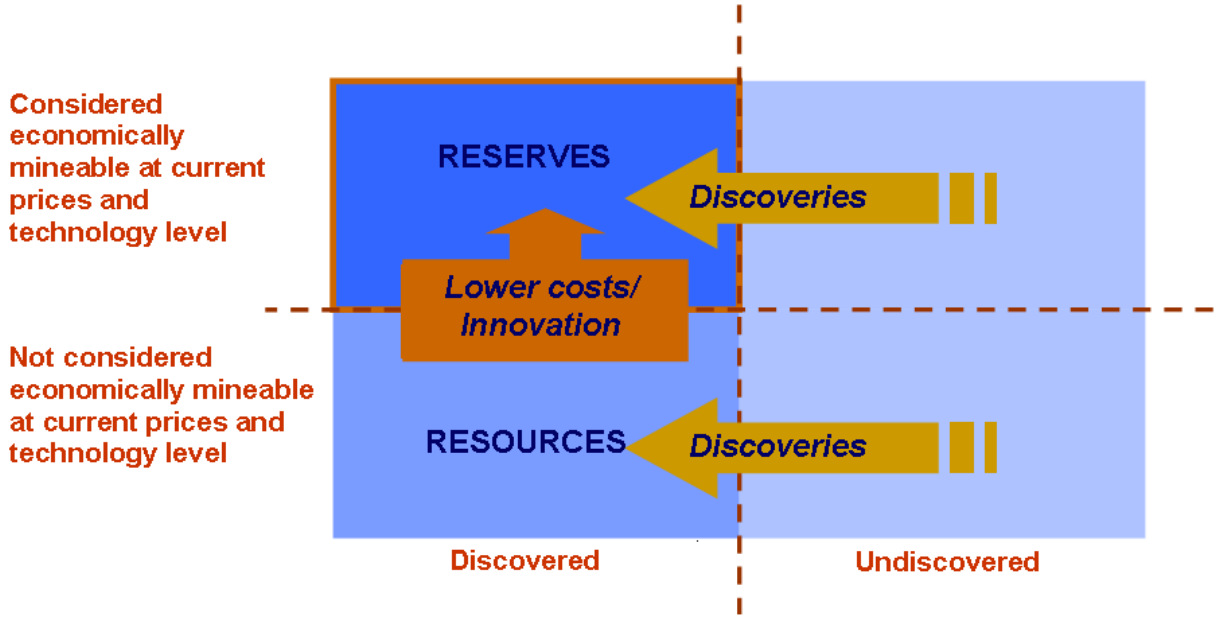


Figure 2: The flow of resources to reserves over time. (Source: BGR)

2.2 Get the production going: Investment conditions and infrastructure

To transform geological endowments to production, investment conditions and infrastructure are important factors. Overall, Africa is far behind its peers such as Canada or Australia in terms of production. Whereas Canada exported minerals worth US-$10,000 per km^2, Africa only exported US-$1,600 per km^2 in 2005.

Investments in the extractive sector are capital intensive and are done over long time horizons. The assessment of risk plays a major role in investment decisions. Therefore, a sound and stable public administration and political stability are essential for the long term development of the sector. The Fraser Institute surveys each year the investment conditions in 65 mining countries and lists them up in a “Policy Potential Index”. The Quebec province in Canada for example ranks top on the Fraser index as it provides a sound mining legislation and taxation system for mining. Zimbabwe ranks number 67 of 68 entities surveyed due to political instability and corruption.[9]

The most important points are the clear grant of mining titles, continuity of mining legislation, the ownership of permits, predictable taxation, political stability, geological data, and security issues.

Infrastructure such as transport and electricity are of particular importance for developing the extractive sector. Many African countries currently lack the infrastructure for an expansion of the sector. Most mineral commodities except precious and some rare metals and gemstones require

[9] Fraser Institute, 2008, 10-11.

bulk transport facilities such as railways, highways, inland waterway transportation and adequate harbor facilities. The same is true for electricity which is a major bottleneck for developing additional production especially in Zambia and Ghana.

2.3 Mineral taxation

Taxation systems and administration are key determinants for government revenues from the extractive sector. This chapter gives a first introduction and describes the major fiscal instruments and the specific problems in executing them.[10]

The extractive sector has a couple of special features which make a distinct taxation system usual. These include the size and timescale of investments, high sector specific risks, as well as the instability of world market prices. At the same time, mineral rights usually belong to the state, and taxes are the price for exploiting these public assets.[11] As a result, mineral taxation is generally complex and often subject to discretionary agreements which grant tax holidays or an individual tax regime to the respective company. Most countries choose a combination of different taxes, charges, and state interests to generate revenues from the extractive sector. Common mechanisms are:

- Royalties
- Windfall profits tax
- Corporate income tax
- Free carried interest/ government share
- Concession charges

Royalties have historically been the most common instrument for taxing the extractive sector and are widely used. Royalties tax the fiscal dues on the basis of either volume ("unit" royalty) or the value ("ad valorem" royalty) of production or exports. There are many different forms for the exact calculation of "ad valorem" royalties as the definition of value varies. Royalties have the advantage of relatively easy assessment and application even though calculation can become complicated if the value is adjusted to subtract costs for transportation, handling etc.[12] They also ensure a relatively stable revenue stream to the government since production and sales normally vary much less than profits.[13] To producers, royalties constitute additional costs that have to be paid irrespectively of profit levels. They can wipe out the entire profit or even impose losses, when world prices and therefore pre-tax profits are low. Very high royalties are therefore a major deterrent to investments, especially for minerals with highly cyclical prices or for less

[10] For further reading see e.g. Otto et al, 2006.
[11] Andrews-Speed, 2000, 1.5-1.6.
[12] Otto et al, 2006, 52.
[13] Radetzki, 2008, 201.

outstanding resource endowments with only normal profitability. They increase the economic cut-off rate of a mine and therefore reduce the economic life of a project.[14]

The windfall profits tax creams off an above normal level supposed profit by taxing the gross revenues. Normally, it depends on a certain threshold e.g. a certain world market price level. With a progressive tax design, using stepped tax rates linked to parameters like world market prices, the government can cream off a substantial proportion of profits that are considered "above" normal. There are a broad range of different applications of windfall profits taxes. For example, in 2006 the Mongolian Parliament enacted a windfall profits tax. The windfall profits tax calls for a 68 percent tax on sales of gold when world market prices rise above US-$500 per ounce and US-$2,600 per tonne of copper. As a result, gold was extensively smuggled out of the country so that the official gold production decreased by several tons of gold.

The corporate income tax extracts fiscal dues on the basis of profits, i.e. taxes are only due when annual revenues exceed some measure of costs and allowances. Key variations of corporate income taxes are the specification of allowable costs, the definition of taxable income, and the applied rate. In its proportional formulation (a fixed tax rate), corporate income taxes are relatively regressive, as their burden in percentage terms remains the same at different levels of profitability.

In general, corporate income taxes avoid the problem of royalties that companies have to pay taxes even though they make losses. For the government, corporate income taxes are much more difficult to compute and to impose as profits have to be assessed. Furthermore, corporate income taxes yield a far greater fluctuation of public revenues than royalties since profits fluctuate much more than volume of output or sales. This is especially true when a progressive rate is applied.[15]

Another measure for fiscal extraction is government participation for free or on concessional terms. The government acquires a carried interest and pays for its share out of future earnings of the project, or it demands a minority equity share for free at the time of the original investment decision (called free carried interest). Public ownership is not always easy to transform into a fiscal income flow as it may expose the government to the costs involved in reinvestments and expansions. There may also be a conflict of interest in the government's role as equity holder and regulator overseeing environmental and social impacts. Overall, government participation represents a cost to the investor. On concessional terms it also reduces cash flow and raises the risk profile of an investment.[16]

Finally, there are different taxes and charges that add to the tax burden of the extractive sector. These include concession charges, duties for imported equipment, payroll taxes, value added

[14] See Tordo, 2007, 37-8; Otto et al, 2006, 51-2; Radetzki, 2008, 201-2.
[15] See Tordo, 2007, 39; Otto et al, 2006, 52-4; Radetzki, 2008, 202.
[16] See Tordo, 2007, 43; Radetzki, 2008, 203-4.

taxes, and environmental taxes. Another important source of government revenues from the extractive sector are direct grants or credits from foreign government in exchange to access to resources.

There are great problems with the execution and implementation of tax regimes. Many countries miss a sound tax and mining administration for effective tax collection. Due to a lack of knowledge on geology and mining operations, the administration is often not really able to countercheck tax statements. Corruption is often widespread. Competences between the different state authorities are distributed unclearly. An additional problem is the uniform pricing of minerals which leads to variations in the computation of royalty payments. Mining companies also apply different exchange rate regimes for the payment of mineral royalties. Some taxes are often simply not paid.[17] As a result, effective tax rates are often much lower than nominal tax rates.

At the same time, it is important to not overtax the sector and to give investors long run stability in their mining taxation. Several African countries currently reform their mineral taxation systems (e.g. DR Congo, Sierra Leone and Zambia) for extracting a higher government share from the current revenues of the sector.[18]

2.4 World market prices

Mineral commodity markets have always gone through periods of high and low commodity prices. In contrast to other economic sectors where such drastic imbalances of supply and demand are hardly known, the commodity sector has its own rules. Demand and supply are subject to a high inelasticity of prices. This means that high prices only lead to a higher supply with a considerable delay. The reason is that new mining projects normally have a lead time of five to ten years. There is a similar situation with regard to the demand side. It often takes time and additional investments to find substitutes.

As a result of the high inelasticity of prices the typical cycles of high and low prices exist in commodity markets. Accordingly, revenues from mineral commodities can be subject to considerable fluctuations. For governments strongly dependent on the extractive sector, revenues should be collected pro-cyclically to distribute them in an anti-cyclical way. Norway for example has established a Petroleum Fund (Norwegian Oljefondet). Its purpose is to invest parts of the large surplus generated by the Norwegian petroleum sector to counter the effects of the forthcoming decline in income and to smooth out the disrupting effects of highly fluctuating oil prices.

[17] See e.g. Government of the Republic of Ghana/ Ministry of Finance and Economic Planning, 2006, 4-5.
[18] Sachs, 2007, S. 180.

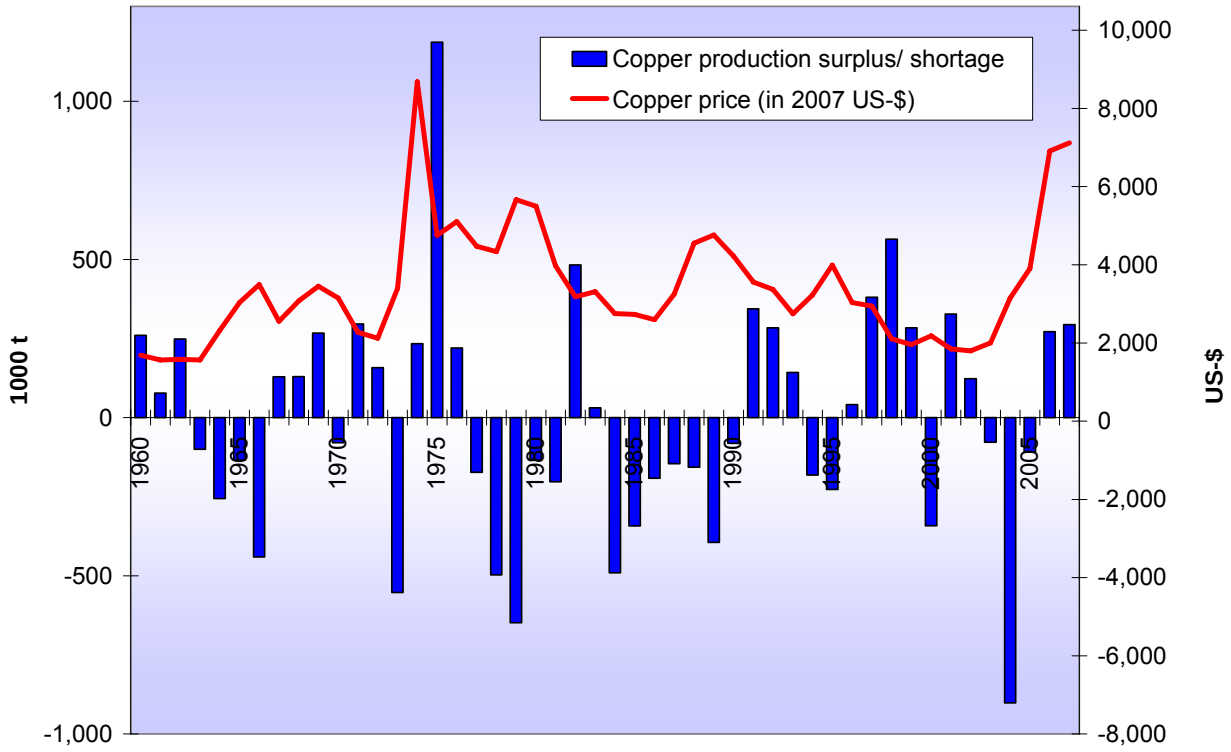


Figure 3: Market imbalances and price cycles in the international copper market from 1960 to 2007. (Arithmetic mean of average monthly LME refined copper prices in 2007 US-$) (Sources: BGR database; International Copper Study Group)

3. Methodology and baseline scenarios

This study works on a scenario approach. Therefore, the results can only serve as first approximations to future development. This means that if the chosen assumptions became reality, the respective government revenue could become real. The recent sudden decline in mineral commodity prices illustrates how difficult it is to estimate any future revenues from the sector. Furthermore, for a more detailed estimation of government revenues a cash flow model and specific operation data on each mine in the four respective countries would have been necessary. Such studies should be done in close cooperation with the respective country officials and local research institutions. The upcoming paragraphs in Chapter 3.1 define each of our assumptions, illustrate the calculations, and explain the underlying data. Chapter 3.2 describes the chosen parameters and assumptions for the three scenarios.

3.1 Methodology and data

This study defines the extractive sector as those industries involved in finding and removing natural resources from the earth's crust to process them to primary mineral and energy commodities. Overall, this study comprises 37 different mineral and energy commodities. All of those have different production and value chains. First processing and refining stages are often done by the same company. This makes a clear separation of mining and processing a difficult challenge. Therefore, this study comprises all processing stages up to the tradable commodity such as copper cathodes. For Mozambique and Ghana the aluminium smelters have not been included in the calculations as both basically process imported bauxite. Furthermore, secondary production and solar salt production are not treated.

Production

Production is defined as the sum of all mineral and energy commodities produced in a respective country. For describing the total future production (Q) future projects (NQ) has been added to the current production level (CQ) up to 2015. As mining projects have a lead time of 3 to 10 years, the range of possible production levels up to 2015 has been determined by today's information on new projects. Exploration projects have been classified in five categories: grassroots, pre-feasibility, feasibility, construction and extensions of existing mines. Many mining projects do not get realized or the start of production is delayed due to decreasing world market prices and complications with respect to infrastructure or equipment. In the three scenarios, different probability factors on the realization of these projects have been used.

$$Q_{i,t} = CQ_i + Q_{i,t-1}(1+a) + NQ_{i,t}b$$

Q = Production
CQ = Current production level

a = Parameter for the development of the general production level

NQ = New production projects

b = Parameter for the realization of future projects

i = Subscript for the respective mineral commodity

t = Subscript for the respective year

The current production data comes basically from the BGR database. It assembles data from BGR own sources, international organizations such as the World Bureau of Metal Statistics, and also other national geological surveys. As especially precious metals and stones can be easily smuggled, there is a considerable range of uncertainty in these statistics.

The information on new projects bases on the BGR digital archive of articles covering relevant metal magazines and journals and the internet as well as on data from the Raw Materials Data Base. These data have been assessed by BGR country experts. Unfortunately, there is no systematic data available when existing mines will have to close due to a lack of resources. Therefore, continuous plant extensions are not covered by our data as they are often used to keep the current production level stable.

Gross revenues

Gross revenues are defined as the total revenues from the sale of all mineral and energy commodities that are produced in a country. To compute these gross revenues, transportation costs had to be subtracted from world market prices. World market prices are either in f.o.b. or c.i.f. F.o.b. means “free on board” and implies that the producer delivers the product for free to a given point of sale, normally on board of a ship in a harbor of the producer country. Therefore, the freight costs from the producer country to the consumer country are paid for by the purchaser. C.i.f. stands for “cost, insurance, freight” and implies that costs such as customs, documentation, freight and insurance to the designated place, normally a consumer country, are paid by the seller.

In the case of f.o.b. prices the transport costs to the point of sale such as the harbor have been subtracted from the world market price. This is especially important for the case study on Zambia. As it is a land locked country, copper and cobalt have to be transported to the coast on train. To compute gross revenues from c.i.f. world market prices, freight costs to the consumer country have been deducted.

$$R_{i,t} = P_{i,t}Q_{i,t} - F_iQ_{i,t} - RC_iQ_{i,t} - TC_iQ_{i,t}$$

$$F_i = D \cdot SF_i$$

R = Gross revenues

P = Commodity price

RC = Refining charge (where applicable)

TC = Treatment charge (where applicable)

F = Freight costs (where applicable)

D = Distance (where applicable)

SF = Commodity and mean of transport specific freight costs per mile

T_0 = Parameter to shift the timeline of the curve

α = Parameter to control the acceleration of the curve

Future prices for scenario 2 and 3 have been calculated on the basis of a logistic sigmoid function.

$$P_{i,t} = P_{i,2007} + (P_{i,2007} - P_{i,2015})(1 - \frac{1}{1 + e^{-\alpha(t-2007-T_0)}})$$

T_0 = Parameter to shift the timeline of the curve

α = Parameter to control the acceleration of the curve

The price data is from the BGR-price database which includes data from Metal Bulletin and Industrial Minerals, Verein der Kohleimporteure e.V. and others. The prices are yearly average prices of monthly average prices. For this study, these prices have been computed to constant 2007 US-$ using the US-consumer price index and exchange rates from the Deutsche Bundesbank. Prices for long term contracts were not available but may be significantly lower than peak prices. Freight costs have been calculated based on rules of thumb from Wellmer et al.[19]

Government revenues

This study defines government revenues as all direct government intakes from the extractive sector including royalties, corporate income tax and free carried interests. They are by far the most important contributors to government revenues in the extractive sector.[20] It does not include indirect taxes and taxes levied on others as it is hard to retrieve the necessary data to compute e.g. personal income taxes, license fees, VAT, withholding taxes, and other local duties. As these indirect taxes are a component of operating expenses, they are also not visible in the financial statements of the respective companies. All government revenues are computed in constant 2007 US-$ prices.

$$T = \sum_{i=1}^{I} \sum_{t=2008}^{2015} R_{i,t} Rr_i + R_{i,t} \Pr_t Cr + R_{i,t} \Pr_t DPFr_i + R_{i,t} Wr_i$$

T = Total tax revenues for a given country

Rr = Royalty rate

Cr = Corporate income tax rate

Wr = Windfall profits tax rate (where applicable)

Fr = Rate of free carried interest (where applicable)

DP = Share of dividend payments (where applicable)

Pr = Share of taxable income from gross revenues

[19] Wellmer/Dalheimer/Wagner, 2008, 107-111.

[20] Compare e.g. Australian government revenues from the extractive sector: Minerals Council of Australia, 2008, 33.

Tax rates have been taken from the respective tax codes as well as from different journal articles and information provided by the World Bank and the IMF. We have computed the corporate income tax on the basis of nominal tax rates, if not otherwise stated. Unfortunately, there is a lack of transparency with regard to individual production and tax agreements between government and mining and oil companies. As these agreements are not freely available, it is hard to estimate the effective tax rate. The nominal tax rate might deviate widely from the effective tax rate applied because of special agreements between governments and companies with respect to depreciation, loss carryforward, ring fencing. Ineffective tax collection and administration are other reasons. To show the magnitude of these effects, we have also computed the corporate income tax on the basis of national effective tax rates from the "Paying Taxes 2008" report by the World Bank and PricewaterhouseCoopers. Unfortunately, these effective tax rates base on normal business and are not specific for the extractive sector. [21] Furthermore, we have used the world average effective corporate income tax rate for mining companies as a comparison. This rate has been derived from the PricewaterhouseCoopers mining survey.[22] This survey analyses the operations of the top 40 mining companies.

The share of taxable income has also been derived from the PricewaterhouseCoopers mining survey. In 2007, the average share of taxable income (Pr_{2007}) was 36 per cent. In scenario 2 and 3 the share of taxable income develops on the basis of a logistic sigmoid function in parallel to world market prices down to 6.3 per cent. This was the rate in 2002 before the recent price hike.

$$\mathrm{Pr}_t = \mathrm{Pr}_{2007} + (\mathrm{Pr}_{2007} - \mathrm{Pr}_{2015})(1 - \frac{1}{1 + e^{-\alpha(t-2007-T_0)}})$$

T_0 = Parameter to shift the timeline of the curve
α = Parameter to control the acceleration of the curve
Pr_{2007} = 0.36
Pr_{2015} = 0.63

[21] PricewaterhouseCoopers / World Bank, 2008.
[22] PricewaterhouseCoopers, 2008.

MDG costing

The MDG costing describes the funds needed to achieve the MDGs by 2015. There is no broadly accepted sharp definition of what should be included in a costing and which spending should be counted as relevant for achieving the MDGs. The estimates are meant to give guidance on the overall volume of aid that will be needed to achieve the goals, but they should not be confused with the detailed costing that will have to be done on the country level.

The UN Millennium Project has done a MDG costing for Ghana and four other developing countries.[23] Based on this methodology the University of Zambia in Lusaka has computed the MDG costs for Zambia.[24] Unfortunately, there are no such costings available for Mozambique and Namibia. To estimate their MDG costs, this study has compared key indicators of the respective countries with those of the five case study countries from the report of the UN Millennium Project. We have assigned the per capita costs for each indicator to the akin indicator of the case study. The per capita costs were computed into 2007 US-$ and summed up for all sectors over the period from 2008 to 2015. Similar to the UN Millennium Project, we assume that the annual costs increase over time due to the need for building capacities to absorb the financial inflows. Underlying these estimates is the assumption that the scaling up of investment goes hand in hand with optimizing current public expenditures using best practices.

After computing the total costs, we have subtracted the contributions from private household similar to the UN Millennium Project. The UN Millenniums Project then deducts those inflows of ODA that are directly spent on the MDGs, but there are others who argue that all ODA is MDG relevant including debt relief, money for refugees etc. We take a medium position and subtract the country programmable aid (CPA) from bilateral and multilateral donors to gain the financial gap that has to be filled by the government. The CPA excludes debt relief, humanitarian aid, NGO administrative funding, imputed students and in donor refugee costs. This index also stresses the predictability of aid inflows to finance capital investments and operational costs.[25] All costs are in 2007 US-$ prices.

$$MDG = \sum_{t=2008}^{2015} SPCC_t N_t - PPCHC_t N_t - CPA_t$$

MDG = Total MDG financing gap that needs to be covered by government expenditures.
SPCC = Sectoral per capita costs for achieving the MDGs
N = Population
PPCHC = Private per capita household contributions to financing the MDGs
CPA = Country programmable aid

[23] United Nations Millennium Project, 2005.
[24] Mphuka, 2005.
[25] OECD, 2008.

3.2 Baseline scenarios

To illustrate the variety of different future outcomes this study works with three baseline scenarios. In general, results for all scenarios are in 2007 US-$ prices unless otherwise noted.

Scenario 1: Extended cycle

In scenario 1 it is assumed that the demand from China and other emerging economies stays high whereas supply problems keep world commodity prices at the 2007 level up until 2015. In this scenario no major world economic turndown would happen. It also presumes that the production of existing projects increases by 5 per cent per year from 2007 production levels. At the same time, 100 per cent of new projects scheduled up until 2010 and 120 per cent of the new production scheduled up until 2015 can be realized. In this scenario, the share of taxable income stays at 36 per cent until 2015.

Scenario 2: Sudden end of the commodity boom

In scenario 2 a strong world wide recession due to the US subprime crisis and a slow down of economic activity in China and other emerging economies leads world market prices to plump from the 2007 price level to their 1997-2007 average in 2011. Afterwards it is assumed that they keep stable on this low level until 2015. At the same time, the production from existing projects decreases by 5 per cent a year from 2007 levels and only 60 per cent of new projects until 2010 and 30 per cent of the projects until 2015 get realized. The share of taxable income decreases rapidly from 36 per cent in 2007 to 8.5 per cent in 2011 and further to 6.3 per cent in 2015.

Scenario 3: Smooth slow down of the commodity boom

In scenario 3 the world economy slows down but the demand from China and other emerging countries stays high. At the same time, world supply of mineral and energy commodities catches up slowly. Therefore, world market prices would slow down smoothly until 2015. They decrease to their average level from 1997-2007 in 2015. The existing production will continue unchanged from 2007 levels to 2015. 80 per cent of new projects until 2010 as well as 70 per cent of projects until 2015 get realized. The share of taxable income is assumed to decrease smoothly from 36 per cent in 2007 to little more than 20 per cent in 2011 and finally to 6.3 per cent in 2015.

4. Namibia

4.1 Overview

Namibia's extractive sector consists mainly of diamond and increasingly of uranium mining. The country, situated in southwestern Africa, is the second least densely populated country in the world with a population of little more than 2 million people. Namibia, a presidential representative democratic republic, is among the most stable countries in Africa. After independence from South-Africa in 1990, President Sam Nujoma governed the country until 2005 when President Hifikepunye Pohamba took over.

Total population (millions):	2.1
Surface area (km^2):	824,292
GDP per capita (PPP US-$):	8,142
GDP growth (annual %):	4.6
Human Development Index (Rank 1 - 177):	125
Life expectancy at birth (years):	51.5
Population below PPP US-$1 per day (%)	34.9
Net enrolment ratio in primary education (% both sexes):	71.6

Table 2: Basic indicators for Namibia. (Source: UNDP, 2007e)

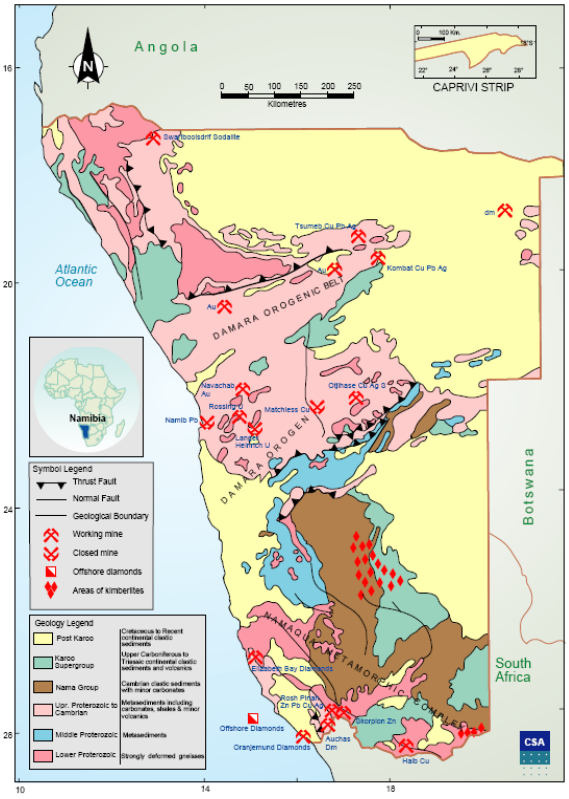
Namibia's economy is closely linked to South Africa, with the Namibian dollar pegged to the South African rand. Namdeb Diamond Corporation, the major diamond producer and accounting for about 10 per cent of Namibia's GDP, is a joint venture between De Beers and the Government of Namibia. The country has experienced about 5 per cent growth of GDP per year during the last five years. There is a well-developed transportation, communications, power and water infrastructure. The high per capita GDP relative to the region masks the high inequality of income distribution with half of the population living from subsistence agriculture.

4.2 Geological potential

Namibia's geology has an important potential for further mineral exploration. About 46 per cent of the country's surface has a bedrock exposure with Proterozoic rocks (older than 542 million years). These divide the country into three geological areas. In the north is the highly prospective Damara belt (1,000 to 500 million years). It hosts a majority of mineral occurrences including copper, lead, zinc, iron ore, gold, tin, and uranium. The Namaqua Belt in the south (1,600 to 1,000 million years) contains also a variety of prospective environments for copper, gold, lead, zinc, tantalum, and world class deposits for diamonds. Sedimentary rocks of the Neoproterozoic Nama group (570-510 million years) in Southern Namibia have only little

potential for mining. The Dwyka formation (Perm: 299 to 251 million years old) hosts coal deposits including 350 million tons of metallurgical coal resources. Some minor gas and oil resources are found on- and offshore. Unconsolidated sands and young near-surface sediments of the Kalahari and Namib deserts cover much of the East and North of the country. In this area the potential for major mineral occurrences is still undefined but advanced geophysical surveys might lead to the discovery of mineral resources.[26]

Diamond deposits are onshore and offshore in the south of the country with an estimated reserve of over 1.5 billion carats. These diamonds were originally sourced from mainly Paleozoic kimberlites (250-550 million years ago) in South Africa. Diamond deposition at river terraces and the mouth of the "Proto"-Orange River peaked in the Late Eozaen (55-33 million years ago). Today, these deposits are situated along the south western and western coast of Namibia and in marine offshore deposits.[27]



Map 2: Geology of Namibia. (Source: ESIPP/SADC/EC, 2006b, 15)

[26] ESIPP/SADC/EC, 2006b, 6-8.
[27] MBendi, 2008, 1.

Mineral commodity	Unit	Reserves	Reserve base
Copper	t cont.	494,000	
Diamonds	ct	1,500,000,000	
Fluorite	t CaF_2	3,000,000	5,000,000
Gold	t cont.	46	137 (Resources)
Lead	t cont.	353,000	
Manganese ore	t	600,000	
Natural gas	m^3	23,000,000,000	30,000,000,000
Uranium	t (<USG 130/kg) U_3O_8	275,000	
Oil	t	20,000,000	40,000,000 (Resources)

Table 3: Reserves and reserve base of mineral raw materials in Namibia. (Sources: Diamonds: Mbendi, 2008; gold: Raw Materials Group, 2008; uranium: OECD/NEA, 2008; others: BGR database and USGS)

There is a significant potential for identifying and developing new projects in gold, copper, zinc, uranium, diamonds and dimension stones. Especially the north-west of the country is virtually unexplored. Overall, only 49 per cent of the country (403,000 km^2) is mapped in detail (>1:250,000). The considerable potential of marine deposits of diamonds has resulted in rapid advances in marine diamond extraction technology as onshore reserves are gradually depleted. Exploration for primary kimberlites is restricted to north eastern Namibia, near the Angolan and Botswana borders, where several foreign Australian and Canadian junior firms are active.[28] Further potential exists for the discovery of new gold deposits. Dozens of copper-lead-zinc deposits are also under assessment. Uranium exploration is in full swing, so that current reserves of 275,000 t (calculated at <130 US-$/kg) might be expanded significantly in the upcoming years. Overall, the country possesses a wealth of different minerals and offers potential for further exploration.

4.3 Namibia's extractive sector and future projects

The mining sector experienced a decline in the 1990s with a few ventures closing due to low mineral commodity prices. However, since the price boom on commodity world markets, Namibia has gained a lot of attention and a bulk of exploration projects focus on diamonds, uranium, base metals, and gold. The mining sector has basically driven Namibia's high annual

[28] MBendi, 2008, 1.

growth rates in recent years. Overall, mining accounts directly for approximately 10 per cent of GDP and 27 per cent of exports where of 70 per cent comes from diamonds.[29]

Overall, the country was the world's seventh-largest producer of diamonds by value in 2005. Cutting and polishing of diamonds also contribute to economic activity. NamDeb, a 50/50 joint venture between the government and De Beers, is the by far most important diamond producer. The government and De Beers have also agreed to extend diamond mining into diamond marketing with the establishment of another 50/50 joint venture, Namibia Trading Company, responsible for the valuing, sorting, selling and marketing of Namdeb's diamond production. The goal is to boost the local cutting and polishing industry by increasing the share of diamonds destined for local sales.[30] Other important diamond producers are Samicor (Pty) Ltd. and Diamond Fields Namibia (Pty) Ltd. About 7,400 people are employed in the diamond industry.[31]

Namibia was the sixth ranked producer of uranium by producing about 8 per cent of the world's uranium supply in 2006.[32] The Rössing uranium mine currently produces alone about 7.7 per cent of world's uranium. It also accounts for 10 per cent of Namibia's total exports. Rössing is part of the Rio Tinto group, which holds 68.6 per cent of Rössing's equity. Earlier this decade, Rio Tinto planned to close the mine by 2009 but positive exploration results and continued favorable uranium market conditions allowed to extend the mine's life to at least 2021.[33]

Paladin Resources Ltd. has started mining calcrete-hosted uranium at its Langer Heinrich uranium deposit in 2007. The company expects to ramp up production to an annual production of 1,680 tons of uranium.[34]

The production of other minerals has also increased in the last years. In 2006, manganese ore production was raised by 58 per cent, which was attributable to the expansion of production at the reopened Purity mine. In the Tsumeb area two new copper mines have opened although there was an overall decline in copper output due to instability during the transition of ownership from Ongopolo mining to Weatherly International. Furthermore, the Skorpion zinc mine started full production, while the Okorusu fluorspar and the Navachab gold mine continued production.

In the period up to 2015 different projects are expected to boost the sector. In uranium mining a major expansion of the Rössing mine is expected in 2009. There are eight different projects at prefeasibility status of which Marenica, Goanikontes, Tubas and Valencia have already scheduled to start production around 2011. Also the Trekkopje mine of the French company Areva will start production within the upcoming years. Overall, these projects could add more

[29] AfDB/ OECD, 2007, 408.
[30] Afrol News, 2008, 1.
[31] AfDB/ OECD, 2007, 409.
[32] USGS, 2008, 1.
[33] USGS, 2008, 2.
[34] Paladin Energy, 2008, 1.

than 16,000 tons of annual uranium production up to 2015. There are also some projects at feasibility status in diamond mining and offshore expansion will continue. Nevertheless, diamond production is expected to stay stable over the next years as onshore deposits run out. Several projects are at prefeasibility status in gold mining, manganese ore, zinc, lead, and copper. Also the four existing copper mines have announced major expansions of their production in 2008.

With regard to hydrocarbons Tullow Oil currently develops the gas field of Kudu. The gas is planed to be transported to an 800 MW power station close to Oranjemund[35] but loggings have so far been disappointing. Natural gas production has therefore not been included in the future production prospects. Nevertheless, Namibia will see further exploration as the Russian firm Sintezneftegaz is expected to drill in the Kunene-1 field.[36]

Mineral commodity	Unit	1985	1995	2000	2003	2005	2006	2007
Copper (Blister)	t cont.	43,500	22,530	5,070	16,175	10,156	6,262	5,800
Diamonds (Jewelry & Industry)	Ct (1,000)	940	1,382	1,552	1,481	1,902	2,356	2,000 est.
Fluorspar (CaF_2 acid grade)	t (1,000)	3 (1988)	34	66	79	115	132	130 est.
Gold	t cont.	0.2	1.9	2.4	2.1	3	2.7	2.5
Lead (ore)	t cont.	48,600	16,084	9,797	16,122	14,320	11,830	11,000
Lead (refined)	t cont.	38,500	26,752	0	0	0	0	0
Manganese ore	t		98,385	0	0	7,320	18,918	52,500
Silver	t cont.	112	66	17	29.4	34	31.3	8
Uranium	t	3,400	2,016	3,201	2,401	3,711	3,617	3,800 est.
Zinc (ore)	t cont.	31,200	30,209	32,937	10,616	0	0	20,300
Zinc (refined)	t cont.	0	0	0	47,436	132,818	129,897	150,080

Table 4: Namibia's mineral production. (Source: BGR database)

A major constraint to the development of the extractive industry is the lack of water resources as the Namibian climate is among the driest in the world. Furthermore, the availability of fuel and electric power are important bottlenecks.[37]

[35] AfDB/ OECD, 2007, 410.
[36] Nickle/Writer, 2008, 30.
[37] USGS, 2008, 2.

4.4 Mining taxation and current government revenues from the extractive sector

Namibia's mining industry is regulated by the Minerals Prospecting and Mining Act from 1992 and the Diamond Act from 1999.[38] In 2003 the government completed a new minerals policy which aims at a sustainable development of the sector and the promotion of value added production.[39] It also announced new impositions on royalty rates and application. After consultations between the mining industry and the government the royalty schedule has become effective in 2007. The following royalties have been imposed: A 3 per cent royalty is levied on the market value of base, precious and rare metals as well as nuclear mineral fuels. A 2 per cent royalty has to be paid on industrial minerals, semi precious stones, and nonnuclear mineral fuels.

Format	National Law
Royalty type	Ad valorem, gross revenues on market value with some unclear reductions/ subject to license terms
Royalty rate	Precious metals: 3%, Base and rare metals: 3%, Semi precious stones: 2%, Industrial minerals: 2%, Nuclear fuel minerals: 3% Non nuclear fuel minerals: 2% Uncut precious stones 10%,
Deferment/Reduction	Yes
Corporate Income tax	Diamond mining companies: 55% Other mining companies: 37.5%
Capital deduction – loss carryforward	Expensing of prospecting/exploration costs in the first year of production; three-year accelerated write-off of development costs, with unlimited carry-forward; no ring-fencing.
Free carried Interest/ Government shares	50% government share in Namdeb Diamond Corporation (Pty) Limited which owns 30% of De Beers Marine Namibia (Pty) Limited
Others	10% withholding tax on dividends

Table 5: Overview of Namibia's mining tax regime.

The exact market valuation for computing the royalties is not clear. According to the Namibian Chamber of Mine the market value is defined by gross revenues at a reduced level.[40] In the Minerals Act from 1992 the market value is either defined by an agreed definition in the license agreement or alternatively by the arm's length sales amount less other costs allowed by the Minister. The Minister might also allow a whole or partial remittance, deferment and refunding of

[38] Government of the Republic of Namibia, 1992 and 1999.
[39] Government of the Republic of Namibia, 2003.
[40] Chamber of Mine of Namibia, 2007, 4-5.

the royalties.[41] The rates of the corporate income tax are 55 per cent for diamond mining companies and 37.5 per cent for all other mining companies. In spite of the high nominal income tax rate, mining companies in Namibia receive many tax benefits.[42]

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08 budget
Diamond mining - Corporate Income tax in million current US-$	64	89	110	23	47	31	53	37
Diamond mining - Royalties in million current US-$	35	33	46	40	60	63	71	40
Other Mining Corporate Income tax in million current US-$	5	12	27	0	1	0	52	51
Other mining royalties in million current US-$	0	0	0	0	0	0	0	34
Total in million current US-$	**104**	**134**	**183**	**63**	**108**	**95**	**175**	**162**

Table 6: Government revenues from the extractive sector in Namibia. (Own calculations based on data from Chamber of Mines of Namibia, 2007, 78-9. Annual average exchange rates have been used though data is for a fiscal year that runs from 01 April to 31 March.)

Tax revenues from the extractive sector have varied significantly in the past years because they depend heavily on diamond operations. While tax revenues from diamonds have never fallen below 6 per cent of total tax revenue and averages approximately 8 per cent of total revenue, non-diamond mining has only accounted for an annual average of 1 per cent of tax revenue over the past ten years. This mainly reflects a tax formula applied in 1992, whereby the higher the rate of profit, the higher the rate of tax. However, this formula was open to abuse, and it failed to deliver a significant amount of tax revenues to the treasury. Even after the introduction of a new flat tax rate in 2000, the non-diamond sector's contribution to fiscal revenues has remained relatively modest.[43] These companies have not paid any royalties and nearly no corporate income tax in the past years.

4.5 Scenarios for potential government revenues

Based on the assumption explained in Chapter 3.2 the following results have been quantified for potential government revenues from Namibia's extractive sector. The major factor driving these estimations is the increase in uranium production.

[41] Section 114 and 116, Part XVI, Minerals (Prospecting and Mining) Act No. 33 of 1992. Government of the Republic of Namibia, 1992, 164-66.

[42] Foreign Investment Advisory Service, 2006, 47-8.

[43] AfDB/OECD, 2007, 408.

In scenario 1 (blue line) with continuously high prices the government revenues would climb up to nearly 700 million US-$ per year in 2011 under the assumption that a corporate income tax rate of 37.5 and 55 (diamonds) per cent is respectively levied. In the case of the world average effective corporate income tax rate on mining of 28 per cent, it still goes up to over 500 million US-$ per year in 2011. Applying the average Namibian effective corporate income tax rate for all businesses of 18.5 per cent, the total government revenues sum up to more than 400 million US-$ a year from 2011.

In scenario 2 (red line), the government revenues decrease to little above 100 million US-$ per year in 2015 for all different corporate income tax rates as profits slow down sharply. In scenario 3 (green line), potential government revenues could increase to above 480 million US-$ per year peaking in 2011 and then slow down to less than 150 million US-$ per year in 2015 at a corporate income tax rate of 37.5 per cent (55 per cent for diamonds industry) as additional production does not outweigh decreasing prices.

Two main risks exist to this outlook. Since Namibia remains overwhelmingly reliant on uranium production, an unexpectedly large drop in world prices or complications in ramping up production could weaken growth prospects significantly. Also, a prolonged shortfall in electric power would constrain the expected government revenues from the extractive sector. There is also no gas or oil production included in our projects as it is highly unlikely that production starts before 2015.

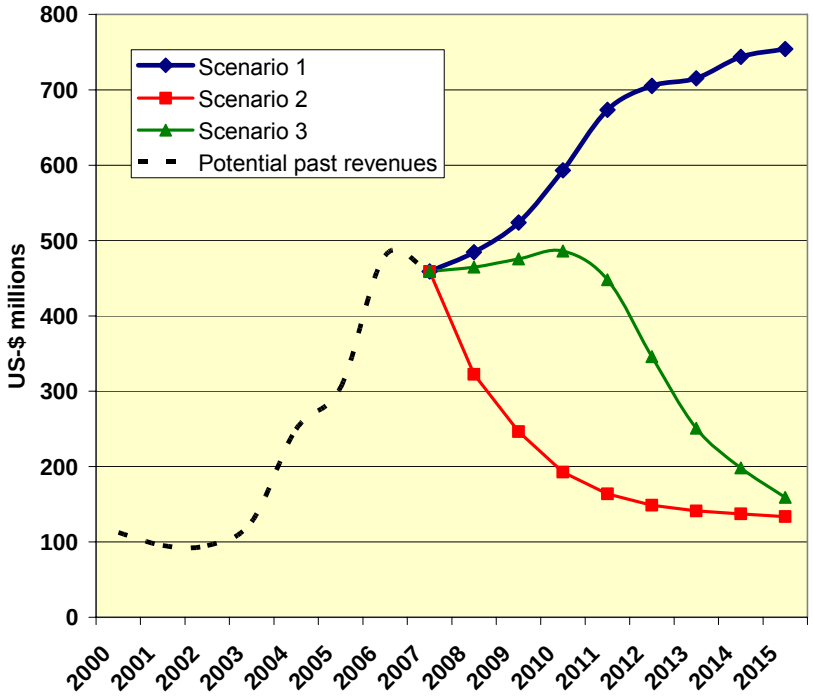


Figure 4: Scenarios for potential government revenues from the extractive sector in Namibia. (in 2007 US-$) (Source: Own calculations)

4.6 Financial gap in achieving the Millennium Development Goals

Namibia fares well in regional comparisons on good governance, macroeconomic stability and openness, and physical infrastructure. According to UNDP the country may even be classified as a middle-income country. At the same time, the distribution of wealth is among the most unequal in the world. The Gini coefficient, which measures income inequality, is of 0.6 and among the most unbalanced in the world. Poverty and food insecurity are widespread, especially in the northern rural regions. Human development has been rolled back due to a severe HIV/AIDS epidemic with prevalence averaging 19.7 per cent (2004). This has contributed to reducing life expectancy at birth from 53.9 years at the beginning of the 1970s to 51.5 years in 2006.[44]

Our estimations for per capita costs for achieving the MDGs start at 113 US-$ in 2008 and climb up to 181 US-$ (all data in 2007 US-$) by 2015. Major costs are in the health sector, education and energy provision. It totals up to 2.5 billion US-$ for the period 2008-2015 as Namibia's population is quite low with little more than 2 million people. At the same time, it is assumed that private household contributions could finance about 250 million US-$ for the period 2008 to 2015. Country programmable aid could reach over 2 billion US-$ for the period 2008-2015. Thus, the finance gap that has to be covered by the government is relatively low at about 240 million US-$ for the period of 2008-2015.

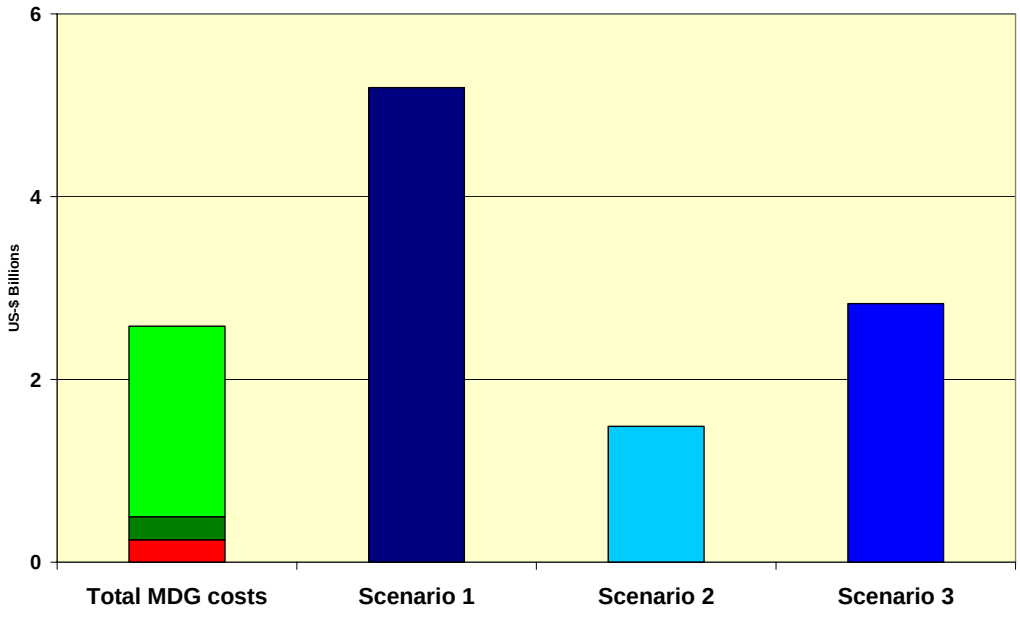


Figure 5: Total potential government revenues from the extractive sector (blue) and estimated MDG finance gap (red) in Namibia for the period from 2008 to 2015. (in 2007 US-$) (Notes: Total MDG finance gap (red) = Total estimated MDG costs – OECD-Country Programmable Aid (light green) – estimated private household contributions (dark green) = Total finance gap to be covered by domestic resource mobilization (red)). (Source: Own calculations)

[44] AfDB/OECD, 2007, 407; UNDP, 2007e.

4.7 Summary

To conclude, per capita MDG costs are quite low in Namibia whereas the inflows from development aid are quite high. Diamond mining contributes clearly to most of the government revenues, uranium and zinc mining could each generate extra government revenues of over 300 million US-$ up to 2015. Environmental standards, especially for uranium mining, are important for a sustainable development of this sector. Overall, potential revenues could outweigh the MDG gap to be filled by the government in all three scenarios.

5. Ghana

5.1 Overview

Ghana has a long history of gold mining. The West African country was the first African country south of the Sahara to achieve independence in 1957. After a series of successions of military and civilian governments, Ghana has been under a stable democracy since 1992.

Total population (millions):	23.5
Surface area (km²):	238,533
GDP per capita (PPP US-$):	2,660
GDP growth (annual %):	6.2
Human Development Index (Rank 1 - 177):	136
Life expectancy at birth (years):	58.5
Population below PPP US-$1 per day (%):	44.8

Table 7: Basic indicators for Ghana. (Source: UNDP, 2007c)

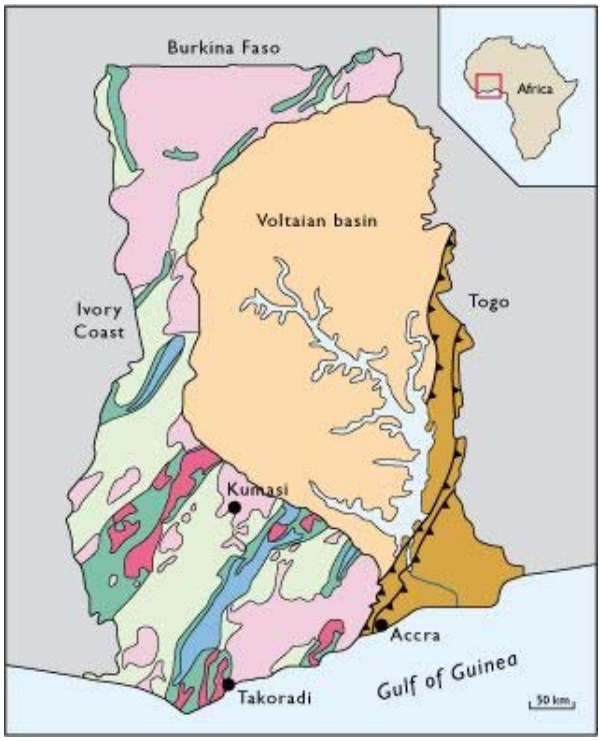
The country is well endowed with natural resources such as gold, bauxite, manganese, diamonds, oil and fertile soils for mainly cocoa plantations. Ghana has roughly twice the per capita output of the poorest countries in West Africa with gold and cocoa production as major sources of foreign exchange. The domestic economy is revolving around agriculture, which accounts for about 35 per cent of the GDP and employs about 55 per cent of the work force, mainly small landholders. Being in crisis in the 1970s and 1980s, sound macro-economic management along with high prices for gold and cocoa helped to sustain the GDP growth at about 5.5 to 6 per cent since 2000. Poverty levels have declined from 39.5 per cent in 1999 to around 28.5 per cent in 2006. Ghana is number 136 on the Human Development Index and it aims to achieve middle income country status by 2015.[45]

5.2 Geological potential

The country has a high geological potential as it abounds in large deposits of gold, diamonds, bauxite and manganese ore. It is characterized by Paleoproterozoic Birimian rocks (2,300-2,000 million years) in the west and south of the country. In these areas, gold, bauxite and manganese occur mainly in the transition zones between volcanic belts and the intervening sedimentary basins. Diamonds are also found in placers in the south of the country, typically in greenstone belts. In the south-eastern part of the country the Neoproterozoic (630 - 1,000 million years) Dahomeyan Mobile Belt has a good potential for a variety of further deposits

[45] UNDP, 2008, 1.

of these minerals. In the eastern and central parts of Ghana lie Proterozoic (older than 542 million years) clastic sedimentary rocks forming the Voltaian Supergroup, which is poor of notable mineral occurrences. Ghana possesses significant oil and natural gas reserves in the Cretaceous offshore formations. There are no known coal or uranium resources.



Map 3: Geology of Ghana. (Source: Government of Ghana)

Ghana is underexplored in comparison to other gold mining countries such as Canada or Australia. The most current geological map dates back to the 1950s, although a new map is due to be published in 2009 through a cooperation project between the Ghana Geological Survey Department and the German Federal Institute for Geosciences and Natural Resources. Under the EU-financed Mining Sector Support Programme (MSSP) the remaining one-third of the surface of Ghana which was not covered by airborne geophysical survey has been surveyed. This gives the country a total Airborne Geophysical Survey (Magnetics and Radiometrics) coverage. In addition to these, geological mapping has been done in some selected areas of the country.[46]

Several local and foreign companies are engaged in exploration.[47] Especially the northern part of the Paleoproterozoic rocks and the Mobile Belt at the eastern frontier to Togo are insufficiently explored but hold potential for additional, large gold reserves. Considerable bauxite resources exist in Paleoproterozoic rocks of the Nyinahin and Kibi areas in the south-west of Ghana.

[46] Mining Journal, 2006, 4; and Minerals Commission, Govt. of Ghana, personnel communication.
[47] Mining Journal, 2006, 4.

Furthermore, there are major exploration activities by Canadian, US-American and British firms looking for further oil and gas occurrences in the offshore area.

Mineral commodity	Unit	Reserve	Reserve base
Bauxite	t	15,000,000	
Diamonds	ct	11,000,000	
Gold	t cont.	1,568	2,999 (Resources)
Manganese ore	t	5,250,000	
Natural gas	Bio m^3	23	30 (Resources)
Oil	t	20,000,000	40,000,000 (Resources)

Table 8: Reserves and reserve base of mineral raw materials in Ghana. (Sources: Bauxite and Diamonds: Minerals Commission of Ghana, 2008; Gold: Raw Materials Group; Others: BGR database and USGS)

5.3 Ghana's extractive sector and future production

The extractive sector is dominated by mining of solid minerals such as gold, bauxite, and manganese. In the 1970s Ghana experienced a breakdown of this sector with substantial losses of production due to low world market prices and a general economic crisis. In the 1980s the government pursued policies to privatize state owned companies, to change the fiscal regime and laws, to legalize small-scale mining, and to establish the Minerals Commission.[48] As a result gold mining experienced significant growth. Annual gold production increased from 9.3 tons in 1985 to 77.3 tons in 2007. Other key minerals have experienced similar upturns.[49] Ghana ranks 10th in terms of world production of gold and is the second largest gold producer in Africa.[50]

Today, 13 large-scale companies are producing gold, diamonds, bauxite and manganese ore, with over 300 registered small scale mining enterprises and 90 mine support service companies. There is also an important artisanal and small scale mining sector[51] with an output of about 2-3 tons of gold per year.

Overall, the mining sector accounts for 6 per cent of the country's GDP, 38 per cent of the exports, and about 11 per cent of the government's fiscal revenues. Gold production accounts for about 95 per cent of the total mining exports.[52]

[48] Tsikata, 1997, 9-14.
[49] Mining Journal, 2006, 2-3.
[50] Ghana Chamber of Mines, 2008, 3.
[51] Artisanal and small-scale mining refers to mining by individuals, groups, families or cooperatives with minimal or no mechanisation, often in the informal sector of the market. See Hentschel et al, 2002, 4.
[52] GEITI, 2008, 1.

Mineral commodity	Unit	1985	1995	2000	2003	2005	2006	2007
Aluminium	t cont.	48,500	135,400	137,000	15,909	13,400	75,000	12,900
Arsenic	t	0	4,409	3,000	0	0	0	0
Bauxite	t	124,453	530,389	424,600	646,600	726,000	886,000	748,200
Oil	barrel	0	0	-	72,000	82,450	160,450	189,378
Diamonds (Industry)	ct	568,600	505,000	549,241	180,000	213,000	190,000	200,000 est.
Diamonds (Jewelry)	ct	63,200	126,000	137,310	724,000	850,000 est.	780,000 est.	800,000 est.
Gold	t cont.	9.3	51.33	73.8	70.75	62.1	69.8	77.3
Manganese ore	t	357,270	186,901	895,700	1,509,432	1,719,589	1,500,000	1,049,500

Table 9: Ghana's mineral production. (Source: BGR database)

Current oil production comes from the Offshore Saltpond field with an annual output of about 24,000 tons. It is operated by Saltpond Offshore Producing Company Limited (SOPCL) that is a joint venture between the state owned Ghana National Petroleum Corporation (GNPC) and the US based company Lushann – Eternit. The company plans to increase production from the current 24,000 to 50,000 tons per year.[53]

The Tema Oil Refinery (TOR), the only oil refinery in Ghana has an annual capacity of two million tons per year which meets 80 – 85 per cent of the domestic market. There is a private oil refinery under construction at Takoradi, in the Western Region. Plans for additional refineries are advanced.

Currently there is no natural gas production in the country; however, there are plans to commercialize the associated gas from the Jubilee Field.

In the oil sector, major exploration activities are underway. According to the Managing Director of the state owned Ghana National Petroleum Corporation the Jubilee Field Development is progressing on a fast-track basis, with first oil expected in year 2010.

During Phase I, the production is approximated to about six million tons per year (at 120,000 barrels per day).

Phase II will be carried out between 2010 and 2012 and daily total output is estimated to be about 12 million tons of oil per year (at 250,000 barrels per day). This will be achieved through subsea production facilities.[54]

[53] Ghana National Petroleum Corporation, personnel communication.
[54] Ghana National Petroleum Corporation, personnel communication.

Up to 2015, output is expected to increase basically with respect to gold mining and oil. Several gold mines are under expansion and a couple of projects are at feasibility status. Furthermore, a long list of projects is at prefeasibility status. Most of them, however, will only add to production after 2015. Overall, gold production could expand from currently 70 tons per year to over 100 tons in 2015 in a high price scenario.

A major bottleneck to production increases is the infrastructure for electricity and transportation. Companies do not have to pay utility prices at cost recovery levels, which impedes needed investment in the sector. The government intends to eliminate these subsidies and has started to address the existing energy supply bottlenecks.[55] There are also constraints in the transportation infrastructure. For example, bauxite mining from the Awaso mine suffered from the breakdown of the railway. Thus, ore had to be transported by heavy trucks on a 150-miles-long track to Takoradi harbor. This implies the possibility for higher transportation costs and puts an additional strain on road transportation and the local population.

5.4 Mining taxation and current government revenues from the extractive sector

The overall legislative framework for the mining sector in Ghana is provided, along with the Minerals Commission Law of 1986, by the Minerals and Mining Act, 2006, which replaced the Minerals and Mining Law of 1986, as amended by the Minerals and Mining (Amendment) Act of 1994, and the Small Scale Gold Mining Law of 1989". It is one of the frontrunner countries of the EITI. Overall, it has attracted more than 11 billion US-$ of investment inflows into the sector in the period from 1990-2007.[56]

The overall legislative framework for the mining sector in Ghana is provided by the Minerals and Mining Law of 1986, as amended by the Minerals and Mining (Amendment) Act of 1994, the Minerals Commission Law of 1986, the Small Scale Gold Mining Law of 1989 and the Minerals and Mining Act 2006. Mining companies are liable to pay royalties between 3 and 6 per cent of their gross revenues depending on their profitability.[57] Companies have to pay corporate taxes at a standard rate of 25 per cent of pre tax profits.[58] The government is entitled to a free carried interest of 10 per cent.[59] Furthermore, there is a 10 per cent withholding tax on dividends and on interests.[60] Companies are exempted from custom duties on accessories, equipment, machinery, and plants used for mining operations.

[55] IMF, 2007, 6+10.
[56] GEITI, 2008, 1.
[57] Government of the Republic of Ghana/ Ministry of Finance and Economic Planning , 2006, 17.
[58] Government of the Republic of Ghana/ Ministry of Finance and Economic Planning, 2006, 18. See also IMF, 2008d, 74.
[59] Minerals Commission of Ghana, 2008, 1.
[60] Government of the Republic of Ghana/ Ministry of Finance and Economic Planning, 2006, 19; PricewaterhouseCoopers, 2007.

Tax rates for oil production are negotiable but typically about 35%. Royalty may range between 5-15%. There is also a 10-15 per cent free carried interest and the state plans a 5-10 % participating interest.[61]

According to the GNPC the cumulative government share sums at least 53 % of net oil revenues. The government of Ghana is currently developing a new policy on natural gas and oil resource management including a review of fiscal regime as well as a policy on government revenue management.[62]

Format	National law and negotiated agreements
Royalty type	Ad valorem, gross sales revenues, graduated on operating ratio
Royalty rate	All minerals 3-6% depending on operating ratio, in practice 3%
Deferment/Reduction	No
Corporate Income tax	35% oil production, 25% all others
Capital deduction – loss carryforward	80%, then 50% reducing balance, 5 years
Free carried Interest/ Government shares	Free carried Interest 10%
Others	10% dividend and interests withholding tax, ground rents

Table 10: Overview of Ghana's mining tax regime.

According to the Ghanaian Chamber of Mines, corporate income tax revenues from mining companies summed up to nearly 3 million US-$ and royalties to about 18 million US-$ in 2002. These government revenues increased to 34 million US-$ and 44 million US-$ in 2006 respectively.[63] Most companies have only paid the minimum royalties of 3 per cent even though the gold price was high.[64] The government revenues from corporate income taxes are low due to accelerated depreciation and the carry forward of losses. A report published by the Ministry of Finance and Economic Planning in the framework of EITI states that no capital gains taxes have been recorded for mining companies.[65]

The government has already tried to strengthen the revenue collection by reforming the local tax agencies and by allowing them to retain 3 per cent of revenues to meet their administrative costs.[66] The government is streamlining the royalty regulations to ensure that the appropriate rate of royalty is applied. Ghana is involved in an initiative by the Economic Community of West African States (ECOWAS) to review and consolidate policies on social, environmental, and business practice standards in West Africa's mining industry.[67] Ghana takes also part in an

[61] Ghana National Petroleum Corporation, personnel communication.
[62] Government of the Republic of Ghana, 2008c, 1; Amporfo, 2008, 9-12.
[63] Ghana Chamber of Mines, 2008, 18.
[64] Mukumbira, 2008, 1.
[65] Government of the Republic of Ghana/ Ministry of Finance and Economic Planning, 2006, 4+19.
[66] AfDB/OECD, 2007, 289.
[67] Minerals Commissioin, Govt. of Ghana; personnel communication.

initiative by the Economic Community of West African States (ECOWAS) which has launched a new mining code to implement social, environmental, and business practice standards across the gold mining industry in partnership with Oxfam.[68]

	2000	2001	2002	2003	2004	2005	2006
Royalties (million current US-$)	18	17	18	22	24	26 (26)[1]	34
Corporate income tax (million current US-$)	2	3	3	8	11	30 (11)[1]	44
Total (million current US-$)	21	21	21	30	35	55 (37)[1]	78

Table 11: Government revenues from the extractive sector in Ghana. (Source: Ghana Chamber of Mines, 2008, 18. Notes: [1]Data for comparison provided by the EITI report of the Government of the Republic of Ghana, Ministry of Finance and Economic Planning. (2008a))

The Government has set up a task-force to prepare a master plan for the emerging oil industry. It aims to identify the requisite legal and regulatory framework as well as infrastructure and human resource needs of the new sector.[69] It also plans to design a stabilization fund to insulate the economy from external shocks, specifically the unpredictability of export in cocoa, gold, timber, and petroleum.[70]

5.5 Scenarios for potential government revenues

Based on the assumptions explained in Chapter 3.2 the following results have been quantified for potential government revenues from the extractive sector. The major factor driving these projections is the future oil production.

In the high price scenario (blue), the potential government revenues would raise 4 to 5 fold up to 2011 under the assumption that the oil production would increase to 500,000 barrels a day as stated by the Ghanaian National Petroleum Corporation.

[68] IRIN, 2008, 1-2.

[69] The Bank of Ghana has also closely studied the issue in a Policy Brief. Bank of Ghana, 2007.

[70] Government of the Republic of Ghana, 2008b, 15.

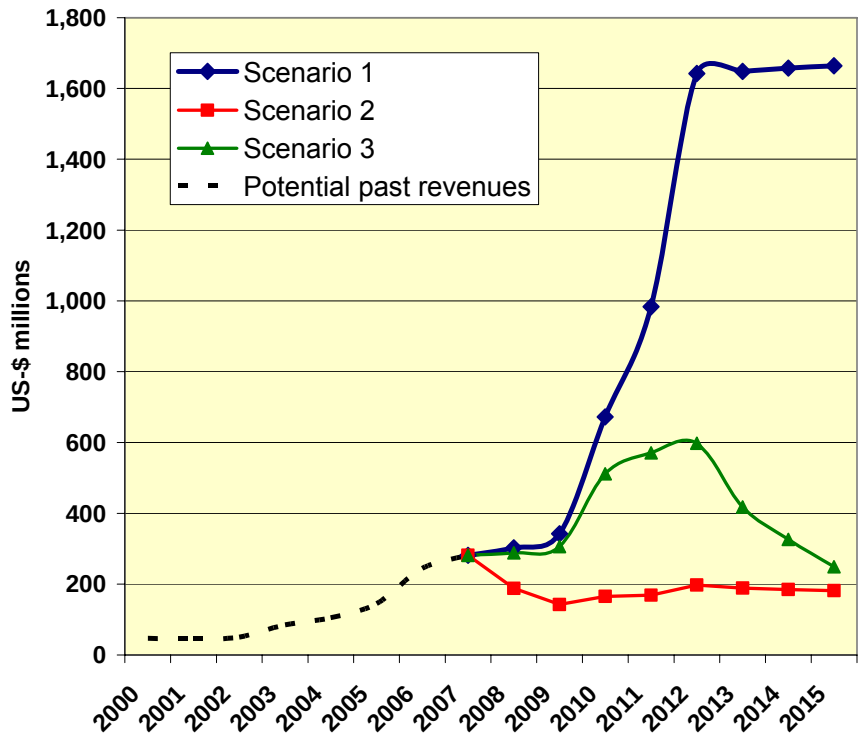


Figure 6: Scenarios for potential government revenues from the extractive sector in Ghana (in 2007 US-$). (Source: Own calculations)

In the medium scenario (Scenario 3, green line) with a smooth decrease of prices, potential government revenues could double up to 600 million US-$ per year in 2012 in the case that the nominal equals the effective corporate income tax rate (35% for oil production and 25% for all others). But even when the average effective tax rate of 18.4 per cent applies, potential government revenues would move up to nearly 500 million US-$ per year in 2012. In the scenario with drastically falling commodity prices (Scenario 2, red line) potential government revenues would plump as oil production does not significantly catch up due to low prices.

Two main risks exist with respect to this outlook. Since the potential government revenues rely overwhelmingly on future oil production, a large drop in world oil price or complications in bringing online the production could weaken growth prospects significantly. A prolonged shortfall of electric power could also constrain the expected government revenues from the gold mining.

5.6 Financial gap in achieving the Millennium Development Goals

According to the MDG-Monitor, Ghana is one of the countries that have made good progress in achieving the Millennium Development Goals since 2000. Its income poverty has declined from 39.5 per cent in 1999 to 28.5 per cent in 2006. The government even aims at achieving middle-income status with an average annual income of 1,000 US-$ per capita.[71] Challenges exist in child health and mortality, maternal mortality, HIV/AIDS, gender equality and worsening income inequalities.

Our estimations for the MDG costs base on the Millennium Development Report from 2005.[72] Ghana was one of the five case study countries for MDG-Costing. Annual per capita costs (all following numbers are in 2007 US-$) develop from estimated 98 US-$ in 2008 to 140 US-$ in 2015. The total MDG costs for the period 2008-2015 could reach over 24 billion US-$ with health and education as the top priority targets. Private household contributions could sum up to 2.9 billion US-$ in this period. Estimated CPA could contribute about 10 billion US-$. Therefore, the gap that has to be covered by the national government is at 11.7 billion US-$ for the period from 2008 to 2015. In a Gleneagles scenario, where donor aid is raised to 85 US-$ per capita, this gap would only sum up to 6 billion for the respective period.

5.7 Summary

The case of Ghana shows that oil and mineral commodities could make a difference for government revenues from the extractive sector. In the high price scenario, government revenues from the extractive sector could alone cover nearly one third of the MDG costs. In the medium scenario, it is still one sixth of the MDG costs. Under the current tax regime, the potential government revenues from the oil sector would make up about 75 per cent of the total government revenues from the extractive sector. In the low price scenario (Scenario 2) it is still 12 per cent and nearly 30 per cent in the medium case scenario. The extraction of oil could alone add 1.6 billion US-$ to government coffers in the period 2008-2015 (medium scenario).This shows that future government action that helps to expand the sector is paramount for increasing revenues.

[71] UNDP, 2008, 1.
[72] UN Millennium Project, 2005.

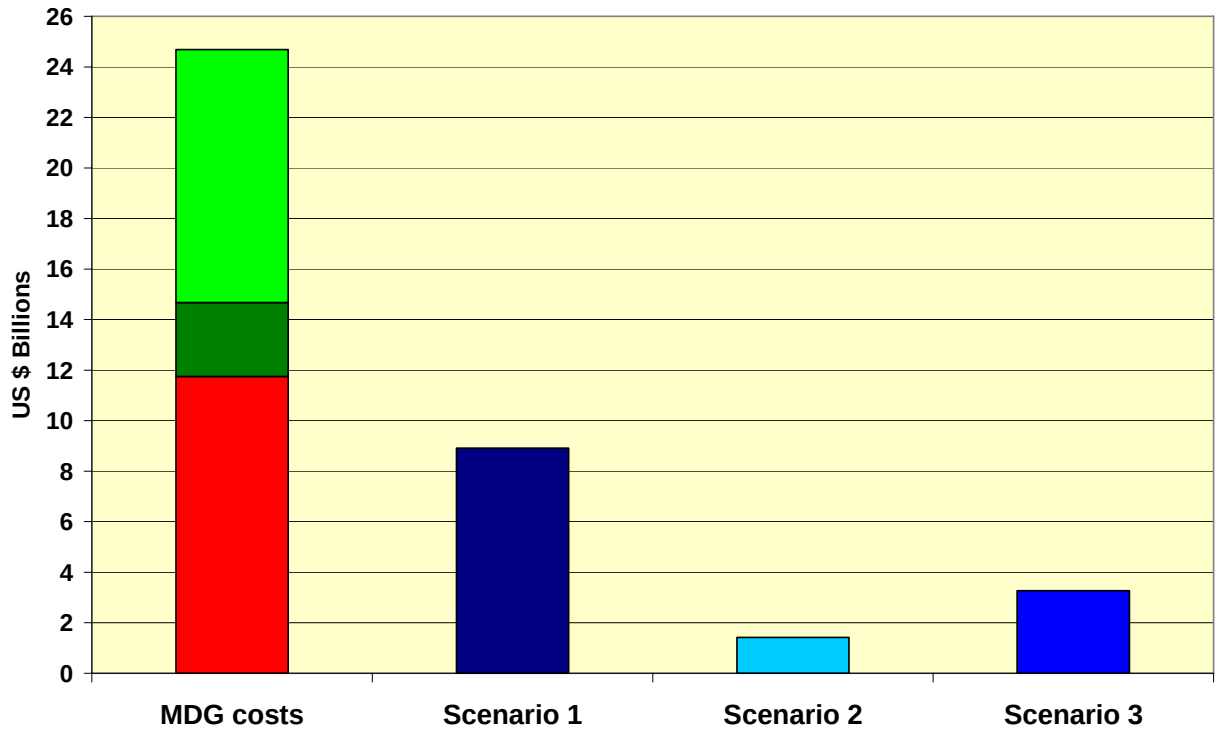


Figure 7: Total potential government revenues from the extractive sector (blue) and estimated MDG finance gap (red) in Ghana for the period from 2008 to 2015 (in 2007 US-$). (Notes: Total MDG finance gap (red) = Total estimated MDG costs – OECD-Country Programmable Aid (light green) – estimated private household contributions (dark green) = Total finance gap to be covered by domestic resource mobilization (red)). (Source: Own calculations)

6. Mozambique

6.1 Overview

Mozambique has not a long record of modern mining due to decades of civil unrest and war until 1992. Since then the country's extractive sector has experienced a steep surge and is expected to develop further in the upcoming years with major products being metallurgical coal, heavy mineral sands, gemstones, natural gas, and tantalum.[73] Overall, the country has seen very strong economic growth in the past decade. Political stability, macroeconomic reforms and donor assistance contributed to 7.5 per cent GDP-growth in 2007. A comprehensive investment program in infrastructure such as roads and railways, ports, storage, energy, and telecommunications is also contributing to improve efficiency and to lower operating costs of businesses. Mozambique has been able to undertake these investments due to strong cooperation with international financial institutions and bilateral partners.[74] Major industrial projects such as the Mozal Aluminium Smelter have increased export earnings significantly.

Nevertheless, Mozambique belongs to the group of Least Developed Countries and is number 168 in the HDI. It remains dependent on foreign assistance for much of its annual budget and the majority of the population lives in poverty.

Total population (millions):	21.4
Surface area (km²):	801,590
GDP per capita (PPP US-$):	1,345
GDP growth (annual %, 2007 est.):	7
Human Development Index (Rank 1 - 177):	168
Life expectancy at birth (years):	44
Population below PPP US-$1 per day (%):	36.2

Table 12: Basic indicators for Mozambique. (Source: UNDP, 2007d)

6.2 Geological potential

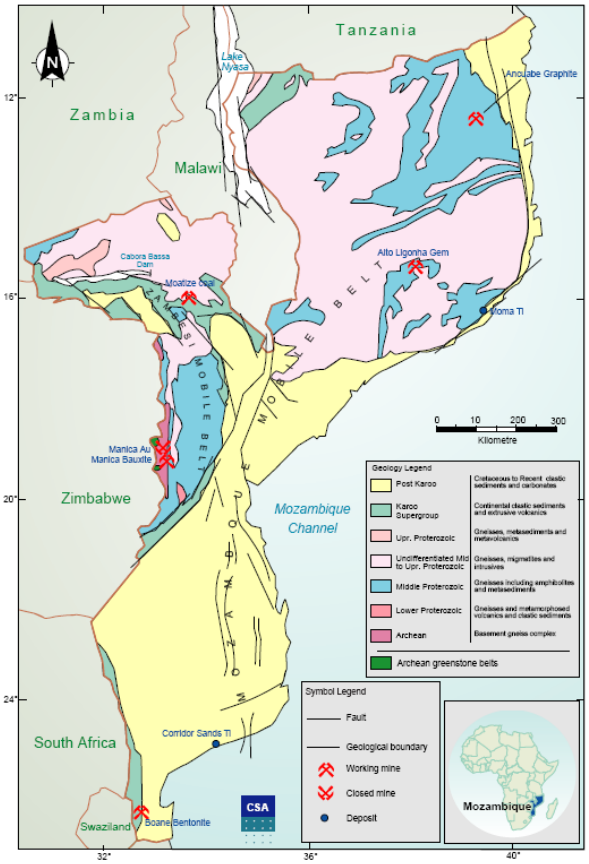
The geology of Mozambique is complex resulting in a considerable diversity of mineral deposits. It can be divided into two major areas: the older Proterozoic rocks (older than 542 million years) in the north and west and the younger Phanerozoic rocks (younger than 542 million years) in the south of the country. The Proterozoic rocks cover nearly two thirds of the country. They include

[73] CIA, 2008, 1.
[74] ESIPP/SADC/EC, 2006a, 2.

the Zambesi Mobile belt in the Manica province which outcrops on the border with Zimbabwe. This belt forms the oldest rocks in Mozambique dating back to 1.34 billion years. It hosts major parts of the country's known but rather small gold, copper, asbestos, lead, iron ore, limestone and nickel resources. Small high-grade bauxite deposits also occur within this area.[75]

The Proterozoic sequences in the north east hold pegmatite rock, a very coarse-grained plutonic rock. It contains a variety of minor metals such as niobium, tantalum, gold, and tungsten but also precious and semi-precious stones, including gem quality aquamarine, tourmaline, and quartz.

The Phanerozoic rocks are characterized by the Karoo Supergroup and Post Karoo rocks. In the west of the country the coal occurrences of the Karoo Supergroup are among the biggest and most important mineral resources of Mozambique. They are mostly of the high quality metallurgical coal. The Post-Karoo rocks in the south of the country and along the coastline consist of marine sedimentary, which host a number of industrial minerals, especially clays and diatomite. Extensive heavy mineral sands including ilmenite, rutile, monazite and zircon occur along the Mozambican coast in dunes and beach placers.[76]



Map 4: Geology of Mozambique. (Source: ESIP/SADC/EC, 2006a)

[75] ESIPP/SADC/EC, 2006a, 6.
[76] ESIPP/SADC/EC, 2006a, 6-8.

It is estimated that there are about 20 million tons of oil resources onshore as well as offshore. Some international companies such as StatoilHydro, ENI, Petrobras und Sasol hold concessions for further exploration at the coastline. There are also known gas reserves and resources of around 127 billion m^3 respectively 200 billion m^3 in the offshore fields of Temane, Pande and Buzi-Divinhe.

Mineral commodity	Unit	Reserves	Reserve base
Beryllium	t	5,000	
Ilmenite	t	21,000,000	510,000,000
Metallurgical Coal	t	2,300,000,000	15,800,000,000
Manganese ore	T	600,000	?
Natural gas	$G.m^3$	127	200 (Resources)
Oil	t		20,000,000 (Resources)
Rutile	t	500,000	6,500,000
Zircon	t	1,600,000	14,400,000

Table 13: Reserves and reserve base of mineral commodities in Mozambique. (Sources: BGR and company data)

The civil unrest has hindered exploration activities for a long time. The government and the international donor community have therefore lanced a “Mineral Resources Management Capacity Building Project” to obtain better information on the country’s mineral resources. The project has produced maps on the basis of geophysical airborne surveys and geochemical analysis.[77]

These have generated no major – before unknown – mineral occurrences. However, this does not impede finding new deposits through more detailed exploration but makes new major world class findings unlikely. Currently, there are different junior and large mining companies exploring the country, especially with regard to base metals, gold, and heavy mineral sands.[78] The coastal zones offer great potential for further heavy mineral sands concentrations, and the delineation of further ilmenite reserves is expected.[79] The exploration of hydrocarbons in the Ruvuma basin seems also promising.[80]

[77] World Bank, 2007, 43-46.
[78] Elsner, 2006, 10-11.
[79] ESIPP/SADC/EC, 2006a, 12.
[80] Petroleum Africa, 2007, 1.

6.3 Mozambique's extractive sector and future projects

Mozambique was renowned as a source of gold in ancient times but its mining sector has historically never been as important as in some other sub-Saharan countries. After the civil war the sector has experienced major inflows of foreign capital with a rate of 15 per cent per year (in 2006). Present mining activities are nevertheless still characterized by artisanal mining.[81] Overall, the sector has contributed 0.9 per cent to GDP in 2005. Most of the country's official mineral output derives from bauxite, steam coal, gold and gemstones but several new production sites for high quality metallurgical coal, tantalum and heavy mineral sands are either under construction or at feasibility status.

Gold mining is limited to one official gold mine, the Monarch Mine, and artisanal and small scale mining. Unreported production plays a major role.[82] There is one small bauxite mine in Manica Province, which recently increased its output by an estimated 26 per cent; and is expected to further rise production.[83] At the same time, Mozambique is Africa's second ranked producer of aluminium after South Africa but the Mozal aluminium smelter, constructed in 1998, uses bauxite that is mostly imported from Western Australia. The share of aluminium in total export revenues was 57 per cent in 2006.

In Nampula province, the Moma Mineral Sands mine has started production in 2007 and is expected to reach full capacity in mid 2008. The mine produces titanium minerals, ilmenite and rutile, and also considerable quantities of zircon.

Tantalite is produced at the Marropino mine which has had production shortfalls due to financial and technical problems in the last years. Gemstones were mined in different mostly small mines in the northern parts of the country and have experienced major production increases. An alluvial deposit in the Alto Ligonha District of Zambezia Province produces gem-quality tourmaline since 2004.[84] Bentonite comes from the southern Maputo province by the state company, Cia Desenvolvimento Mineira, since 1993.[85]

[81] AfDB/OECD, 2007, 393-4.
[82] ESIPP/SADC/EC, 2006a, 9.
[83] USGS, 2007, 1.
[84] USGS, 2007, 2.
[85] ESIPP/SADC/EC, 2006a, 8.

Mineral Commodity	Unit	1985	1995	2000	2003	2005	2006	2007
Aluminium	t cont.	0	0	53,800	408,500	553,700	564,000	559,900
Bauxite	t	5,000	10,660	8,100	11,793	9,518	11,069	11,800
Bentonite	t	361	277	0	684	547	610	600 est.
Beryl	t	9	0	19	78	146	150	150 est.
Diatomite	t	0	0	0	3,000 (2004)	5,000	6,000	5,000 est.
Gold	t cont.		0.2	0.023	0.063	0.063	0.068	0.068
Natural Gas	million Btu	0	0	0	36,409	84,323,763	84,833,492	113,700,000
Niobium	t cont.			5	23	34	29	29
Steam Coal	t cont.	38,000	40,000	0	36,742	3,000	10,000	28,000 est.
Tantalum (concentrate)	t cont.	4.5	0	10	54	712	281	80
Tantalum (refined)	t cont.	4.5	0	0	0	0	0	0

Table 14: Mozambique's mineral production. (Source: BGR database)

Artisanal mining produces noteworthy amounts of gemstones including beryl, aquamarine, tourmaline, and garnet mostly in the Northern provinces. The amounts and quality of these gemstones are difficult to estimate as they are easy to smuggle and valuation bases on each individual gemstone.

With regard to hydrocarbons, the state owned company Carbomoc at Moatize produces some steam coal. Since 2005 a pipeline transports natural gas from the fields of Pande and Temane to South-Africa. There is currently no crude oil production. The construction of two refineries in Matutuine in the south and Nacala in the north is planned for the next decade.[86]

Several major projects for heavy mineral sands, coal, natural gas as well as downstream aluminium production are undergoing construction or are at feasibility status.

The Moatize Coal Project of Companhia Vale do Rio Doce (Vale) which is currently under construction is expected to produce 9 million tons of coking coal and 3.5 million tons of steam coal from 2009. It is a world class coal mine but the development of the mine depends upon global market trends and the rehabilitation of rail and port infrastructure.

Furthermore, the government has granted licenses to the Australian company Riversdale Mining to explore coal occurrences in the Tete province and to build a 2000 MW coal plant.[87]

[86] Afrika-Verein der deutschen Wirtschaft, 2008b, 1.
[87] Afrika-Verein der deutschen Wirtschaft, 2008a, 1.

Mozambique has the potential to become a big producer of heavy mineral sands. The Moma Mineral Sands Mine project will reach full production level by 2008. The Limpopo Corridor Sands Titanium Mine is currently at prefeasibility status but pending since a couple of years. A bankable feasibility study is expected mid-2008. If the project proceeds, it could attain an initial production level of 375,000 tons of high-grade titanium feedstock per year. The start is not likely before 2015. Ultimately planned production could be one million tons per year.[88]

BHP Billiton Ltd. plans to expand the production of the Mozal Aluminium Smelter by 250,000 tons per year from 2009.

There are currently two small to medium gold mining projects at prefeasibility status. The Manica gold deposit is expected to produce 2.7 tons of gold per year.

Noventa Ltd. constructs the Marropina Mine which will start the production of tantalum concentrate from 2008 and the company has another tantalum project at prefeasibility status.

In addition to mining projects, natural gas production from Temane and Pande gas fields in the southern Inhambane Provinces is expected to double to 249 million GJ per year by 2010.[89] Further offshore concessions have been issued in the Rovuma Basin and the Inhambane Province in central and northern parts of the country.

Major bottlenecks to the projects are the infrastructure for electricity and transportation. At the end of 2007, and after years of negotiations, the government took over Portugal's majority share of the Cahora Bassa Hydroelectricity Company, a dam that was not transferred to Mozambique at independence because of the ensuing civil war and unpaid debts. More power is needed for additional investment projects in titanium extraction and processing and garment manufacturing.

6.4 Mining taxation and current government revenues from the extractive sector

The extractive industry in Mozambique is governed by the Mining law from 2001[90], the Petroleum law from 2001, and the Petroleum operations regulation from 2004[91]. In spring 2008 a new taxation framework for mining and petroleum activities came into law in order to simplify and modernize the taxation system. It does not affect contracts that have already been signed unless the company prefers to join the new taxation system.[92] Royalty rates are at 10 per cent in the case of diamonds and precious metals, 6 per cent for semi-precious stones, 5 per cent for base metals and 3 per cent for coal and other minerals. In addition, mines have to pay taxes on the

[88] PR Newswire Europe Ltd., 2008, 1.
[89] Net News Publisher, 2008, 1.
[90] Government of the Republic of Mozambique, 2002.
[91] Government of the Republic of Mozambique, 2004. For more detailed summary please see: Southern and Eastern African Mineral Center, 2006.
[92] African Oil Journal, 2007, 1; Mozlegal, 2008, 3-4; Government of the Republic of Mozambique, 2007.

used area varying between 5,000 and 10,000 Mozambiquan Meticals (about 208 to 417 US-$) per square kilometer according to the type of license or concession.[93]

Format	National law
Royalty type	Ad valorem, gross revenues on market value
Royalty rate	Diamonds and precious metals: 10%; Base metals: 5% Coal and other minerals: 3% Oil: 10% Natural gas: 6%
Deferment/ Reduction	No
Corporate Income tax	32%
Capital deduction – loss carryforward	Capitalization of initial exploration and development expenditures to first year of production; accelerated depreciation for this expenditure and thereafter standard straight-line rates. Unlimited carry forward of depreciation deductions; operating losses may be carried forward for a period of three years. Exemption of import duties, taxes and other charges on goods imported during and for purposes of exploration, development and mining. Exemption of duties and taxes on exports of mineral product
Free carried Interest/ Government shares	Production Sharing Agreements, 15-30% Free carried Interest by state owned oil company Empresa Nacional de Hidrocarbonetos de Moçambique (ENH) in the gas fields Pande 25% and Temane 25%[94]
Others	Tax on area of concession of 208 to 417 US-$ per square kilometer according to the type of license or concession.

Table 15: Mozambique's mining tax regime.

The new law changes the taxation for oil activities. The old framework has been considered to be too complex by making a distinction between onshore and offshore operations and even the depth of drilling offshore operations. Under the new terms any company has to pay a 10 per cent royalty on the value of oil, calculated as an average of international prices. The rate for natural gas is 6 per cent.[95]

As in the previous framework, the government has the right of a 15-30% free carried interest by the state owned oil company Empresa Nacional de Hidrocarbonetos de Moçambique (ENH). It already holds free carried interests of 25 per cent in the gas fields of Pande and Temane.[96] The government also intents to join the EITI.[97]

[93] African Oil Journal, 2007, 1.
[94] Sasol Ltd., 2008, 1; MBendi, 2008, 1.
[95] Mozlegal, 2008, 3-4.
[96] Sasol Ltd., 2008, 1; MBendi, 2008, 1.
[97] Frey, 2008, 1.

	2002	2003	2004 Prel.	2005 Proj.	2006 Proj.	2007 Proj.	2008 Proj.
Turnover (all numbers in current US-$)	629	623	915	1,084	1,086	1,076	1,088
Operating profit (before tax, after interest payments)	20	-131	320	426	345	344	352
Corporate income tax	1.8	3.7	4.3	7.9	9.8	10.2	10.2
Dividend Withholding tax	0.0	0.4	3.9	6.9	6.5	7.7	4.4
Tax on salaries	1.0	4.3	3.6	3.6	4.0	5.0	4.9
Total:	**2.8**	**8.4**	**11.8**	**18.4**	**20.3**	**22.9**	**19.5**
Tax revenue (in percent of total gov. revenues)	**0.6**	**1.4**	**1.1**	**1.4**	**1.6**	**1.5**	**1.3**

Table 16: Government revenues from Mozambique's "megaprojects" including Moma heavy sand mine, Sasol gas pipeline, Cahora Bassa dam, and the Mozal aluminium smelter. (Source: IMF, 2006, p. 32)

Past fiscal revenues from the sector have been low although projects in the mining and petroleum sector have experienced major inflows of foreign direct investments. The main reasons are generous fiscal incentives to attract investments during the post-civil war period. Government revenues are expected to rise in the medium run as production ramps up and investors have recovered their initial development costs. The IMF estimates that the future mining and hydrocarbon projects could yield revenues in the range of 2-4 per cent of GDP from 2010 and that further gas and oil discoveries could result in significant revenue contribution in the long run.[98] Unfortunately, further data on the past and present government intakes are not available.

6.5 Scenarios for potential government revenues

Based on our assumptions the following results have been quantified for potential government revenues from Mozambique's extractive sector. The major factor driving these projections is new additional production of metallurgical coal and natural gas.

In the first scenario (blue), the potential government revenues would rise nearly three fold to over 500 million US-$ per year up to 2011 because of additional coking coal, natural gas and titanium sands production. Nominal and effective corporate income tax rates as well as the world average effective tax rate are quite close, so that there is no big difference in the scope between the scenarios.

[98] IMF, 2007a,22-23.

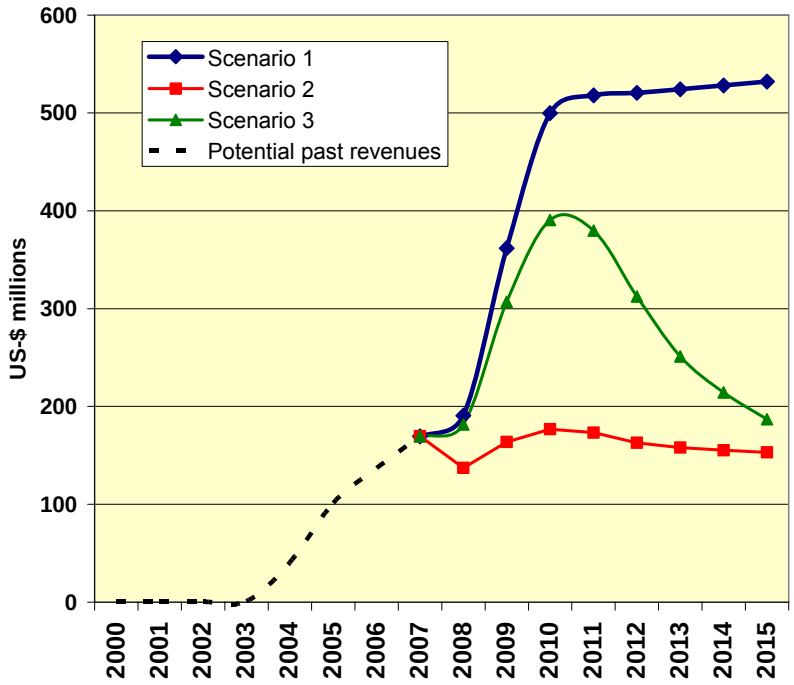


Figure 8: Scenarios for potential government revenues from the extractive sector in Mozambique (in 2007 US-$). (Source: Own calculations)

In the second scenario (red) government revenues would stay at today´s level. In the third scenario (green) government revenues would increase to about 400 million US-$ per year in 2010 but then fall back to little below 100 million US-$ per year due to decreasing prices for coal and gas.

Two main risks exist to this outlook. Mozambique remains overwhelmingly reliant on new gas and coal projects. Complications in ramping up production of these two mineral commodities could weaken growth prospects. In addition, the heavy mineral sands projects do not offer such a benefit as titanium prices have been stable over the past years and are not expected to rise.

6.6 Financial gap in achieving the Millennium Development Goals

According to UNDP, Mozambique is on course to halve the proportion of people living in extreme poverty by 2015 but is unlikely to halve the proportion of those suffering from hunger, because of drought, floods and other natural calamity-related constraints. UNDP also states that the triple threat of HIV/AIDS, food insecurity, and the ensuing weakened governance capacity especially for service delivery, threatens to reverse recent gains.[99] Life expectancy is still 44 years.[100]

Per capita costs are the highest in comparison to the other case study countries. They are estimated to develop from 117 US-$ (all following numbers are in 2007 US-$) to 183 US-$.

[99] UNDP, 2007d, 1.
[100] CIA, 2008, 1.

Costs in the health sector are especially high as the country suffers from a 12 per cent HIV/Aids prevalence rate and a very high risk for infectious diseases such as hepatitis A, malaria, plague and others. Education is also a focal point. Only 32 per cent of women read and write.[101] Overall, the costs for reaching the MDGs are estimated at nearly 30 billion US-$ for the period 2008-2015. Private households could finance 2.3 billion US-$. CPA could sum up to 11.5 billion US-$ over the respective period. Thus, the total government financing need is estimated at 15.2 billion US-$ from 2008-2015.

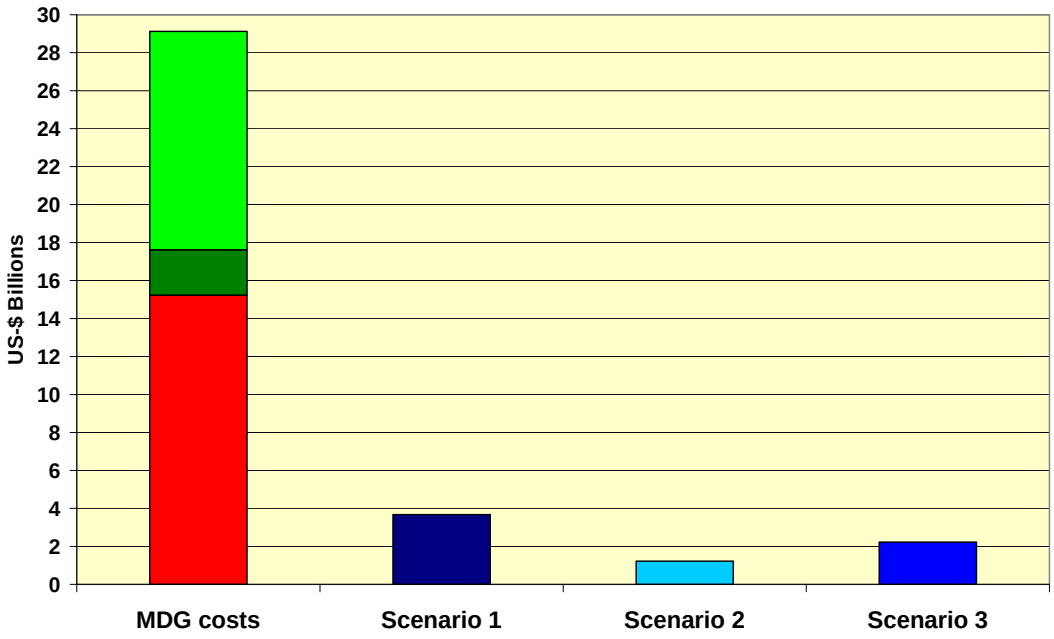


Figure 9: Total potential government revenues from the extractive sector (blue) and estimated MDG finance gap (red) in Mozambique for the period from 2008 to 2015 (in 2007 US-$). (Notes: Total MDG finance gap (red) = Total estimated MDG costs – OECD-Country Programmable Aid (light green) – estimated private household contributions (dark green) = Total finance gap to be covered by domestic resource mobilization (red)). (Source: Own calculations)

6.7 Summary

Government revenues from the extractive sector in Mozambique could potentially make an important contribution to financing the MDGs in Mozambique. Nevertheless, it is not as high as in the other analyzed countries. The first reason is that MDG Costs in Mozambique are very high due to severe poverty. Secondly, Mozambique is often viewed as one of the countries with huge potentials for an expanding extractive sector although in reality it is mostly limited to heavy mineral sands, gemstones, natural gas, and metallurgical coal. From a very small base the sector has grown by 15 per cent in 2007. The new aluminium smelter project in Mozal currently

[101] CIA, 2008, 1.

relies on imported bauxite, and only makes a small contribution to sector wide revenues due to special agreements with the government. At the same time, world market prices for titanium and gemstones have not been rising in recent years. Therefore, the only additional sources for government revenues are the metallurgical coal project and upcoming gas production from around 2011/2012. Balancing this to the huge government financing need for reaching the MDGs in Mozambique, the extractive sector can make a difference of about 14 per cent from 2008 to 2015 in the medium scenario (Scenario 3).

7. Zambia

7.1 Overview

Zambia has a long tradition in copper and cobalt mining. The former Northern Rhodesia, situated on the Central African plateau, is a land-locked country, so that train transportation to the coast is essential. In the 1980s and 1990s, the country suffered from declining copper prices and a prolonged drought. In recent years the Zambian economy has performed well with annual growth rates of about 6-7 per cent per year. This economic expansion has benefited in particular from a revival of mining in the wake of privatization and from increased world copper prices.[102] At the same time, Zambia still belongs to the poorest countries in the world. It is part of the group of Least Developed Countries and is ranked number 165 of 177 in the Human Development Index.[103] After the sudden death of President Mwanawasa, Rupiah Banda has been elected as new president in November 2008.

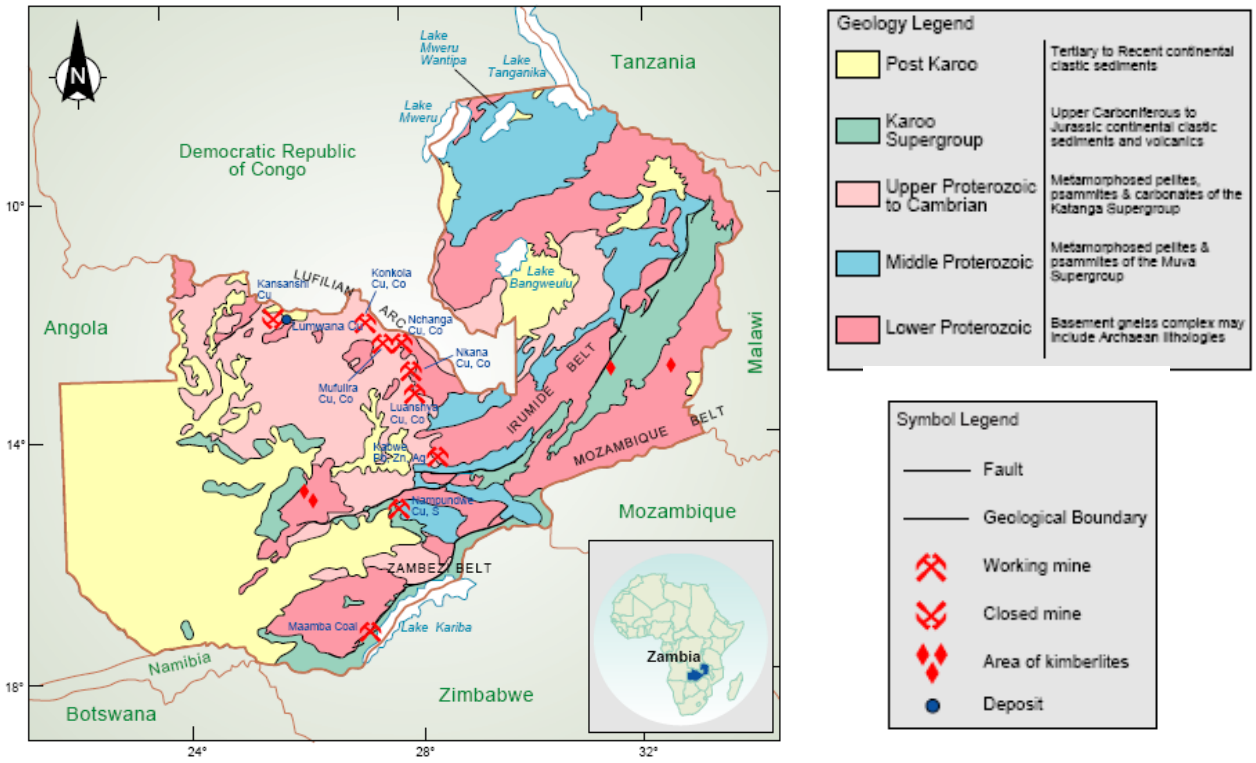
Total population (millions):	11.9
Surface area (km²):	752,618
GDP per capita (PPP US-$):	1,098
GDP growth (annual %):	6.0
Human Development Index (Rank 1 - 177):	165
Life expectancy at birth (years):	39.2
Population below purchasing power parity (PPP) US-$1 per day (%):	63.8

Table 17: Basic indicators for Zambia. (Source: UNDPb, 2007)

7.2 Geological potential

Zambia is well endowed with mineral resources and possesses a high geological potential. Situated between the DR Congo and the Zimbabwean cratons, it contains geological elements characteristic of metal-rich ancient mobile belts and of ancient cratons. Two thirds of the country are underlain by Proterozoic (older then 542 million years) rock formations. These include the Katanga Supergroup hosting the world famous Zambian Copperbelt which straddles the border to the DR Congo in the north. It especially possesses high grade copper and cobalt deposits.

[102] IMF, 2008b, 4.
[103] UNDP, 2008, 1.



Map 5: Geology of Zambia. (Source: ESIPP/SADC/EC, 2006a, 28; Please see source for scale)

The other third of the country's area consists of Phanerozoic (younger then 542 million years) Karoo sedimentary rocks with coal and uranium as the principal minerals of economic significance, and poorly exposed Post Karoo clastics and Kalahari sediments in the west.

Zambia has world class copper and cobalt deposits. There are also about 50 known deposits of iron ore, numerous small deposits of manganese ore all over the country, about 150 occurrences of tin-tantalum, especially in the Tin Belt in southern Zambia, and lead-zinc ores at the Upper Roan Group of the Copper Belt. Furthermore, there are over 300 known occurrences of gold spread all over the country and small amounts of diamonds, mainly in kimberlites, can be found in the north-east.[104]

[104] ESIPP/SADC/EC, 2006a, 8-14.

Mineral	Unit	Reserves	Reserve Base
Steam coal	t cont.	10,000,000	179,000,000 (Resources)
Cobalt	t cont.	270,000	680,000
Copper	t cont.	19,000,000	35,000,000
Iron Ore	t cont.	114,000,000	-
Gold	t cont.	41	88 (Resources)
Lead	t cont.	44,000	-
Manganese Ore	t	25,000 (?)	-
Nickel	t cont.	113,000	112,000
Selenium	t cont.	3,500	6,500
Uranium	t cont (prognost. resources < 130 kg/kgU)		22,000
Zinc	t cont.	1,026,000	-

Table 18: Reserves and reserve base of mineral raw materials in Zambia. (Sources: Manganese ore: Freeman, 2006; Uranium: OECD/NEA, 2008; All others: BGR database and USGS; according to government sources resources for iron ore shall be 1,2 Bn t ore, for copper ca. 54 Mt copper contained in ore, and for manganese ore 100 Mt; Mt = million tonnes)

Zambia's resources of energy minerals are relatively small. It possesses substantial coal reserves in the lower Karoo formation and modest Uranium resources in the upper Karoo formation. There might be some geological potential for oil in the North-East of Zambia at the East-African rift. Further exploration has been stopped by the government because as it plans to introduce a new law on preserving domestic resources first.

Since commodity prices have soared on the world markets, Zambia has been experiencing a lot of new exploration activity. According to its prospective geology, the country offers huge potential for adding further reserves and resources to the known deposits and occurrences. Overall, large parts of the country have a high potential for the exploration of further deposits, especially for copper-cobalt, iron ore, and copper-gold-uranium, with opportunities for small and large scale operations.

7.3 Zambia's extractive sector and future production

Zambia's extractive sector has a long tradition in copper and cobalt mining. In the 1970s the annual output reached its peak with about 750,000 tons of refined copper per year and also considerable amounts of lead, zinc and cobalt were produced. Due to low metal prices and investments in the 1990s the production of copper decreased enormously to about 220,000 tons in 2000. Lead and zinc mining at Kabwe closed down completely in 1994.

At the end of the 1990s the Zambian government restructured and privatized the copper sector. Moreover, with help from the current copper price boom, the Zambian copper industry has increased its production tremendously to over 520,000 tons of refined copper in 2007. It has become the ninth most important producer of copper and the fourth important producer of cobalt worldwide.

Overall, Zambia's mining sector contributes to about 5.1 per cent to the GDP and 64 per cent to the balance of trade. The extractive sector accounts for 80 per cent of the export value of which are 90 per cent from copper exports. Formal employment in the sector has recovered from an all-time low of about 35,000 employees in 2001 to over 48,000 in 2004. In terms of investment, a total of US-$1.4 billion has been injected in the mining sector by new mine owners over the same period.[105]

There is currently no production of oil or gas. One refinery in Ndola has a capacity of 1.2 million tons per year for domestic use. It obtains its crude oil through a pipeline from Tanzania and is being currently expanded. There are two open pit mines for steam coal with a production of 200,000 tons per year, which is used for domestic consumption. Zambia also produces some industrial minerals including lime, cement, and smaller amounts of other industrial minerals such as kaolin and talc.

Small scale and artisanal mining plays a certain role with about 10 tons of illegally mined tin-tantalum concentrate in the south of the country. There is also artisanal mining in gemstones with a production of 1,100 tons of amethyst and good quality emeralds. The government has actively promoted gemstone mining and processing by setting up a gemstone exchange and a training center for polishing.[106]

[105] Government of the Republic of Zambia, 2006. 1.
[106] Government of the Republic of Zambia, 2006. 1.

Mineral commodity	Unit	1985	1995	2000	2003	2005	2006	2007
Cobalt	t cont.	4,290	2,934	3,342	6,620	5,472	4,658	4,425
Copper (concentrate)	t cont.	519,600	341,938	257,000	346,900	459,324	492,016	528,300
Copper (refined)	t cont.	510,000	307,181	226,169	360,100	403,000	455,800	479,200
Gold	t cont.	0.2	0.08	0.1	0.14	0.17	0.96	1.96
Manganese ore	t						5,000 est.	5,000 est.
Selenium	t cont.	19	18	10	10	10	10	10
Silver	t cont.	19	8	6	6	9	11	10est
Steam coal	t cont.	500,000	154,000	168,000	150,000 est.	150,000 est.	150,000 est.	168,000 est.
Zinc (ore)	T cont.	31,900	0	0	0	0	0	0
Zinc (refined)	t cont.	22,800	0	0	2	0	0	0

Table 19: Zambia's mineral production. (Sources: Manganese ore: Freeman, 2006, p. 4; Gold in 2006 and 2007: Raw Materials Data; All others: BGR database)

New mining projects include the Lumwana copper and cobalt mine, which will probably start producing at the end of 2008 and add 169,000 tons of copper and 3,000 tons of cobalt production per year. Further projects are under construction at Konkola, Baluba, Mulyashi and Munila. In addition, several existing copper/cobalt mines expand their production and a whole list of projects is under feasibility and prefeasibility status. If all projects would come into production until 2015 over 800,000 tons of annual copper production and 16,000 tons of annual cobalt production would be added to the current production.

Activities with regard to other minerals are also widespread. At Munali, a nickel mine is currently under construction. Albidon Mining Ltd. plans to produce 10,000 tons of nickel per year there. At Kabwe, Metorex Ltd. plans to produce 4,500 tons of refined zinc per year from tailings at the abandoned zinc mine from 2008.[107] Furthermore, there are several uranium mining projects at prefeasibility status.

Nevertheless, all projects are at risk and may not comply with projections as electricity is a key bottleneck. According to the IMF no major additional mine production will be possible in the upcoming 3-4 years as Zambia has not seen any significant addition to its power generating capacity since the 1970s.[108] Although there is a high potential for hydro electricity, the public utility, ZESCO, lacks the financial capacity to invest in new power plants. Tariffs paid by the

[107] Metorex Ltd., 2008, 1.
[108] IMF, 2008b, 13-14.

major mining companies, which consume more than half of the electricity generated, are well below costs, despite a 35 per cent increase in early 2008. These tariffs were established several years ago in long-term power agreements but do not cover the full cost of service and thus impede new investments. The government has recognized the current electricity shortages and the importance of alleviating supply constraints and works on a strategy to attract private and public investment in cooperation with the World Bank and the IMF.[109] There are also two new power plants planned by Chinese companies.

A further factor that might impede new investments is the introduction of a new mining tax regime in April 2008. More details on the tax rates will be given in the next section. Nevertheless, representatives of the industry complain that these new taxes will hinder Zambia in further increasing its copper production. They also complain that this breaches development agreements, which the government had signed with the individual mining companies awarding them tax holidays, and that this tax reform risks denting Zambia's image as being a safe investment destination.[110]

7.4 Mining taxation and current government revenues from the extractive sector

After the restructuring and privatization process in the 1990s, Zambia's mining industry has become attractive for foreign investments. Surcharges on mineral production were favorable in terms of royalties and taxes, and a number of financial incentives have been created specifically to encourage investment in the mining industry. Corporate income taxes were at 25 per cent and royalties at two per cent. In addition, most copper companies have enjoyed royalty rates of 0.6 per cent which have been part of so called "development agreements" in the base metal sector.[111] Artisanal and small scale miners had to pay a five per cent royalty instead.

Under this tax regime, government revenues from the extractive sector have been very low.[112] In spite of high copper prices, they only summed up to nearly 11 million US-$ in 2005 and about 60 million US-$ in 2006. In 2007, they increased to about 162 million US-$.

	2002	2003	2004	2005	2006	2007	2008	2009
Mining royalties[1] (million current US-$)	1	2	1	9	16			
Total government revenues from the extractive sector (million current US-$)				10	60	160	410 est.	650 est.

Table 20: Government revenues from the extractive sector in Zambia. (1Source: IMF, 2008d, 17. 2Source: IMF, 2008c, 9. Notes: Total government revenues include mining royalties, corporate income tax, customs and withholding tax.)

[109] IMF, 2008c, 53-58.
[110] Reuters, 2008a, 1.
[111] The "development agreements" are downloadable at http://www.minewatchzambia.com.
[112] See also Foreign Investment Advisory Service, 2004, 14, 37-8.

Since April 2008 a new fiscal regime for the mining sector has come into effect that aims to increase government revenues. The changes include an increase in the mineral royalty to 3 per cent (from 0.6 per cent), an increase in the corporate income tax to 30 per cent (from 25 per cent), and the introduction of either a variable profit tax when the profit ratio is above 8 per cent[113] or a graduated windfall tax. The windfall tax has been introduced with rates of 25 per cent for a copper price of more than 5,512 US-$ LME, of 50 per cent for more than 6,614 US-$ and of 75 per cent rate for more than 7,716 US-$. When the windfall tax sets in, the corporate income tax is fixed at 30 per cent. The loss carryforward is 10 years and depreciation of exploration costs are immediately expensed and capital costs (tangible, intangible and replacement) can be carried forward for four years (straight line method). Furthermore, withholding taxes on interests (15 per cent) and subcontractors' income (15 per cent) have been introduced. Though mining companies have massively protested the new regime supersedes the existing development agreements.[114]

The IMF cautiones that the marginal effective tax rate might be too high when world market prices are high. It has therefore proposed to make the windfall tax, like royalties, deductible for the purpose of calculating taxable profits or even to replace the windfall tax by a progressive profit-based variable tax. This would take into consideration the different cost structures across mines. The Zambian authorities argued, however, that they consider the windfall tax a more effective way to capture a sizable share of the rent when prices are exceptionally high and that current income tax provisions do not allow taxpayers to deduct other tax payments.[115]

Mining companies and the government are currently engaged in discussions to find an alternative solution to arbitration or litigation. The timing and outcome of these discussions is uncertain.[116] According to First Quantum Minerals Ltd. the government has also sent out letters stating that the windfall tax will be applied on provisional basis at a flat rate of 25 per cent at any price above the first trigger price for both copper and cobalt.[117]

The government hopes to increase its revenues substantially over the medium term. According to the IMF all mining revenues in excess of what would have been collected under the old regime will be saved in a separate government "Mining Resource Account" at the Bank of Zambia. Used as a stabilization fund, it aims to smoothen expenditures over time. Net inflow to the Mining Resource Account will be based on the medium-term expenditure framework. Net savings from accumulated mining taxes are projected to be 5 per cent of GDP at the end of

[113] Variable Income Tax (applies if there is no windfall tax; if there is windfall tax the flat rate is 30%)
Formula: y = 30% + (a - (ab / x)), if x>b where: "y" is the tax rate to be applied, "a" is the marginal tax rate, "b" is the portion of tax free revenue. "x" is the per centage ratio of taxable income to total income. "a" should be set at 15% and "b" at 8%.
[114] IMF, 2008b, 7-8.
[115] IMF, 2008b, 11.
[116] Reuters, 2008b, 1.
[117] First Quantum Minerals Ltd., 2008, 3.

2010.[118] These should finance high priority projects identified in the Fifth National Development Plan.[119] In addition, the government is working towards adopting the Extractive Industries Transparency Initiative (EITI).[120] It also plans to modernize and strengthen its tax administration and aims to create a specialized team for auditing mining companies and for implementing the new fiscal regime.[121]

	Zambia (until April 2008)	Zambia new (from April 2008)
Format	National law and negotiated development agreements	National law, supersedes existing development agreements
Royalty type	Ad valorem, net back value NSR	Ad valorem, net back value NSR
Royalty rate	Base metals with development agreements 0.6% , other minerals 2% , ASM 5%	3%
Deferment/Reduction	Yes	Yes
Corporate Income tax	25%	30% plus an variable income tax of 15% when the profit ratio is above 8% and the windfall tax does not apply
Capital deduction – loss carryforward	100%, base metals 10 years, some mining companies 20 years.	Loss carry forward of ten years; depreciation of exploration costs are immediately expensed; capital costs (tangible, intangible and replacement) can be carried forward for four years (straight line method).
Free carried Interest/ Government shares	Government shares in some enterprises	Government shares in some enterprises
Others		15% withholding taxes on interests and subcontractors' income; graduated windfall tax: 25% ≥ 5,512 US-$ LME copper price, 50% ≥ 6,614 US-$ LME copper price and 75% ≥ 7,716 US-$ LME; when the windfall tax sets in, no variable income tax sets in; in 2008 the government only applied a 25% windfall tax

Table 21: Overview of the new and old mining taxation regime in Zambia.

7.5 Scenarios for future government revenues

Based on our assumption described in Chapter 3.2, the following results have been quantified for potential government revenues from the Zambian extractive sector.

In the first scenario (blue, dotted line), potential government revenues would more than double up to 2010 and then move at about 500 million US-$ per year under the old tax regime. With the

[118] IMF, 2008b, 9.
[119] IMF, 2008b, 33. See also: Government of the Republic of Zambia, 2006.
[120] IMF, 2008b, 34.
[121] IMF, 2008b, 34.

new regime in place (Scenario 1 New; blue, solid line), the government income could increase to 3 billion US-$ per year in 2013. The major driver of this surge is the upcoming copper and cobalt production in combination with the newly introduced windfall profits tax and additional corporate income tax. For such a rapid increase of production world copper prices would have to stay bullish for the next years and bottlenecks in electricity would have to be solved on a sustainable basis. Please also note that the new tax regime does not affect investment in additional mining capacities in this scenario.

Furthermore, it is important to know that the nominal corporate tax rates (25 per cent in the old tax regime and 30 per cent in the new regime) differ widely from effective tax rates, which are at 1.7 per cent according to the Doing Business Database of the World Bank (not mining specific – includes all businesses). In this case, the potential government revenues stay below 150 million US-$ per year in the case of the old tax regime whereas they still move to more than 1.9 billion US-$ with the new tax regime as additional profit tax and windfall tax set in.

In the medium scenario (Scenario 3 New; red, solid line), government revenues would also increase sharply to over 2.2 billion US-$ per year in 2011 under the new tax regime. Then the income would fall sharply as lower profits and prices set in and the windfall profits tax does not apply anymore. This shows that the windfall tax might make it possible to cream off additional profits but also makes the government budget highly dependable on the world copper market price.

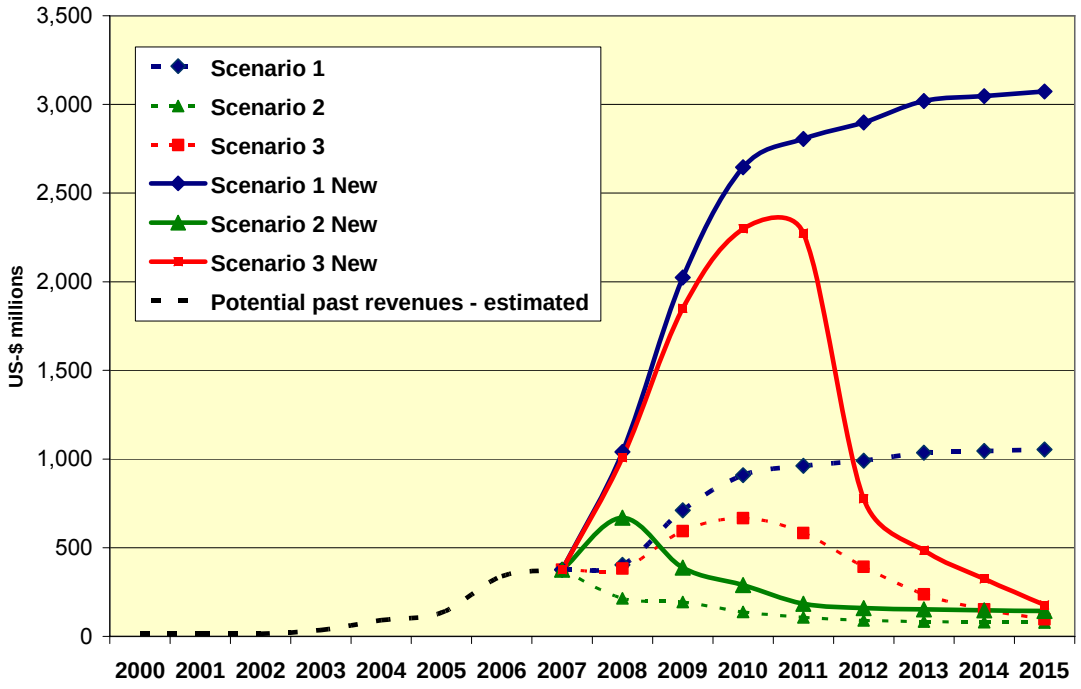


Figure 10: Scenarios for potential government revenues in Zambia. Former and new tax regime. (in 2007 US-$). (Source: Own calculations)

In scenario 2 (green, dotted line), potential government revenues would fall in the upcoming years under the old tax regime. With the new regime in place (Scenario 2 New; green, solid line), government revenues would increase significantly in 2008 but then would slow down, too.

The new tax regime really makes a difference to government revenues. Under the pessimistic scenario (Scenario 2), it potentially doubles the government revenues. Up until 2011, the medium scenario with the new tax regime in place (Scenario 3 New; red, solid line) would even outperform the optimistic scenario with the old tax regime in place (Scenario 1; blue, dotted line).

Two main risks exist to this outlook. Since Zambia remains overwhelmingly reliant on copper, an unexpectedly large drop in copper price could weaken growth prospects. Also, a prolonged shortfall in electric power would constrain the expected government revenues.

7.6 Financial gap for achieving the Millennium Development Goals

The longest spell of positive growth in Zambia's post-independence period (since 1999) has contributed to reduce the incidence of poverty from 75 per cent in 1998 to 64 per cent in 2006. Nevertheless, much of the growth and the reduction of poverty have largely been concentrated in the urban centers. Over 80 per cent of rural population remains in poverty (measured as population with an income lower than 1 US-$ per day PPP).122

The MDG-costing bases on a report by Mphuka, who has done it for Zambia based on the methodology of the UN-Millenniums Project.[123] This report was commissioned by several Catholic development NGOs. Annual per capita costs rise from 116 US-$ to 152 US-$ (all following numbers in 2007 US-$) for the period from 2008 to 2015 as the report assumes that the costs increase over time due to the need for building capacities to absorb the money. This sums up to total costs of 14.4 million US-$ for the respective period. Costs are especially high in the health sector as the country is badly affected by malaria and HIV/AIDS.[124] Investments in transportation and energy infrastructure are also quite costly as the physical infrastructure is a major bottleneck for development.[125]

Nearly 1 billion US-$ could be covered by private household contributions and we estimate CPA at about 7.25 billion US-$ in this period. Thus, we estimate the gap that has to be filled with government expenditure at about 6.2 billion US-$ from 2008-2015. The total annual costs to achieve the MDGs in Zambia would sum up to approximately 1.4 billion US-$ in 2008 and increase up to 2.5 billion US-$ per annum in 2015. Overall, total MDG costs are estimated at more than 15 billion US-$ for the period from 2008-2015.

[122] IMF, 2008b, 4.
[123] Mphuka, 2005.
[124] UNDP, 2006.
[125] IMF, 2007b, 5-6.

7.7 Summary

The new tax regime could increase government revenues significantly in the medium scenario (Scenario 3). The difference between the old and the new tax regime is about US-$ 5 billion in the period from 2008 to 2015, with the potential to fund more than 60 per cent of the total financing required to achieve the MDGs. Under an optimistic scenario (Scenario 1) with the new tax regime in place, high prices and major production increases, Zambia could completely finance its total MDG costs . Even under a pessimistic scenario (Scenario 2), based on low world market prices and low production increases, new revenues could provide around 15 per cent of the total MDG financing and more than 30 per cent of the finance gap that is left to the national government. The lack of infrastructure, especially with regard to electricity, is an important factor for further development of the sector.

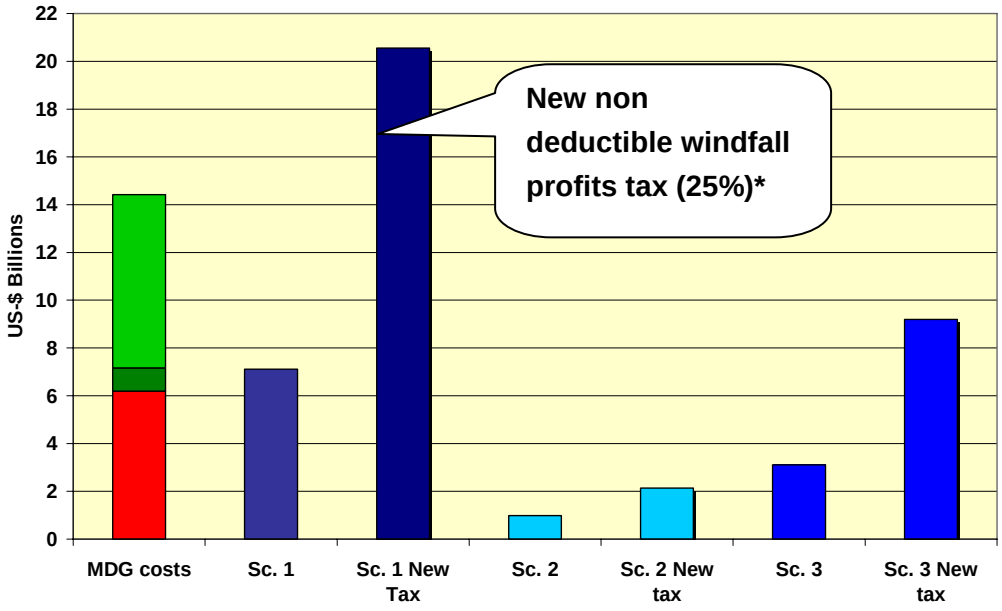


*Figure 11: Total potential government revenues from the extractive sector (blue) and estimated MDG finance gap (red) in Zambia for the period from 2008 to 2015 (in 2007 US-$). (Notes: Total MDG finance gap (red) = Total estimated MDG costs – OECD-Country Programmable Aid (light green) – estimated private household contributions (dark green) = Total finance gap to be covered by domestic resource mobilization (red)).v*Currently under negotiation. (Source: Own calculations)*

To conclude, government revenues from the extractive sector can potentially make a significant contribution to funding the MDGs in Zambia. With the new tax regime in place, the sector could more than outweigh the financial gap that has to be filled by the government. Overall, these government revenues depend on the rapid construction of infrastructure, especially electricity, on the government's capacity to attract further investments, and on the development of world market prices.

8. Policy options

Government revenues from the extractive sector are no quick money as the extractive sector is highly capital-intensive and bases on long term investment cycles. In addition, world market prices fluctuate enormously. The development of the extractive sector is thus a long-term exercise. Short-term contributions to government revenues should not be overestimated.

Overall, “Good governance” is crucial to the extractive sector. It is not only a prerequisite for sustainable mining, for the reduction of corruption, and for increasing transparent financial flows, but also directly linked to the country’s risk rating, an important parameter for investment decisions. The tax regime and investment conditions, which benefit both, investors and the government, are keys for using opportunities in the long run. There is no “one size fits it all” recipe for a sound development of the sector but the following policy options for donor countries and international development organizations might support this undertaking:

- **Capacity development in geological and engineering knowledge.** Only a public administration that knows its country’s geological potential and that understands the economics of the extractive sector is able to achieve beneficial results from negotiating concessions. Only a sound knowledge about mining operations and basic geological data enables mining inspectorates and mining taxation departments to check tax statements. National geological surveys and mining inspectorates should be strengthened, so that accessible basic geological, mining and mineral market data is adequate.
- **Strengthening fiscal regimes skills:** Public authorities need fiscal regimes skills in the mining sector to develop and manage a balanced taxation system. This is especially the case for collecting corporate income taxes. Capacity building is necessary to control tax declarations by mining companies and to counteract tax evasion loopholes.
- **Strengthening transparency and fighting corruption.** The taxation of the sector should be done in a transparent manner that promotes public accountability. Initiatives such as the Extractive Industries Transparency Initiative (EITI), the Kimberley Process, and support for “Good governance” in the public and private sector should be strengthened.
- **Enhancing cooperation between universities and other institutions of higher education.** The extractive sector needs highly specialized and trained employees which are still hard to find in the local population. Cooperation and exchanges between universities and other institutions of mineral exploration and engineering education in donor and resource-rich African countries are necessary to enable the local population in benefiting from the development of the extractive sector.
- **Finance and construction of necessary infrastructure.** Infrastructure is an important bottleneck to the development of the extractive sector. A good transportation

infrastructures as well as ample access to water and electricity are preconditions for investments into the sector. The local population and economy often also benefit from an enhanced infrastructure.

- **Promotion of value added production.** Manufacturing of raw materials and spill over effects to other sectors such as construction raise the opportunity for employment and further government revenues. This study only includes direct tax revenues from the extractive sector and where applicable also from the first stage of processing. For example, although Zambia has a high production of refined copper, an important part of copper leaves the country as concentrates without added value. Therefore, added value production and manufacturing should be supported.
- **Establishing sound revenue management schemes.** As world market prices fluctuate enormously, governments strongly dependent on raw materials should collect revenues pro-cyclically and distribute them in an anticyclical way. There is great need for capacity building in revenue management to circumvent the so called “Dutch disease” phenomenon.
- **Supporting environmental and social standards.** The extractive sector has negative impacts on the environment, especially in small and artisanal mining. Technological and administrative capacity building, the implementation of environmental standards and the recultivation of mining sites would help to minimize these social costs. Certified trading chains are another instrument to establish environmental and social standards.
- **Fulfilling the Gleneagles promises.** Even countries with a flourishing extractive sector still need the promised financial support for achieving the Millennium Development Goals. This is especially the case for current expenditures such as payments to teachers, health etc. where a continuous flow of financial support is needed.

9. Summary and conclusions

This report has estimated the potential government revenues from the extractive sector up to 2015 for three different scenarios and then compared these revenues to the financial needs for funding the MDGs. The three scenarios include a scenario (1) with high prices until 2015, one with steeply falling prices (Scenario 2) and one with smoothly falling prices until 2015 (Scenario 3). Overall, potential government revenues from the extractive sector give sub-Saharan African countries the opportunity to increase domestic funding mobilization for achieving the MDGs. Sub-Saharan Africa could have the potential to develop its extractive sector similar to those in Australia or Canada.

Our analysis reveals that the development of the mining sector in all four case study countries depends heavily on the construction of additional transportation and electricity infrastructure as well as sound investment conditions. Furthermore, the level of world market prices and thus mining companies' profits have strong effects on the government revenues from the sector. Finally, effective tax collection and administration need geological and mining engineering knowledge.

There are significant differences for each case study country with respect to the scope of potential government revenues.

In Namibia the potential government revenues from the extractive sector could outweigh the MDG costs that have to be covered by the national government. Namibia's MDG costs are quite low whereas the potential for government revenues from diamond, zinc and uranium mining is relatively high.

The case of Ghana shows that oil production really makes a difference for government revenues from the extractive sector. This alone could raise over 1.6 billion US-$ of government intakes in the period 2008-2015 in the medium scenario. At the same time, gold mining still accounts for most of the intakes. Overall, government revenues from the extractive sector could cover an important part of the government costs in achieving the MDGs.

In contrast to long standing mining countries the outlook for financing the MDG costs through the extractive sector in Mozambique is quite low. The first reason is that MDG costs in Mozambique are very high. Secondly, Mozambique is often viewed as one of the countries with huge potentials for an expanding extractive sector although in reality it is limited to heavy mineral sands, gemstones, natural gas, and metallurgical coal. At the same time, world market prices for titanium and gemstones have not increased in recent years. Therefore, the only additional sources for government revenues are the metallurgical coal project and upcoming gas production from around 2011/2012. Balancing this to the huge costs for reaching the MDGs in Mozambique, the extractive sector can still make a difference.

The case of Zambia shows that the new tax regime and upcoming mining projects could significantly increase government revenues from copper and cobalt mining. At the same time, the high effective tax rates risk to slow the investment into the sector. Overall, the potential government revenues from the extractive sector could make a great contribution to funding the MDGs in Zambia. They outweigh the MDG costs that remain to be covered by the government in scenario 1 and 3. Even with steeply falling copper prices like in scenario 2, these government revenues could potentially contribute to nearly half of these costs.

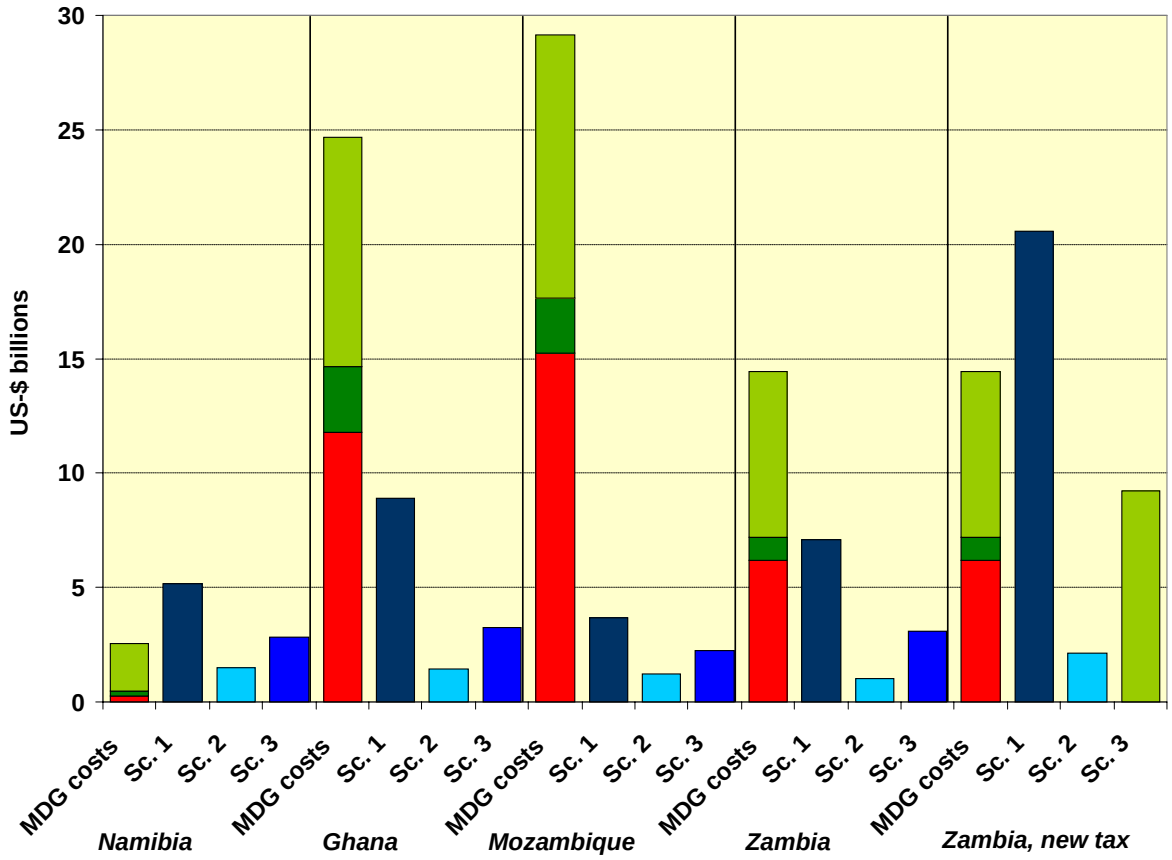


Figure 12: Summary of total potential government revenues from the extractive sector (blue) and estimated MDG finance gap (red) in Namibia, Ghana, Mozambique and Zambia for the period from 2008 to 2015 (in 2007 US-$). (Notes: Total MDG finance gap (red) = Total estimated MDG costs – OECD-Country Programmable Aid (light green) – estimated private household contributions (dark green) = Total finance gap to be covered by domestic resource mobilization (red), Source: Own calculations).

This study can only serve as a starting point for further studies on the potential of the extractive sector for economic development. It has been especially difficult to estimate corporate income taxes on the basis of the available data. Furthermore, indirect taxes such as payroll taxes could not have been taken into account. Secondary economic effects on other sectors such as construction, but also on employment and income levels should be examined in detailed individual country studies. It would also be worth to analyze the government revenues from

these secondary effects. Such studies should be done in close cooperation with local authorities and research institutions of the respective country.

To conclude, government revenues from the extractive sector can make an important contribution to finance the MDGs. These revenues depend on factors such as world market prices, tax collection, investment conditions and production levels. It is therefore important to strengthen a long term development of the sector while minimizing risks such as environment degradation. It takes a long way from geological occurrences to government intakes but it is worth to develop this sector for generating funds to finance poverty reduction and the long run development of the overall economy.

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Appendix 1 – Mineral commodity prices, transportation costs

Mineral commodity prices in 2007-US-$ (from 2008: Scenario 3) – Source: BGR database

Commodity	Notes	Unit	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Aluminium 99,7%	Free in LME warehouse	US-$/t	2,077	1,718	1,701	1,866	1,698	1,552	1,608	1,885	2,019	2,649	2,638	2,625	2,605	2,555	2,452	2,292	2,132	2,029	1,947
Arsenic 99%	Free in Rotterdam warehouse	US-$/t	1,374	1,272	1,300	1,265	1,235	1,207	1,056	1,206	1,287	1,247	1,660	1,649	1,632	1,589	1,499	1,360	1,222	1,132	1,061
Bauxite 87% Al_2O_3	FOB	US-$/t	0	0	0	199	194	190	185	181	213	214	212	212	212	211	209	205	202	200	198
Bentonit, crude, orig. Wyoming	Ex-works	US-$/t	38	47	48	46	46	46	45	44	43	46	54	53	53	53	51	50	48	47	46
Beryllium >10% BeO	2002-2005: estimates	US-$/tu	1,109	1,081	1,068	1,029	1,005	982	960	939	909	881	854	857	860	870	889	919	949	968	983
Cobalt 99.8%	Free in European warehouse	US-$/t	66,103	60,160	46,248	40,648	27,459	17,989	26,914	58,523	36,847	37,103	64,880	64,364	63,517	61,453	57,142	50,487	43,833	39,522	36,095
Coking Coal	CIF Japan	US-$/t	72	64	54	48	49	48	47	67	95	96	93	93	92	90	86	80	74	70	67
Copper 99.9%	Free in LME warehouse	US-$/t	2,956	2,093	1,966	2,184	1,856	1,792	1,999	3,148	3,913	6,929	7,117	7,048	6,935	6,659	6,083	5,193	4,303	3,727	3,269
Crude oil Brent	FOB	US-$/bl	25	16	22	35	29	28	32	41	58	67	72	72	70	68	62	53	44	38	33
Diamonds Ghana	FOB Ghana	US-$/ct	0	0	0	21	27	24	28	31	37	42	41	40	40	40	38	36	34	33	32
Diamonds Namibia	FOB Namibia	US-$/ct	0	0	0	475	415	392	388	452	474	474	497	496	494	491	483	471	460	452	446
Diatomite, filter aids, calcined, orig. US	Del. UK	US-$/t	506	494	488	470	459	448	438	429	415	402	390	391	393	397	406	419	433	442	449
Fluorspar: 170-200 mesh	1997-2001: estimates	US-$/t	97	94	93	90	88	86	84	82	79	77	74	75	75	76	77	80	83	84	86

Commodity	Notes	Unit	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Gold 99.9%	Free in LME warehouse	Mio US-$/t	13.8	12	11.2	10.8	10.3	11.5	13.1	14.5	15.2	20	22.4	22.2	21.9	21.1	19.6	17.1	14.7	13.1	12
Ilmenite concentrate >54% TiO_2		US-$/t	109	96	109	110	117	108	104	97	85	82	80	80	81	82	85	90	94	97	100
Iron ore (SSF) 64.5% Fe	FOB	US-$/t	24	24	22	22	22	21	22	25	38	47	51	51	50	48	44	38	32	28	25
Lead 99.97%	Free in Rotterdam warehouse	US-$/t	810	669	628	546	560	520	578	974	1,038	1,329	2,579	2,549	2,501	2,383	2,136	1,755	1,373	1,126	930
Lithium Spodumen >7.25% Li_2O	FOB Durban	US-$/t	0	0	0	0	0	0	0	0	0	501	553	553	552	550	546	540	534	530	527
Manganese ore 48-50% Mn	FOB	US-$/t	88	85	79	74	77	75	74	72	115	90	129	128	126	122	114	101	88	79	73
Natural Gas LNG	CIF Japan, 2007 est.	US-$/Mio Btu	5	4	4	6	5	5	5	6	6	7	7	7	7	7	7	6	6	6	6
Nickel 99.8%	Free in LME warehouse	US-$/t	8,997	5,860	7,514	10,407	6,994	7,784	10,820	15,190	15,679	24,994	37,216	36,820	36,171	34,588	31,283	26,181	21,078	17,773	15,145
Niobium/ Columbium		US-$/t	0	0	0	0	0	0	0	0	0	8,184	7,938	7,940	7,944	7,953	7,971	7,999	8,028	8,046	8,061
Rock salt	Deliv. UK	US-$/t	32	32	31	30	29	29	28	27	27	26	25	25	25	25	26	27	28	28	29
Rutile concentrate, >95% TiO_2, pigment grade		US-$/t	691	653	565	578	578	517	487	494	492	484	479	480	482	487	497	513	529	539	547
Selenium 99.5%	Free in European warehouse	US-$/t	7,343	5,616	6,267	8,401	9,154	9,505	12,482	49,969	111,160	53,216	72,580	71,775	70,457	67,240	60,525	50,158	39,791	33,075	27,736
Silver 99.5%	Free in LME warehouse	1,000 US-$/t	205	226	210	192	165	170	176	235	250	383	430	426	420	403	369	316	264	229	202
Steam coal	CIF Japan	US-$/t	59	51	45	42	45	42	39	56	67	65	63	63	63	62	60	58	55	53	52
Tantalum	CIF	US-$/t	85,182	83,025	81,988	152,70	270,71	71,799	61,931	62,186	84,436	80,876	77,160	77,257	77,416	77,804	78,613	79,863	81,113	81,922	82,566

Commodity	Notes	Unit	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
> 30% Ta_2O_5	European warehouse	Ta_2O_5				6	2														
Tin 99.85%	Free in LME warehouse	US-$/t	7,330	7,009	6,749	6,546	5,272	4,664	5,496	9,345	7,847	9,044	14,529	14,406	14,202	13,707	12,672	11,075	9,478	8,444	7,621
Uranium U_3O_8		US-$/t	7,099	5,919	5,814	4,484	4,696	5,155	5,884	9,249	12,772	23,040	44,702	44,084	43,072	40,602	35,445	27,484	19,523	14,366	10,266
Zinc special high grade, >99.995%, cash	Free in LME warehouse	US-$/t	1,709	1,296	1,345	1,359	1,042	895	930	1,151	1,470	3,376	3,242	3,212	3,165	3,048	2,805	2,430	2,055	1,813	1,619

Estimations for transportation costs (US-$)

Source: Own calculations based on rules of thumb from Wellmer, F.-W./ Dalheimer, M./ Wagner, M., 2008, Economic evaluations in exploration. Berlin/ Heidelberg/ New York, Springer. p. 107-111.

Please note that these calculations depend on the conditions (cif, fob, location of warehouse etc.) of world freight prices.

Commodity	Ghana	Mozambique	Namibia	Zambia
Aluminium	38	21		
Bauxite	21	21		
Bentonite		1		
Beryllium (non gemstones)		1		
Coal				36
Cobalt				109
Copper (Blister)			42	
Copper concentrate				384
Copper (refined)				96
Crude oil	1	1		
Diamonds	1		1	
Diatomite		66		
Fluorspar			19	
Gold	46	66	161	109
Ilmenite		22		

Commodity	Ghana	Mozambique	Namibia	Zambia
Iron (prim.)	21			
Lead			53	
Manganese ore	21		19	70
Metallurgical coal		15		
Natural gas		1		
Nickel				96
Niobium		1		
Rock salt	38			
Rock salt (non marine)		36	24	
Rutile		22		
Selenium				109
Silver			53	109
Steam coal		15		
Tantalum		66		
Uranium			53	109
Zinc			0	96
Zinc (refined)			42	
Zircon		22		

Appendix 2 – Basic data for Namibia

Mineral production – Source: BGR database

Commodity	Dimension	2000	2001	2002	2003	2004	2005	2006	2007
Copper (Blister)	t cont.	5,070	15,003	18,040	16,175	11,174	10,156	6,262	5,800
Diamonds	ct	1,552,000	1,487,000	1,562,000	1,481,000	2,004,000	1,902,000	2,356,285	2.000.000 est.
Fluorspar	t cont.	66,128	81,551	81,084	79,349	104,785	114,886	132,249	130.000 est.
Gold	t cont.	2	3	3	2	2	3	3	3
Lead	t cont.	9,797	12,827	12,088	16,122	14,338	14,320	11,830	11,000
Manganese ore	t	0	0	0	0	0	7,320	18,918	52,500
Silver	t cont.	17	20	44	29	27	34	31	8
Uranium	t	3,201	2,640	2,751	2,401	3,583	3,711	3,617	3.800 est.
Zinc	t cont.	32,937	37,622	41,007	10,616	0	0	0	20,300
Zinc (refined)	t cont.	0	0	35	47,436	120,533	132,818	129,897	150,080

Potential future projects – Sources: Raw Material Group, Company information, BGR, different mining journals.

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Copper 99,8%	Haib	South Deep	F	?	0	0	0	0	0	0	0	0
Copper 99,8%	Tsumeb West	Weatherly	E	2008	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900
Copper 99,8%	Matchless	Weatherly	E	2008	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Copper 99,8%	Otjihase	Weatherly	E	2008	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Copper 99,8%	Tschudib	Weatherly	E	2008	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Copper 99,8%	Tschudi open pit	Weatherly	PF	2009	0	2,000	5,000	7,000	7,000	7,000	7,000	7,000
Copper 99,8%	Kombat	Weatherly	PF	2010	0	0	1,500	3,000	3,000	3,000	3,000	3,000
Copper 99,8%	Elbe	Forsys Metals	PF	?	0	0	0	0	0	0	4,000	4.000
Copper blister 99,8% total					**9,000**	**11,000**	**15,500**	**19,000**	**19,000**	**19,000**	**23,000**	**23,000**
Gold	Omaruru	Forsys Metals	PF	?	0	0	1	1	1	1	1	1

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Gold	Ondundu	Forsys Metals	PF	?	0	0	1	1	1	1	1	1
Gold	Otjikoto	African Rainbow Metals	PF	?	0	5	5	5	5	5	5	5
Gold total					**0**	**5**	**7**	**7**	**7**	**7**	**7**	**7**
Lead	Berg Aukas	Weatherly	PF	2010	0	0	2,000	10,000	12,000	12,000	12,000	12,000
Lead total					**0**	**0**	**2,000**	**10,000**	**12,000**	**12,000**	**12,000**	**12,000**
Manganese ore 50%	Tambao	Weatherly	F	?	0	0	350,000	350,000	550,000	550,000	550,000	550,000
Manganese ore total					**0**	**0**	**350,000**	**350,000**	**550,000**	**550,000**	**550,000**	**550,000**
Uranium	Langer Heinrich	Paladin Resources	C	2008	1,200	1,678	1,678	1,678	1,678	1,678	1,678	1,678
Uranium	Engo Valley	Xemplar	PF	?	0	0	0	0	0	0	0	0
Uranium	Goanikontes	Bannerman	PF	2011	0	0	0	4,000	4,000	4,000	4,000	4,000
Uranium	Marenica	West Australian	PF	2011/2012	0	0	0		2,000	2,000	2,000	2,000
Uranium	Reptile	Deep Yellow Ltd.	PF	?	0	0	0	2,000	2,000	2,000	2,000	2,000
Uranium	Rössing	Rio Tinto	E	2009	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Uranium	Trekkopje	Areva	PF	?	0	0	4,000	4,000	4,000	4,000	4,000	4,000
Uranium	Tubas	Deep Yellow Ltd.	PF	2011	0	0	0	2,000	2,000	2,000	2,000	2,000
Uranium	Valencia	Forsys Metals	PF	2010	0	0	1,315	1,315	1,315	1,315	1,315	1,315
Uranium	Spitzkoppe	Forsys Metals	PF	?	0	0	0	0	0	0	2,000	2,000
Uranium total					**1,200**	**2,678**	**7,994**	**15,994**	**17,994**	**17,994**	**19,994**	**19,994**
Zinc concentrate	Sperrgebiet	Forsys Metals	PF	?	0	0	0	0	0	0	0	0

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Zinc concentrate	Berg Aukas	Weatherly	PF	2010	0	0	10,000	30,000	40,000	40,000	40,000	40,000
Zinc concentrate total					0	0	**10,000**	**30,000**	**40,000**	**40,000**	**40,000**	**40,000**

Dimension = t; F = Feasibility, PF = Prefeasibility, E = Expansion, C = Construction

Potential gross revenues of the extractive sector in scenario 3 (in million 2007-US-$) – Source: Own calculations.

Commodity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total: 2008-2015
Copper (Blister)	30	29	64	70	84	91	77	64	60	53	563
Diamonds	1,115	992	990	987	980	964	941	917	902	890	7,571
Fluorspar	8	7	7	7	7	8	8	8	9	9	63
Gold	51	53	53	135	163	163	143	123	109	99	988
Lead	15	28	27	27	29	35	30	23	19	16	207
Manganese ore	1	6	6	6	34	35	38	32	28	25	205
Silver	11	3	3	3	3	3	2	2	2	2	20
Uranium	83	170	210	256	413	531	439	311	243	174	2,576
Zinc	0	33	33	32	43	55	54	46	40	36	338
Zinc (refined)	433	480	476	469	451	415	359	302	266	237	2,974
										Total revenues	**12,532**

MDG costs in 2007-US-$ if not noted otherwise – Population sources: UNDP, 2008, MDG Monitor

Per Capita MDG costs with respect to	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Totals 2008 - 2015**
Hunger	3	4	4	5	6	7	8	9	10	11	
Education	19	20	20	21	21	22	23	23	24	25	
Gender equality	2	3	3	3	3	3	3	3	3	3	
Health	27	29	32	35	37	40	44	47	51	54	
Water supply/ sanitation	7	7	7	8	8	9	9	10	11	11	
Improving the lives of slum dwellers	3	3	3	3	3	4	4	4	4	4	
Energy	22	22	22	22	21	22	22	22	18	22	
Roads	12	12	12	12	11	16	21	25	30	35	
Other	9	9	10	10	10	11	12	13	14	15	
Total per capita MDG costs	**106**	**110**	**113**	**117**	**121**	**133**	**145**	**157**	**165**	**181**	
Total population	2,100,000	2,129,400	2,159,212	2,189,441	2,220,093	2,251,174	2,282,690	2,314,648	2,347,053	2,379,912	
Total MDG costs 2007$	**221,797,753**	**233,276,966**	**245,034,125**	**257,074,763**	**269,404,511**	**299,987,910**	**331,374,841**	**363,581,808**	**386,657,237**	**430,523,398**	**2,583,638,592**
Per Capita Household contribution	10	11	11	12	12	13	14	15	16	17	
Total Household contributions	21,235,955	22,729,551	24,260,804	25,830,479	27,439,348	29,847,026	32,316,741	34,849,758	37,447,366	40,110,876	252,102,399
Per capita CPA (Country programmable aid)	71	86	100	109	123	121	119	118	116	114	
Total CPA	149,645,390	182,269,504	214,893,617	238,297,872	272,340,426	272,340,426	272,340,426	272,340,426	272,340,426	272,340,426	2,087,234,043
Total government MDG financing need	**50,916,408**	**28,277,912**	**5,879,704**	**-7,053,588**	**-30,375,263**	**-2,199,542**	**26,717,674**	**56,391,624**	**76,869,446**	**118,072,097**	**244,302,150**

Appendix 3 – Basic data for Ghana

Mineral production – Sources: Diamonds: 2000-2004: IMF, 2005, 41: 2005-2007 USGS, 2008; all others: BGR database.

Commodity	Dimension	2000	2001	2002	2003	2004	2005	2006	2007
Aluminium	t cont.	137,000	162,300	132,400	15,909	13,000	13,400	75,000	12,900
Bauxite	t	424,600	715,500	795,800	646,600	585,600	726,000	886,000	748,200
Crude oil	Barrel	0	0	62,474	72,000	160,115	82,450	160,450	189,378
Diamonds	ct	666,193	878,384	1,018,417	936,244	921,237	1,063,000	970,000	1,000,000
Gold	t cont.	74	68	69	71	63	62	70	77
Manganese ore	t	895,700	1,076,666	1,135,828	1,509,432	1,597,085	1,719,589	1,500,000	1,049,500

Potential future projects – Sources: Estimates based on BGR; company information; Government of Ghana; Raw Materials Group.

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Bauxite	Kibi/Nhyinahin	Alcoa Inc	PF	?	0	0	0	0	0	0	0	0
Bauxite total					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Crude oil	Offshore	Different	F			0	21,900,000	43,800,000	91,250,000	91,250,000	91,250,000	91,250,000
Crude oil total						**0**	**21,900,000**	**43,800,000**	**91,250,000**	**91,250,000**	**91,250,000**	**91,250,000**
Gold	Bibiani	Central African	E	2009	0.00	5.69	5.69	5.69	5.69	5.69	5.69	5.69
Gold	Wa-Lawra	Azumah	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Kwahu Praso	Midlands Minerals	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Kaniago	Midlands Minerals	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Sian/Kwahu Praso	Midlands Minerals	PF	2010	0.00	0.00	0.62	1.56	1.56	1.56	1.56	1.56
Gold	Serpentine Rigde	Adamus	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Southern Ashanti	Adamus	F	?	0.00	3.11	3.11	3.11	3.11	3.11	3.11	3.11
Gold	Obuasi Underground	Anglogold	E	Next five years	0.00	0.00	2.00	3.00	6.59	6.59	6.59	6.59

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Gold	Banka	Mwana	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Ahanta	Mwana	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Konongo	Mwana	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Grumesa	Perseus	F	?	0.00	0.00	3.22	3.22	3.22	3.22	3.22	3.22
Gold	Ayanfuri	Perseus	Cl		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Chirano	Red Back	E		0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Gold	Akoase	Resolute	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Weststar/ Blue River	Resolute	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Anuoro	AMI Resources	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Beposo	AMI Resources	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Bogosa/Prestea	Golden Star	E		4.57	6.90	6.90	6.90	6.90	6.90	6.90	6.90
Gold	Prestea Underground	Golden Star	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Hwini-Butre/ Benso	Golden Star	F	2010	0.00	0.00	3.42	3.42	3.42	3.42	3.42	3.42
Gold	Benso	St. Judes Resources	PF	?	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	Kubi	PMI Gold Corp	PF	2011	0.00	0.00	0.00	1.01	1.01	1.01	1.89	1.89
Gold total					**4.95**	**16.08**	**25.34**	**28.29**	**31.88**	**31.88**	**32.76**	**32.76**

Dimensions = Bauxite in t, Crude oil in barrels, Gold in t cont.; F = Feasibility, PF = Prefeasibility, E = Expansion, C = Construction, Cl = closed

Potential gross revenues of the extractive sector in scenario 3 (in million 2007-US-$) – Source: Own calculations.

Commodity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total: 2008-2015
Aluminium	196	34	33	33	32	31	29	27	26	25	237
Bauxite	171	143	143	143	142	140	138	136	134	133	1,108
Crude oil	10	13	13	13	1193	1,897	2,861	2,367	2,046	1,792	12,185
Diamonds	40	40	39	39	39	37	35	33	32	31	284
Gold	1,337	1,645	1,715	1,876	1,960	1,887	1,680	1,440	1,289	1,165	13,013
Manganese ore	103	113	112	110	106	97	84	70	61	54	694
										Total revenues	27,522

MDG costs in 2007-US-$ if not noted otherwise – Population sources: UNDP, 2008; CPA: OECD, 2008; MDG-Costing: Based on UN-Millennium Project, 2006.

Per Capita MDG costs with respect to	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Totals 2008 - 2015
Hunger	3	4	4	5	6	7	9	10	12	13	
Education	19	20	20	21	21	22	23	23	24	25	
Gender equality	2	3	3	3	3	3	3	3	3	3	
Health	20	22	24	25	27	29	31	34	36	38	
Water supply/ sanitation	7	7	7	8	8	9	9	10	11	11	
Improving the lives of slum dwellers	2	2	2	2	2	2	3	3	3	3	
Energy	15	15	16	16	17	18	18	19	18	20	
Roads	12	12	12	12	11	11	11	11	11	11	
Other	9	9	10	10	10	11	12	13	14	15	
Total per capita MDG costs	**90**	**94**	**98**	**102**	**106**	**113**	**120**	**127**	**132**	**140**	
Total population	23,500,000	23,970,000	24,449,400	24,938,388	25,437,156	25,945,899	26,464,817	26,994,113	27,533,995	28,084,675	
Total MDG	**2,112,359,551**	**2,248,870,787**	**2,389,997,528**	**2,535,869,791**	**2,686,620,945**	**2,921,100,076**	**3,163,883,723**	**3,415,210,275**	**3,632,631,175**	**3,944,476,877**	**24,689,790,390**

Per Capita MDG costs with resprect to	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Totals 2008 - 2015**
costs 2007$											
Per Capita Household contribution	10	11	11	12	12	13	14	15	16	17	
Total Household contributions	237,640,449	255,859,551	274,712,360	294,216,937	314,391,813	344,001,805	374,670,441	406,428,221	439,306,444	473,337,225	2,921,065,246
Per capita CPA (Country programmable aid)	43	41	39	45	52	51	50	49	48	47	
Total CPA	1,006,737,589	984,751,773	962,765,957	1,112,765,957	1,323,404,255	1,323,404,255	1,323,404,255	1,323,404,255	1,323,404,255	1,323,404,255	10,015,957,447
Total government MDG financing need	**867,981,512**	**1,008,259,463**	**1,152,519,211**	**1,128,886,896**	**1,048,824,877**	**1,253,694,015**	**1,465,809,026**	**1,685,377,799**	**1,869,920,476**	**2,147,735,396**	**11,752,767,698**

Appendix 4 – Basic data for Mozambique

Mineral production – Source: BGR database.

Commodity	Dimension	2000	2001	2002	2003	2004	2005	2006	2007
Aluminium	t cont.	53,800	266,000	273,200	408,500	549,000	553,700	564,000	559,900
Bauxite	t	8,100	8,597	9,119	11,793	6,723	9,518	11,069	11,800
Bentonite	t	0	254	580	684	578	547	610	600 est.
Diatomite	t	0	0	0	0	3,000	5,000	6,000	5,000 est.
Gold	t cont.	0.023	0.023 est	0.063 est	0.063	0.063 est	0.063	0.068	0.068
Natural gas	million Btu	0	0	72,818	36,409	47,149,945	84,323,763	84,833,492	113,700,000
Niobium	t cont.	5	3	6	23	87	34	29	29
Steam coal	t cont	0	27,600	43,512	36,742	16,525	3,000	10,000	28,000 est.
Tantalum (concentrate)	t cont	10	8	13	54	205	712	281	80

Potential future projects – Sources: Estimates based on BGR; Raw Materials Group; Company and government information; different mining journals; Yager, 2007.

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Aluminium	Mozal Aluminium Smelter	BHP Billiton	E	2009	0	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Aluminium total					**0**	**250,000**	**250,000**	**250,000**	**250,000**	**250,000**	**250,000**	**250,000**
Bauxite	Monte Snuta	E.C. Meikles	E	2008	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Bauxite total					**1,200**	**1,200**	**1,200**	**1,200**	**1,200**	**1,200**	**1,200**	**1,200**
Natural Gas	Pande/Temane fields	Sasol/ Petronas/ ENH	E	?	**0**	**26,300,000**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**
Natural Gas total					**0**	**26,300,000**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**	**113,738,054**
Gold	Manica Gold Deposit	Metorex	PF	2011	0	0	0	3	3	3	3	3
Gold		Pan African Resources	PF		0	0	0	0	0	0	0	0

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Gold total					**0**	**0**	**0**	**3**	**3**	**3**	**3**	**3**
Metallurgical Coal	Moatize	Vale	C	2009	0	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000
Metallurgical Coal total					**0**	**9,000,000**	**9,000,000**	**9,000,000**	**9,000,000**	**9,000,000**	**9,000,000**	**9,000,000**
Tantalum concentrate	Marropina Mine	Noventa Ltd	C	2008	143	181	227	227	227	227	227	227
Tantalum concentrate	Morrua	Noventa Ltd	F	2009	0	45	159	204	204	204	204	204
Tantalum concentrate total					**143**	**227**	**386**	**431**	**431**	**431**	**431**	**431**
Ilmenite	Limpopo Corridor Sands Titanium Mine	WMC Resources/ Industrial Dev. Corp.	PF		0	0	0	0	0	0	0	0
Ilmenite	Moma Mineral Sands Mine	Kenmare	Production / E	2008	800,000	800,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Ilmenite concentrate total					**800,000**	**800,000**	**1,200,000**	**1,200,000**	**1,200,000**	**1,200,000**	**1,200,000**	**1,200,000**
Rutile	Limpopo Corridor Sands Titanium Mine		PF		0	0	0	0	0	0	0	0
Rutile	Moma Mineral Sands Mine	Kenmare	Production / E		21,000	21,000	21,000	21,000	21,000	21,000	21,000	21,000
Rutile total					**21,000**	**21,000**	**21,000**	**21,000**	**21,000**	**21,000**	**21,000**	**21,000**
Zircon	Limpopo Corridor Sands Titanium Mine		PF		0	0	0	0	0	0	0	0
Zircon	Moma Mineral Sands Mine	Kenmare	Production / E	2008	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
Zircon total					**56,000**	**56,000**	**56,000**	**56,000**	**56,000**	**56,000**	**56,000**	**56,000**
Steam Coal	Moatize	Vale	C	2009	0	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000
Steam Coal total					**0**	**3,500,000**	**3,500,000**	**3,500,000**	**3,500,000**	**3,500,000**	**3,500,000**	**3,500,000**

Dimensions = Aluminium, Gold, Metallurgical coal, and Steam coal in t cont., Bauxite, Tantalum, Ilmenite, Rutile, and Zircon in t, Natural gas in Mio BTU; F = Feasibility, PF = Prefeasibility, E = Expansion, C = Construction, Cl = closed

Potential gross revenues of the extractive sector in scenario 3 (in million 2007-US-$) – Source: Own calculations.

Commodity	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total: 2008-2015
Aluminium	1,482	1,460	1,453	1,957	1,919	1,901	1,775	1,650	1,569	1,504	13,728
Bauxite	2	2	2	2	2	2	2	2	2	2	19
Diatomite	2	2	2	2	2	2	2	2	2	2	14
Natural gas	624	812	809	952	1,422	1,450	1,369	1,289	1,238	1,196	9,725
Gold	1	1	1	1	1	29	24	20	18	16	111
Metallurgical Coal	0	0	0	559	545	580	530	480	448	422	3,564
Niobium	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2
Tantalum	23	6	15	20	30	35	36	36	37	37	247
Ilmenite	0	0	37	38	58	69	73	78	81	84	519
Rutile	0	0	8	8	8	9	9	10	10	10	71
Zircon	0	0	39	39	38	41	39	36	35	33	300
Steam Coal	1	1	1	136	133	145	137	129	124	120	924
										Total revenues	**27,163**

MDG costs in 2007-US-$ if not noted otherwise – Sources: MDG-costing based on UN-Millennium Project, 2006; Population: UNDP, 2008; Country Programmable Aid: OECD, 2008.

Per Capita MDG costs with respect to	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Totals 2008 - 2015
Hunger	4	5	6	7	8	9	11	13	14	16	
Education	19	20	20	21	21	22	23	23	24	25	
Gender equality	2	3	3	3	3	3	3	3	3	3	
Health	27	29	32	35	37	40	44	47	51	54	
Water supply/ sanitation	7	7	7	8	8	9	9	10	11	11	
Improving the lives of slum dwellers	3	3	3	3	3	4	4	4	4	4	
Energy	16	16	16	17	17	18	18	19	18	20	
Roads	15	17	19	21	24	26	28	30	33	35	
Other	9	9	10	10	10	11	12	13	14	15	
Total per capita MDG costs	**102**	**110**	**117**	**124**	**131**	**142**	**152**	**162**	**171**	**183**	

Per Capita MDG costs with respect to	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Totals 2008 - 2015**
Total population	21,400,000	21,913,600	22,439,526	22,978,075	23,529,549	24,094,258	24,672,520	25,264,661	25,871,013	26,491,917	
Total MDG costs 2007$	**2,188,089,888**	**2,400,647,191**	**2,622,146,905**	**2,852,895,833**	**3,093,210,352**	**3,416,511,641**	**3,753,549,702**	**4,104,797,680**	**4,430,628,912**	**4,851,890,388**	**29,125,631,412**
Per Capita Household contribution	9	9	10	10	10	11	12	13	15	16	
Total Household contributions	192,359,551	203,131,685	214,310,084	225,908,041	237,939,258	270,722,000	304,941,261	340,647,110	377,891,194	416,726,782	2,389,085,730
Per capita CPA(Country programmable aid)	61	60	59	61	62	61	59	58	56	55	
Total CPA	1,302,482,270	1,315,602,837	1,328,723,404	1,410,638,298	1,460,638,298	1,460,638,298	1,460,638,298	1,460,638,298	1,460,638,298	1,460,638,298	11,503,191,489
Total government MDGfinancing need	**693,248,068**	**881,912,669**	**1,079,113,417**	**1,216,349,494**	**1,394,632,797**	**1,685,151,343**	**1,987,970,143**	**2,303,512,271**	**2,592,099,419**	**2,974,525,308**	**15,233,354,193**

Appendix 5 – Basic data for Zambia

Mineral production – Sources: BGR database; Raw Materials Group, 2008..

Commodity	Dimension	1985	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Coal	1,000 t cont.	500	154	150 est.	150 est.	150 est.	168	150 est.	150 est.	150 est.	150 est.	150 est.	150 est.	168 est.
Cobalt	1,000 t cont.	4	3	5	5	4	3	5	6	7	6	5	5	4
Copper concentrate	1,000 t cont.	520	342	331	379	271	257	307	308	347	412	459	492	528
Copper (refined)	1,000 t cont.	510	307	309	303	268	226	308	347	360	408	403	456	479
Gold	t cont.	0	0	0	0	0	0	0	0	0	0	0	1	2
Manganese ore	t	0	0	0	0	0	0	0	0	0	0	0	5,000 est.	5,000 est.
Selenium (refined)	t cont.	19	18	17	13	12	10	13	10	10	10	10	10	10
Silver	t cont.	19	8	7	7	6	6	5	6	6	8	9	11	10 est.
Uranium	t cont.	100	100	100	100	100	100	100	100	102	0	0	0	0
Zinc ore	t cont.	31,900	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (refined)	t cont.	22,800	0	0	0	0	0	0	2	2	2	0	0	0

Potential future projects – Sources: Estimates based on BGR; Raw Materials Group; company information; different mining journals.

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
Cobalt	Munali	Albidon	PF	late 2008	100	480	480	480	480	480	480	480
Cobalt	Konkola Copper/Cobalt Mine	Vedanta	E	2008	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Cobalt	Lumwana	Equinox	C	late 2008	0	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Cobalt	Mulyashi	Luanshya Copper Mine	C	?	0	0	1,000	1,000	1,000	1,000	1,000	1,000
Cobalt	Nama	Caledonia	G	late 2008	0	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Cobalt total					**2,100**	**15,480**	**16,480**	**16,480**	**16,480**	**16,480**	**16,480**	**16,480**
Copper concentrate	Kadola Copper Deposit	Caledonia	G	?	0	0	0	0	0	0	0	0
Copper	Cheowa	Zambezi	G	?	0	0	0	0	0	0	0	0

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
concentrate		Resources										
Copper concentrate	Chifupu	Metorex	F	?	0	0	0	0	0	0	0	0
Copper concentrate	Kasempa	Metorex	G	?	0	0	0	0	0	0	0	0
Copper concentrate	Ndola	African Eagle	PF	?	0	0	0	0	0	0	0	0
Copper concentrate total					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Refined copper	Konkola North	African Rainbow Minerals	F	?	0	0	0	0	0	0	0	0
Refined copper	Konkola Deep	Vedanta, CDF, State of Zambia	C	2010	0	0	100,000	150,000	180,000	180,000	180,000	180,000
Refined copper	Chibuluma	Metorex	E	2008	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Refined copper	Chambishi	State of China	E	2008	22,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000
Refined copper	Munali	Albidon	Cn	late 2008	200	1,650	1,650	1,650	1,650	1,650	1,650	1,650
Refined copper	Baluba Copper/Cobalt Mine	Luanshya Copper Mine	C	2008	22,000	22,000	22,000	22,000	22,000	22,000	22,000	22,000
Refined copper	Kansanshi	First Quantum	E	2008	25,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Refined copper	Konkola Copper/Cobalt Mine	Vedanta	E	2008	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Refined copper	Mkushi	CGA Mining, African Eagle Res	PF	?	0	0	0	0	0	23,040	23,040	23,040
Refined copper	Mwambashi	African Rainbow Minerals	F	?	0	0	0	12,000	12,000	12,000	12,000	12,000
Refined copper	Mulyashi	Luanshya Copper Mine	C	?	0	0	60,000	60,000	60,000	60,000	60,000	60,000
Refined copper	Lumwana	Equinox	C	late 2008	59,000	100,000	169,000	169,000	169,000	169,000	169,000	169,000
Refined copper	Luanshya	Weatherly	S / Restart plans	2008	0	20,000	60,000	60,000	60,000	60,000	60,000	60,000
Refined copper	Mokambo	ICS Copper	PF	?	0	0	0	0	0	11,000	11,000	11,000

Commodity	Mine	Company	Status	Opening year	2008	2009	2010	2011	2012	2013	2014	2015
		Systems/ African Eagle										
Refined copper total						**288,650**	**557,650**	**619,650**	**649,650**	**683,690**	**683,690**	**683,690**
Gold	Matala	Luiri Gold	G	?	0	0	0	0	0	3	3	3
Gold	Lumwana	Equinox	C	late 2008	0	1	1	1	1	1	1	1
Gold total					**0**	**1**	**1**	**1**	**1**	**4**	**4**	**4**
Manganese ore	Chiwefwe	Red Rock Resources	PF		0	0	0	0	0	0	0	0
Manganese ore total					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Zinc	Chipirinyuma Zinc Deposit	African Eagle	G	?	0	0	0	0	0	2,000	2,000	2,000
Zinc refined	Kabwe/ Sable	Metorex	Cn	2008	2,000	4,500	4,500	4,500	4,500	4,500	4,500	4,500
Zinc total					**2,000**	**4,500**	**4,500**	**4,500**	**4,500**	**6,500**	**6,500**	**6,500**
Uranium	Gwabe	Energy Ventures, Albidon	G	?	0	0	0	0		200	200	200
Uranium	Mutanga	Denison	PFy	?	0	0	0	0	0	1,000	1,000	1,000
Uranium	Lumwana	Equinox	PF	2012?	0	0	0	0	500	500	500	500
Uranium	Njame	Albidon/ Energy Ventures	PF					500	500	500	700	700
Uranium total					**0**	**0**	**0**	**500**	**1,000**	**2,200**	**2,400**	**2,400**
Nickel	Munali	Albidon	C	2008	2,000	7,500	10,000	10,000	10,000	10,000	10,000	10,000
Nickel total					**2,000**	**7,500**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**	**10,000**

Dimension = t. cont.; F = Feasibility, PF = Prefeasibility, E = Expansion, C = Construction, G = Grassroots, S = Suspension

Potential gross revenues of the extractive sector in scenario 3 (in million 2007-US-$) – Source: Own calculations.

Commodity	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total: 2008-2015
Cobalt	287	392	1,066	1,080	1,098	970	842	759	693	6,901
Copper concentrate	226	223	219	210	190	160	129	109	93	1,334
Copper (refined)	3,365	3,331	4,856	6,073	6,059	5,235	4,393	3,791	3,312	37,050
Gold	42	41	50	49	46	40	55	49	45	376
Manganese ore	0	0	0	0	0	0	0	0	0	1
Nickel	0	36	134	171	174	145	117	98	84	0
Selenium	1	1	1	1	1	1	0	0	0	4
Silver	4	4	4	4	4	3	3	2	2	25
Steam coal	5	5	5	4	4	4	3	3	3	30
Uranium	0	0	0	0	9	14	21	17	12	0
Zinc	0	5	11	11	11	9	10	9	8	0
									Total revenues:	**45721.69**

MDG costs in 2007-US-$ if not noted otherwise – Sources: MDG costing based on: Mphuka, 2005, The cost of meeting the MDGs in Zambia. S. 38. Download from http://www.sarpn.org.za/documents/d0001728/Zambia_MDGs_Oct2005.pdf;

Per Capita MDG costs with respect to	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Hunger	5	6	8	9	11	12	14	16	17	19	21	
Education	13	13	13	13	13	13	15	17	19	20	22	
Gender equality	2	2	2	2	2	2	2	2	2	2	2	
Health	32	32	33	33	33	34	34	35	35	36	36	
Water supply/ sanitation	8	8	9	9	9	10	10	11	11	11	12	
Improving the lives of slum dwellers	4	4	4	4	3	3	3	3	3	4	4	
Energy	6	6	7	7	8	8	9	10	10	18	11	
Roads	23	27	30	33	36	39	39	39	39	38	38	
Other	6	6	6	6	6	6	6	6	6	6	6	
Total per capita MDG costs	**99**	**104**	**110**	**116**	**121**	**127**	**132**	**137**	**142**	**154**	**152**	
Total population	11.8	11.9	12.1	12.4	12.6	12.9	13.1	13.4	13.7	13.9	14.2	
Total MDG costs (in	**1,162**	**1,242**	**1,334**	**1,431**	**1,531**	**1,635**	**1,734**	**1,836**	**1,941**	**2,151**	**2,161**	**14,421**

Per Capita MDG costs with respect to	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Million 2007$)												
Per Capita Household contribution	6	7	7	8	8	8	9	9	10	10	11	
Total Household contributions (in Million 2007 US-$)	74	80	87	94	101	108	117	125	133	142	152	972
Per capita CPA(Country programmable aid)	69	68	66	64	69	72	71	70	68	67	66	
Total CPA (in Million 2007 US-$)	817	809	801	794	871	931	931	931	931	931	931	7,250
Total government MDG financing need (in Million 2007 US-$)	**271**	**352**	**446**	**544**	**559**	**596**	**686**	**780**	**876**	**1,078**	**1,079**	**6,199**