

African Natural Resources Center
African Development Bank

Running the numbers

How African governments model
extractive projects

ANALYTICAL REPORT



AFRICAN DEVELOPMENT BANK GROUP



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EXECUTIVE SUMMARY

Extractive industries (mining, oil and gas) have been some of the leading drivers of economic growth in Africa over the past decade. Yet, there is a perception that the continent has failed to turn its natural resources endowment into positive development outcomes. This may – at least in part – be caused by comparatively low technical capacity and information asymmetry when assessing the value of resources, designing fiscal regimes, negotiating with extractive companies and monitoring revenue from extractive projects.

Extractive companies, sponsors and investors use financial models intensively to assess the financial feasibility of projects under a range of technical, operational, market and regulatory scenarios. A financial model is a linked system of variables wherein a user can change a range of inputs to see the impact it has on outputs. Increasingly, African governments are adopting these models to assist in fulfilling their roles as trustees of extractive resources on behalf of citizens. The models can help simulate the consequences of different fiscal terms on extractive activities; inform government's negotiating position for resource contracts, leases and production sharing agreements; and inform *ex-post* assessment of revenue streams.

Through a survey of government officials in nearly 20 African resource-rich countries, this study illustrates not only the extent to which financial models are used but also how they are used. Further, the study examines the purposes for which they are used, how governments are organized internally to maximize their use and whether there is access to sufficiently robust data to generate reliable models.

The findings of this study – the first of its kind in Africa – suggest that governments are increasingly using financial models, with a majority of the countries in the sample using them to fulfill at least one function, usually in support of negotiations. However, detailed analysis suggests that the impact and effectiveness of the models could be significantly improved. Models, where they are used at all, are rarely updated regularly and are seldom used for revenue monitoring. Also, there seems to be a substantial gap in access to data that are key inputs for financial models. This suggests the importance of enforcing company reporting requirements where they exist and introducing them where they do not. It is also important to improve business flows and circulation of information across entities within the public sector – to address the somewhat large gap that the study finds between the information available to different agencies, departments and ministries.

The findings of the study have implications for development partners as well. Financial modeling should become a more significant part of general support to the management of extractive resources. It is equally important that models are not just supplied as technical assistance by third parties during negotiations or donor-supported revenue auditing processes, but that some investment is made towards equipping government officials with the skills to create and use models. That way, there will be a stronger sense of ownership and continued capacity to use the models beyond the duration of technical assistance.

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Running the numbers: how African governments model extractive projects

1. INTRODUCTION

Extractive resources (mining, oil and gas) have been a leading drivers of economic growth in Africa over the past decade, especially during the boom in commodity prices. Foreign Direct Investments in the continent's extractive sector increased between 2000 and 2012 from \$10 billion to \$50 billion.¹ Yet, there is a perception that the continent failed to turn its natural resources endowment into development outcomes,² often because of the opacity of the sector and rent-seeking behavior. This led to a wave of efforts to improve governance and accountability frameworks, often driven through international initiatives such as the Extractive Industries Transparency Initiative (EITI) or the Kimberley Process Certification Scheme (KPCS).³

The flurry of investor interest in Africa during the upswing in commodity prices was accompanied by a sense that countries (and their citizens) failed to secure a fair share of benefits from the sector. To blame is the fact that governments are often disadvantaged by information asymmetry and unequal technical capacity when negotiating terms and conditions with extractive companies. A number of initiatives, usually donor-funded, have been established over the past few years to strengthen the ability of governments in the developed world to secure better deals for extractives. The same issue plagues the management of projects once they begin operations. Lack of capacity in financial analysis may leave governments unable to evaluate whether payments have been correctly assessed (tax gap analysis) or to conduct sound revenue forecasting and predict vulnerabilities to market and industry conditions.

The factors governing the relationship between governments, as custodians of extractive resources, and companies, as operators of extractive projects, are multifaceted and can affect the degree to which resources are turned into development outcomes. This paper looks specifically at financial models, a technical tool that can help bridge information asymmetries between investors and governments and inform governments' policy choices. Nearly 200 public officials in 35 countries were contacted (mostly through interviews), with nearly 50 responding from 19 resource-rich countries in Africa.

Through the analysis of the responses, the paper aims not only to illustrate the extent to which African governments use financial models, but also how they are used (i.e. whether they are used for negotiations, policy setting, auditing etc.). In addition, it examines whether government officials have access to data that are key inputs for developing and running financial models. The paper also explores the organizational arrangements in place within government for using models, in particular how the model's outputs (if there are any) influence decision making. It attempts to provide a preliminary picture of capacity gaps as well as an understanding of how government officials would like models to be used.

¹UNCTAD (United Nations Conference on Trade and Development). 2013. "Time Series on Inward and Outward Foreign Direct Investment Flows, Annual, 1970-2012." ² See, for example: Africa Progress Panel. 2013. "Equity in Extractives: Stewarding Africa's natural resources for all". ³KPCS is a process established in 2003 to prevent "conflict diamonds" from entering the mainstream rough diamond market by certifying their origins. The EITI is a tripartite arrangement between participating governments; extractive companies and civil society to monitor the collection of revenues from extractive activities.

To our knowledge, no one has previously carried out a survey on the usage of financial models for extractive projects in Africa. By presenting the results of what we believe to be the first such undertaking, we hope to inform government and development partner efforts to strengthen African capacity in managing extractive projects. This paper also represents an initial effort to understand current experiences and constraints of policymakers on the ground. The aim is to pave the way for further research and capacity building to improve African governments' ability to negotiate, monitor and shape the extraction of natural resources for development.

BOX 1

SUPPORT TO MODELING CAPACITY:
WHAT IS ON OFFER?

AFRICAN LEGAL SUPPORT FACILITY

The African Legal Support Facility (ALSF) is dedicated to providing legal advice and technical assistance to African countries in the negotiation of complex commercial transactions, creditor litigation and other related sovereign transactions. As part of their mandate, they offer support to governments in negotiating extractive contracts, and financial modeling is one of the tools they use. ALSF focuses on legal aspects of negotiations but also supports economic facets of project appraisal to inform the legal approach.

CONNEX

G7 leaders launched the CONNEX Initiative in 2014 to strengthen advisory support to resource-rich, low-income country governments in negotiating complex commercial contracts. The objective is to make the support that is available more comprehensive and responsive to government needs and to contribute to fairer, more sustainable investment deals. This includes not only providing information and capacity building, such as in financial modeling, but also improving advisory services involved directly in contract negotiations.

INTERNATIONAL MONETARY FUND

The Fiscal Affairs Department (FAD) of the International Monetary Fund (IMF) provides policy and technical advice on public finance issues to IMF member countries. FAD has developed a fiscal analysis of resource industries (FARI) framework, an Excel-based modeling tool used for advisory work on fiscal regime designs. FAD offers targeted support to governments on designing fiscal regimes, revenue forecasting and related fiscal policy. The IMF also hosts the Managing Natural Resource Wealth Trust Fund. Launched in 2011 with funds from seven donor countries, the fund helps countries build capacity to manage their natural resource wealth. The fund also helps create a stable macroeconomic environment for exploration and exploitation of natural resources, helping to ensure that they are managed in a socially responsible way.

EXTRACTIVES GLOBAL PROGRAMMATIC SUPPORT

The Extractives Global Programmatic Support (EGPS) Multi-Donor Trust Fund managed by the World Bank aims to support resource-rich developing nations in the governance of their oil, gas and mineral resources. The aim is to use the resources sustainably and transparently to reduce poverty and boost sustainable economic growth. To achieve this objective, the EGPS supports programs ranging from transparency and governance, to legal and regulatory reform, local economic diversification, institutional strengthening and social and environmental sustainability.

AFRICAN NATURAL RESOURCES CENTER

The African Natural Resources Center is a department of the African Development Bank providing advisory services, technical assistance and capacity building to African countries and Regional Economic Communities to improve development outcomes from natural resources. Its activities include a program of support to negotiations, advocating for a structured and multi-disciplinary approach, to develop negotiations skills and systems for contract enforcement.

AFRICAN MINERALS DEVELOPMENT CENTER

The African Minerals Development Center (AMDC) was established in 2013 to drive and coordinate the implementation of the African Mining Vision, the pan-African blueprint to maximize development outcomes from minerals. The vision emphasizes the importance for African countries to secure fairer deals not only to maximize revenue intake but also to ensure that mineral projects are integrated into the domestic economy. AMDC has organized, in collaboration with ALSF, training courses on negotiating mineral deals.

OIL FOR DEVELOPMENT

The Norwegian Agency for Development Cooperation (NORAD) initiated the Oil for Development program in 2005. The program is based on the premise that responsible governance is an important prerequisite for sustainable economic growth and the welfare of citizens. It provides broad-based institutional capacity support for managing petroleum resources, environmental and safety issues, and revenues earned from the petroleum sector.

2. WHAT IS A FINANCIAL MODEL?

For the purposes of this study, we define a financial model as a system that simulates a simplified version of a real-world project; or a system using a set of equations through which a user can change a range of inputs or assumptions to instantly see the impact it has on a range of outputs.⁴ Financial models are most often made in spreadsheets, commonly in Microsoft Excel.

An extractive project, much like any major investment, is backed up by detailed economic analysis to check its viability. An investor first wants to know whether the investment they are about to make will generate adequate return on investment. They also want to know the break-even commodity price,⁵ and they want to be able to forecast revenue under varying market environments. In order to determine all three, the investor typically prepares a financial model.

By changing the inputs in the financial model – production profile, commodity prices, capital and operating expenditure, corporate tax rates, government share of production – an investor can estimate the profitability of the project under different market and regulatory scenarios. Financial models are thus a key tool for making investment decisions, and no extractive company would consider embarking on a project without first having a detailed financial model of the project. Companies usually devote significant human and other resources to technical and economic modeling and generally see these as core functions.

2.1. IMPORTANCE OF FINANCIAL MODELS TO GOVERNMENTS

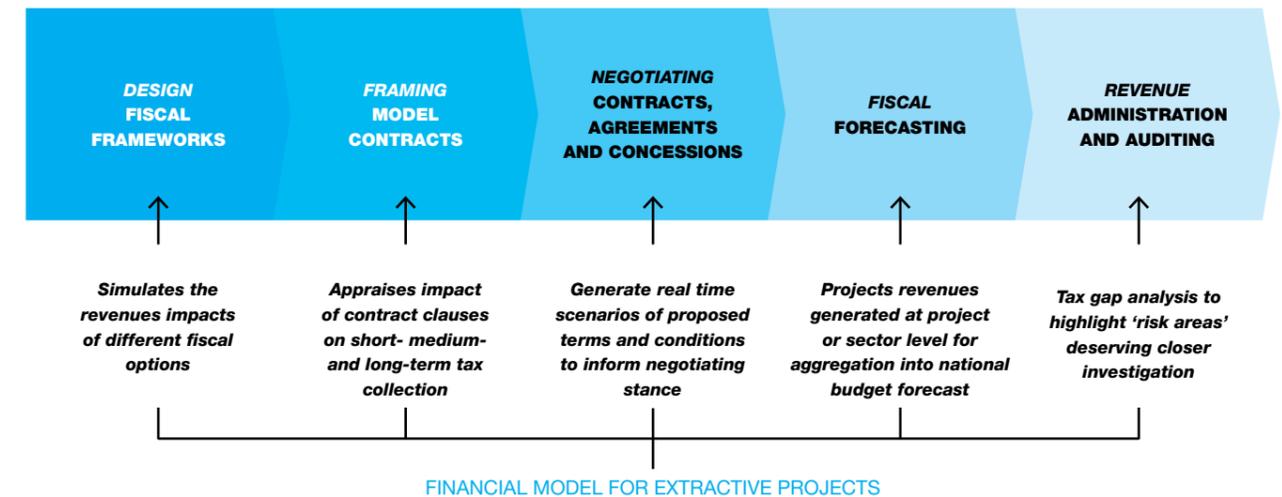
Financial models can also be extremely valuable for governments of countries that host extractive projects. The models provide useful inputs to the management of extractive resources across the policy cycle, before and after an extractive project commences. Figure 1 shows the policy value chain for an extractive project and the role of extractive models in each.

⁴The full definition used in the questionnaire underpinning this study is [...] "a system where you can change a range of inputs to instantly see the impact it has on a range of outputs. For example, you could raise the royalty rate from 5% to 6% and see how much extra revenue the government was going to earn. Or cut the price the commodity gets in the market from \$97 per ton to \$89 per ton and see the impact that has on all government revenue streams in a project such as profit tax, profit share, resource rent tax, state participation or royalties."

⁵The price required to achieve a minimum acceptable return for the investor.

FIGURE 1

THE EXTRACTIVE POLICY CYCLE AND FINANCIAL MODEL



2.1.1 Designing fiscal frameworks for extractive projects

A fiscal regime is the array of fiscal instruments, such as royalties, bonuses, corporate income taxes and withholding taxes, that govern the sharing of revenue from extractive resources between government and an extractive company. The first step in establishing a sound governance sector is designing a sound fiscal regime. This has to be carefully considered and designed before government awards concessions, whether through bid rounds or bilateral negotiations.

Governments have an array of fiscal instruments at their disposal to generate revenues from extractive projects as seen in Box 2.

BOX 2

THE FISCAL TOOLKIT

SIGNATURE BONUS

A payment made to government when the contract is granted. The amount may be negotiated or set by legislation. Signature bonuses tend to be small (or zero) for fields where geological data is relatively poor or nonexistent, and so exploration cost and risk are high. Conversely, signature bonuses are high where there is an already discovered mineral deposit or good geological data, and thus a higher chance that exploration will be successful.

PRODUCTION BONUS

A payment made at any agreed point during the life of the petroleum contract. A production bonus is usually payable at a defined production rate or at a defined quantity of cumulative production.

SURFACE RENTAL PAYMENTS

A fixed payment made annually at the beginning of the calendar or contract year. A rental may take on different forms – a fixed amount for the contract, a fixed amount per square kilometer of operations land or a negotiated amount. It may be payable during the exploration phase, the production phase or both.

ROYALTIES

A payment made by reference to the amount and value of production. The most common royalty is a fixed percentage of the commodity produced or sales revenues. Royalties can also be based on a sliding scale, which allows for higher payment when a project becomes more profitable, i.e. when the production rate is higher, prices are higher, costs are lower or costs have been recovered.

CORPORATE INCOME TAX

A tax on the net income (or profit) generated by a corporation from the activities it conducts.

PROFIT SHARE

This fiscal instrument is mostly used in petroleum production sharing agreements. The agreements differentiate between “cost oil”, oil that goes to the oil company to recover costs it incurred, and “profit oil”, which is what is left after cost oil. Profit oil is shared, according to an agreed formula, between government and the oil company.

STATE PARTICIPATION

A state may negotiate ownership interest in an oil or mineral project. This gives the state either a share in the distributed profits of a company or the right to distribute or sell part of the extracted resource.

RESOURCE RENT TAXES

These are fiscal mechanisms designed such that government can capture an increased share when the extracting company's returns exceed a given threshold.

OTHER PROFIT-BASED TAXES

Also called windfall profit taxes, these are taxes paid when commodity prices rise significantly.

OTHER GENERAL TAXES

These include value added tax, import duties, export duties, turnover taxes, industrial taxes and withholding taxes. These taxes are not unique to extractive industries but are applied to all corporate entities; however, there are often special rules for how they apply to extractive companies.

A financial model is instrumental to visualizing the implications of each fiscal tool and their combined effect on government revenue. Different fiscal instruments generate revenues at different stages in the life cycle of a project. A signature bonus, for instance, is paid to government at the beginning of a project, but profit-based taxation accrues only once the project turns a profit, usually in its later years. While an early payment might be tempting for a government in the short term, a model allows policymakers to assess the trade-off between lower early revenues and higher deferred revenues by measuring the present value of different options, considering the whole life cycle of the project and explicitly modeling the government time preference (or discount rate).

As well as providing revenue to government at various times in the project, different fiscal instruments also interact with each other in a complex manner. As an example, if a government is thinking of proposing a sliding scale royalty, starting with a base royalty of 5% when production begins, moving to 7.5% when cumulative project revenue equals cumulative project cost, 10% when cumulative project revenue is 150% of cumulative project cost and 15% when revenue is double the project cost,⁶ it would be impossible to determine when each of those points might be reached – if ever. A government would first need a view of variables such as projected costs, production levels and forecast commodity prices. It is also important to know that the higher the royalty payment, the lower the base for assessing corporate income tax, and possibly other liabilities.

Having a financial model of the fiscal regime – whether contained in a model contract or free-standing in the case of countries that do not use model contracts – allows a government with plausible project, commodity price and fiscal regime inputs to see what they are proposing and how the proposals will affect projected government revenue and investor outcomes. It also allows government to project a detailed picture of the impact of exogenous variables such as prices on fiscal take. This in turn allows for planning around the medium-term impact of lower commodity prices that producers are currently facing.

Models also allow government to simulate changes in tax parameters (as part of the fiscal regime), to create “what-if” scenarios and to see how those changes affect government revenue, e.g. the impact of different rules to amortize capital costs.

⁶This describes a hypothetical royalty where the royalty rate is determined by the R (for “ratio”) factor as the ratio of cumulative revenues to cumulative costs.

2.1.2 Framing model contracts

Project feasibility and profitability are essentially driven by geology, which means that no project is like another. Therefore, while it is advisable to establish most aspects of the relationship between government and companies' *ex-ante* through legislation, regulation and the fiscal framework, it is inevitable that project-specific negotiations will be necessary for certain aspects. However, governments have a further option to set out *ex-ante* the basic parameters of the relationship ahead of a negotiation by designing a model contract (also called a Model Production Sharing Agreement (PSA) for oil and gas resources and a Model Mining Development Agreement (MDA) for mineral resources). These are pro forma contracts used as the basis for negotiations to improve investment agreements between mining companies and host governments, usually in jurisdictions where mining laws require supplementation by contracts. These model contracts allow government negotiating teams to lay the groundwork for rounds of competitive bidding and to avoid discussing every contract item, instead focusing on issues specific to the project. They also introduce an element of public accountability into negotiations, providing a publicly shared "baseline" for the government's negotiating position. Government's performance in the negotiation can then be gauged in terms of improvements or deviations from the terms of the model contract (provided of course that agreed terms are disclosed).

Models can inform the design of model contracts by simulating the fiscal impact of different contractual clauses over the lifetime of the project. By providing a long-term overview of the fiscal benefits of a project, models (if their outputs are shared with the public) can inform national debate and highlight the impact of specific choices on current and future generations, thus mitigating the risk of decisions taken with only short-term gains in mind.

2.1.3 Contract Negotiation

In the negotiating context, models help address information asymmetry that is often stacked against the government negotiating team. The ability to speak the language of the investor, backed by the same basic but powerful tools that the company team uses to make projections, can help address the imbalances in negotiation ability.

At the negotiation table, having the capacity to create and manipulate financial models in response to the company's proposals is extremely important to the outcome. Without this capacity, a government negotiation team cannot quantify trade-offs or evaluate how a proposed fiscal change will affect the investor's outcomes. For example, government might be asked to agree to a tax holiday when, in the absence of the tax holiday, the project would still be highly profitable for the company. This would amount to government forgoing millions of dollars in tax revenue unnecessarily.

2.1.4. Fiscal forecasting

Revenue projections – for specific projects or the extractive sector as a whole – that are derived from financial models can be aggregated into fiscal projections underpinning the national budgeting process. It is particularly important for countries whose public finances are disproportionately dependent on a small number of large extractive projects to have project-based foundations for forecasting public finances. This could also highlight the vulnerability of the national budget to commodity price fluctuations or departures from production plans.

Because of the nature of fiscal forecasts, in particular the volatility of commodity prices, a degree of caution must be embedded in assumptions supporting revenue projections from the extractive sector. Specifically, they require a robust sensitivity analysis showing how projections will vary as key assumptions change. Publishing the key assumptions underpinning extractive revenue projections in budget documentation can help manage public expectations, strengthen public accountability and preserve the credibility of forecasters by allowing the public (or informed civil society) to track the source of forecasting errors.

2.1.5. Revenue administration and auditing

Financial models also allow for backward-looking analysis, using historical data to see what revenue should have been at different points in the past. This would afford governments a risk-based approach to revenue auditing, allowing for the quick identification of red flags where actual revenues diverged significantly from projections. They could thus credibly question any discrepancy between what the payment should have been and what it actually was.

Calibrating and updating financial models with current data also allows relevant government ministries, departments and agencies to do tax gap analysis. It also permits them to follow up with extractive companies if there are discrepancies in payment during a particular payment period before it becomes a bigger and more complex issue that could result in court cases. In this sense, modeling in the public space can complement governance mechanisms such as the EITI.

In addition, financial models feed into internal government processes such as budget preparation, assisting in proper revenue forecasting and helping ensure that budget is backed up by actual projections of revenue from extractive projects.

2.2. TYPES OF FINANCIAL MODELS

From the government standpoint, a distinction is made between micro (project-level) models and macro (sector-wide) models.

2.2.1. Sector-level models

Sector-based models simulate the financial flows generated by a particular resource in a country into the broader economy. A sector-based model also gives a full view of total revenue from all projects. Macro models allow ministries of finance or budget units to generate relatively quickly expected revenue from that sector within a particular period. They tend to be used in budget forecasting routines.

2.2.2. Project-level models

Project-based or micro models are models of each individual project that provide granular information about the specific fiscal terms of the project. These are the models upon which contract negotiations are based and which give a view of the performance of a particular project. Project-based models can be used to monitor revenue from a specific project.

The main advantage of project-based models is that their assumptions track project-specific characteristics more closely in terms of costs, production levels and fiscal terms. (In some countries, each project has different fiscal terms.) These models are thus more suited to inform individual negotiations or to audit the revenue from specific projects. The downside is that project-level models require a greater amount of very specific information and data as inputs. Because projections at national level would require careful aggregation, micro models are less suited to underpin forecasts for the national budget unless the country has a small number of relatively large extractive projects.

2.3. WHAT DOES A USEFUL MODEL NEED?

Models are only as good as the data that go into them (as well as, of course, the specification of the relationship between variables). Some data are easily available to governments, while others are harder to source and verify. Price data, for instance, may be widely reported, at least for some commodities. However, disaggregated costs incurred by the extractive company are often hard to access. Without cost data, it is not possible to determine at what point the project will turn a profit and therefore when some of the profit-based taxes will start yielding revenue. Most production contracts already specify the right of government to these data, and some governments exercise this right by demanding that companies provide them with these data regularly (often monthly).

There are strategies available to address some of these data gaps, either by subscribing to commercial data and analysis providers such as Platts, Wood Mackenzie, Rystad Energy, etc., or by gathering data from corporate filings and global benchmarks.⁷ It is also important however that data are correctly interpreted and, if necessary, adapted to the context before they are added as inputs to the model. Issues of data format, internal consistency and comparability need to be addressed to ensure robust model outputs (see Box 3).

⁷Although data gaps can be addressed through subscription to these services, it is important to stress that governments do, in most cases, have the right of access to data from companies, including disaggregated costs, and that they should be regularly exercising the rights.

BOX 3

USING OPEN DATA

CORPORATE FILINGS

Publicly listed companies are legally obligated to supply data on their activities to their investors through the exchanges where they are listed. Such filings often include the technical specifications of projects as well as their own evaluation of the profitability of operations. Aleph (aleph.openoil.net) is an online search engine that allows users to search for public domain documents filed by oil and gas and mining companies to financial regulators around the world. Over 2 million documents are currently indexed and searchable. Documents searchable through Aleph that are particularly relevant for financial models include company financial statements, annual reports, project technical reports, feasibility studies, investor presentations, project updates and press releases. Technical reports and feasibility studies normally contain data such as proven reserves, projected capital and operating costs, and projected annual production levels – all of which are essential inputs for a financial model.

BENCHMARKS

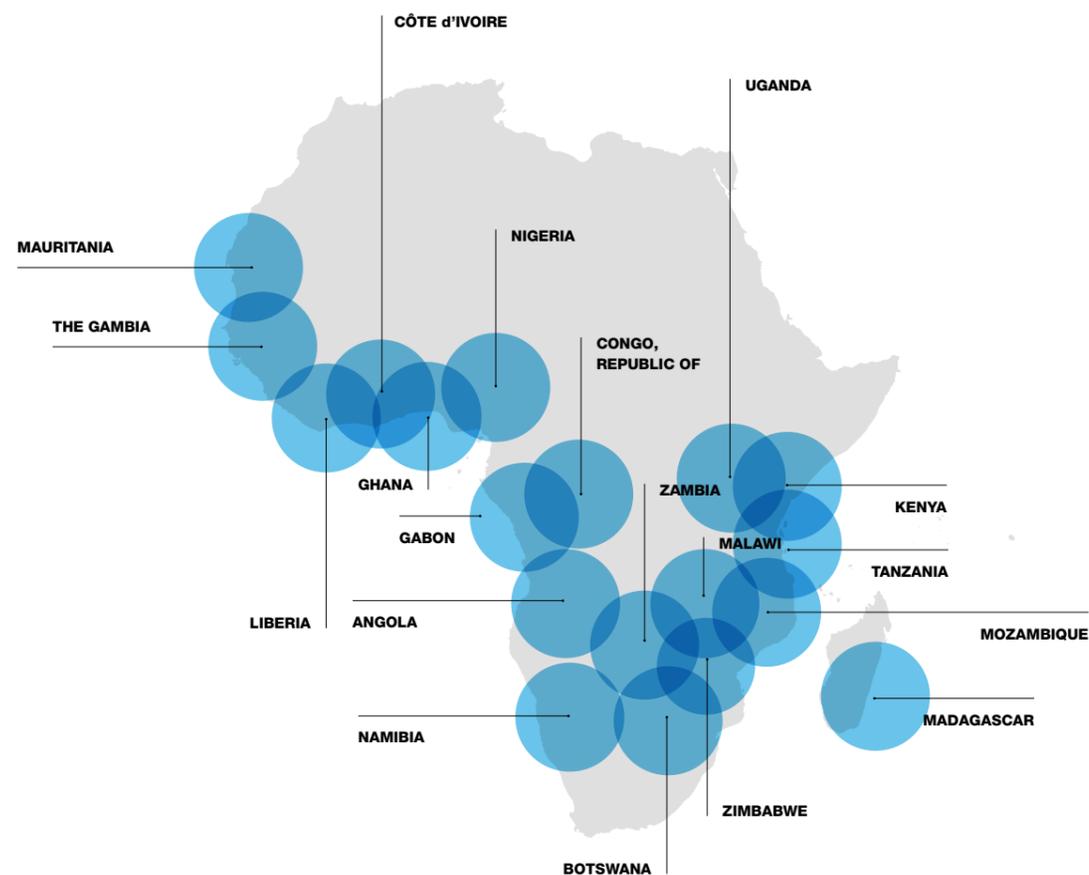
Benchmarks are heavily traded commodities that have become the accepted standards against which the type and quality of commodities, as well as prices, are measured. In the crude oil market, benchmark crudes are oils against which other crude oils are priced, either at discount or premium depending on the crude oil grade and location, among other factors. There are three primary benchmarks that serve in the world's crude markets: West Texas Intermediate (WTI), Brent Crude and Dubai Crude. Each has an accepted publicly available reported price, which is based on aggregate trading activity over a specific period. Benchmark prices are normally available on websites of commodity exchanges.

The same applies for minerals – but with some caveats. The benchmark prices for gold and copper are available on the website of commodities exchanges such as the London Metals Exchange, but diamonds and mineral sands do not have benchmark prices. Some other minerals, such as coal, have an array of benchmarks available, making it challenging to identify the relevant ones.

Models also need to be regularly calibrated and updated with current information to incorporate the impact of changes in parameter as soon as those data points become available. Doing this regularly also makes it possible to track changes in assumptions and feed them into expectations around revenue in real time. It also allows for timely demands for clarification from companies whenever discrepancies are noticed. This would be particularly important to maximize the usefulness of models as contract management tools after a mining or petroleum agreement is concluded.

Data and information needed to develop and run a model are rarely held at a single focal point in government. Rather, each agency has access to specific skills and information that might be a key input to the financial model. Revenue authorities have a clear view of past revenue performance from a project and the time profile of tax collection, while the mining ministry has information on the grade of ore produced and thus the price fetched in the market. It is important that the information held by government is shared effectively and input regularly in the model to generate the best possible estimates. In turn, the outputs from the model inform a range of policy decisions that reside with different ministries and agencies. It is therefore important to set up inter-agency processes and business flows to maximize information sharing. It might be useful for countries to also consider having inter-agency, extractive resource policy committees, with members from all relevant agencies who can read, understand, calibrate and update financial models. This would also solve the problem of different

FIGURE 2
COUNTRY COVERAGE OF THE SURVEY



agencies having access to only particular categories of data. It would also facilitate consistency in analytical approach across government. Having two parts of government using divergent models for the same project carries obvious risks.

2.4. LIMITATIONS OF FINANCIAL MODELS

The key drawback of a financial model – especially project-based ones – is that they might delude an inexperienced user into a false sense of accuracy, by providing numerical estimates without giving a sense of the significant margins of error. It is important that users are made aware of the uncertainties surrounding model estimates, making sure that outputs are subject to robust sensitivity analysis, showing how results change if assumptions are modified.

Moreover, financial models are no substitute for sound tax policy, a robust legal framework and an effective tax administration. These are all areas that governments have to plan for carefully, not just in relation to the management of extractive resources, but also in the effective management of the economy in general. Financial models can support these reforms to achieve a more efficient administration, but they are hardly a substitute. Financial models also have limited power of prediction for profit shifting strategies and abusive transfer pricing implemented by extractive companies. They can however guide tax authorities to identify risks though, for example through tax gap analysis that highlights sizable gaps between predicted and received revenues. However, to act on these red flags, government will need to build separate specialist capacity on tax auditing and transfer pricing.

3. METHODOLOGY AND SAMPLE

This study targeted public sector officials⁸ in a range of agencies responsible for functions along the extractive value chain: ministries of finance, revenue authorities, ministries of mines or petroleum, national mining and oil and gas companies, regulatory authorities, and, depending on institutional context, the office of the prime minister and/or the presidency. A list of relevant contacts at the technical and the managerial levels was drawn up, building on existing contacts of the African Development Bank and OpenOil, and on both institutions' knowledge of a country context. A structured questionnaire was then submitted to the 182 contacts, followed by e-mail reminders and phone calls. Most questionnaires were filled through telephone interviews, which allowed interviewers to also collect information outside the questionnaire and seek clarifications when needed. Respondents however had the option to return the questionnaire by e-mail or fill it in online. Overall, 46 questionnaires were returned, covering 19 African countries.⁹

⁸ An explicit choice was made to target primary decision makers in setting the key policy parameters that determine the benefits accruing to the state from extractive projects. This is not to diminish the important role of strengthening capacity in civil society in using financial models to better understand and disseminate the impact of policies on extractive projects.

⁹ These are Angola, Botswana, Cote d'Ivoire, Gabon, Ghana, Kenya, Liberia, Madagascar, Malawi, Mauritania, Mozambique, Namibia, Nigeria, Republic of Congo, Tanzania, The Gambia, Uganda, Zambia and Zimbabwe.

In terms of institutional make up, the study distinguishes between “central” agencies – ministries of finance, planning, tax authorities etc. – and “sector” agencies. Central agencies are agencies or ministries that are affiliated with the Ministry of Finance (either directly or indirectly) and deal with the revenue side of extractive development outside of sector agencies. These include ministries such as economic budget planning, and the revenue or tax authorities. Sector agencies are agencies or ministries that are directly responsible for the day-to-day management of extractive resources, including their regulation and promotion e.g. ministries of mines or petroleum, national resource companies etc.

The distinction is useful because the latter category can be expected to possess an in-depth technical understanding of the sector and act as the primary interface with investors. Central departments on the other hand would not hold sector-specific knowledge but are likely to have a broader view of policy trade-offs across multiple sectors (e.g. they are likely to look at taxation of the extractive sector in relation to the national fiscal outlook and budgetary pressures rather than strictly on its own). The sample has a slightly higher number of respondents from sector agencies, with 25 respondents (54%) as compared with 21 (46%) from central agencies.

Interestingly, respondents on average had been occupying their present position for a relatively short period – only 20% of respondents had been in their post for over five years, while the majority (40%) had held it for less than two years. The balance had held their position between three and five years.

This probably reflects the fact that some countries surveyed are new producers of at least one of the resources,¹⁰ and that they are in the process of formulating the governance and institutional structures of the sector, setting up new regulatory or supervisory entities. This is supported by the analysis of tenure by agency type, with only 8% of respondents in sector agencies having held their current position for longer than 5 years. In contrast, if one looks at more established, multi-sector central agencies, one-third of respondents have a tenure of over 5 years. There are likely also other factors such as higher turnover in highly technical sectors such as extractives, where the private sector is able to attract public officials with high remuneration, especially during commodity booms.

There are some caveats concerning the sample and its impact on results. While the overall sample size is sufficiently large, it is likely to suffer from respondent bias. In particular, it is possible that those who responded to the request to participate are individuals and institutions most aware of the use of models, either because they make use of one or because they have been exposed to training. Therefore, when interpreting the results, one should bear in mind that they might overestimate public sector capacity and the use of financial models.

¹⁰ An example is Ghana, which is a long-established mining producer but new to petroleum extraction

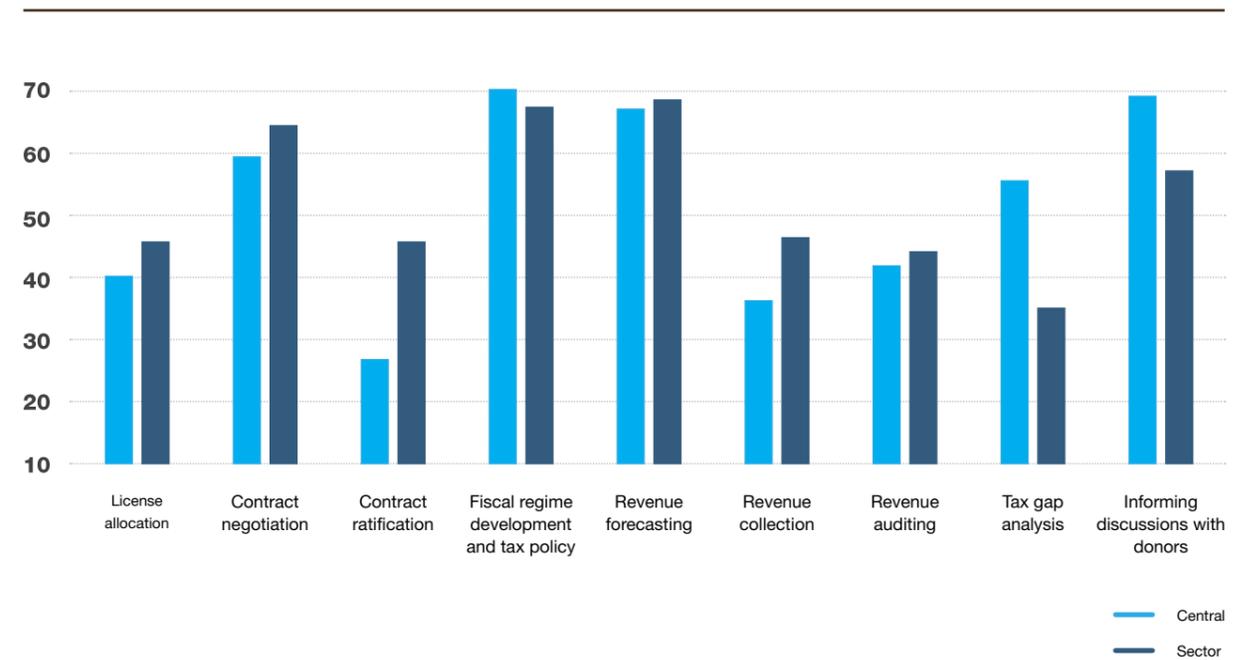
4. RESULTS AND ANALYSIS

4.1. SETTING THE SCENE: FUNCTIONS, DATA NEEDS AND SOURCE OF INFORMATION

In order to set the scene, respondents were asked to rate, in order of importance, a number of functions in the management of extractive resources fulfilled by their organization. Figure 3 compares the scores along each function for sector agencies and central agencies. Ratings are normalized between 0 (not relevant at all) and 100 (essential).

FIGURE 3

KEY FUNCTIONS IN MANAGEMENT OF EXTRACTIVE RESOURCES

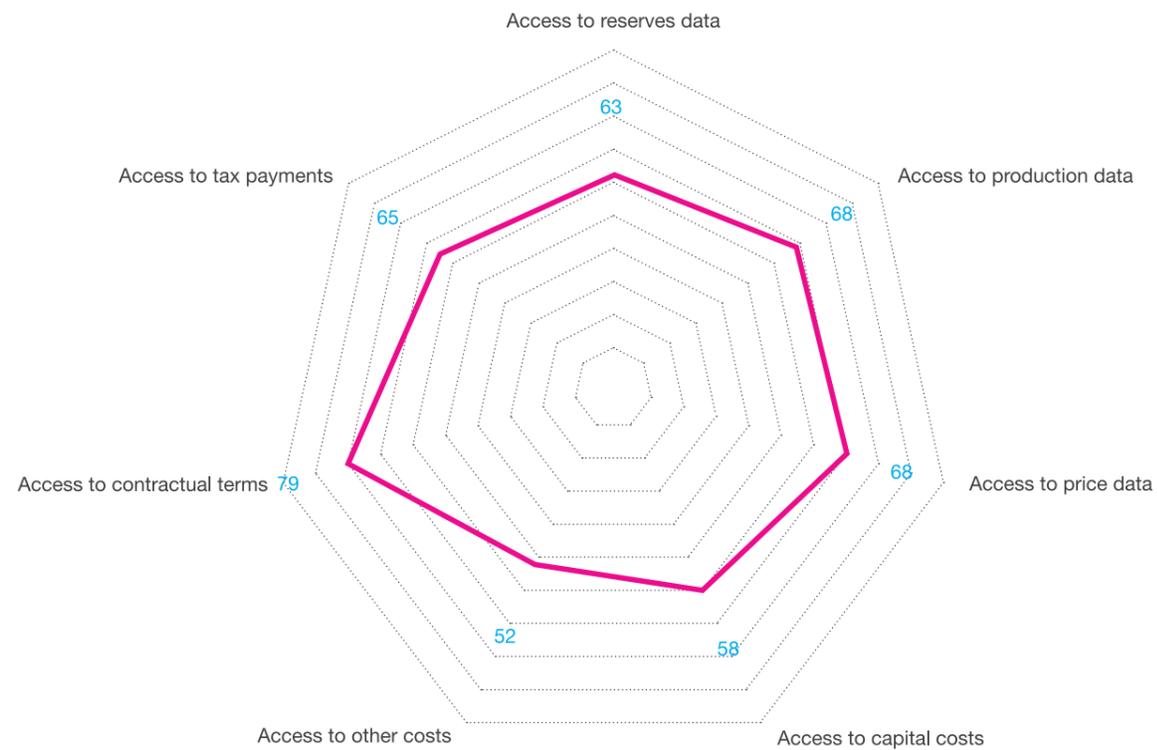


As one would expect, respondents from sector agencies have a more relevant role in allocating licenses and (marginally) in negotiating contracts, leases and concessions. In contrast, those from central agencies score higher for their role in carrying out tax gap analyses and engaging with external partners. Surprisingly, however, sector agencies appear to rate similarly to central agencies for their importance in setting the fiscal regime and developing tax policy and, even more surprising, in revenue collection, given that national revenue authorities are classified as central agencies. This likely reflects the role of sector agencies in collecting (and often retaining) non-tax payments and, in some cases, royalties.

Effective use of financial models requires robust and accurate data in order to generate reliable estimates. The survey asked respondents to rank which data they felt were most important to fulfill their roles, and subsequently to rank their access to such data. Figure 4 shows a measure of access to data normalized between 0 (no access) and 100 (complete access).

FIGURE 4

ACCESS TO KEY DATA

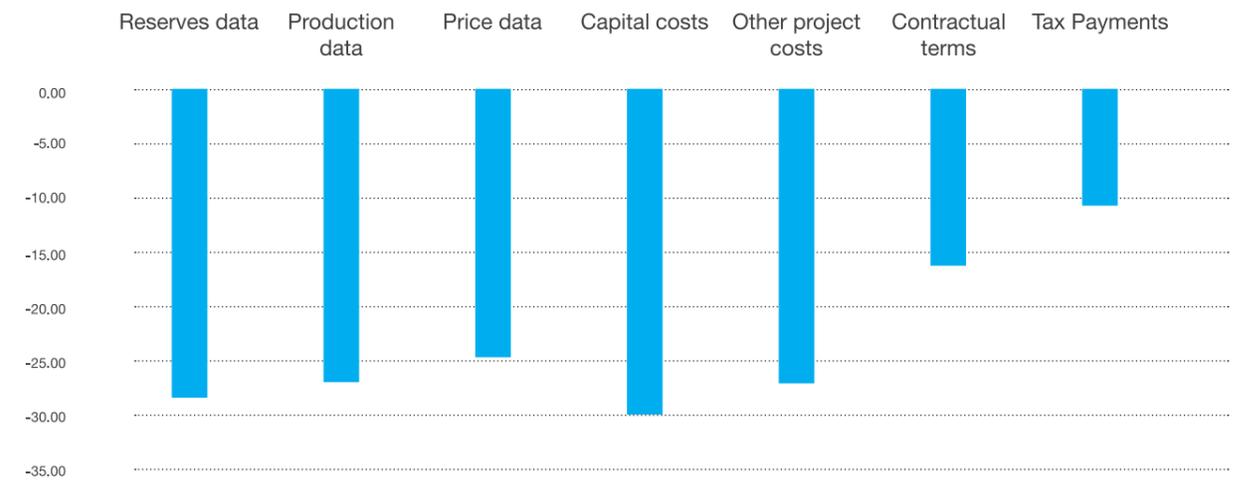


As the figure shows, the largest gaps are seen in accessing information on capital costs and operating costs of projects, having a rating just over the mid-point of the scale. Central agencies generally have lower access to data, except for tax payments, which are normally collected by central agencies. Access to production data and data on reserves is also low, presumably reflecting poor geological information and weak public sector capacity to monitor extractive operations.

It is useful to analyze not only access to data, but also the gap between the importance of a given data category and its access. Figure 5 juxtaposes the ratings on the importance of data against their access. A negative score means that the score for importance exceeds the one for access – that is, the degree of public access to data falls short of need.

FIGURE 5

GAP BETWEEN IMPORTANCE AND ACCESS TO DATA

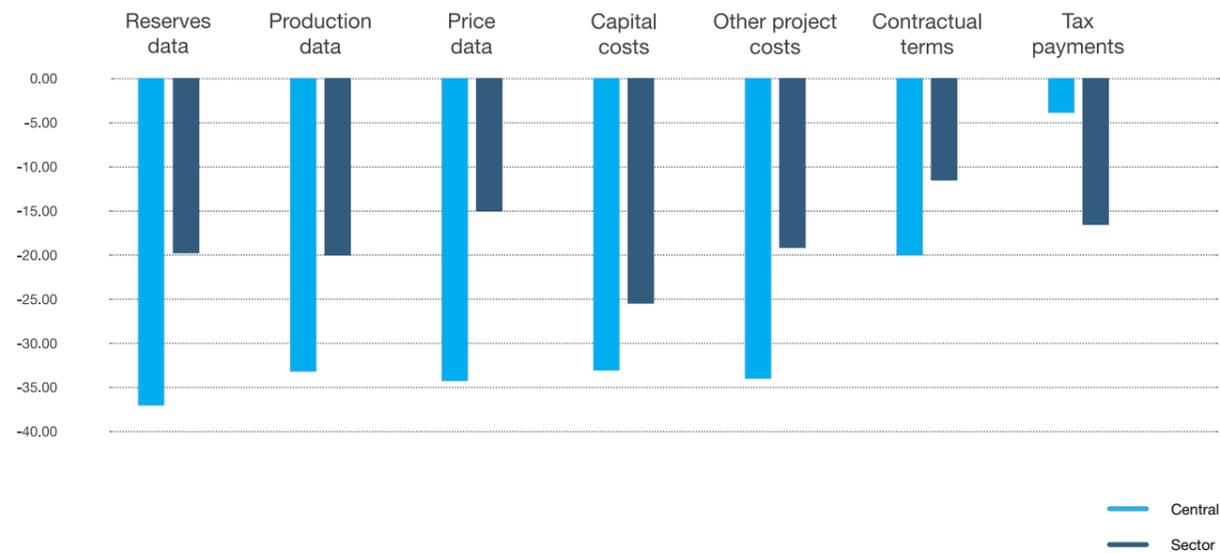


As Figure 5 suggests, for all categories there is a gap between perceived need and access. This is particularly marked for project costs (opex and capex), reserves data and production data, where the responses suggest a 25% gap between access to data and perceived need. The gap is smallest for contractual terms and tax payments, at 15% and 10%, respectively.

The breakdown of these data along central and sector organizations in Figure 6 provides some further insight into these results. The figure plots the frequency (number of responses) for each score of the gap between importance and access.

FIGURE 6

ACCESS TO INFORMATION VS. IMPORTANCE: CENTRAL VS. SECTOR MINISTRIES



As Figure 6 shows, central organizations suffer the largest information gap, posting the highest negative scores for each dimension (with the predictable exception of the tax payment category). This suggests that there is considerable room for improvement in coordinating information sharing between central and sector agencies, possibly supported by integrated IT systems for data sharing. There is no reason why the information set available in sector organizations should not be available to central organizations, especially when deemed by the latter to be relevant for fulfilling their functions.

A sizable majority of respondents reported having a close working relationship with other departments, ministries and agencies across the central and sector divide – about 80% from line organizations and 90% from central organizations reported working closely with other agencies. These results suggest that, although there is a working relationship between sector and central agencies, there is need for stronger emphasis on the quality of interaction and inter-agency coordination, and for a more open and trustful relationship among departments in sharing data and information. Box 4 discusses an example of the benefits of improving institutional coordination.

BOX 4

INSTITUTIONAL COORDINATION IN SIERRA LEONE: THE ROLE OF THE EXTRACTIVE INDUSTRIES REVENUE TASKFORCE

In 2011, Sierra Leone established the Extractive Industries Revenue Taskforce (EIRTF) to improve coordination of mining sector policy at the technical level. The Tax Revenue Policy [unit] at the Ministry of Finance and Economic Development hosts the EIRTF. Its membership includes the Ministry of Finance, National Revenue Authority, National Minerals Agency, and the Extractive Industries Transparency Initiative (EITI) secretariat. The EIRTF has been the key mechanism for engaging with key stakeholders and ensuring systematic compliance information reaches all mining entities.

EIRTF's work has reportedly brought vital improvements to EITI reconciliation reports. One important achievement has been reducing the export duty on gold that is individually mined to levels more comparable to the other Mano River Union countries (Guinea, Liberia, Côte d'Ivoire). This is seen as the driving factor in recent decreases in smuggling and increases in official gold exports.¹¹

The Mining Cadaster Administration System, coordinated by the EIRTF, has recorded over \$150 million of revenues since its inception in 2009. The system manages over 7,000 mining licenses across five offices. The Online Repository portal was made public in 2011 and has over 3,000 registered users.¹²

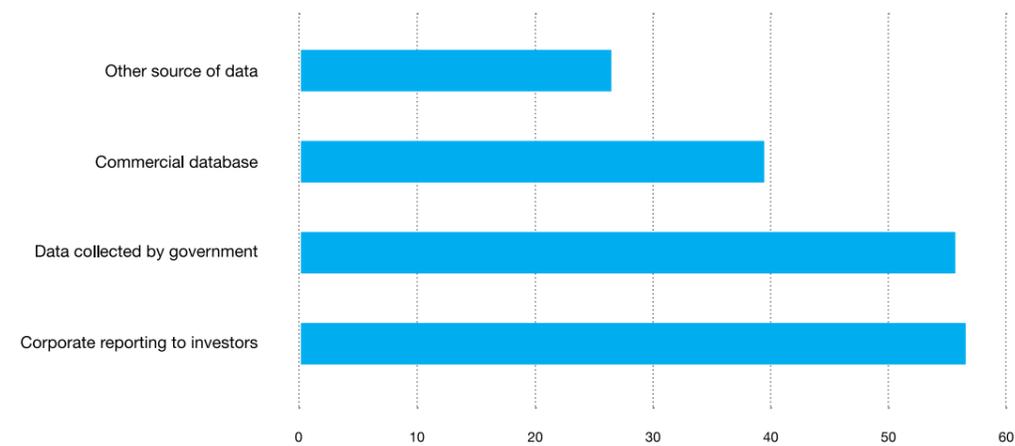
Understanding the source of data and information used by governments can also help assess their robustness and, crucially, the ability to bridge the information asymmetry with extractive companies by using robust independent data. Figure 7 plots responses on use of different data sources, normalizing results on a scale from zero to 100.

¹¹ Readhead, Alexandra. 2016. "Preventing Tax Base Erosion in Africa: A Regional Study of Transfer Pricing Challenges in the Mining Sector." Available online at https://resourcegovernance.org/sites/default/files/documents/nrgi_transfer-pricing-study.pdf

¹² Revenue Development Foundation. 2016. "RDF Mining Sector Governance Solutions." Available online at <https://revenuedevelopment.org/>

FIGURE 7

DATA SOURCES



Extractive companies typically publish reports as part of mandatory disclosure requirements from stock market regulators and investor protection provisions in their home jurisdiction. These reports represent the most used source of data. Qualitative responses during the interview suggest that this result refers to the companies own reporting to government using publicly available material, rather than government using reports to third-party investors.

The next category is data collected directly through governments' own monitoring activities, from tax audits to inspection of production and audits of costs. Use of commercial databases providing cost and price comparator benchmarks is relatively low. Respondents cited the cost of these services and difficulties in securing a permanent budget allocation for the subscription as the reason. Among "other" sources, respondents often mentioned ad-hoc studies commissioned from international consultancies as one source of information.

Overall, however, the use of available data sources appears limited. In fact just below one-quarter of respondents reported not using any data source, and even the utilization of publicly available corporate reporting receives an aggregate score of just over 50 out of 100. The infrequent use of publicly available data sources suggests that the relatively optimistic responses concerning access to information might need to be interpreted in a more cautious light. It also suggests the importance of stepping up awareness and training on strategies to fill data gaps.

The infrequent use of commercial databases is particularly interesting in view of the practice of commissioning ad hoc studies from international consultancies (at least some of which presumably make use of these very databases). Having daily in-house access to a commercial database – provided that staff is trained to use it and interpret its output – might offer a more flexible on-demand solution to information needs than commissioning ad-hoc external studies. In the long term, it might also prove more cost efficient.

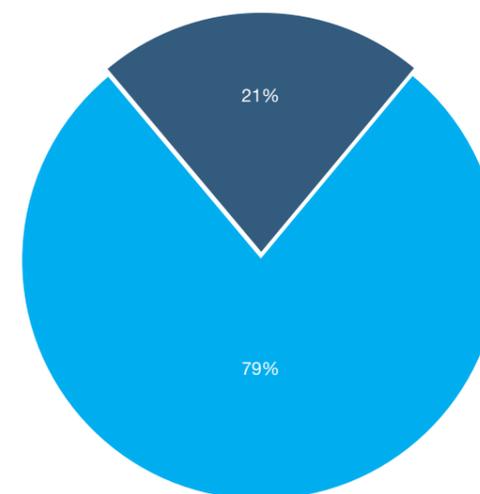
4.2. USE OF MODELS AND HANDLING OF THEIR OUTPUTS

Having set the scene on functions, information needs and general data use, this section focuses on the use of financial models to guide public decision making on policy and investment in extractive projects.

Figure 8 shows that of the 19 countries surveyed, 15 (around 80%) report having some kind of financial model relating to extractive projects, while only 4 (20%) do not.

FIGURE 8

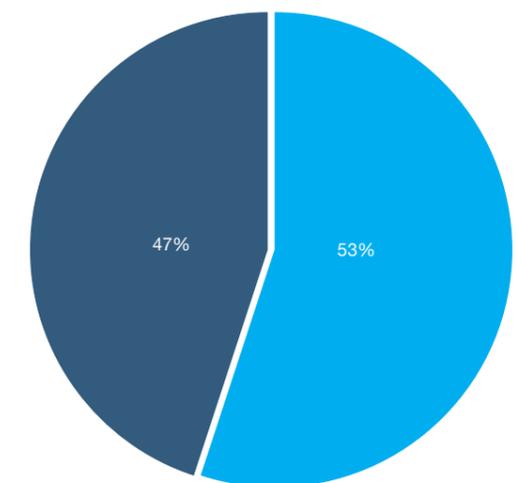
PROPORTION OF COUNTRIES HAVING A FINANCIAL MODEL



— Yes
— No

FIGURE 9

COVERAGE OF FINANCIAL MODELS



— Project level
— Sector level

However, this picture of a preponderance of the use of financial models needs to be interpreted with some caution. When drilling down to consider the model's coverage, data show that only just over half of these models are designed to carry out project-level analysis (Figure 9), while the other half

are sector or macroeconomic models. It is important to distinguish between sector- and project-level monitoring, and to ensure a balance between them. While useful for budget forecasting, aggregated models do not offer the same level of granularity as project-level ones. In addition, they rely on more general assumptions and cannot be used for a number of functions, such as informing negotiations or tax audits. Revenues are only ever earned and owed at a project level as determined by contractual obligations, which can only be modeled in a project-level model. In order to carry out a tax gap analysis, or to take a decision to invest or approve work plans, there is no alternative to the project model.

BOX 5

USING MODELS TO ASSESS
PETROLEUM DEALS: THE CASE OF
TANZANIA

In 2016, UAE's Dubai-based Dodsai Group discovered 2.7 trillion cubic feet of gas in Tanzania's Ruvu Basin Coast Region. This brings Tanzania's gas potential to 3.8 trillion cubic feet, potentially the third largest reserves in sub-Saharan Africa.

In 2007, Tanzania's government, through the Ministry of Mines and Energy, signed a production sharing agreement (PSA) with Norwegian oil company Statoil and the Tanzania Petroleum Development Corporation (TPDC). However, an addendum of the Statoil contract, which diverges in some aspects from the earlier model PSA, sparked the debate over whether Tanzania is getting a fair share of its natural gas. It is estimated that Tanzania's tax take would be reduced by \$900 million a year under the terms of the addendum as compared with the model contract.

According to the terms of the addendum, if the project produces 500 million cubic feet of gas per day, Statoil and other equity partners would first keep enough gas to pay costs, and then keep 65 percent of the remaining gas (profit gas), while giving 35% to TPDC. TPDC's share of profit gas would climb to 40% if production rises to a billion cubic feet of gas per day.

The Natural Resources Governance Institute ran a simulation of the impact of the new fiscal terms on the project.¹³ The analysis finds that the addendum and other publicly available information about the deal suggest that it is not out of line with international standards for a country that had no proven offshore reserves of natural gas when the original contract was signed. This is because the investment decision of the company and how risk-adjusted profitability of the project is affected need to be considered when assessing the impact of fiscal regimes.

The public sector, in particular TPDC, is integrating the use of models in policy and investment decisions. TPDC used an internal model to estimate government's take in the gas project at 61%, including the share of total revenues generated by the project and collected by government.

¹³ David Manley and Thomas Lassourd. 2014. "Tanzania and Statoil: What Does the Leaked Agreement Mean for Citizens." Available online at https://resourcegovernance.org/sites/default/files/Tanzania_Statoil_20140808.pdf

The majority of models in place were developed with the support of an external party (73%), while 10% were developed in-house (15% of respondents were not sure how their models were developed). Of those who had the model developed externally, a development partner (World Bank or a bilateral donor) supported almost all of them, usually through a consultancy company. Three countries in the sample use models developed by extractive companies when they were negotiating with governments.¹⁴

In the majority of cases (80%), the models are not run according to a pre-determined schedule, but rather when a specific policy issue emerges or senior management request a specific piece of information. In more than half of the cases where models are used according to a fixed routine, the models were run once a year to correspond with the budget forecast. Cross-referencing coverage of models with the frequency of use, the data show that, in almost all cases where a fixed routine is followed, the models are sector-wide. Only one country in the sample runs project-level models on a regular basis. This is a drawback, as models need regular calibration to test the interactions between parameters and to check regularly for errors.

This periodicity suggests a general use pattern in which models are not being routinely used to maintain oversight or conduct tax gap analysis. The inference, confirmed by comments during the interviews, is that models are used at the front end of the value chain during negotiations. However, their use to monitor compliance with agreements and the fiscal regime, as well as to feed into the tax monitoring process, is more limited.

Fewer than half of respondents who indicated having models felt that they received good to adequate training in the using them, and a sizable proportion (40%) deemed the training received to be insufficient, as seen in figure 10.

¹⁴ This is not necessarily a drawback per se, and it is fairly common practice during negotiation of complex transactions for government to use and adapt the sponsors' model. However, in the specific case of extractive projects that generate large rents that can have significant impact on public finances, it is important that government has strong ownership over and in-depth understanding of the model. In this way, they can also continue using it regularly to monitor implementation after a contract is signed or a project commences. The general assumption is that models developed in-house (or with the support of a development partner) from the outset are more likely to be tailored to government's needs and thus used more frequently.

Because the outputs of a model are important to the work of different government agencies and institutions, the effectiveness of a model in informing policy will also depend on how well those outputs are shared across government. Figure 11 shows that in about half of the countries in the sample that have models, results are shared with inter-organizational structures such as inter-ministerial committees or ad-hoc teams that are set up specifically to negotiate contracts, leases or concessions. In a smaller number of cases, outputs are shared ad-hoc with other agencies and departments.

FIGURE 10
LEVEL OF TRAINING RECEIVED

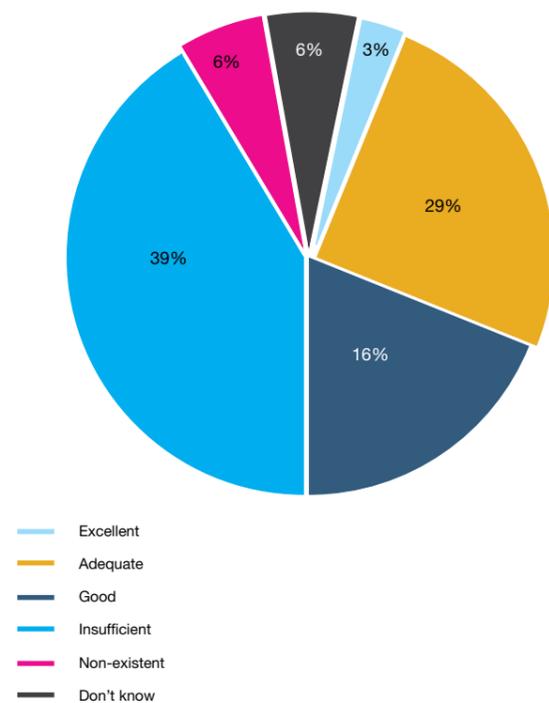
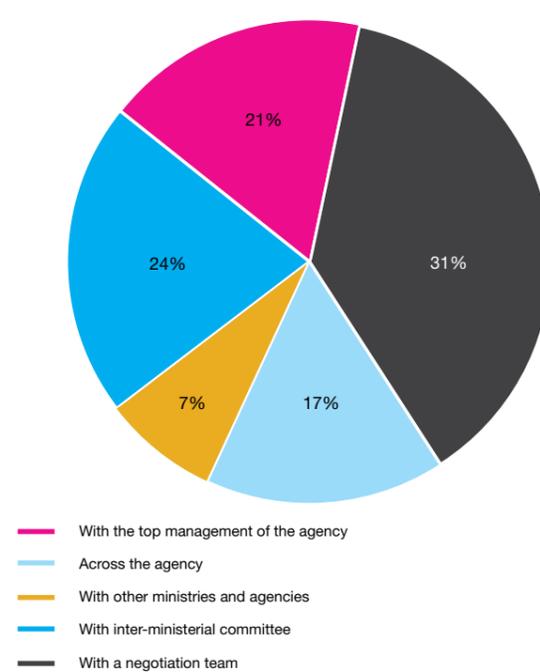


FIGURE 11
HOW ARE THE RESULTS OF THE MODEL SHARED?



However, in the remainder of cases (less than half), the outputs of the model do not seem to be shared outside the agency that produces them. Rather they are submitted to top management, presumably for clearance and sharing with other departments and agencies. This additional step however might slow down the circulation of information and the fluidity of the modeling routine, which would benefit from sharing outputs on a provisional basis at the technical level to verify assumptions before they are taken to management.

BOX 6
WHAT ARE MODELS FOR? TO MINE OR NOT TO MINE IN MALAWI

The Kayelekera Mine, the largest mining investment in Malawi, began uranium production in 2009, contributing about 2.6% to the country's gross domestic product (GDP). But production at Kayelekera was suspended in 2014 as a result of low uranium prices following the Fukushima nuclear incident.

Paladin Africa Limited – a subsidiary of Paladin Energy Limited, listed on the Australian Securities Exchange, Toronto Stock Exchange and Namibian Stock Exchange – operates the mine. The Government of Malawi has a 15% equity stake.

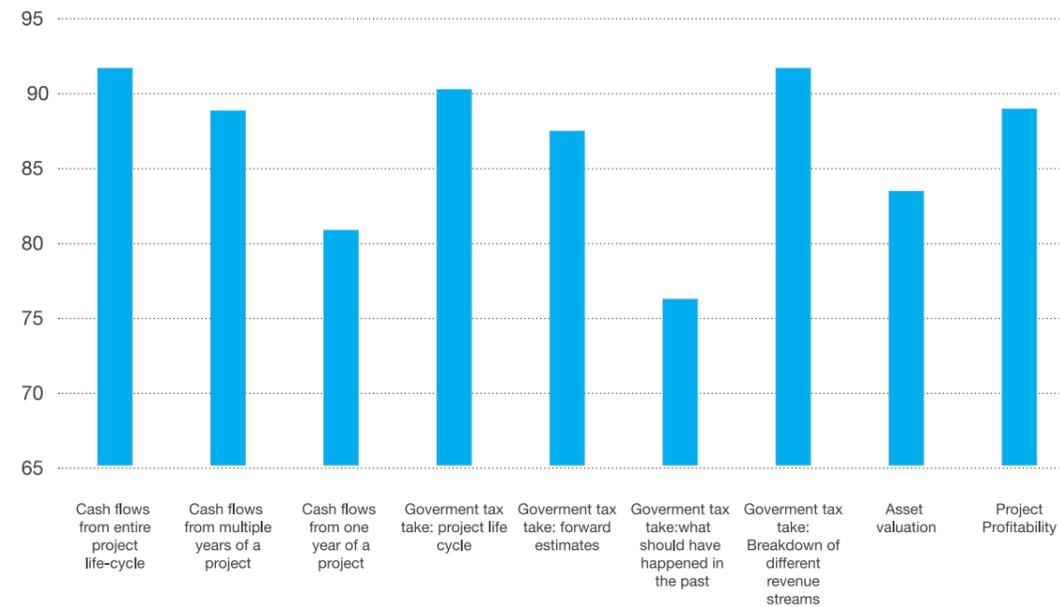
A financial model by OpenOil reveals the setback the mine could face should it commence production at the current price of uranium. Specifically, the model indicates that Kayelekera needs a break-even price of \$58/lb. to come back to operation; but the uranium spot price is \$22/lb. as at May 2017. Further, the model shows that the spot price of uranium would have to more than double for the Kayelekera mine to commence production profitably.

4.3. POTENTIAL USE OF MODELS

The survey asked participants about potential outputs from financial models of extractive projects that would be useful for their work, as well as the potential uses. Both questions were posed to everyone, including those who indicated that they do not have financial models. This was done primarily to ensure that responses around potential usage could inform the design of future support.

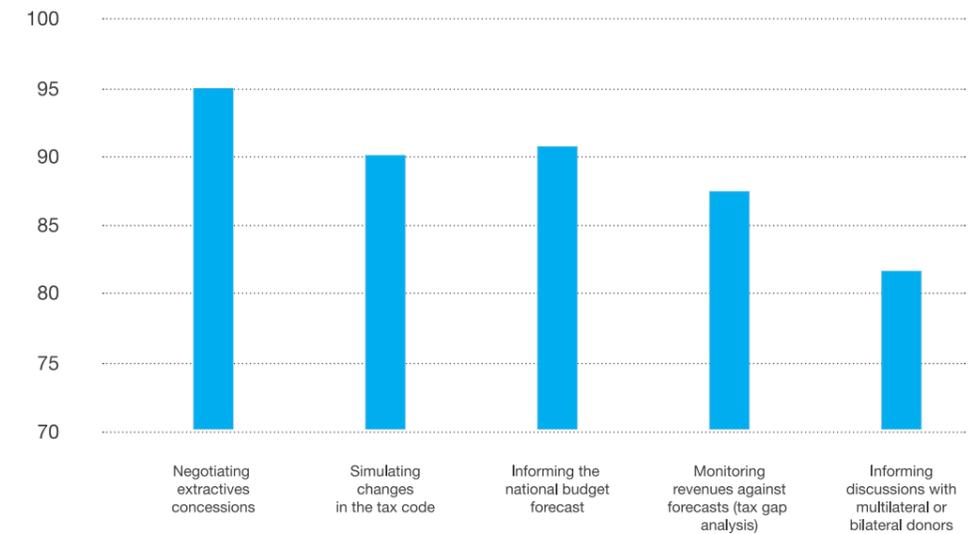
In responding, survey participants ranked cash flow projection over the project lifecycle and government tax revenue (ideally with a breakdown by tax category) as the most desired outputs. Closely following those responses are measures of project profitability such as internal rate of return or break-even points.

FIGURE 12
DESIRABILITY OF POTENTIAL OUTPUTS OF MODELS



In responding to the second question, survey participants rated the use of financial models in negotiating extractive agreements and contracts highest, followed by forecasting and simulating the impact of changes to tax terms on government revenues. Even if respondents generally rated all potential use cases as highly relevant, it is striking that they see negotiations as the key function to be supported by a model, with less emphasis on the *ex-post* monitoring of agreements and tax codes (through, for example, the use of models for tax analysis and revenue forecasting). This might reflect development partners' current emphasis on supporting negotiations over the longer term, day-to-day implementation of agreements and monitoring of project performance. It could also be because many governments only request external support for front-end negotiations, when public pressure is higher to get things right.

FIGURE 13
POTENTIAL USES OF FINANCIAL MODELS



A number of respondents also noted the growing attention to non-fiscal linkages between extractive projects through beneficiation processes, local content requirements and infrastructure development. These linkages often imply a trade-off with fiscal benefits (for example, to the extent that they reduce margins of profitability for companies). Some respondents stressed the attractiveness of a model that could incorporate non-fiscal benefits of projects such as employment generation, local content and skills transfers.

5. CONCLUSIONS AND RECOMMENDATIONS

Financial modeling is important to the management of extractive resources across the value chain. This starts from the design and drafting of the fiscal regime – including the drafting of model contracts – and continues through negotiations into the assessment and monitoring of revenue for projects that are in production. Extractive companies and project sponsors use financial models as the key tool to evaluate projects and take investment decisions. This should also be the case for host countries, especially since revenue from extractive resources can represent a significant part of government revenue in resource-rich African countries.

The result of this study shows that African governments are increasingly aware of the importance of financial models: respondents from 80% of countries in the sample indicate that they have models. This is a good base to build on. However, more effort is needed to embed modeling functions into the regular policy cycle of governments.

Inadequate training for using models, a prevalence of externally developed models and a lack of regular schedules for employing them suggest that models are used in a one-off, rather than continuous manner throughout the lifetime of the project. This is possibly because models are provided as part of external technical assistance and use peters out as these programs end. Moreover, only about half of the models that are used are project-level, suggesting that most of the countries in the sample do not have models that can track the performance of specific projects, assist in negotiating their terms or that allow for simulating project-specific parameters.

It is important that capacity is built sustainably within governments, and that the focus around the use of models is expanded beyond supporting *ex-ante* negotiations, to *ex-post* implementation and monitoring of agreements and fiscal provisions, and informing tax policy design.

In view of these and other observations from the study, we offer the following recommendations to governments and development partners supporting capacity in extractive resources management.

5.1. REGULARITY OF USE OF MODELS

The study finds that in most of the sample countries that have models (80%), they are not run according to any schedule but, rather, as the need arises. Most of the models that are run according to a specified routine are sector-level (with one exception).

While it is hard to prescribe a specific frequency for updating and running models, it would be valuable to run project-based models according to a fixed schedule, whereby all parties can plan for the inputs and updates they would be required to provide. A country's circumstances should determine the frequency, but in principle an update each quarter for major projects is a good default.

This would on the one hand ensure that the models are regularly calibrated and updated with new data and, on the other guarantee that comparisons are regularly made between projected and actual revenue. This would, in turn, allow for the planning of remedial measures in a timely manner if discrepancies are highlighted, as well as for monitoring the accuracy of the model itself.

5.2. CALIBRATION OF MODELS

The study shows that most governments' financial models are rarely calibrated against actual results, which means that their reliability is never fully tested. A sector-wide model predicting revenues in the next fiscal cycle must be updated regularly against actual results, with differences analyzed as to whether they were caused by unforeseen market events (influencing degrees of confidence and margins of error) or by an internal shortcoming. Costs of calibration are small relative to the overall cost of commissioning a model – 10% of the initial model build cost would be enough annually to build the reliability of a model over time. With appropriate training, these costs can gradually be reduced by carrying out the function in-house.

5.3. INFORMATION SHARING ACROSS AGENCIES

The study found that some countries have inter-ministerial technical committees, typically supporting the negotiation process. A number of such committees have financial modeling capacity, with modeling one of the tools that help the committee clarify positions that are then suggested to the negotiating team. The asymmetry in data access between sector and central agencies highlighted in the study also suggests the need to improve information circulation and business flows within the public sector, possibly through strengthening the role of inter-ministerial committees beyond the negotiation stage as well as their links with the modeling process. This would help tackle the problem of varying access to data that the study shows exists between central and line agencies, especially in cases where sector ministries/agencies collect revenue from extractives (e.g. some type of royalty, fee etc.).

5.4. TRAINING IN THE USE OF FINANCIAL MODELS

For those that have financial models, less than 50% consider their training in the use of the models as adequate. The level of training directly affects the ability to design, build, calibrate and update financial models. We would recommend that governments (and, when relevant, development partners) make significant investment in and commitment to improving capacity in this area, and make training in building and maintaining financial models an integral part of extractive resources management. We would further recommend an approach reflecting a series of concentric circles where the center circle contains a core team able to develop financial models, while the outer circle contains a greater number of people who are able to read and understand the model. This would ensure that there would always be someone in a relevant decision-making agency who could read the model, enter new values to see its effect on results and ensure the model's wider and continuous use.

Some respondents noted that, even though they have financial models that were commissioned by development partners and built by consultants, either for contract negotiation support or as part of general technical assistance programs, these models are rarely ever used after the technical assistance program is concluded or the consultant leaves. We would, therefore recommend that where multi- and bilateral development partners support low-income countries with extractive sectors, such support should include financial modeling capacity – not just as one-off delivery of a model but also in building capacity that ensures that such skills stay in-country and become part of revenue management for the projects.

5.5. DATA ACCESS AND DATA ASSESSMENT

The study also found significant gaps in access to and availability of key data, in particular for cost data, reserves data and production data. These data are typically generated and controlled by extractive companies, and the study findings underscore the information asymmetry faced by governments. To address this asymmetry, we recommend that governments consider specific legislative requirements and contractual clauses relating to data sharing with extractive companies, clearly defining the boundaries of proprietary data and specifying templates and standards. For governments that already have such clauses in extractive contracts, we encourage them to exercise the rights to such data according to a defined schedule.

We strongly recommend the inclusion of a data gap analysis and a data evaluation component in capacity building programs for financial modelling. It is important to devise pragmatic approaches to deal with data gaps by identifying the most material ones and prioritizing them (for example through a sensitivity analysis to assess which data have the highest impact on model results). Lack of perfect data should not be allowed to lead to “model paralysis”, where governments believe they are unable to carry out any form of modeling until they have a complete data set. In many cases, the model itself will indicate the margin of uncertainty caused by lack of data, making it possible to proceed on a “what we have now” basis, while guiding future actions by pinning down areas where data should be improved.

5.6. MODELING STANDARDS

Another reason that models commissioned through technical assistance are rarely used after the assistance is concluded is because many are not built according to standard methodology and so they need to be learned from scratch. To address this, we recommend that governments (and, when relevant, development partners) endeavor to ensure that when financial models are commissioned, they are built in compliance with existing financial modeling standards such as FAST Standard or BPSM Standard, both of which are widely used by companies for financial analysis. The FARI system, developed for fiscal regime analysis by the International Monetary Fund (IMF), is also an option, as the template is publicly available. Moreover, many countries have some familiarity with it through IMF’s advisory work. The adoption of a standard would enable governments to train cohorts to interact with models and avoid lock-in to specific companies and individuals.

5.7. REGIONAL COOPERATION

To maximize economies of scale, governments could adopt multi-country and regional initiatives where officials from different governments can be trained in using similar modeling standards. The perception prevalent among some countries that they are competing with others can be managed by agreeing on how to share particular sets of sensitive data. There is strong interest in promoting financial analysis systems from inter-governmental bodies such as the Collaborative Africa Budget Reform Initiative, the African Tax Administrators Forum and the Macroeconomic and Financial Management Institute of Eastern and Southern Africa. There is a potential network effect to be achieved by channeling interest across multiple countries.

5.8. AVENUES FOR FUTURE KNOWLEDGE CREATION

In our understanding, this is the first study of financial modeling capacity within African governments. As noted above, its results need to be interpreted in light of a possible respondent bias: those who agreed to participate are likely those who have interacted with financial models or who are aware of its importance in the management of extractive resources. Moreover, institutional arrangements in the management of extractives in Africa are evolving fast. A number of countries, especially in East Africa, have recorded major discoveries of extractive resources and are restructuring institutional arrangements in view of the start of production. The need for use and awareness of financial models may well expand significantly in the near future.

Further work is needed to understand which institutional arrangements could help countries maximize information flows and optimize use of the models. An effective work flow, engagement across departments at the right level of seniority and expertise, sound strategies to access data and surrogate for data gaps, and robust modeling methodologies with well-defined roles across government teams would all go a long way toward bridging information asymmetry with companies and sponsors.

Further work could develop country-level case studies, adding in-depth qualitative analysis of institutional arrangements in using models and providing a set of case-specific recommendations and capacity building suggestions. Future research could also sample modeling practices in select extractive industry companies to see what governments can learn from how investors organize modeling functions. Such research could also expand to include specialist financial modeling firms. The resulting brief could recommend how governments might consider organizing modeling functions, including team compositions and roles. The brief could also contain key elements of a successful capacity building program that truly embeds skills within government, including identifying target audiences inside government.



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