Background Notes

Natural Gas Development in Tanzania - *Challenges and Opportunities*[1]

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1. Introduction

Natural gas has become an increasingly important energy source around the world, and its importance is expected to increase in the coming decades as demand continues to rise and new sources of supply are exploited.

Gas was discovered in the Tanzanian subsoil in 1974 but significant production did not start until 2004. With rising global interest in natural gas has come an enormous expansion in exploration and discovery including, in the last decade, in the Indian Ocean off the East African coast, yielding significant finds.

While exploration activity around these finds has been dominated by international oil and gas firms – both 'majors' and independents – the development of the fields will draw the Government of Tanzania directly into the sector and will also start to generate potentially large flows of revenue to government. The natural gas sector therefore represents a hugely beneficial opportunity for Tanzania. If used efficiently, a natural resource windfall can contribute to poverty reduction and help place the country on a successful and inclusive economic growth path. But as is widely appreciated, the transition to substantially increased natural resource dependence is far from straightforward and places considerable demands on government and key stakeholders to develop a coherent medium-term economic and political strategy for the management of the resource windfall. Close attention is required across a range of areas, including: fiscal and monetary policy formulation; industrial and trade policy; skills, training and employment; and the development of robust and transparent institutional foundations for effective inclusive growth.

This note provides some brief background to the natural gas sector in Tanzania and then outlines the main opportunities and challenges facing the country.

2. The windfall: how big, how soon, how certain?

Scale

Proven worldwide reserves of natural gas have increased steadily over the years. Between 1980 and 2010, the total reserves have more than doubled, from around 80 trillion cubic metres to around 200 trillion cubic metres in 2010 (BP, 2012).

In 2011, Africa ranked fourth in terms of the world's proven reserves, with around 7% of total reserves after the Middle East (40%), Europe and Eurasia (35%), and Asia Pacific (8%). The four largest African countries are: Nigeria (35% of Africa's reserves), Algeria (31%), Egypt (15%) and Libya (10%).

[1] This note summarizes a longer paper of the same title to be published by the President's Office, Planning Commission and the IGC and written by Arun Jacob, François-Xavier de Mevius and Mujobu Moyo.

Tanzania's current proven reserves amount to around 30 trillion cubic feet (slightly less than 1.0 trillion cubic metres), accounting for less than 6% of total reserves in Africa. And while new offshore discoveries of gas in the last three year have seen Tanzania jump from the 80th to the 28th in international rankings of proven reserves, the country remains a rather small player internationally.

Given the uncertainties over the evolution of prices and production between now and the time Tanzanian offshore gas is exploited, it is difficult to translate these estimated reserves into a clear sense of additional national income the resource discovery may be expected to generate in the medium term. However, one useful reference point is provided by the IMF/World Bank *Debt Sustainability Analysis* (June 2012) which suggests that under reasonably favourable conditions, deep water gas production might add approximately US$3bn per annum to export revenues (in current US$ values). To put this into perspective, this is approximately 50 percent of total current exports and almost exactly equal to the current cost of oil imports.

A second measure of potential scale is public revenue where current estimates, suggest that by the early 2020s, public revenues may be approximately US$2.5bn per annum. By comparison, current aid grants in recent years average around 5 percent of GDP or US$1.6bn.

Thus, future income from natural gas exports may be of the same order of magnitude as current oil imports, while the public revenue from production-sharing agreements and taxation may be around 50% higher than current aid grants. With the population forecast to reach almost 60 million by the end of the 2020s an annual cashflow of $2.5bn over the lifetime of the resource translates into around US$40 – US$50 per person per year. This is a non-trivial sum but nor is it of itself, transformative.

How soon?

Lead times for realization of revenues from natural gas exploitation are long, much longer than for oil, for example. Upstream and midstream investments are very substantial, as are recurrent operating costs. But once incurred, these investments can yield a long and steady flow of revenue.

Current estimates suggest up to 30 years of revenues from current wells at the production levels necessary to justify investment in the two-train LNG plants. Critical decisions on whether to proceed with the major capital investment required to construct the LNG plants are unlikely to be made before 2015.

In the interim, however, progress is being made on the development of established fields at Songo Songo and Mnazi Bay through the construction over the next two years of the Mtwara-Dar es Salaam pipeline and the development of invest programmes for gas-fired power plants.

How uncertain?

The pay-off from this natural resource windfall may be high but it is also uncertain, not least because the global market for energy in general and gas in particular is in a state of flux. This medium-term uncertainty makes it difficult to evaluate the long run costs and benefits of investments and their return on investment.

On the demand side, by 2025, natural gas will have become the second most widely used source of energy worldwide, more important than coal but still dominated by oil. It is likely that the share of natural gas in the fuel mix will rise. ExxonMobil (2012), for example, project that natural gas will

experience a growth in global demand of around 60% between 2010 and 2040 and Africa will experience the second largest increase in demand with a total growth of 73% over the period. Nonetheless, while gas is increasingly being seen as a cleaner substitute for oil and especially coal in power generation, it too faces competition from other energy sources, including renewable, geo-thermal and, potentially, nuclear. The fuel-mix in energy demand over the coming decades is highly uncertain and hence so are the demand projections for gas.

On the supply side, the development of the Indian Ocean basin is just one of a number of major exploration activities in play at the present time. The development of unconventional (shale gas) reserves in the US has the prospect of imparting a very large shift in global net supply, with inevitable consequences for prices. And, as transport technologies develop, the current, highly segmented gas markets (which sustain high price differentials across markets) are likely to give way to a more integrated market and lower prices.

3. The opportunity of harnessing gas resources for investing in growth

The newly-discovered natural gas reserves offers gains in four areas: (i) taking advantage of rising global demand for natural gas; (ii) improving the domestic fuel mix to more efficiently meet domestic energy demands; (iii) exploiting new sources of comparative advantage in production for the domestic and regional markets and, as a consequence, supporting sectoral diversification and employment generation; and (iv) using public tax revenues in the development of physical and human infrastructure capital.

Exporting to the global market

International trade in gas has been bolstered by the development of liquefied natural gas (LNG) transportation and the construction of an intercontinental network of pipelines. Given their strategic location, West African countries, like Nigeria and Angola, have the possibility to develop exports towards Europe and North America. East African producers, including Tanzania and Mozambique may export to the neighbouring countries, to the Middle East and the fastest growing region of the world, East and South Asia. By 2040, Asia is expected to become the leading consumer of natural gas in the world, accounting for almost 40% of global demand.

Meeting local energy demands

Thanks to its versatility, gas can be used extensively in the industrial sector and by enabling a reliable and affordable access to energy, gas can help reduce energy costs and contribute to a sectoral diversification of the economy.

Power generation: In recent years the Tanzanian economy has been constrained by a combination of high cost and intermittent supply of reliable power. Tanzania's national electric supply company, Tanesco has been forced to substitute towards high-cost oil-fired generation while firms and households have had to rely on high-cost stand-by generators. Between 2009 and 2011 the sharp decline in electricity supply has been a critical factor in the slow-down of growth.

Even for gas-importing countries, producing electricity from gas-fired power plants is an attractive option: in fact, the transformation of natural gas into power is the largest component of usage of natural gas worldwide, amounting to 40% of total gas usage. Economies of scale in general raise the possibility that exporting power rather than gas itself to neighbouring countries may be a high-return activity.

Sectoral diversification: Gas can also be used in the production processes of a wide range of industries as a chemical feedstock and as a fuel source for industrial heating. Its low carbon intensity and the need for limited processing before end-use make it a choice fuel and feed stock for the production of fertilizers, petrochemicals and for high energy-consuming industries.

Production of ammonia and fertilizer: Ammonia produced from natural gas is the chief ingredient of the nitrogenous fertilizer, representing 60-70% of the cost of nitrogenous fertilizer production, which translates into a reduction of fertilizer prices by up to US$155-US$175 per ton.

Conversion to Liquid fuels: natural gas can be converted to a variety of liquid fuels, such as methanol, diesel, ethanol and gasoline. Though ethanol and diesel can be produced from natural gas, the chemical conversion process involved is more capital intensive and less efficient than the one for methanol. Also, methanol can be easily exported, as the global demand for it is huge. Alternatively, methanol can be used to produce formaldehyde, which can be further processed to produce plastics, paints and explosives.

Industrial Heating: Process heating is a crucial manufacturing process in the production of metals, coal products, rubber, plastic, concrete, cement, glass and ceramic. Natural gas provides an efficient alternative for industrial process heating with a much reduced environmental impact.

CNG: Natural gas in its compressed form, CNG, is an efficient source of cooking fuel for households, restaurants and for centralized cooling facilities of large-scale retail customers like hotels and office buildings. But, the cost of constructing CNG pipelines to households is huge. CNG can also be used to fuel light duty cars, substituting gasoline in ordinary gasoline engines with minor transformation. Although the investments required to establish adequate infrastructures across cities is colossal, it could help reduce importations of oil and environmental impacts of the transport sector.

Domestic versus Export Market

The allocation of a finite supply of gas production between domestic and export markets is a delicate balancing act. The value of increased supply to the domestic market – for energy and to support downstream development, particularly given projections on population growth, industrial development and urbanization – needs to be traded off against the requirement of a guaranteed minimum throughput of natural gas to the LNG/export sector in order to justify the extremely high capital costs of constructing LNG trains. Striking this balance between competing legitimate concerns will require a transparent and coherent policy framework for the sector combined with careful and flexible management capable of responding to changing market conditions and developmental concerns.

The Dutch Disease – channels and consequences

The 'Dutch Disease' describes how a natural resource boom can undermine the competitiveness of the 'non-resource' sector of the economy.

In a small open economy, such as Tanzania, a resource windfall sets in train two forces that together may squeeze the non-resource tradable sector. On the one had the booming sector may draw labour and capital away from other sectors. On the other, and often more powerfully, the rising income as a result of the resource boom creates a 'spending effect'. Some of this is manifest in terms of higher imports, but partly spills over on to the demand for so-called 'non-tradable' goods and services (those produced exclusively in the domestic economy). In response, these sectors compete for scarce (skilled) labour and other inputs, driving up domestic prices and thereby undercutting the competitiveness of the tradable-goods sector (export- and import-substituting goods). This re-shaping of the economy is not, in itself, problematic (since resources are moving in response to genuine demand pressures) but may have adverse side effects if, for example, it leaves the economy with a less diversified export structure, and hence more vulnerable to the volatility in natural resource prices, or if it is in the contracting tradable goods sector that powerful productivity growth effects are lodged.

4. Managing public resource inflows

Production sharing arrangements and other revenue measures can be expected to transfer substantial resources to the public purse and sub-soil or undersea assets are monetized. As is well documented, the efficient management of these resources is extremely challenging and history is littered with examples of countries that have failed to manage natural resource booms well.

The fundamental objective facing government can be thought of as the efficient transformation of natural capital (i.e. gas reserves) into other forms of productive capital that underpin sustainable long-run growth, be they physical capital, such as infrastructure, or human capital such as health and education. Efficient and sound political management of the country's natural resources is thus a fundamental prerequisite in order to transform the windfalls into broad-based growth and a long-lasting socio-economic development. Tanzania's history and experience with precious metals has highlighted the importance of transparency and good governance on many occasions. It is therefore important to manage additional revenues carefully by creating an adequate macroeconomic and industrial policy framework.

<u>Creating a strong and coherent macroeconomic framework</u>

Avoiding the Dutch Disease: The box above describes the fundamental macroeconomic challenge of the so-called 'Dutch Disease' in which the growth of the natural gas sector can undermine the productivity and growth of the rest of the export and import-substituting sectors of the economy. The risk is that while the economy may be richer (as conventionally measured) following the discovery of natural gas, it may also be more concentrated and more vulnerable to uncertainties of the global market. Moreover, the expansion of the natural gas sector may come at the expense of the expansion of high-productivity and labour intensive activities in the rest of the economy, particularly manufacturing and cash-crop agriculture.

Management of the pressures from the Dutch Disease requires a fiscal policy (supported by monetary policy) that seeks to moderate excessive aggregate demand pressures combined with a range of supply-side measures geared to the effective investment of resources, removal of bottlenecks, especially in the construction, transport and power sectors, so as to deploy the windfall resources in a manner that supports the sustainable development of the non-resource sector. The objective is to ensure that increased natural resource development is matched with greater diversification. These macroeconomic policy measures need to be accompanied by measures geared towards the development of skills that support employment and job generation that strengthens the process of diversification.

Fostering sound public investments and an efficient public financial management

Resource windfalls may increase the scale of public expenditures but too often they are associated with a reduction in quality. Experience shows that resource-rich countries become increasingly dependent on their exports to finance public expenditure, and as the economy specialises government revenues become more volatile. Weak fiscal policies and expenditure control mechanism increase the risk that expenditure becomes dangerously pro-cyclical as boom-bust cycles emerge characterized by poor project evaluation, low productivity and the prevalence of incomplete 'white elephant' projects.

Ensuring intergenerational equity

The fiscal issues discussed in the preceding paragraphs have to be also analysed with the aim of ensuring intergenerational equity. As the revenues of gas will start flowing in the near future, it is important to make sure that the future generations share in the benefits. This may be achieved by investment in financial assets – so-called Sovereign Wealth or Future Generation Funds – but the objective may be more effectively pursued by investment in physical and human capital in the economy itself. The investment in human capital is especially important. Tanzania's global competitiveness ranking is 120 out of 142 countries[2] and its worst performing indicator is "higher education and training", which ranks 135th. In 2007, only 16% of Tanzania's workforce could be categorized as skilled[3].

Finally, public policy needs to support the creation of a regulatory framework that ensures appropriate environmental responsibility. For example, issues such as to the recycling of waste gas production; the monitoring and protection of the marine ecology need to be central to this regulatory framework.

Enhancing the quality of institutions and governance

Enhancing the quality of institution is already a priority for the government of Tanzania. In the 2012 ease of doing business ranking, Tanzania ranks 127th out of the 183 economies surveyed[4]. The country ranks particularly badly when it comes to acquiring construction permits, registering property, paying taxes and starting a business. Efforts to improve the institutional environment face will be challenged with the discovery of natural resources since the latter often undermine the integrity of institutions and governance structures. Poor decision-making, corruption, rent-seeking and state predation undermine the quality of institutions. Increased revenues have a tendency to weaken the prudence and "due diligence" in public investment. Large revenue flows also make it

[2] Global Competitiveness Report 2011-2012, World Economic Forum.
[3] IGC-POPC, (2011), Attaining Middle Income Status, Tanzania : Growth and Structural Transformation Required to Reach Middle Income Status by 2025
[4] World Bank, (2012), Ease of Doing Business Ranking 2012.

more difficult to spot relatively small leakages, which drives corruption and rent seeking. This can increase the incentives to acquire and hold on to political power, which in turn might result in internal tensions and the erosion of democratic checks and balances. Guarding against this requires, amongst other things close monitoring of the Government revenues, to increase transparency and external visibility in audits and revenue collection.

Supporting regional development

Finally, the development of the natural resource sector which has limited intrinsic linkages with the rest of the economy – other than through the fiscal channel – requires that the authorities engage with issues of local and regional development. It is necessary to inform them about new existing opportunities that would enable them to benefit from the windfall through employment for example. This would also help to manage expectations.

First of all, it is necessary to inform the population about what is happening at their doorstep and to build capacity of Government officials that are new to the subject. It is crucial that they are able to explain exactly what is under implementation, how the projects are going to develop, what the central Government is planning to do with the resources, and how the region is going to benefit. Sharing information about the needs of the sector would be extremely beneficial. If the local population know what skills are required, what jobs are offered and what standards are expected by foreign investors, they could adapt their education, training or services, such as catering facilities or accommodation. Training local workers is indeed crucial to bring back all the resource-related work and serviced that have been outsourced to Dar es Salaam due to the local lack of human capital. This would increase employment in the region, which the population is eagerly waiting for.

Also, informing the local population about new investments and considering their needs when discussing new infrastructures, such as roads, is fundamental for an equitable development of and the management of popular expectations. Sharing benefits and opportunities given by the resource discoveries is a key to gain the support of the civil society and bring the country on a stable and peaceful growth path.