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Tanzania—from mining to oil and gas

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Abstract: This paper compares and contrasts the economic situation in Tanzania during the resurgence of gold and diamond production after 1999, with the situation that is now emerging as the country begins to exploit very large resources of natural gas mainly from the Indian Ocean. The mining boom after 1999, provided the authorities with significant lessons and opportunities associated with managing natural resources wealth. The paper assesses some of the key component issues and interprets these in the context of the new possibilities (and dangers) opened up by the natural gas revolution.

Keywords: Tanzania, gas, liquefied natural gas, mining, energy generation

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Acronyms

boe	barrel of oil equivalent
BoP	balance of payments
CNG	compressed natural gas
CNG	compressed natural gas
fob	free on board
LNC	liquefied natural gas
mcf	million cubic feet
MEM	Ministry of Energy and Mining
mmscfs/d	million metric standard cubic feet per day
mmt	million metric tons
NGV	natural gas vehicles
NOC	National Oil Company
PSA	production sharing agreement
tcf	trillion cubic feet
TEITI	Tanzanian Extractive Industries Transparency Initiative
TPDC	Tanzania Petroleum Development Corporation
Tsh	Tanzanian Shilling

1 Introduction¹

In common with several other African economies including Ghana, Kenya, Mozambique, and Uganda, Tanzania will soon enter the ranks of oil and gas producing countries. In Tanzania's case the discoveries to date are very large, are mainly off-shore in the Indian Ocean and are likely to be dominated by gas rather than oil. These discoveries have excited expectations of greatly improved economic growth and incomes and of a large windfall for the Tanzanian budget. If properly used this revenue windfall could radically improve many aspects of life for the Tanzanian people. At the same time, the government has recognized the need to manage carefully this situation and above all to manage expectations about what all this may mean for particular communities.² The component issues involved in this task are particularly pertinent in the Mtwara/Lindi region in the South of Tanzania where much of the gas will come on shore and be processed.

This paper begins in Section 2 with a resume of the situation in Tanzania during the resurgence of gold and diamond production after 1999. It notes that the huge investment boom in that period was associated with the first real signs of structural change in the economy since Independence: new mining investment did make a big difference to the Tanzanian economy. At the same time there was considerable controversy in Tanzania over many aspects of mining; particularly around the scale of revenues received by government from mineral exploitation, and around questions as whether the nation was receiving an adequate return on its gold and diamond resources. It was also argued that the windfall associated with new gold and diamond investments had not been managed in a way that might have yielded optimum benefits both to the nation and to the affected communities around Mwanza and Shinyanga. If nothing else, the mining boom provided the authorities with significant experience of the very difficult issues associated with managing natural resources wealth.

Section 3 of the paper then explains the nature and likely scale of the new (mainly) gas finds both in the Indian Ocean and at on-shore and shallow water locations. Many of the corporate final investment decisions that are needed to take advantage of these new finds are yet to be made. However, the broad orders of magnitudes of the increased output, exports, employment and government revenues that can be expected can already be analysed and assessed. Also in Section 3 an attempt is made to identify some of the critical challenges that are associated with this new activity in Tanzania. Will it indeed be a new twist on the already familiar story from gold and diamond mining or will it be a radical new chapter in Tanzanian development?

Section 4 of the paper addresses some of the possible downstream possibilities and assesses some of the alternative domestic uses to which the huge amounts of new gas might be put. As this matter begins to receive increased attention in the country it is important to differentiate serious and commercially feasible uses of the new gas from other potential uses that may be theoretically possible but are unlikely to be commercially feasible. Most exciting is the possibility that the new gas could significantly improve Tanzania's ability to generate electric power and at delivery prices to customers that could quickly expand the number of Tanzanians with access to electric power—presently this number lingers at less than 20 per cent of the population.

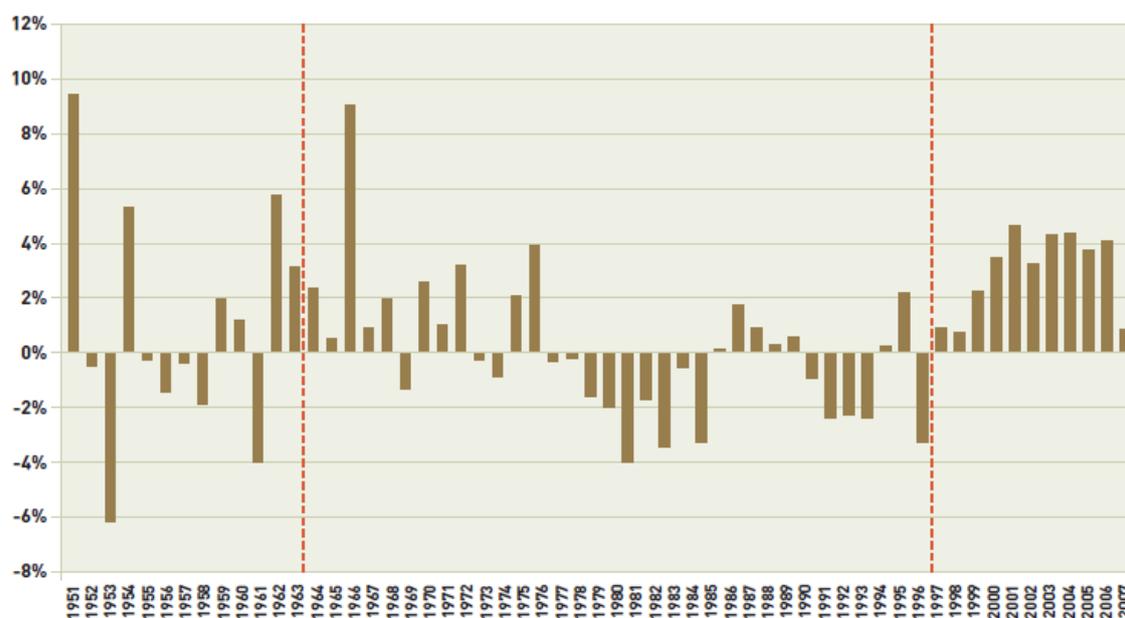
¹ This paper draws on some earlier work to which I have contributed and which is published in various locations that are referred to at the appropriate places in the text. These include ICMM (2007); ICMM (2009); Uongozi Institute (2013; and Tanzanian Affairs (2014).

² This recognition is articulated clearly in the government's Natural Gas Policy presented to the Cabinet in 2013. See URT (2013).

2 The new era for gold and diamond mining

After a few years of significant economic growth in the mid-1970s, the Tanzanian economy descended into a slew of economic decline from 1978 onwards. This persisted almost uninterrupted through the 1980s and the first half of the 1990s. The reasons for this have been much analysed and need not be repeated here. It is also well known that by the early 1990s, the many years of declining per capita incomes had persuaded the Tanzanian authorities that a different approach was called for. As a result they began along a track of cautious liberalization and started to allow greater private sector engagement in economic activity.³ Helped by the new Mineral Code of 1998 (see Box 2) a boom of new mineral investment was quick to follow. Some of the results of this are evident from Figure 1 which documents the rates of per capita GDP growth from 1950—several years before Independence through 2007. That figure shows both the sustained economic decline from 1977 and then the recovery and sustained real GDP growth from 1996 through 2007. Significantly, that latter period was the first time in the post-Independence years and indeed in the post-war years that Tanzania had managed to achieve ten years of uninterrupted growth.⁴ That positive growth trend has been sustained from 2007 through 2014 at rates around 7 per cent (5 per cent in per capita terms).⁵

Figure1: Per capita income growth: 1951 to 2007



Notes: The first vertical red line indicates the date of Tanzania's Independence. The second indicates the date of introduction of Tanzania's new more liberal mineral policies.

Source: Author, based on the Maddison-Project Database (n.d.).

³ This commitment was intensified from 1996 with a major IMF and World Bank programme to which other donors rapidly added their support.

⁴ Independent estimates indicate that about one-third of the GDP growth 1996 to 2007 came from agricultural activities—still the main source of livelihoods for the majority of the Tanzanian population. Trade and services (notably tourism) contributed another one-third of the total with the balance of growth coming from industry, mining and construction. Mining was one of the fastest growing sectors in the later part of this period. But the small initial base of mining in 1996 and the concentration of the fast growth of the sector in the years since 2000, means that the mining sector added only 0.3 per cent to the overall GDP growth of 4.8 per cent seen in the ten years taken as a whole (Treichel 2005).

⁵ Growth rates have been slightly reduced as a consequence of the recent re-basing of Tanzania's national income accounts—an exercise that has also increased the country's per capita income.

So whatever might be said about the possible shortcomings of Tanzania's new and more liberalized policies, these policies undoubtedly helped to transform the growth record of the country and to raise average living standards. After 1998, new mining activity was a very significant contributor to the improvements that were seen.

Mining of course was hardly new to Tanzania as Box 1 below briefly explains. However, most of the older commercial gold mines referred to in Box 1 had become exhausted by the late 1960s and 1970s and the absence of significant new investment during the period of socialist policies meant that gold production almost ceased by the 1970s: only 84 ounces being sold in 1975.⁶

Box 1: Mining has a long history in Tanzania

Over a thousand years ago Arabs settled on the Swahili coast in order to purchase gold and other goods produced by African workers. These goods were transported by human caravan from Great Zimbabwe and fuelled a very active Indian Ocean trade that continued for many years. It was primarily the lure of gold which drew the Portuguese to the region and they became the first Europeans to settle on the coast of East Africa in around 1500.

Alluvial gold has been mined for centuries by Tanzanian farmers, who have used it mainly as an alternative source of income in the off-season. It is now commonly referred to as artisanal mining. However, it was only in the nineteenth century that larger-scale commercial mining first began to be organized in Tanzania, commencing with gold discoveries in the Lake Victoria area by German prospectors in 1894. The first mine to start producing gold was the Sekenke in Iramba district in 1909. Other mines began operation in the Geita and Musoma districts in 1913, during the German colonial administration. Then in the 1920s, after the British had assumed colonial control, further substantial gold deposits were discovered in the Mwanza and Musoma districts of Northwestern Tanzania and several mines began to produce gold. The mining of diamonds, especially by the famous Williamsons mine at Mwadui also became important at this time.

Just before the Second World War, gold output peaked at more than 100,000 ounces in 1938 and in 1939, gold was exceeded only by sisal as Tanganyika's main export, earning almost £1 million. But most of these gold mines became exhausted in the late 1960s and 1970s and the national significance of gold was effectively over by the late 1970s.

Source: ICMM (2007: 19).

This situation changed dramatically as more liberal policies were introduced. From 1992 onwards, the Tanzanian Government actively sought to rejuvenate the mining industry. Resolute Mining's Golden Pride Mine in the Nzega district was the first of the major new mines to pour gold. This was in December 1998. By the year 2000, Tanzania's gold production exceeded its peak 1938 output level with production of 388,324 ounces. This represented a huge increase on the 48,078 ounces in the preceding year and zero in 1998. Since 2001, annual gold production has continued to grow rapidly and now routinely exceeds one million ounces per annum. This is about half the values achieved in Ghana in the same years.

The mining-specific reforms that contributed to the impressive resurgence of the sector are briefly reviewed in Box 2. In brief, the authorities in the early 1990s as part of their broader liberalizing reforms were seeking changes that would benefit both larger-scale commercial mining and also the traditional artisanal mining sector that was expected could provide substantial benefits in terms of new employment opportunities if not in terms of government revenues and exports.

⁶ Diamonds did rather better in this period and remained as the most significant component of the mining sector.

2.1 Outcomes

The outcomes from the reforms were indeed impressive and not least in terms of *new investment*. Data from the 2015 World Investment Report show that fuelled mainly by extractives companies, the accumulated stocks of foreign direct investment (FDI) in Tanzania rose from a modest US\$388 million in 1990 to US\$2.78 billion by 2000 and to a massive US\$17.0 billion by 2014—the fifth highest of all the less developed economies in the world (UNCTAD 2015, Annex Table 2). Through 2012 much of this FDI increase was associated with mining—especially gold—and by this time Tanzania had become the most successful non-oil recipient of FDI in the whole of sub-Saharan Africa: total new inflows being often in excess of US\$1 billion per annum as against the modest annual figures of around US\$50–100 million in the 1970s.

Box 2: The mining sector reforms of the 1990s

A study published in 2001 argued that two key policy decisions set off the mining boom from the mid-1990s. One was the decision in the late 1980s to end the State Mining Company (STAMICO) monopoly and allow any Tanzanian to register a claim and sell minerals. The second was the liberalization of currency controls, beginning with permission to exporters to use their export proceeds more freely: culminating in the floating of the currency in 1994. This significantly improved the benefits of mining, as any foreign exchange proceeds could now be used to finance imported consumer goods, equipment and spare parts, which had long been scarce. These changes first set off an immediate artisanal mining boom. From a few thousand artisanal miners in the 1980s, activity grew rapidly in the 1990s. In 1993, 330,000 Tanzanians were estimated to be involved and by 1995, 550,000 Tanzanians earned at least some of their income from mining.

However, a further critical manifestation of the new government attitude to mining—and one that had a profound impact on commercial mining—was the promulgation of a radical new Mineral Code in 1998. This code allowed 100 per cent foreign ownership; provided guarantees against nationalization and expropriation; and offered unrestricted repatriation of profits and capital. It pegged the royalty rate at a maximum of 3 per cent, and provided waivers in respect of import duties and tax exemptions on imported machinery, equipment and other inputs. It also waived the requirement (in the 1979 Mining Act) for local procurement of goods and services.

Source: Based on Phillips and Semboja et al. (2001).

Little noted in Tanzania at the time was the boom's extremely significant effect on the composition of export earnings. As early as the year 2000, this new investment had resulted in *export earnings* from gold alone overtaking coffee as the country's largest export earner. By 2008 gold export earnings were much larger than all other traditional exports put together and some nine times larger than the next most important export commodity—cotton—with an annual export value of over US\$1 billion. In spite of the disruptions caused by the global financial crisis and a softer price for gold thereafter, this dominance of gold exports has been sustained through 2015⁷—see Figure 2.

Furthermore, although the *government revenues* from mining have been at the centre of controversies around the sector, there is no doubt that these revenues also received a very substantial boost from the mining boom after 2000. Specifically as new mineral production started up production in the early 2000s, mining tax payments rose from less than Tsh4 billion per annum (1999/00) to some Tsh50 billion by 2004 (ICMM 2009: Table 3.3). But even after this big increase, mineral revenues were equivalent to only about US\$45 million which in turn

⁷ The IMF expects gold exports in 2015/16 to amount to US\$1.5 billion as compared to only about US\$1.0 billion for traditional exports. See IMF (2015).

represented only about 7 per cent of the then mineral export total of some US\$600 million. The figure was widely criticized as inadequate on that account.⁸

Figure 2: Tanzanian exports of gold, 1998–2012



Source: IMF (2014: 38, Figure 3).

However, by the time of the fourth report of the Tanzania Extractive Industries Transparency Initiative (TEITI) in 2012, the total revenues collected from the extractives sector had risen much further and by then amounted to TSh758 billion (for the year July 2011 to June 2012) of which Tsh614 billion (circa US\$390 million) was accounted for by the tax and royalty payments of the 23 major mining companies who reported to TEITI; the rest was from oil and gas companies. This not only indicated a huge increase in government receipts (2004 through 2011/12) but also a total payment to government that was now equivalent to almost 20 per cent of the exports of the same year: a high figure by international standards. As a share of total government tax receipts, the extractives sector was by then providing 12.8 per cent of the total with mining alone providing 10.4 per cent.⁹

However, this was an increase that was anticipated reasonably well by a 2008/2009 study for which I was the lead author. This study looked at the actual business projections for all years from 2007 through 2034 of the four largest mines in Tanzania. It used these to calculate the tax and royalty payments that would be associated with their future expected levels of production and costs assuming unchanged tax rates. The results of that exercise are reproduced in Figure 3.

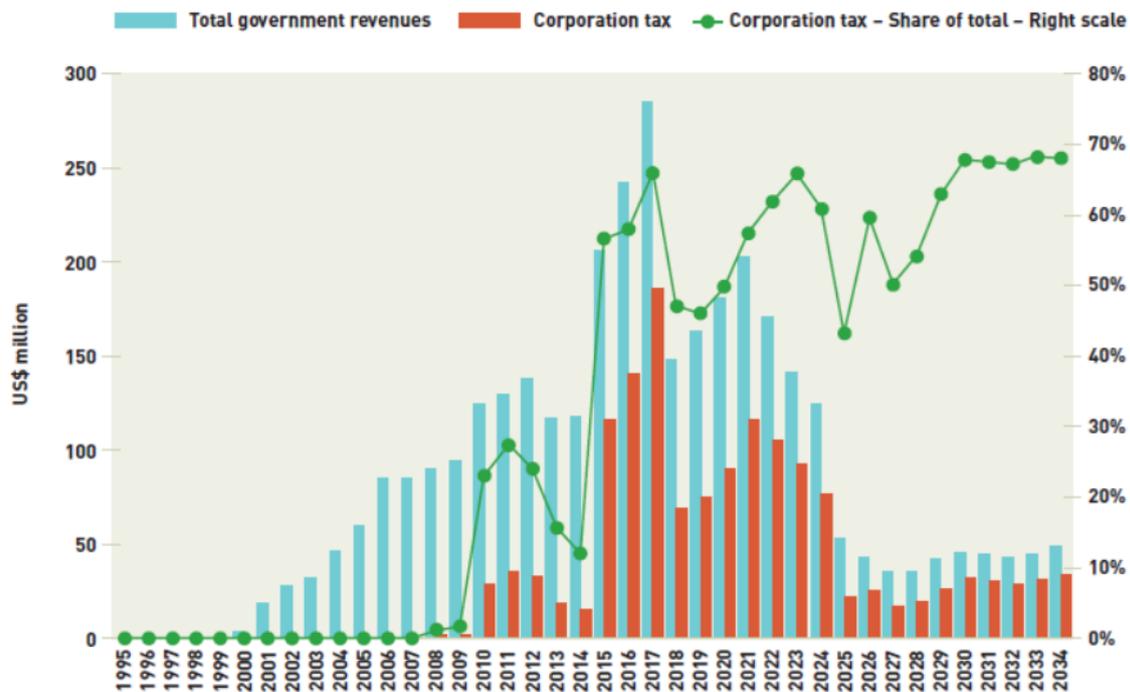
These results were important because they challenged the then-prevailing pessimism about government mineral revenues by showing that on reasonable assumptions about the growth of the government's other revenues, the mineral taxes and royalties (even from the four identified existing mines) would rise to represent some 7 per cent of the government's total tax-take by 2017 as compared to only 0.5 per cent in 1999 and 3.6 per cent in 2004. One of the keys to this anticipated rise was the unwinding of the capital allowances against the multi-billion dollar

⁸ Not least in the 2008 paper sponsored by various faith groups (see Curtis and Lissu 2008).

⁹ The IMF Article IV Report for 2011 (Table 2a) shows expected government tax revenues in total to amount to Tsh5904 billion.

investments that the mining companies had undertaken after 1998. Once these allowances ceased to be deductible against profits, it was known that the companies would become liable for very large payments of corporation tax from around 2009/10 as illustrated in Figure 3. By that date and for all the later years, it was also clear from the forward-looking data that the other sources of government revenue—including royalties—would become relatively much less important. As the hard numbers from the TEITI evidence for 2011/12 have subsequently confirmed, this prediction has been shown to be broadly correct.¹⁰

Figure 3: Government revenues from existing mines (in 2008) through 2034



Source: ICMM (2009: 34).

2.2 So what went wrong?

Why then in spite of this impressive contribution of mining to the Tanzanian economy after 2000—in the macroeconomic dimensions of investment, exports and government revenue—has the role of mining in Tanzania’s development been so commonly under-rated and very frequently criticized? There are several lines of answer to this question. They range from criticisms of the fairness of the agreements that the government signed with the new mining companies; familiar criticisms of the conduct of mining companies as regards their alleged use of transfer pricing and unreasonable employment practices; large numbers of complaints about the treatment of local communities in the mining-affected areas; and disappointment that the

¹⁰ In fact the TEITI number for revenues in 2011/12 at circa US\$390 million is significantly higher than the 2009 projection for the same year of only US\$150 million. This is for three main reasons. First there have been increases in the rates of royalty and some taxes since the 2009 projections were made. In the new mining legislation introduced in 2010, the government required mining companies to increase their royalties on gold exports from 3 per cent of netback value (essentially, the difference between total costs of bringing commodity to market and revenues from the sale of the commodity) to 4 per cent of gross value, as well as paying the government 0.3 per cent of their annual turnover, up from a capped maximum of US\$200,000 a year. Second, those projections related only to existing known gold resources and not to a broader coverage of mining activities. Third, the TEITI analysis covered 23 mining companies and not only the four large ones included in the 2009 projections.

artisanal mining component of the sector had proved unable to provide a solid core of new sustainable employment for the economy.

It is beyond the scope of this present paper to engage with most of these contentious issues important as they may be. Box 3 refers briefly to just one of them, namely the community issues in order to try to convey the general attitudes of mining communities.

Box 3: Selected community attitudes to mines

In a study undertaken in 2010/2011, the communities around four major mines in Tanzania (Geita Gold Mine, Mwadui diamond mine, Bulyanhulu and Buzwagi gold) were asked about a range of issues to do with these mines. A majority of community respondents had negative perceptions of the benefits from mining, with respect to most of the benefit streams but this was not across the board. Although all four companies had made efforts to maximize local job creation, communities generally do not feel the mines have provided good employment opportunities and benefits: among other things there was perceived to be an endemic problem of patronage. Incomes had undoubtedly increased significantly in recent years in many villages due to more mineworkers, more community investment projects and the construction of other new projects. But people felt that increased incomes had led also to localized inflation for basic commodities, with the result that those not benefitting from the mine have therefore found it more difficult to pay their bills: increased immigration has exacerbated such problems. Inequality was also argued to have increased and this had spilled over to affect the access to basic health and education services partly due to the provision of good quality facilities by the mining companies for some sections of the local populations but not for all. However, there was evidence that the presence of mines may have been beneficial to health in some ways. While consumption of meat and milk fell in other parts of the country between 2001 and 2007, this was not the case in the two mining regions. Similarly, demographic health data shows that mosquito nets are much more prevalent in mining regions than in other parts of the country, and that child nutritional status was better in mining regions than in other rural areas.

Through these examples the reports showed the inherent difficulties of managing local mining impacts—with unintended consequences often arising from well-intentioned actions. It recommended the adoption of a more coordinated local, regional and national approach. Many of its specific recommendations were aligned directly with those from the Bomani Report discussed later in this paper.

Source: Oxford Policy Management (2011).

Aside from this we focus instead on a set of issues that help to explain why the industry in its new post-1990s manifestation seems to have failed to deliver any real structural change to the economy. In examining these issues, we draw on the important comprehensive internal review of the mining sector conducted in 2007–08 under the chairmanship of the respected Tanzanian Judge Mark Bomani. The Bomani Report (URT 2008) as published in April 2008 recognizes the official position towards mining as articulated in Tanzania's *National Development Vision 2025* published in 1994.¹¹ But Bomani also identifies a number of failings in the industry and elaborates a programme of regulatory and other reforms designed to achieve larger economic and social benefits for the Tanzanian people. That programme includes:

- 1. Infrastructure—the need for an improved approach.** The Bomani Report recognizes explicitly the responsibilities of the government to provide supporting infrastructure in mining areas covering roads, electricity, water and social services such as village dispensaries, schools and security services. Some of these services have direct relevance

¹¹ This position was that mining's role in the economy could increase over time. Specifically, it envisaged an increase in the economic role of mining in Tanzania that would result in its contribution to GDP increasing from 3.8 per cent in 2006 to a share that would be three times greater at 10 per cent of GDP by 2025. This would incidentally bring it close to the share of monetized agriculture: 16 per cent of GDP as of 1994.

for the operations of the mines and so affect their cost-base. Other services are more directly relevant to the wellbeing of the mine-affected populations. On the specific subject of electricity and access to the grid, Bomani argues that a more concerted effort to extend capacity across the contiguous mining regions would serve to eliminate the contentious issues around the diesel fuel subsidy to mines. The companies have needed this subsidy only to compensate for the high costs of having to generate their own electricity.

2. **Compensation and the associated development possibilities.** The Bomani Report recommends a tightening-up of the existing systems for compensating farmers and others who lose access to land as a result of mining activity. But significantly it also argues that compensation revenues can provide the basis for helping the beneficiaries to fund new types of business activity. However, this would require policies and programmes whereby systems for, say, small and medium-enterprise (SME) promotion are well integrated with the needs of both the local communities and the mining companies. Such arrangements, Bomani argues, could help to ensure that the new businesses can become a part of a new development dynamic in mine-affected areas.
3. **Improved training arrangements.** It is a recurring criticism of mining that insufficient numbers of Tanzanians are being engaged. But this of course is not surprising given the long hiatus in significant mining activity in Tanzania after the 1970s that degraded such skills as had previously been available. A long-term programme of training is one obvious answer with the responsibility for this ideally being shared between the national as well as the corporate stakeholders. The Bomani Report recommends tighter legal requirements on the companies in this regard but combined with a more systematic set of government-driven arrangements, including larger budgets for existing colleges and other training institutions.
4. **Enhancing value added.** The Bomani Report makes some useful suggestions about ways to add greater value to the mineral products that are exported and to also ensure assistance in marketing of the enhanced products. Bomani recognizes that the high energy costs and other complexities (e.g. of smelting rock containing both gold and copper) may limit the scope for much beneficiation but argues that it is important for there to be solid information about the possibilities to allow an informed policy decision to be taken.
5. **Mining towns.** The Bomani Report argues that the development of such towns has been haphazard and has happened in a manner that has left some of the affected populations without proper access to the normal social and other supporting services. The Report recommends the government to work more closely with the companies to plan and monitor the development of these towns.
6. **Improved integration of mining into the local economy.** Recommendations in this area constitute arguably the most important in the whole of the Bomani Report. However, they are described only very briefly. Specifically, Bomani argues for two main things. The first is for improved policies and programmes to help the strengthening of any sector that works closely with the mining sector to capture *'the immense benefits that the growing mining industry provides'*. The second is a plea for more explicit and effective arrangements to promote the greater local procurement of goods and services. The second of these tasks is proposed to be undertaken in partnership between a proposed

new Minerals Authority and the Tanzanian mining companies through the Chamber of Mines.¹²

- 7. A better revenue deal for local mining-affected areas.** The Bomani Report advocates a Ghana-style distribution of a part of the royalty revenues. This would provide 10 per cent of that revenue to the districts where a mine is actually located; 7 per cent to adjacent districts that will also see some impact from mining; and 3 per cent directly to the villages around the mine. In Ghana this system has worked only moderately well and suggestions have been made to enhance it through explicit government and donor programmes to improve the technical capabilities and accountability of the districts receiving a share of revenues. With such enhancements this system could be very helpful for local development around mining in Tanzania.

The unifying theme across these seven recommendations is a broad vision that mining in Tanzania can and should be used as a focal point for broader economic development with government (local and national) and mining companies playing partnership roles in various joint activities to bring this about. The confrontational tone of much of the previous Tanzanian debate around mining (mining companies being characterized as inimical to Tanzanian development) is largely absent in the Bomani recommendations. So it is ironic, disappointing and unhelpful that events subsequent to Judge Bomani reporting in 2008 have put almost the whole of the emphasis on another set of his Report's recommendations namely:

- 8. Increased rates of royalties and mining taxes.** In Section 2.5.1 of the Report, Bomani argues for the royalty rates on mining to be increased (from 5 to 7 per cent for rough diamonds and from 3 to 5 per cent for metals such as gold, copper and silver). It also argued for capital allowances to be made somewhat less generous and to be unified with the normal arrangements of the Income Tax Act of 2004; for some exemptions under excise, VAT and customs duties to be made less generous; and for the tightening up of some other tax arrangements.

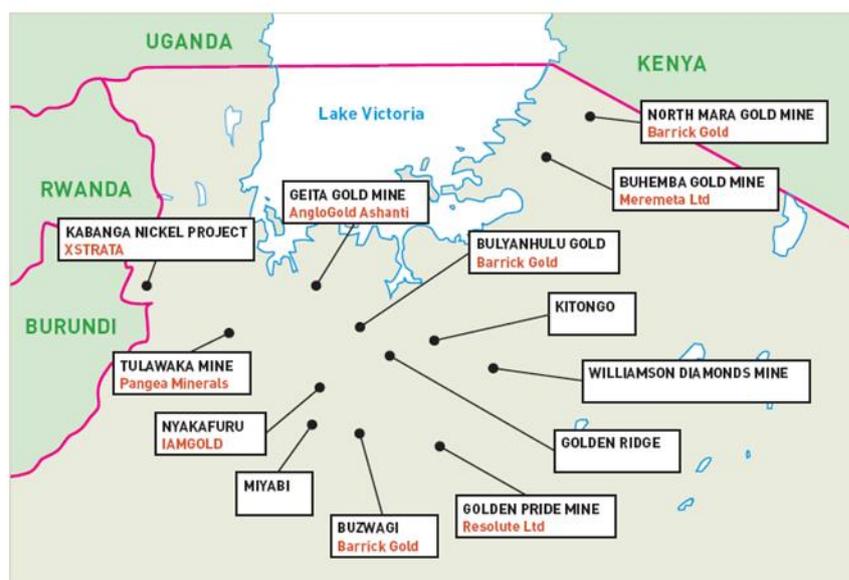
These tax-reforming and tax-raising measures pretty much dominated the subsequent discussion around the Bomani Report and the associated press coverage. The wide range of other important matters that were identified by the Report that, if implemented, could have improved the structural contribution of the industry, were effectively side-lined in this process.¹³ The broad vision for the developmental role of the sector that is seen in the Bomani Report has been little reflected in subsequent debate and new policies. Arguably a major opportunity has been lost to utilize the huge investments of the mining companies in broadly contiguous area around the southern part of Lake Victoria, to help catalyse a significant cluster of new economic activity based also on a set of judicious supporting investments and policies by the government. Figure 4 shows the location of the major mine investments and illustrates the existence of at least the necessary conditions for such a cluster to have been successful. Tanzania would not have been out of line with other African countries had it seized on this opportunity to promote broader

¹² Significantly, strengthening of electricity delivery through TANESCO would be an explicit part of this improved programme of integration as would the 'urgent' improvement of the central railway line. More systematic land-use planning in the broad catchment areas of the mines would also be part of the proposed package.

¹³ This problem may have arisen in part because the Bomani Report itself does not present these structural ideas in a fully integrated manner linked to the theme of local and regional development in the areas of Tanzania most impacted by the new mines. Rather the recommendations are presented as separate and independent ideas and are scattered throughout the report: it is largely left to the reader to join them together and most readers have not done this.

development based in part on some of the component suggestions advanced by the Bomani Commission.¹⁴

Figure 4: Major mine locations in Tanzania—2008



Source: author, based on information received from the Tanzanian Chamber of Mines.

This is not to suggest that the proposed tax reforms were unnecessary: they were certainly very well argued by the Report. But with the benefit of hindsight, it is clear that the perceived imperative at the time to extract more revenue from the industry by raising royalty and tax rates was not the only, or even the major priority for the industry at that time. The subsequent major boost to revenues revealed by the work underlying Figure 3 and the subsequent hard data from the TEITI analysis are evidence that there would in any event have been a large boost to government revenues even without the partial adoption of the Bomani revenue recommendations that were eventually adopted as part of the new Mineral Legislation of 2010.

This history of elevating revenue matters to a position of dominant importance and relegating a myriad of other important issues to a position of virtual insignificance, is relevant we suggest to the new challenges that now face the Tanzanian authorities in deciding on the many things that need to be done to incorporate the new gas discoveries into their thinking about longer-term development. This is especially true of the broader developmental effects that investments in extractives can help to catalyse. It is to be hoped that the short-term emphasis on revenue maximization will not dominate Tanzanian debate quite so much as it seems to have done in the context of mining.

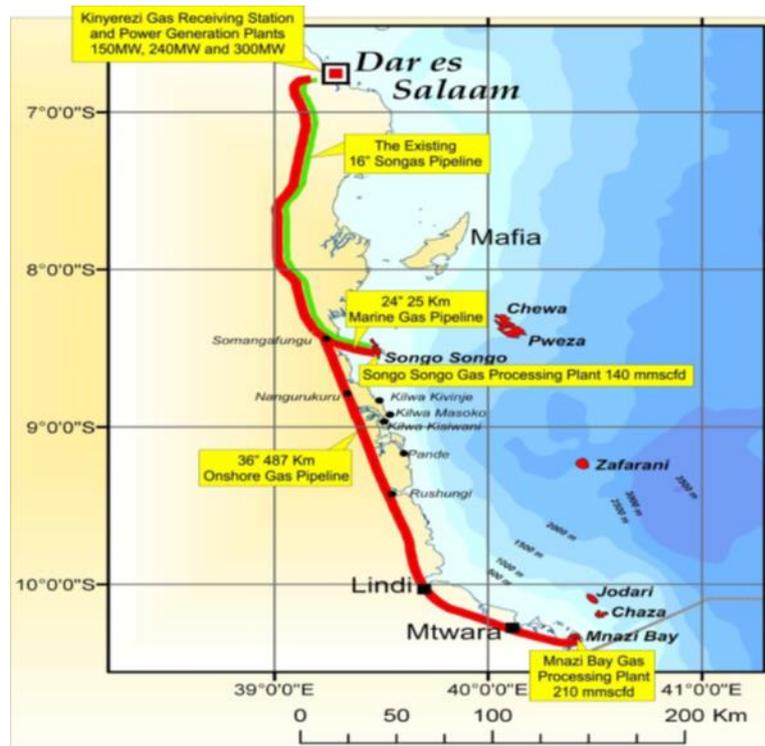
¹⁴ Such approaches have for some time been advocated for African and other mining countries. For example a 2004 pilot study conducted by the Economic Commission for Africa (2004) concluded that:

This paper has shown that cluster development strategies orientated around a natural resource base have the potential to create sustainable economic development and provide a springboard for enhanced productivity, even in today's technology-driven society. The successful clusters in both South Africa and Mozambique (meso and macro) show that their establishment and sustainability was largely dependent on favourable factor conditions, both internal and external, together with specific, pro-active Government actions. (pg 145)

3 The discovery of new gas reserves

How do these new gas discoveries compare with the earlier record from 1998 regarding gold and diamonds? Recent discoveries have shown that the country possesses potentially huge reserves of hydrocarbons mainly in the form of natural gas.¹⁵ Gas has already been produced for over ten years at Songo¹⁶ and this is fed into a pipeline that delivers gas mainly for power generation in or near Dar es Salaam. The current throughput is circa 90 mmscfs/day¹⁷ of which some 74 mmscfs/d is thought to be used for power generation.¹⁸

Figure 5: Map of gas pipelines



Source: Wentworth Resources Limited (2014).

However, more recent discoveries have radically changed the future perspective for gas in Tanzania. In the past decade, there has been very large exploration activity in the concessions so far granted by the Tanzanian Petroleum Development Corporation (TPDC).¹⁹ These have

¹⁵ There are possibilities of oil in some of the off-shore fields now under exploration. But, to-date and in spite of some 50 years of exploration activity, Tanzania still has no proven oil reserves and remains dependent on imported petroleum products.

¹⁶ The first discovery of natural gas in Tanzania was at sites in Songo Songo in 1971 (see Figure 5). However, it was only in 1991 that a formal agreement was signed for the development of this gas field and production itself began only some thirteen years later in 2004. The field is located on- and off-shore Songo Songo island which is about 15km from the Tanzanian mainland and 200km south of Dar es Salaam.

¹⁷ mmscf/d = million metric standard cubic feet per day

¹⁸ The balance is used for compressed natural gas (CNG)/natural gas vehicles (NGV); and fuel for the industrial sector.

¹⁹ TPDC was established in 1969 by the Tanzanian government. It is the TPDC through which the Ministry of Energy and Mining (MEM) implements its petroleum exploration and development policies. However, one of the reforms in the recent Petroleum Bill that received presidential assent in July 2015, is that TPDC is to be re-

already resulted in vast commercial finds that are only now beginning to be developed. The first in time—but not the largest—have been the on-shore and shallow-water finds at Mnazi Bay (south of Lindi and Mtwara) by the French–Anglo consortium of Maurel et Prom and Wentworth. These discoveries delivered their first gas into the major new Chinese-financed pipeline from Mnazi Bay in August 2015. They will quickly have the capacity to deliver more than 100 mmscfs/d: i.e. significantly more than the existing through-put from Songo Songo which itself is expected to increase.

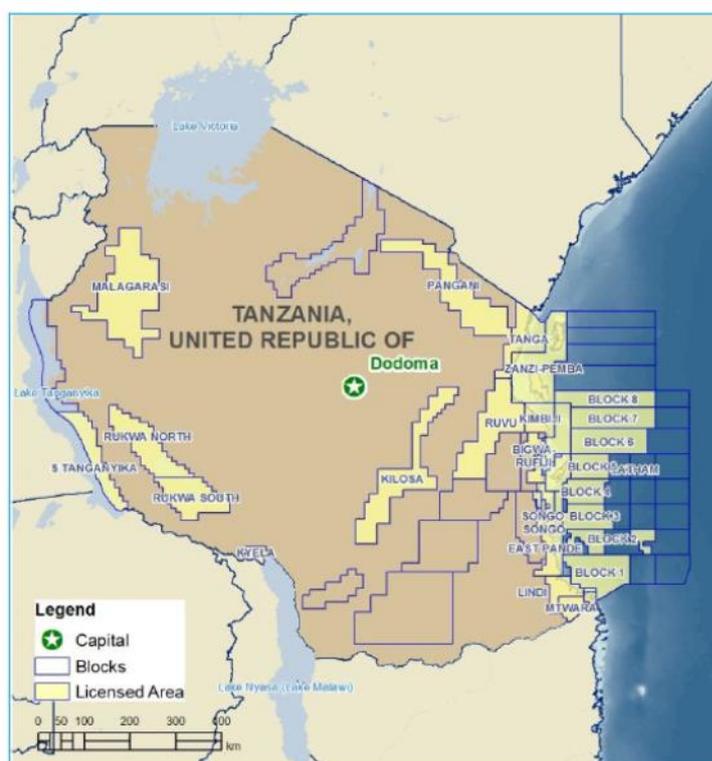
However, the largest gas reserves have been discovered much further off-shore (more than 80km) from mainland Tanzania by other consortia led by private multinational companies. Specifically, in 2010, Ophir Energy Plc.²⁰ announced an agreement with the BG Group of the UK over Ophir’s exploration interests in three off-shore exploration Blocks 1, 3 and 4 in the Indian Ocean along the south eastern coast of Tanzania. BG Group took over operatorship in July 2011 and then embarked on an exploration drilling campaign, which resulted in seven gas discoveries as shown in Figure 6.²¹ In addition, there have been significant finds in Block 2 by the Norwegian company Statoil and there is ongoing exploration in Blocks 5, 6 and 8 by the Brazilian company Petrobras and in Blocks 9, 10, 11 and 12 by Shell (some in the waters of Zanzibar). The discoveries meant that by 2012 Tanzania’s total estimated natural gas reserves had quadrupled from 10 trillion to 40

designated as the National Oil Company (NOC)—hiving off its present regulator role to a new independent regulatory body.

²⁰ Ophir Energy is a conglomerate in which Indian Steel magnate Lakshmi Metal holds 14 per cent of the shares, a hedge fund (10 per cent), the Polish millionaire Jan Kulkzic (10.6 per cent), plus a holding by Tokyo Sexwale, the South African tycoon jailed with Nelson Mandela on Robben Island.

²¹ These discoveries include Mzia-1, Jodari-1, Jodari-North and Chaza-1 in Block 1, Papa-1 in Block 3 and Chewa-1 and Pweza-1 in Block 4.

Figure 6: Map of exploration areas



Source: © Deloitte (2014: 24).

trillion cubic feet. A press report of June 2015 indicated that this figure may now have risen to as much as 55 trillion cubic feet (Bariyo 2015). When combined with the more than 100 trillion cubic feet of gas finds in Mozambique, the Indian Ocean of Eastern Africa seems set to become a major new hub for gas production.

To provide some perspective on the relative importance of the deep-water versus the near-shore gas, the technically recoverable gas in Songo Songo and Mnazi Bay is thought to total something less than 2 trillion cubic feet (tcf). By comparison, the BG Group has already confirmed reserves in their deep water Blocks of 15 tcf²² and Statoil has confirmed reserves of 22 tcf.²³ In other words the known deep sea reserves are some twenty times larger than the known on-shore and shallow water reserves.

A major point to be made on this matter is that the gas discoveries so far known about are on a scale far larger than anything ever seen in gold and diamond mining. Early estimates from just one of the 20 or more major companies currently licensed to explore for oil and gas, suggest that the FDI from their project alone could top US\$5 billion in the single peak year of construction. This is some five times larger than the *maximum* annual FDI seen in any of the years of the gold resurgence.

The issue of what all this may mean for the economy of Tanzania and its longer-term development still needs to be clarified given the uncertainties about various factors: the volumes of gas that will in practice be developed, the future prices that this production can command

²² See: www.bg-group.com/111/media/press-releases/

²³ See Statoil (2015).

given the recent softness of oil and gas prices, and the actual dates when production may start. The next few paragraphs of the paper seek to clarify as much as is possible, based on existing information and some reasonable assumptions.

3.1 Prospects in the short term

The short-term situation is dominated by the developments in Mnazi Bay and the likely impact that this will have on Tanzania's capacity to generate electric power. Already by August 2015, the availability of new gas from this source had resulted in the delivery of some gas through the new high capacity pipeline from Mnazi Bay that was financed on soft commercial terms by the China Exim Bank. Full use of this pipeline may need to await the delivery of some domestic gas from the off-shore BG/Ophir/Statoil fields that are unlikely to be available until around 2021.

However, even the new short-term gas can have a very significant impact on both the availability and the delivery-costs of electric power in Tanzania. In the *Big Results Now* programme—the centre piece of recent Tanzanian planning—it is anticipated that it will be possible to provide electricity to five million more Tanzanians by 2030, thereby alleviating to a degree the shockingly low rate of access to electricity that currently exists.²⁴ This achievement will depend on many factors including the completion of a major programme of new power stations at Kinyerezi near Dar es Salaam. Generating capacity currently—before the new Kinyerezi plants come on stream—is some 1,200 MW. However, the four phases of the planned expansion will increase this capacity to more than 2,200 MW which for gas-fired technologies would require a total gas feed stock of some 220 mmscfs/d. The new Maurel and Prom/Wentworth deliveries plus some early-stage expansion from the older Songo Songo fields would seem likely to provide at least 90 per cent of this requirement, and in the very near term future.

That would be extremely good news for the Tanzanian economy in several different ways. First, it would mean that TANESCO—the national energy supply company—should quite soon be able to decrease its dependence on expensive imported feed stocks of diesel, and also reduce its use of aging and unreliable hydro plants. Second, Wentworth has stated that its gas sales agreement with TPDC means that it will deliver gas at Mtwara at US\$3.07 per million cubic feet (mcf)²⁵ meaning that TPDC should be able to supply to TANESCO at US\$5 per mcf (Wentworth 2014). This in turn should enable TANESCO to produce and supply power at a price per kwh which is less than half the price that is currently necessitated by the use of expensive imported diesel. Third, as well as hopefully lowering prices for some consumers, this would also reduce import bills. A spokesperson for the Ministry of Energy has said that this change of feedstock could save the country some US\$1 billion per annum in import costs. Finally, it should also enable there to be a large reduction in the massive fiscal subsidy paid to TANESCO: a subsidy justified by the company's inability to set prices to fully cover its currently excessive costs. This subsidy payment amounted to Tsh 399 billion in 2013/14 which compares to total government revenues in the same year of Tsh 10,182 billion: i.e. the energy subsidy was nearly 4 per cent of that total (IMF 2015).²⁶

²⁴ The domestic energy situation in Tanzania is currently very poor. Power supply is not widely available and even where available is unreliable; most of the country is not connected to the grid; and less than 20 per cent of the population have access to electricity.

²⁵ This figure excludes the pipeline transmission costs and is also subject to an inflation adjustment based on the US price level.

²⁶ That same report projects a payment of zero in 2014/15 but in reality the savings may be delayed to the 2015/16 financial year.

The other significant thing that is happening in the short-term is the initial planning and construction work around the large BG/Ophir project (described in more detail in the next section).²⁷ During this planning and construction phase, capital investment for the project (in the upstream gas extraction and midstream processing activities) will be around US\$11 billion, with the largest annual capital investment US\$5 billion made in the final year of construction—possibly 2020 or 2021. Construction work has been underway for some time and during the full four year period that is involved it will employ many thousands of construction workers. This has meant that the Tanzanian Revenue Authority has already been receiving significant PAYE revenues associated with the wages and salaries paid to these workers. These revenues have amounted to more than US\$100 million in some recent years which compares favourably with the US\$390 million for all the revenues from mining companies reported by TETI (for 2011/12).

3.2 Prospects in the medium and longer term

The off-shore gas from the BG/Ophir, Statoil and from similar new reserves is located mostly in gas fields that are up to 85 km from mainland Tanzania, in water between 1,000–1,400 metres deep, and up to a further 2,000m below the seabed, in an area of 200 km². Producing this deep-water offshore gas is far more costly than shallow water or on-shore gas.²⁸ This is because it is technically more complex and so requires more specialized equipment and engineering skills. This also means that significant engineering problems still have to be solved to produce this gas, and that the development of these fields will have costs that cannot be fully assessed at the present time. One unavoidable consequence of this is that in order to make the huge BG/Ophir investment commercially viable, large volumes of gas will have to be produced from these fields so that the revenues from selling the gas can cover the cost of the initial investment as well as the ongoing operating costs of the gas fields. This logic results in a message that *if wrongly interpreted* can be politically very difficult to accept. This is that most of the gas (as much as 95 per cent as in the Production Sharing Agreement (PSA)²⁹) already signed with government) will need to be exported as a large ‘anchor volume’ of liquefied natural gas (LNG) in order for the project to be commercially viable.

The Tanzanian government however is not wrong to agree to this large export component in the project, for two main reasons. First the country and the government can still extract tremendous benefits from the project (additional to any benefits from domestic gas usage) as explained below. Second, it would in any case be impossible for such huge volumes of gas to be used in the domestic market. As was noted above, the BG/Ophir and Statoil reserves alone are some twenty times larger than those of the on-shore reserves at Songo Songo and Mnazi Bay. Those lower-cost reserves can and will be made fully available for domestic use and will quickly provide most of the extra gas that Tanzania needs to meet its requirements for power generation in the medium-term future. The 5 per cent or more of domestic supply from the deep-water reserves will itself represent a volume of gas broadly equivalent to what is currently provided from Songo Songo and so leave open a variety of possibilities for further domestic uses of gas beyond energy:

²⁷ The total capital cost of this one project alone is estimated to be US\$27 billion.

²⁸ As much as US\$7 per barrel of oil equivalent (boe) versus US\$3-4 per boe for the on-shore gas

²⁹ PSAs are standard agreements under which the government contracts a private company, or a contractor consortium of private companies, to carry out gas operations while ensuring that the government still retains ownership over the gas reserves. These contracts shift the risk and cost of exploration and operations onto the private contractor, while at the same time guaranteeing that the government receives a share of the cash flow as soon as the project starts to generate any gross revenue.

uses such as fertilizer production and increased production of compressed natural gas (CNG); see the discussion in Section 4 below.

3.3 The likely scale of the macroeconomic impacts

In the remainder of this section, the future prospects are assessed by reference to some actual projections based on the possible (but still hypothetical) scale of activity associated with the various BG/Ophir wells already identified above. Since this approach implicitly ignores the large wells from the other multinational companies that could come on stream in a similar time period, the results can be interpreted as being at the bottom end of a range of possible outcomes for the gas sector of the economy. However, the work was done while oil and gas prices globally were still heading downwards. The very low prices subsequent to the research work could of course push the numbers much lower than those presented here.

The work underlying all the projections is from a joint Oxford Policy Management (OPM) and UONGOZI Institute activity in 2013.³⁰ That assumed quite realistically that the scale of the BG/Ophir discoveries would support two liquefaction plants (or ‘trains’) to convert gas into LNG. These trains in turn would be able to export some 7.4 million metric tons (MMt) of LNG each year. In addition, it was assumed in accordance with the terms of the PSA, that 5 per cent of the natural gas production would be fed into the domestic market at an international price.³¹ The modelling was based on two alternative price scenarios, namely (i) a ‘high price scenario’ where the fob³² export price was assumed to be US\$13.2 per mmBtu and (ii) a lower price scenario assuming an fob price of US\$8 per mmBtu. It was anticipated that the four-year construction period of the project would probably run from about 2016 through 2020 and that the actual production of gas and LNG would begin in 2021. But these dates were fluid and delays were and remain possible.

The numerical results in brief were as follows:

- The final year of construction could bring with it new inflows of FDI of some US\$5 billion that would be six times the size of annual FDI receipts in most recent years;
- LNG would quickly become the country’s largest single export activity with the export value climbing to US\$5 billion per annum. This figure would easily overtake the gold and diamond exports that have come to dominate Tanzania’s exports since 2000—this overtaking would happen even in the lower price scenario;
- In the balance of payments (BoP), the FDI will be used in part to import specialist equipment and services not available locally, and exports will also be partly offset by both other imports and the repayment of the initial capital investment. Nonetheless, the positive net overall BoP effects in most future years will be positive and significant with a typical annual improvement of US\$2 billion;
- Under the high price scenario the additional revenue to government would be as high as US\$2 billion in peak years, equivalent to between 2–3 per cent of GDP (projected forward). This sum is also equivalent to more than two-thirds of the country’s current

³⁰ Uongozi Institute (2013), *LNG in Tanzania: Likely impact & issues arising*. Uongozi Institute Workshop Report, Dar es Salaam, August 2013. See in particular, the section in that report by Samantha Dodd, Mark Henstridge and Alan Roe, *An assessment of the macro-level socio-economic impacts of a potential LNG plant in Tanzania*.

³¹ A ‘netback’ price is equal to the ‘free on board’ export price less the cost of liquefaction

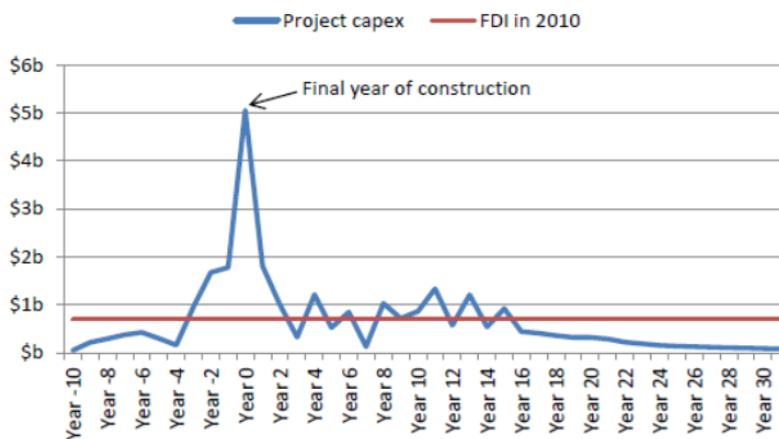
³² fob = free on board

receipts of overseas development assistance. However in the lower price scenario that is now much more likely, these peak years' additional revenues would be approximately halved at US\$1 billion;

- There will be thousands of jobs created in the four-year period of construction. However, the *direct* employment impact of the project is likely to be fairly modest during the longer operational phase (perhaps only 400–500 direct jobs) due to the highly capital-intensive nature of LNG projects.

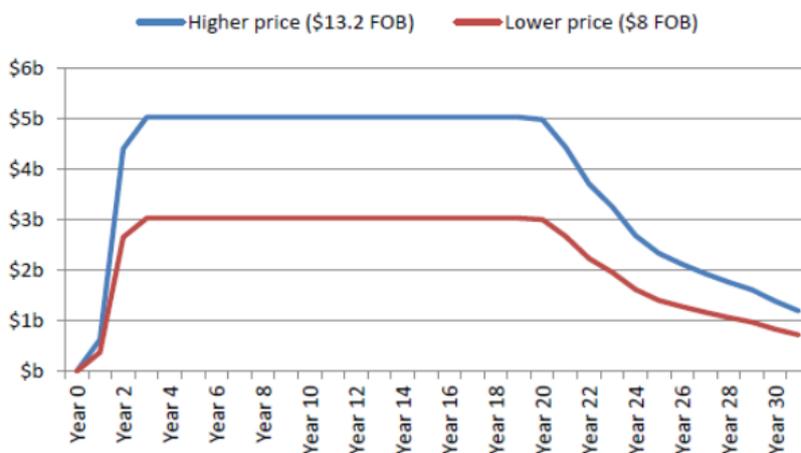
Graphics to provide greater detail on these headline results for a full 30 year period after gas production begins follow in Figures 7 (FDI); 8 (Exports); 9 (Balance of Payments); 10 (Government Revenue by type); and 11 (Government Revenue scenarios). These graphics relate to the high price scenario unless otherwise stated.

Figure 7: Capital investment in the project (US\$ billion at constant 2012 prices)



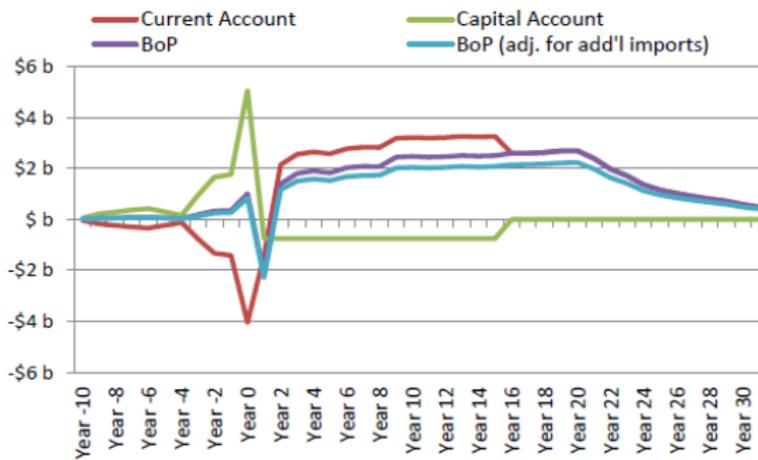
Source: Uongozi Institute (2013).

Figure 8: Project export values in (US\$ billion at constant 2012 prices) for the two scenarios



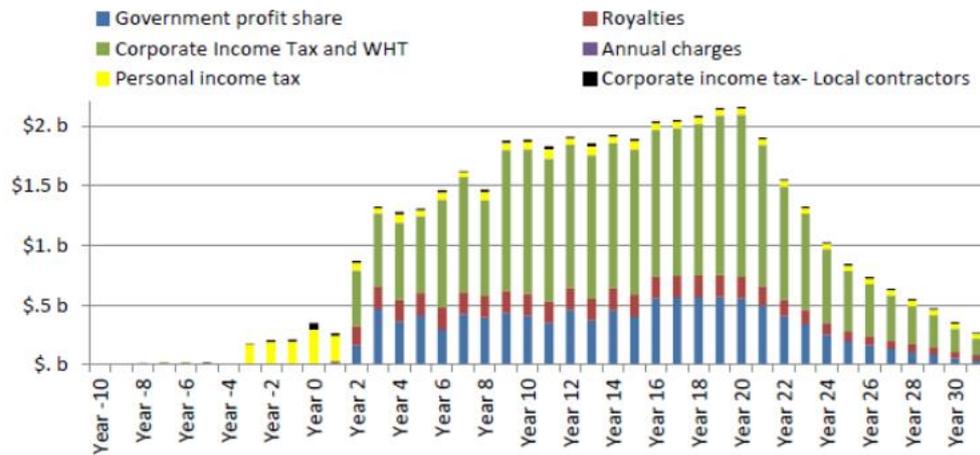
Source: Uongozi Institute (2013).

Figure 9: Overall balance of payments impact (US\$ billion at constant 2012 prices)



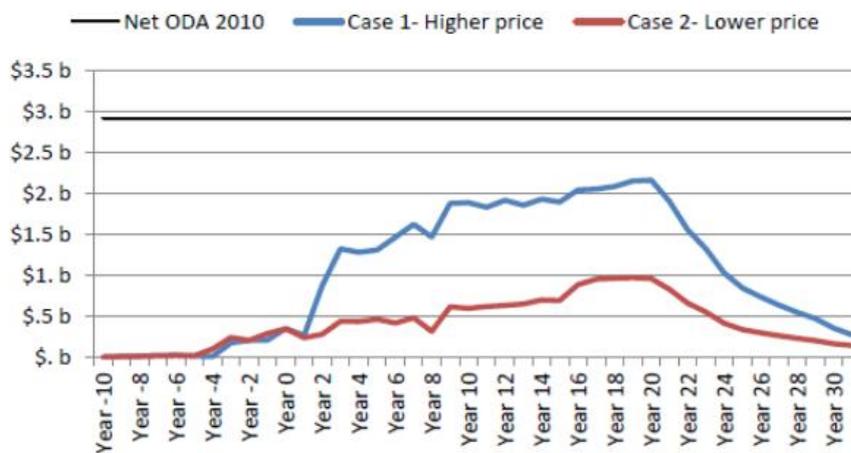
Source: Uongozi Institute (2013).

Figure 10: Government revenue by type of revenue (US\$ million at constant 2012 prices)



Source: Uongozi Institute (2013).

Figure 11: Government revenue (\$ million at constant 2012 prices) for the two scenarios



Source: Uongozi Institute (2013).

In addition to the points already made, the LNG plant will increase GDP through the total value of production (export sales plus domestic sales). From this total, non-labour operational costs (intermediate consumption) are removed to generate the value added for GDP purposes. When production starts, the project's contribution to GDP has been estimated to be roughly US\$4.5 billion and so equivalent to a roughly 9 per cent GDP improvement by the second year of operations. However, this *percentage* impact will decrease over time as it is assumed that other drivers of GDP will grow which will render the LNG project *proportionately* less important.

3.4 Will the new revenues be transformative?

These orders of magnitude are clearly extremely large in all the macroeconomic dimensions that we have considered. But are they large enough to be transformational for the Tanzanian economy in the way that the mining boom from 2000 appears not to have been?³³ Transformation of the economic situation can be encouraged and stimulated by using two main policy strategies. These are:

- A strategy where new government revenues are dedicated to solving immediate poverty and other social problems by spending directly on these areas;
- A strategy where those revenues are used explicitly in concert with the increased spending by the private sector to try to promote a structural shift in the productive potential of the economy—and from that longer-term but indirect gains in the social condition of the country. The new private sector activity might be either in (i) downstream activities directly linked to gas or (ii) in local supply-chain businesses that provide both intermediate and consumers goods to the gas sector and those employed by it.

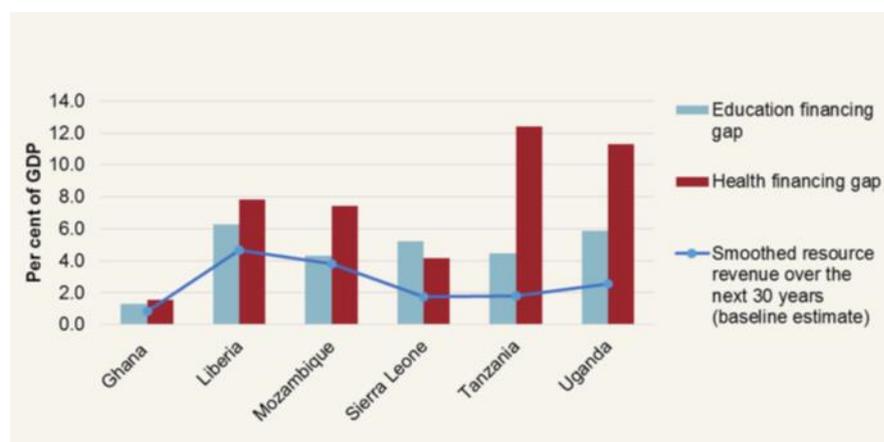
Recent research by Oxford Policy Management (OPM) with the African Development Bank (AfDB)³⁴ has sought, inter alia, to assess the transformative potential of the new revenues in the first of these areas: in particular in relation to the critical social areas of health and education. The main result of this analysis—for both Tanzania and the other newly oil and mineral rich countries of Africa—is summarized briefly in Figure 12.³⁵ The other strategic route involving downstream activity is discussed in Section 4 below.

³³ In addressing this question we need to remember that these magnitudes are based on the likely outputs from just three concession blocks. In addition to these three, there are at least another nine concession blocks in the Indian Ocean with exploration underway by, among others Statoil of Norway, Shell and Petrobras of Brazil—See Figure 6.

³⁴ Supported by the Bill and Melinda Gates Foundation. See Witter et al. (2015).

³⁵ The methodologies used to calculate the funding gaps are explained fully in Witter et al (2015).

Figure 12: Health and education funding gaps compared to smoothed natural resource revenues in the sample countries, annual average 2016–25



Source: Witter et al. (2015).

These data suggest that in Mozambique and Ghana, and to a lesser extent in Liberia, the new revenues, *if used solely for education and health*, could fill a significant proportion of the estimated education and health funding gaps over the period of the next decade. But this would not be the case in Tanzania or indeed in Sierra Leone or Uganda. In the case of Tanzania this is also partly due to the relatively smaller scale of those revenues and to these projected revenues arriving somewhat later than in the other countries.

Similarly, the same project examined the case for paying out the new gas revenues as an equal cash dividend to each member of the population, and compared this with the poverty-reducing effects of instead boosting the targeted cash transfer programmes already in place. In brief it concluded that the scale of resource revenues predicted in the sample countries is not sufficient to have a significant impact on human development if distributed as direct dividends. In the case of Tanzania the dividend would only amount to around US\$12 per family per quarter in the first ten years of production. The alternative of using the same total pay-out money to support existing government cash transfer initiatives would be a much more efficient route to reducing poverty given the targeting built into these systems and the quality of the institutions already established by government and donors to manage and monitor the programmes. However, it also concluded that Tanzania’s expected resource revenues were unlikely to be large enough to make it comparable to Angola or Gabon where the distribution of even 10 per cent of the annual resource revenues as direct dividends could eradicate half or more of the average depth in poverty in these countries (Barca, Pellerano and Jakobsen 2015;Giugale and Nguyen 2014).

4 Economic transformation and downstream activities

The first part of Section 3 above has already assessed the transformational effects that can be achieved by using the early stage on-shore and shallow-water gas to increase Tanzania’s gas-fired energy generation. Here we examine other possible industrial uses of the additional domestic gas that will become available once the deep-water reserves begin to be produced. As already explained, the PSAs already signed indicate that at least 5 per cent of this potentially huge volume of additional gas will be supplied to the domestic market. How might this be used and what are the commercial considerations regarding possible alternative uses?

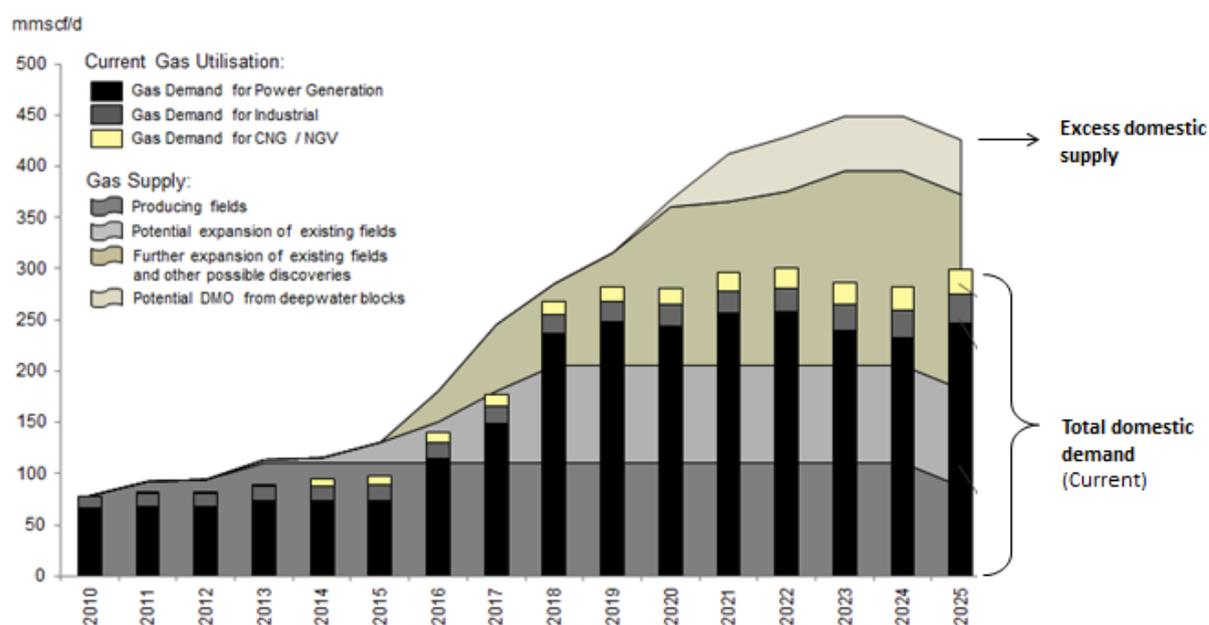
In order to simplify the discussion we here distinguish between the use of gas to expand existing Tanzanian uses and the use of gas in new areas. Feasibility is assessed against the likely capital

costs of developing the production facilities required for the new uses and the likely maximum cost prices of gas that those facilities could bear if they were to be operated on a fully commercial basis (i.e. with no subsidies).

4.1 Existing uses

As already noted, until very recently Tanzania only extracted gas from on-shore wells and the resultant gas was used domestically for three main purposes: electric power generation; fuel for the industrial sector; and compressed natural gas (CNG)/natural gas vehicles (NGV). Currently the gas produced by the Songo Songo on-shore wells is sufficient to fully cover the demand for gas in these three areas given the existing infrastructure. Figure 13 shows the actual and projected demands for these three uses through 2025

Figure 13: Gas supply and demand—current gas utilization



Source: Uongozi Institute (2013, Figure 5.1).

It can be seen that the existing domestic uses are dominated by the needs of power generation—a matter that we have already discussed in detail earlier in the paper. At present there are only a small number of industrial users (e.g., in textiles, cement mills and breweries)—some supplied with gas via a 50 km low pressure pipeline. But industrial users as a whole consume an estimated 15 per cent of the Songo Songo production. Gas usage for residential CNG plus the natural gas used for vehicles is much lower at present but could rise somewhat faster. Gas could displace some use of fuel oil, electricity and of course wood. Even so, the overall growth of demand in these two uses is unlikely to be particular rapid.³⁶ So the total demand would be unlikely to preempt the available domestic gas supplies that are anticipated: usage might reach some 20–25 mmscf/d by 2025. The uses in question could sustain a gas price of some US\$8–9 per mmscf and capital costs need not be high—perhaps US\$10 million of capital costs to reach a million new residential customers who together would need circa 6 mmscf/d of gas.

³⁶ Although the increased anchor demands from the new power stations and the setting up of CNG/NGV stations would gradually underpin a network expansion to link new customers.

4.2 Possible new uses

Far larger demands on the available domestic supplies of gas would be placed by some of the new downstream uses, including petro-chemical production that may be technically possible. These would also involve very much larger capital cost. Furthermore the scale of the likely Tanzanian demand for the outputs involved would mostly not be sufficient to utilize fully the scale of the production facilities that would be needed to ensure an internationally competitive product. It follows that Tanzania would need to seek and find export markets to justify some of the large investments. The specific possibilities to illustrate these general points are as follows:

- Fertilizer production. A domestic fertilizer facility could make a significant potential contribution to Tanzania's large agricultural sector which presently has a low rate of fertilizer use as well as an expensive subsidy policy to help farmers. However, a world-competitive ammonia/urea plant would likely produce some 2,200 tons per day of ammonia and perhaps 3,800 tons per day of urea. It could be competitive if it could be supplied gas at US\$5–6 per mmBtu: a figure that is more demanding than the US\$7–8 supply price needed for a viable LNG export activity. Fertilizer production would also encounter the problem of a very large capital cost of circa US\$1.6 billion and it would also need a large volume of gas if it were to operate at near full capacity: circa 60 mmscf/d. That full capacity output would be significantly higher than the anticipated future demands in East Africa as a whole. So the investment could only be justified if Tanzania had real prospects of also finding large export markets outside the region.
- Methanol production. The economics are even more difficult here. A world-competitive plant would need to produce some 5,000 tons per day. But it would cost circa US\$1.7 billion in terms of capital costs and consume some 160 mmscf/d of gas at full capacity. It would also be more demanding than fertilizer in that it would probably need a gas supply price of circa US\$4–5 in order to ensure its competitiveness. But the real danger for Tanzania in going down this route comes from its very small domestic market for the product (methanol being used mainly as a feedstock into chemical industries). Hence a very large export market would need to be found to justify such a large capital outlay.
- Converting gas to liquid fuels. This would be an even more challenging investment for the country. Production facilities to produce naphtha and high quality diesel need to be very large and they are very expensive. A facility to produce 70,000 barrels a day would cost around US\$7.5 billion in investment and require some 700 mmscf/d to operate at full capacity. It would only work competitively if it could acquire gas at a price of around US\$3–4 mmBtu—half the price that ought to be possible in an exporting LNG facility. Although this type of project would have some superficial attraction in being able to save Tanzania's large petroleum import bill, the investment needed to achieve this saving would be huge.

The authorities (and especially TPDC) face a significant challenge of assessing their priorities in this matter and then attracting the necessary additional private investment to ensure that the gas at their disposal (i.e. mainly the part not committed to the LNG trains) is used effectively and above all competitively. Based on the admittedly crude figures used here, it seems likely that the best strategy will be to develop further the existing domestic uses of gas—where this can be done at competitive prices; rule out activities such as methanol and gas to liquid conversion; and take a serious but hard-nosed look at the feasibility of developing some fertilizer capacity. But the strategy also needs to factor in the need to find significant export markets for a possible

fertilizer plant and to assess carefully the possible supply prices of the domestic gas that may be possible when deep-water gas production eventually begins.

4.3 Challenges, dangers and management

The opportunities offered to Tanzania by virtue of the huge new gas finds of recent years are without precedent in its history. The challenges of managing that opportunity are beginning to be understood. However, this paper contends that much can be learned from understanding better what Tanzania did well but also badly when confronted with an earlier windfall based on extractive resources—just 15 years ago. In particular, it seems important this time around, to establish a clear long-term vision about both the scale and timing of the new gas activities and also the alternative ways in which the government can possibly utilize its own share of those revenues. This calls for realistic and flexible forward planning and not merely a rose-tinted view of the gas future that could easily lead to excessive and ineffective spending as well as inflated levels of new borrowing. The choices about alternative allocations of resources call for a perspective and procedures that are far longer-term in nature than those typically employed even in medium-term budget frameworks.

This section of the paper merely seeks to identify some of the key issues³⁷ that still need to be addressed and managed if the potential windfall that we have described is to be turned into a reality. Full analysis of these matters would require a much longer paper.

Expectations management

Everyone involved in the debates around gas recognizes that a powerful communications strategy is needed to manage expectations in government, in the affected local communities and in the country more generally. Policy choices can get horribly distorted if expectations about the gains from new gas are allowed to run too far ahead of reality. Local communities can become quickly disillusioned if they develop inflated expectations of the benefits they might expect. The 2013 Gas Policy refers directly to this matter, but the government is handicapped by a degree of unavoidable ignorance (and so rumours) about the true magnitudes and timing of benefits.³⁸

Although the potential macroeconomic effects are very large, a major part of the challenge will be to communicate effectively the manner in which the effects will distil down to the Tanzanian people and when. In the case of the new on-shore and shallow water gas where there is already some good news to report, the task is a bit easier. But even here the benefits are accruing in indirect ways: as cheaper and more broadly available electric power rather than as the large income gains that some people may expect. In the case of the deep water gas there is a much bigger problem of communication because the production of gas is still several years distant and only the jobs and the additional incomes associated with construction will be visible in the near-term future. Beyond that, some of the benefits of, enhanced government revenue for example, may distil down to the general population only as a range of improved but often diffused public services—not easily traceable to the new gas. Other benefits will arise from the increase in local

³⁷ The government is well aware of most of the main issues and its Natural Gas Policy presented in 2013 contains initial ideas on most of them but without yet the detail that will ultimately be needed.

³⁸ For example, in Section 3.1.11 the government commits itself as follows:

The Government shall: (i) Develop an effective communication strategy that provides an accurate and timely information to the public on activities implemented throughout the natural gas industry as well as manage public expectation and stewardship of natural gas resources.

This commitment needs to be implemented through a large and public communications programme.

business opportunities as workers in the gas areas receive and spend their increased incomes. Disappointments are highly likely amongst the general public especially in the most directly impacted areas around Mtwara/Lindi as they compare headline figures showing US\$ billions of investment with the diffuse but arguably limited personal gains that they observe. A good communication strategy can only partly solve this problem. But at the very least this should include the regular dissemination of as much hard information about the gas projects as can reasonably be assembled by technically expert teams, including very frank statements about the various uncertainties that will overlay the projects for some time to come.

Technical and commercial constraints

Foremost among the technical³⁹ uncertainties are the capabilities of, and costs to, the companies of solving the still numerous difficult technical problems involved in extracting gas from several miles into the Indian Ocean under 1,400 metres of water and a further 2,000 metres of variable sea bed strata. There is no guarantee that the concessionaires will be able to solve these problems at an acceptable level of cost especially in the light of the recent softness of energy prices. These technical problems in turn interpose themselves with the various commercial risks that the companies and government will also need to solve, including:

- Will the companies be able to justify to their shareholders, the huge upstream and mid-stream investments that are required given the (changing) expectations of the global market (e.g., for LNG)—for example, taking account of the recent large falls in oil prices? One concessionaire alone is anticipating a full investment cost in excess of US\$20 billion;
- For the government and TPDC—can they raise the finance for the very large infrastructure and supporting investments needed to ensure the delivery and effective usage of the available gas?—e.g., in electricity power generation, compressed natural, natural gas for vehicles and possibly also the very large investment needed in fertilizers;
- Will the companies be able to establish commercial terms with TPDC and the government more generally that are robust enough for projects to proceed: e.g., arrangements on payment and payment guarantees;
- Will the government honour the PSAs already signed, given the potentially different terms (e.g., about tax and royalty rates) built into the recently promulgated Petroleum Act of 2015.
- Will the global demand and supply situation remain favourable to exploiting the Tanzanian resources over the very long period (circa 30 years or more) anticipated by the off-shore projects?

Skills development

As was seen clearly in the case of gold and diamonds much of the criticism that arose especially from local mining communities was associated with the allegedly limited employment opportunities created by the new mines. The gas development in spite of its huge investment cost will be even more limited in terms of its *direct* job creation. In the light of this, strenuous efforts need to be made to ensure (i) that skills are developed to provide Tanzanians with the

³⁹ These embrace both geological and engineering issues. For example, on geology, there are still gaps in the understanding of the characteristics of the gas reservoirs even after the discoveries have been appraised for scale: e.g., temperature and pressure. On engineering, a very large sub-sea pipeline will have to be designed and built to cross the huge underwater canyon that lies between the gas reservoirs and the shore.

maximum possible number of these jobs and (ii) that parallel activities are actively promoted along the lines proposed in the Bomani Report to achieve the largest possible numbers of indirect jobs. In reality there will be large opportunities for *indirect* job creation through linkages to the rest of the economy that were only weakly recognized and promoted in the earlier case of gold and diamond mining. One problem is that most of the big numbers of direct jobs come in the construction phases: the first 3–4 years. If these jobs are to be filled by Tanzanian workers, a large skills training programme needs to start very early—as indeed it has but on a relatively small scale. Although these jobs may be partly specialized to construction, the skills developed could in most cases be transferable at a later stage to support other Tanzanian objectives such as increased house-building where there are also major skill constraints.

Public sector capacity

This is an important area of further uncertainty regarding the prospects for realizing fully the potential from the new gas finds. Tanzania has an effective civil service that includes many effective and well qualified managers and specialists. But the depth of the skill bases is often quite thin and the weaknesses inherent in this may easily be exposed by the sheer scale of the technical analysis and decision-taking that is associated with the huge new gas projects and their possible downstream uses. There are numerous specific issues of public sector management that need to be addressed. The following paragraphs merely consider some important examples:

Coordination

Effective implementation of policies and strategies for the gas sector will require an unusually high level of coordination of decision-making and authorizing powers across many agencies of government. Such coordination is difficult in any government—partly due to the competitive set-up of different ministries (e.g., as they compete for scarce budget funds) but also because of the inherent ambitions and possibly divergent objectives of different ministers. In Tanzania, there is a plethora of ministries and agencies that need to work together on gas.⁴⁰ This proliferation superimposed on agencies which sometimes lack the full range of technical skills seems likely to be a cause of lengthy delays in decision-making and some occasional bad decisions. The situation is equally complex in relation to the management of environmental and community issues.⁴¹ Effective coordination is hindered because many of the component state institutions lack the authority to convene high-level decisionmakers from partner institutions on a regular basis. So there is a danger that they may operate with inadequate information and consultation. Further, in the absence of enough high-level oversight to direct the component parts, in the past there has been a distinct danger of some agencies occasionally making decisions outside their mandated scope. Hopefully this situation will be improved by the establishment of

⁴⁰ These include, the Ministry of Energy and Minerals (MEM) as the lead policy and administrative institution; TPDC (now the NOC) as the national partner in all petroleum ventures; the Petroleum Upstream Regulatory Authority that will shortly take over the regulatory functions of TPDC; the Energy and Water Utility Regulatory Authority whose role is confined to midstream and downstream regulation, the Ministry of Finance (MOF), as the lead policy institution in setting royalty and profit-sharing terms at the project level; the Attorney General's office that is also involved in negotiation and devising contracts; the Tanzania Revenue Authority that collects income taxes from gas companies, while MEM collects the large share of non-tax revenues from petroleum activities via TPDC including royalties, license fees, application fees and annual rent, and profit oil and gas, with MOF collecting revenues from equity holdings, and local authorities collecting a local service levy from mining companies.

⁴¹ The Vice President's Office is the lead coordinates on overall policy. But the National Environment Management Council; in coordination with Local Authorities manages environmental issues; the Ministry of Labour and Employment, leads on the formulation of labour, labour market, social security and employment policies while the Ministry of Lands, Housing and Human Settlements Development has to approve land allocations for extractives use.

a new Oil and Gas Bureau within the Office of the President (Petroleum Act 2015). The challenges of coordination are most acute in relation to the important additional relationship between oil and gas on the one hand and the wider economic issues that need to be addressed to support the non-hydrocarbon economy on the other. The apparent failure of government policy in this area in relation to gold and diamonds as discussed earlier is an example of why this matter needs serious attention.

The role of the NOC

Now that TPDC (Tanzania Petroleum Development Corporation) has been officially designated as the country's official National Oil Company, issues will arise about the dividing lines of decisionmaking as between TPDC on the one hand and the government more generally on the other. In the previous pre-2015 legislation (mainly the Petroleum Exploration and Production Act 1980) this matter was somewhat ambiguous. The new Act is more explicit about the role of TPDC/NOC.⁴² Indeed it sets out several functions for it including participation in petroleum reconnaissance and the development of projects; the aggregation of natural gas; the ownership and operation of major gas infrastructure on its own or through its subsidiaries; and the establishment of appropriate subsidiaries (section 8) presumably to manage specific projects. In short TPDC looks set to become a much larger and more influential autonomous agency than in the past. This then raises a host of questions about practical matters such as the financing arrangements for the NOC (will it merely retain all or part of the royalties and profit-oil/gas that it collects, or will it also be eligible for funding from the state budget and be authorized to borrow on its own account); and how much residual control over larger strategic decisions will in practice be retained by the government (e.g., through the new Oil and Gas Bureau?).

Recent in-depth research (Heller et al. 2014) on 12 NOCs in other countries has revealed a wide variety of practice and outcomes (good and bad). Of particular relevance to a country such as Tanzania is the comment that ...

it is important that the company has sufficient access to financial resources to execute it effectively ('it' being whatever commercial strategy is set for the NOC). This can be particularly challenging where the NOC aspires to costly operational activities. When an NOC is responsible for a substantial share of project costs, it often faces heavy upfront capital expenditures, for projects that may take anywhere from seven to fifteen years to generate revenues. (p. 4)

and

...in states where a major share of government revenue passes through the NOC, leaving the company with too much autonomy over its revenues can have grave consequences for public financial management. (p. 4)⁴³

On a more positive note, it would seem that TPDC will not face the conflicts of interest seen in other NOCs of needing to conduct its commercial operations alongside a regulatory function:

⁴² See section 10 of the Act.

⁴³ Also 'In Angola, where Sonangol has had *de facto* authority to retain control of huge revenue flows, the IMF uncovered an "unexplained residual" in state accounts initially measured at more than US\$31 billion: equivalent to 25 per cent of annual GDP that has not been managed using the ordinary rules of public financial management'.

the latter having been hived-off to PURA (Petroleum Upstream Regulatory Authority) by the 2015 Act.

As a related issue much attention needs to be given to the strengthening of a reforming National Oil and Gas (NOC) company (the present TPDC)—its financing, its specific roles, building its capacities. The division of roles as between government and the NOC has been a source of much difficulty in other countries.

Macroeconomic and revenue management

The government needs to exercise caution on the macroeconomic fundamentals to avoid exchange rate appreciation and damage to traditional export activities (the Dutch Disease problem):

- Sovereign wealth fund: Should there be one?
- Stabilization arrangements—against the future volatility of oil and gas prices—and so government revenues: should these be set up?

Inclusive growth: ensuring that other sectors are not left behind: Much of the emphasis must lie in skills and knowledge and the government should focus on building human capacity in all sectors with transferable skills from oil and gas.

Transparency and good governance: Tanzania is fortunate to discover gas now. They can learn from lessons from other countries on the importance of transparency and good governance.

Above all the politics of the situation: how to protect this unique opportunity from political opportunism and mismanagement especially when a major election is due in October 2016!

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