



Mapping and analysis of the needs for petroleum related education in Tanzania



Mapping and analysis of the needs for petroleum related education in Tanzania

FINAL REPORT 11 December 2013

Siri Bjerkreim Hellevik (Nordic Consulting Group Norway, NCG A/S), Farouk Al-Kasim (Petroteam A/S), Prosper Ngowi (independent), Harald Stokkeland (Sic International Consulting Ltd.) and Karen Sund (Sund Energy A/S)

Frontpage photo: Ken Opprann

Norwegian Agency for Development Cooperation

P.O. Box 8034 Dep, NO-0030 OSLO
Ruseløkkveien 26, Oslo, Norway
Phone: +47 23 98 00 00
Fax: +47 23 98 00 99

ISBN 978-82-7548-714-6
ISSN 1502-2528

Responsibility for the contents and presentation of findings and recommendations rests with the study team.
The views and opinions expressed in the report do not necessarily correspond with those of Norad.

Abstract:

This study maps and analyses the needs for petroleum related education in Tanzania. This study represents an attempt to systematize the needs required at a detailed skills level, indicating gaps in demand and supply. The analysis is structured in a matrix that details skills needs at the professional and technical levels. The matrix is a useful tool that the government and the industry may use to plan for matching demand and supply of skills needed in years to come. Based on the findings, this study provides recommendations as to the type and level of education needed. There are many uncertainties as to the future as to the industry. Hence, the estimates given here have to be treated with caution and are likely to change as future decisions are made on development of the oil and gas sector in Tanzania.

The study does not take into account education and training needed on the overall system and leadership levels. Moreover, the study does not take into account needs in indirect and induced jobs that may emerge from the petroleum activities. Most international studies demonstrate that these supporting industries and related activities provide more jobs than those in the petroleum activities. Hence, the estimates given in this report do not reflect the total number of skills or jobs anticipated in Tanzania related to all aspects of the petroleum operations.

The clients of this study are Ministry of Energy and Minerals (MEM), Ministry of Education and Vocational Education and training (MOEVT), Government of Tanzania, Norad and Petrad.

Disclaimer:

Nordic Consulting Group Norway A/S and its sub-contractors (Petroteam A/S, Sic International Consulting A/S, Sund Energy A/S and Prosper Ngowi (independent consultant) do not take responsibility for any actions based on the conclusions of this report. There are several uncertainties as to what the future may bring in terms of development related to gas in Tanzania. All estimates being presented in the report are thus to be treated with caution. It is first when LNG development projects have been structured that one can define exact need of education and exact skills. The estimates given in the report are preliminary and based on information obtained from various sources of information and analysis of existing LNG projects. The clients, Ministry of Energy and Minerals, Ministry of Education and Vocational Training, Norad and Petrad reserve all rights to this report and its content.

Note of thanks

The authors of this study would like to thank our clients Ministry of Energy and Minerals, Ministry of Education and Vocational Education and Training, Petrad, Oil for Development Programme in Norad and Royal Norwegian Embassy in Dar es Salaam. Moreover, the team wishes to express our gratitude to the many interviewees and the reference group in Tanzania and Norway for their valuable inputs to our work.

Table of content

Abbreviations and Acronyms	4
Executive Summary	5
1 Introduction	9
1.1 General introduction.....	9
1.2 Methodology	9
1.3 Limitations to the study	10
2. Existing and planned petroleum-related education in Tanzania	10
2.1 Overview of gas findings, production and plans in light of global market uncertainties	11
2.2 Oil and Gas in Tanzania: The Big Picture.....	11
2.2 Review of existing policies and plans on development, education and energy	14
2.3 Existing Petroleum-related education and training	15
Assessment of the quality of TVET	22
2.5 Future education plans.....	23
2.6 Other models for skills development outside the education system.....	26
2.7 Organisation and coordination.....	28
3. Skills gaps analysis	30
3.1 Introduction	30
3.2 Specific skills needed and activity levels	30
3.3 Existing estimates	31
3.4 Skills gaps at the professional level.....	32
3.4.1 Professional level skills gap for the government	32
3.4.2 Professional level skills gaps for the industry	34
3.5 Technical level skills gaps.....	36
3.5.1 Technical level skills gaps for the government.....	36
3.5.2 Technical level skills gaps for the industry	36
3.6 Skills gaps for other activity levels.....	37
3.6.1 For high activity level	37
3.6.2 Skills gaps for low activity level	38
3.6.3 Skills gaps for the commercial discovery of oil in addition to gas	38
4. Conclusions.....	39
Recommendations	40
References.....	43
Annex 1: Matrices for professional and technical skills gaps.....	46
Annex 2: List of interviewees	48
Annex 3: General observations on gas, markets and uncertainties.....	51
End notes.....	51

Abbreviations and Acronyms

BRN-Big Results Now
CIDA- Canadian International Development Agency
COSTECH- Tanzania Commission for Science and Technology
CSO- Civil Society Organisation
GIZ- Deutsche Gesellschaft für Internationale Zusammenarbeit
HSE- Health, Safety and Environment
HSSE- Health, Safety, Security and Environment
LNG- Liquefied Natural Gas
LPG-Liquefied Petroleum Gas
M&E-Monitoring and Evaluation
MEM- Ministry of Energy and Minerals
MKUKUTA- Poverty Reduction Strategy Paper of Tanzania
MOEVT-Ministry of Education and Vocational Education and Training
NACTE- National Council for Technical Education
Norad- Norwegian Agency for Development cooperation
NTNU- Norwegian University of Science and Technology
O&G- Oil and Gas
PSA- Production Sharing Agreement
Sida- Swedish international development agency
TCIAA- Tanzania Chamber of Industry and Commerce
TCU- Tanzania Commission for Universities
TET- Technical Education and Training
TPDC- Tanzania Petroleum Development Cooperation
TVET- Technical and Vocational Education and Training
UDOM-University of Dodoma
UDSM- University of Dar es Salaam
URT- United Republic of Tanzania
VET- Vocational Education and Training
VETA- Vocational Education and Training Authority
VSO International- Volunteer Services Organisation International

Executive Summary

The objective of this study is to map the demand and supply of petroleum-related education in Tanzania. Petroleum-related education implies education directly related and relevant to petroleum operations. The study limits its focus to the skills needed for petroleum operations in the industry and the government, i.e. the direct jobs and does not look into skills needed in related industries (i.e. indirect and induced jobs) (e.g., Grant Thornton, 2013; PWC, 2013; Warner 2013a; 2013b). Moreover, the study is limited to upstream development and does only to a limited extent identify skills needed for downstream and midstream operations.

Methodology: The study is based on document analysis, several interviews with key stakeholders in Tanzania, participatory methods and direct observation.

Limitations/uncertainties: An overall limitation is that the international oil companies in Tanzania have not yet taken a decision whether to develop the fields and construct LNG plants. Hence, there are uncertainties as to the number of LNG plants, whether there will be any joint planning, whether there will be parallel oil exploration activities, and the balance between local deliveries and export. Another limitation is that the institutional framework is not yet fully in place. A third limitation is that the team has been unable to access the numbers on current staff with petroleum-related background in key government institutions.

Approach: The analysis of future education needs is done by:

- Identifying two levels of skills needed:
 - Professional level skills- corresponding to education offered at higher education institutions
 - Technical level- corresponding to education offered at technical and vocational education and training institutions
- Gap analysis:
 - Departs from these skills and sub-categories
 - Separate between government and industry's needs
 - Takes into account four activity levels/scenarios, but focuses most on the moderate activity level.

Findings:

Existing and planned education initiatives:

- Several initiatives funded by the government, the industry and some donors are in place for petroleum-related education at higher education level, technical level and vocational education and training institutions:

Level	Number of students (gender disaggregated data available only for some students)
BSc Petroleum geosciences and engineering	177 (UDSM: 62 (13 female), UDOM. 110)
MSc level Petroleum geosciences and engineering	10 (twinning UDSM and NTNU)
Technical level	110 students (9 female) (1 st and 2 nd year)
Vocational education and training	275 (trained in O&G in addition to general trades) (17000 enrolled in general relevant trades, but not directly employable in the industry.

Table 1: Education statistics

Gap analysis:

- Departing from a medium/moderate activity level that assumes the construction on one LNG plant from two fields, the need for skilled labour will mostly be during the construction phase, lasting from 2-5 years.
- Skills needs may vary dramatically over time, but most skills are transferrable to other industrial activities that may emerge from the petroleum operations. International experience shows that the job potential in such industries are at least four times as many (indirect jobs) and ten times as many induced jobs.
- **Skills gaps at the Professional level:**
 - Urgent for both government and industry, especially petroleum engineers.
 - If existing and future education plans are realised and quality and sufficient teaching capacity is ensured, the gap might be covered at BSc level.
 - MSc/MA level education in petroleum engineering, petroleum geology and petroleum chemistry and additional top-up courses in business, finance, law are planned at UDSM.
 - Based on the assessment of the quality, UDSM seems to be best equipped to provide MSc level education in petroleum sciences. UDSM has staff in the key disciplines, have developed research capacity in these disciplines over a long period of time and may build on the existing MSC collaboration programme with NTNU, NORWAY (ANTHEI)
 - There is no need for additional MSc courses in other universities.
 - Industry's needs: 3-400 during construction of LNG plant, maybe 100 needed during operations.
 - Government's needs: Stable demand– and presumable decreases somewhat over time.
 - The education provided and planned mostly cater for upstream activities and not downstream and midstream activities.
- **Skills gaps at the Technical level:**
 - *In numbers*, more skilled labour with Vocational Education and training and technical training needed than those with professional skills (university degrees) in numbers.
 - Employment numbers likely to vary with numerous factors (e.g., how installations are being built, whether there are pre-fabricated modules, where the site is, etc).
- **Variation as to activity levels:**

Activity level	Assumptions	Skills needed
LOW	No LNG plant	Few additional people
HIGH	2+ LNG plants	For each LNG project: approx doubling the skills needed
OIL & GAS	High on-shore and off-shore gas activity, exploration phase for oil	Approx 12 Geologists+other geo-scientists, 12 technicians (for oil activities) in individual companies and in government
Domestic utilisation of gas, downstream and midstream activities	A wide spectrum of activities and a domestic market	Economics, market analysts, infrastructure specialists, technicians and plant operators, etc.

Table 2: Activity levels and skills needed

Recommendations

On education levels and needs:

- More people need to be trained at technical and vocational level than university level

On types of education needed:

Professional skills:

- BSc. Level education established suffices in providing for the need
- MSc and MA education plans in geo-sciences and petroleum engineering at UDSM should continue- the best place to offer such education
- Quality of education and teaching needs to be ensured.
- In law, economics, finance and related sciences, additional specific courses, not degrees on oil and gas may suffice. With realisation of downstream and midstream activities, a separate MA/MSc in economics related to such themes is needed.
- **Technical skills:**
 - Government needs to strengthen focus on TVET education.
 - Existing training in key oil and gas skills in VETA Mtwara and VETA Lindi could be further extended
 - Need to ensure that skills are transferrable to other sectors
 - Apprenticeship systems should be reinforced to ensure more practical training.

Recommendations for all actors involved:

- A joint coordination forum/organ between government, industry and education institutions should be established for overall coordination of education activities.
- Ministry of Education and Vocational Training should lead this forum as it is responsible for skills development. Members of the forum should include, but may not be limited to these institutions/actors: relevant companies providing support for petroleum-related education, MEM, Ministry of Gender, TPDC, Ministry of Science and Technology, the universities, the VETA Head office and selected schools, selected technical schools, NACTE, COSTECH, TCU, selected NGOs involved (e.g., VSO International).
- A small working group with administrative/ secretariat functions for this coordination forum should be established within the MoEVT to ensure smooth operations and make sure planning and decisions are followed up on by the respective organisations involved in between meetings.
- Sub-forums for coordination on the specific education levels should be considered:
 - Coordination Forum for higher education
 - Coordination forum for technical education
 - Coordination forum for vocational education and training
- The overall coordination forum and the sub-forums should work on these tasks:
 - Regular (preferrably, monthly) meetings with identification and analysis of demands vs. supply in job market and in education
 - Assessment of quality in education
 - Identification of gaps in apprenticeships offered by the industry
 - Identification of needs and division of labour in funding to avoid overlaps and gaps- likely to result in improved quality of existing education.
 - Identification of gender barriers and measures to improve gender inequalities in education and employment in the sector.
 - Use an M&E system to track quality in education over time

- Collaboration between the two government-donor technical working groups on education and energy should take place in order to plan for how external funding can be utilised to strengthen petroleum-related education.
- The second round of Big Results Now should include the TVET programme in its focus and develop Key Performance Indicators on skills development for and related to the petroleum sector.
- *Recommendations for future studies:*
 - Follow-up analyses based on MEM's own work on identifying existing skills within government should be further analysed and combined with this study to make a comprehensive overview document on existing supply versus demand for all government institutions—in short, medium and long-term perspective. The matrix provided in this study can be utilised and expanded upon as a tool for such a study as it takes into account the time perspective.
 - Follow-up analyses are needed to establish in more detail the skills gaps with relation to downstream and midstream activities and the expansion of a domestic market and domestic utilisation of gas.
 - A study on local content, including an assessment of the indirect and induced job potential from a future LNG project should be done. Such a study should in particular identify job opportunities related to improving the gender balance in all types of jobs.
 - A study on the current situation regarding gender in the petroleum sector—identifying all gender disaggregated data that this report does not cover, the gender barriers in the sector, the gender imbalance is needed. Such a study should also focus upon entry points and suggestions for how to operationalise the gas policy's ambitions regarding gender.
 - Future work involving relevant stakeholders in the Tanzanian government, civil society and the companies should be undertaken to identify the skills gaps of the Tanzanian government at the systems and leadership levels. There is a dire need to explore and define what systems and leadership skills are required to ensure that the petroleum involve and how it should be handled.

1 Introduction

1.1 General introduction

Tanzania has emerged as a potential major global gas producer with large discoveries of gas on deep off-shore in recent years, currently amounting to around 43 TCF (TPDC, 2013). The country's first gas discoveries happened on-shore, at Songo Songo Islands in 1974 and Mnazi Bay in 1984. It was not until 2004 and 2006 respectively that these fields opened for production. Despite the fact that gas is not a new phenomenon in Tanzania, the country has had limited exposure to the oil and gas sector so far and have few people with petroleum-related education. As the newly approved Natural Gas Policy outlines, Tanzania faces challenges that calls for ensuring that there is 'availability of human resource with the requisite skills, attitude, discipline and knowledge of the natural gas industry' (URT, 2013a: 2).

The main objective of this study is to map the demand and supply of petroleum-related education in Tanzania. By petroleum-related education, this study implies education directly related and relevant to petroleum operations. Moreover, the report describes on-going and planned petroleum-related education at the university level, the technical level and the vocational level.

Furthermore, the report assesses the quality of the existing education described. Based on this mapping, the report provides a gap analysis of current supply and likely future demand for identified skills in government and in the industry over the next 25 years. The study develops four scenarios/activity levels for assessing the skills gaps. A moderate activity level/scenario where one LNG plant from two fields with four trains is constructed is mainly used for assessing the skills gaps. Moreover, as estimates on skills needed in Tanzania are not available yet, the study uses examples of other LNG projects to estimate the skills gaps.

Based on the gaps identified, the report recommends prioritisation as to levels and types of education needed within the next 25 years in Tanzania. The companies are still in exploration phase, so all numbers in the report are to be regarded as estimates based on existing information and international experience. It is first when LNG development projects have been structured that one can define exact need of skills.

Gender barriers in the industry, reflections on how gender may be included in future work and gender disaggregated data is provided throughout the report where data has been available. Furthermore, the report includes an assessment of gender aspects in relation to the gas policy.

The study has four chapters and proceeds as follows: Chapter one gives an introduction to the study, describes the methodology used and the limitations of the study. Chapter two describes briefly the production profiles, the global market on gas in the future, highlights issues of the gas policy and surrounding debates. Moreover, this chapter identifies relevant elements for petroleum-related education in national and sector policies. Then, the chapter maps the existing education offered and future plans. In the third chapter, the study presents the skills gaps analysis based on the current and planned education and needs. The fourth chapter concludes and gives recommendations for prioritisation of levels and types of education and related aspects, such as coordination of actors involved in education.

1.2 Methodology

The main methods for data collection used in the study are systematic document analysis, interviews, participatory methods and field observations.

Systematic document analysis: The team has reviewed several types of documents, including overall United Republic of Tanzania (URT) development policies and plans, sector policies and plans on energy, education, local content and oil and gas specific documents. Documents on education initiatives by the universities, the TVET system, donors and O&G companies have also been reviewed. *Interviews* have been conducted with several relevant

stakeholders in Norway, Tanzania and some from other countries. *Participatory methods* were used in three meetings with group of stakeholders in Tanzania to discuss skills needed. *Field observations* have been conducted. *Reference group*: A reference group was established for this study and the team interacted with the reference group to get their feedback on pertinent issues before the draft report was delivered. The interaction with the reference group allowed for a process-oriented and more comprehensive validation process than was originally planned in the TOR and in the assignment proposal. In general, the use of various methods in this study increases *data validity* and *reliability* through a process of *triangulation of data*.

1.3 Limitations to the study

The study limits its focus to the skills needed for petroleum operations in the industry and the government, i.e. the direct jobs. Hence, the study does not discuss or assess education that is needed to cover indirect jobs– i.e., jobs generated throughout the wider supply chain of the oil and gas industry. Moreover, the report and the estimates in the gap analysis does not cover induced job opportunities–i.e., jobs that supply the industry involved in a given sector likely to result from the future gas operations. Examples of induced jobs are catering and security services. Experience shows that most LNG projects create at least four times as many indirect jobs as direct jobs (e.g., Grant Thornton, 2013; PWC, 2013; Warner 2013a; 2013b). The comparative figure for induced jobs to direct jobs is often regarded as being at least 10:1. However, the actual number of jobs created depend upon the features of the specific LNG project. Nonetheless, the job potential is much wider if taking into account these types of jobs.

Another limitation is that other data sources have been more limited than was originally envisaged when the study was planned².

A third limitation is that the study does not take into account *the total system perspective* essential to manage petroleum resources in nations as it was regarded as outside the scope of the study. The system level (S-level) requirements refer broadly to the skills needed to build government institutions and the entire government's approach to govern the sector. The leadership level (the L-level) refers to the skills needed for the development of good leadership and management in government and the industry. The environment or extra level (E-level) refers to local content requirements, environmental and social aspects, job creation from induced and indirect employment opportunities, etc. All these three levels have profound implications on the possibility of making petroleum a blessing for Tanzania³.

2. Existing and planned petroleum-related education in Tanzania

This chapter has five parts:

- Overview of gas findings, production and plans in light of global market uncertainties
- A brief overview of the big picture related to oil and gas in Tanzania
- A review of key policies and plans on energy, education and development.
- A description of the existing petroleum-related education in Tanzania and assessment of its quality.
- A description of the future plans for petroleum-related education.
- Identification of opportunities for education and training outside the formal system.
- SWOT analysis that sums up and analyses our findings and discuss coordination among the actors involved in petroleum-related education.

2.1 Overview of gas findings, production and plans in light of global market uncertainties

About 35,1 TCF of the inventory of natural gas resources proven is so far has been discovered on deep off-shore, eight TCF on on-shore. The gas from the two on-shore operating fields in Tanzania Mnazi Bay and Songo Songo Island is mostly used for power generation (MEM, 2012). The Tanzania Petroleum Development Corporation has signed 26 Production Sharing Agreements (PSAs) with companies. Statoil in partnership with Exxon Mobile has found 10-13 TCF of gas in four discoveries (EIA, 2013:1). BG Tanzania and Ophir have made seven discoveries amounting to more than ten TCF of gas (EIA, 2013: 1). Statoil and BG Tanzania plan to take their final investment decision on development and production in 2016. The production of LNG is likely to start in 2020/21 if the final investment decision implies production.

The government of Tanzania has demanded that the two companies set up a joint LNG plant onshore in Mtwara region if they decide to go into production. It is most likely that the oil and gas companies involved in Tanzania will prefer to export most of its gas. The government has ambitious plans for domestic use of the gas, but this require largest-scale investments by the government in infrastructure. There is a current demand not met from industrial actors in the country. The fact that most of the gas reserves discovered in Tanzania are found deep off-shore limits the potential of the gas to be developed for domestic use to fill domestic energy needs in Tanzania. Oil has not been found yet, but it is desired by the government in order to reduce dependence on imports of oil. A new licensing round was launched in October 2013 (TPDC, 2013).

The shale gas findings in the US has been described as a 'game changer' and has upset the price map (USA \$4 to Japan \$15.00). Hence, there is uncertainty on gas pricing – Japan prices– that the Tanzanian producers are aiming for– could well come down, with intense competition from new LNG in US, Canada, Australia, Mozambique, Russia and others. The context is that shale gas development and recession implies that there is buyer's market and low prices. Even Japan wants to buy cheap gas. Everyone is overproducing. This situation may create uncertainty in the future for Tanzania. A few questions that are likely to be discussed in Tanzania– within companies and in the government– are the following: What is the acceptable price is for gas for Tanzania? What do the oil companies need to produce? As price conditions the market, one cannot say anything about the market without considering the price. The price for the Tanzanian gas may be double the price of the US gas. What is the netback for the gas to be exported, that is, when do you stop producing? Do you stop producing if you can not sell your gas for 18 USD? Moreover, what is plan B if the domestic and/or international markets do not develop in the current positive scenarios outlined by companies and government? These are pertinent questions to address for Tanzanian actors in years ahead.

2.2 Oil and Gas in Tanzania: The Big Picture

There are huge expectations for better economic times in different corners of Tanzania due to the newly found gas and possibly oil. Gas. The general population expects high reduction in poverty thanks to the oil and gas money. The local captains and titans of the industry have expectations of owning a stake in the industry rather than the whole industry being populated by foreigners. The government, on its side, sees oil and gas economy as the conduit through which the country will realise its objective of becoming a middle-income country by 2025.

At national level and among analysts, key issues include the way Tanzania will benefit from gas taking into account that the country has arguably not benefited adequately from such extractive activities as gold, diamond, tanzanite and other mineral findings. Areas of concern include the extent to which locals will get meaningful direct and indirect employment; the way the government can tap revenues from the oil and gas pipelines – and most importantly how this will be used for national development in this and the coming generations. A major advantage would be to replace imported oil with own gas – that would improve trade

balance, economy and environment. It would probably be easier to build a market with less risk and less local resistance if the government had opted for small-scale LNG. Small-scale LNG is less intrusive in infrastructural terms and easier to build up step-by-step.

The gas policy

The gas policy has been approved. The new policy is to supplement the Petroleum Act of 1980, the National Energy Policy of 2003 and 'provide guidance to the increasing mid and downstream activities' in Tanzania (URT, 2013: 1a). The gas policy makes an explicit link to existing overall national development policies, in particular the long-term plan, Vision 2025. The policy has 15 specific objectives and five main pillars. They focus on how the natural gas is to benefit the population of Tanzania through institutional frameworks, regulatory frameworks and systems that ensure strategic participation. As to human resource development, the policy states that it is to take place to ensure 'efficient and sustainable natural gas industry development'. The policy gives few details as to how the objectives are to be realised and presents limited analysis of the current and future situation as it sees it.

The gas policy was subject to a consultative process whereby it was discussed with many stakeholders in Tanzania (URT, 2013a; Kahyoza, 2013). Some critics have claimed that the policy is not clear, has a number of contradictions, lacks some key issue and is too ambitious. Moreover, some people argue that the policy should have been in place, with associated laws, regulations and guidelines before petroleum activities such as licensing and exploration begin.

The policy outlines an active role for the state in petroleum management and exploration. According to the policy, the commercial operations will be separated out from the regulatory authority Tanzania Petroleum Cooperation Development (TPDC), and the government will set up a national gas company.

Domestic use of gas

A related aspect is whether the government is able to realise its goals of using the gas domestically, even for household consumption. Only 14% of the Tanzanian population has access to electricity. Up front, gas as an energy source thus represents a huge potential for widening this access. However, from an economic point of view, development of gas for households might not be a feasible option, as it requires massive investments in infrastructure development. It will also be interesting to see what the producers find most attractive – export or domestic sales⁴. If global gas prices fall and oil prices stay high, it may be more attractive to sell some more gas locally than to export all. On the other hand, if oil prices fall (or prices domestically are kept low) and gas prices stay high, exports will be given maximum priority and any suggestions to be "nice to the country" will be seen as a barrier to trade (and profit). The government has opportunity to influence local prices. For gas to replace oil is quite attractive today, but if oil is subsidised, it is of course more difficult. Thus, policy of power prices, gas prices to power (and others) need to consider the attractiveness both to sellers and buyers.

Gender

The Tanzanian government sees gender mainstreaming and focus on women's empowerment as an important issue in all work and the gas policy includes a separate section on gender. This section sets out that gender issues shall be mainstreamed in the gas industry and states that it will support activities that ensure gender mainstreaming. Active participation of female in the natural gas industry is thus encouraged. Natural gas industry development is likely to have different impacts on women, men, children and vulnerable groups.

Furthermore, there is one policy statement that demonstrates in general how the government is to work on gender mainstreaming and women's empowerment: 'Ensure that all programmes related to natural gas value chain including education and training opportunities

are based on gender equality and equity' (URT, 2013a: 21). In addition, the policy briefly addresses the inequality in opportunities- by stating that 'most of such opportunities are usually dominated by men' (URT, 2013a). Hence, indirectly the policy addresses the existing gender imbalance in the industry and women's barriers to enter the industry. Globally, there are very few women in construction and operation of LNG plant. Besides, there are more women today in sales and marketing of LNG, but this area will probably be handled by the IOCs – except for possible local sales. Barriers to women's entry that should be addressed in Tanzania by the companies and the government include the following: work in the petroleum industry is regarded as 'men's work' as it often requires physical work and work away from home. Moreover, the work places are often not well adapted to women's needs, i.e. they are not gender sensitive. In addition, traditional attitudes to what type of labour that is suited for women continue to exist in society.

In order to address these gender barriers, attention to and work to improve the current imbalance of female and male students in trades and higher level education subjects in petroleum-related fields is one point of departure. Few female students enter into the education that make them qualified for work in the industry- as demonstrated in the gender-disaggregated statistics in this report and related documents, wherever available.

The general statistics, moreover, reflect the imbalance: enrolment of female learners in Science and Technology programmes in both VET and TET schools were only 11-19 % in 2011/12 compared to about 46.8% female learners in VET and 47.9% female learners in TET 2011/12 in general (URT, 2013: 22). Special efforts will be required to address this imbalance in science and technology studies– where petroleum-related education mostly takes place– and to achieve the national gender policy goals in this sector. If the government, the education institutions and the industry addresses gender issues in the education and as part of local content engagement– given adequate conditions and support to overcome existing gender barriers– the entry of girls and women into petroleum-related education and training could double the available labour/talent pool for many of the needed skills.

The Ministry of Gender in Tanzania needs to be included in future strategic planning across government to ensure gender mainstreaming and work to improve the imbalance. The government should work with the companies to address this gender imbalance. Most companies have an active recruitment focus related to gender, on a competitive basis. Some companies stated that they preferred to recruit women over men if they had the same qualifications. One service company stated that it had recruited more female engineers than men in the last round of recruitment. However, it is more difficult to find women than men for technical positions and thus work to improve the gender balance among students is a good way forward. For administrative staff, there does not seem to be such a challenge in recruiting women. Given that the companies support several education initiatives, they may set clear targets as to gender in their own operations, training and education support, but also in their support to education institutions or in other ways work with the government to ensure that the gender imbalance is addressed in education and in recruitment.

The Institution for Engineers in Tanzania–the independent professional organisation for engineers in the country– offers an example of one measure for the way forward in terms of addressing the gender imbalance in jobs and education system in petroleum sciences. The organisation is running campaigns targeted for girls in school to promote engineering.

Local content

The discussion of local content in relation to education is outside the scope of this study. Hence, the report only gives a brief description of local content in Tanzania. In line with the current international trend, the government policy separates between local content and corporate social responsibility (e.g., World Bank, 2013). Thus, the policy interprets local

content as being obligations for the companies rather than concessionary and voluntary contributions. The government does not have a local content policy yet, so there are uncertainties as to how the local content ambitions outlined in the policy will be in practice. The current local content work of the government is regarded as weak (Warner, 2012a and b)⁵. The PSAs that the government has established with the companies includes local content obligations, that is, they stipulate a minimum sum to be spent on training of Tanzanians. TPDC and MEM currently share the funding emanating from the PSAs (50-50 split). The institutions fund scholarships for students (see section on existing education initiatives) and education and training for government staff.

2.2 Review of existing policies and plans on development, education and energy

The two major long-term national policies and plans are the Vision 2025 and the long-term perspective plan 2011/21-2025/26. they make few specific references to natural gas. Both iterate the overall goal of Tanzania in a long-term perspective (i.e., up to 2025) which is to achieve Middle-income status⁶. This goal vision is well integrated in the gas policy and is often referred to in discussions related to potential benefits of gas in the future. Other studies have stipulated that reaching MIC status will require the high level skilled population to increase by four times and the medium level skilled population to triple (URT, 2012a; AfDB, 2013). Education, economy, growth, good governance are all major pillars of the vision and the plan reiterates these.

The 5- year national plan from 2012/13-2017/18 is the main medium term development plan. The plan has limited focus on petroleum and education. For instance, it emphasises the need to increase the number of students in engineering and ‘provision of scholarships for targeted skills (development of natural gas, iron and steel and petroleum)’ (ibid.: 75). *The poverty reduction strategy paper (MKUKUTA II, 2010/11-2015/16)* is the second overriding medium term development plan focusing explicitly on poverty reduction and how this should be achieved. The three main clusters of work- Growth for Reduction of Income Poverty; Improvement of Quality of Life and Social Well-Being; Good Governance and Accountability- are all of relevance to petroleum-related education. The link between ‘employment-generating growth’ and related challenges for making business in Tanzania, such as limited reliability of energy and infrastructure is made.

As to education, one of the goals is to ‘Ensuring expansion of vocational, technical, polytechnics, and higher education, and improving non-formal and continuing education’. Moreover, it is noted that there is a ‘need to strengthen technical and vocational training, expand apprenticeship schemes and mentoring systems in strategic partnership with the private sector’ (ibid.: 68). There is also focus on ‘reviewing curricula and up-dating the range of courses offered in order to provide knowledge and skills relevant to the job market and the national growth and development agenda’ (ibid.:69). Increased work with the private sector on technical and vocational education and training is also encouraged, through PPPs

Big Results Now: The Tanzanian government initiated the Big Results Now (BRN) programme in 2013 based on the Malaysian model of development. The main goal of the BRN is to get rid of existing implementation bottlenecks and install a new working culture in the Tanzanian government; “business unusual” (URT, 2013; DFID, 2013). Energy and natural gas is among the six priority sectors selected for work so far, but natural gas has not been included in planning so far.

Moving to the sector plans, the *GOT Education Sector Development Programme (2008-2017)* is the overall long-term education plan⁷. In addition, there is a medium term strategic plan from 2010/11-2012/13. The long-term plan which is named a programme focuses on strengthening education to ‘realise the objectives of MKUKUTA’ in getting an ‘internationally competitive labour force’. The programme, however, gives more attention to primary and secondary education than vocational education and higher education. In terms of internal sector organisation, the programme puts forward an integrated approach by giving MOEVT the coordinating responsibility.

As to higher education, the priorities that are relevant for petroleum-related higher education is that the programme is to 'enhance cognitive, conceptual and technical skills of both academic staff and students; and promote linkages with production and service centres/firms' (ibid.: 18). The priorities for the TVET sub-sector, moreover, mentions this last priority. Moreover, the sub-sector priorities include increasing teachers' technical skills, curriculum reviews to improve quality and establish a sub-sector-wide Education Management Information System (EMIS) that is linked to ESMIS.

In addition, separate programmes for basic education, TVET, higher education and folk education have been developed from the overall education programme. It took 5 years from the overall plan to the launching of a TVET programme-the first of its kind in Tanzania. It lasts from 2013-2017 and aims to increase the number of TVET students and their job opportunities through training, such as through apprenticeships. Moreover, the program aims to increase the enrolment of female learners in science and technology at vocational and technical level from the current level of 11-19 percent to at least 35 percent in 2017 (ibid.: 22). Additionally, two of the goals are particularly relevant as to future petroleum-related education; 'Enhance the coordination of TVET at national level' and 'ensure TVET is more responsive to the dynamic needs of the labour market and society' (URT, 2013b: 23). A coordinating committee has been established. However, coordination must be managed tightly to work as it involves many actors. As to gender, there are several useful suggestions as to how gender is to be mainstreamed and addressed in the program, such as focus on retention of female learners and ensure that there are female trainers who can be used as role models.

The Higher Education Development Programme is the overall programme for the sub-sector and runs from 2010-2015. The programme has had major challenges in implementation so far, due to inadequate resources (ED DPG, 2013). The programme outlines strategic goals as to increase the number of students in science, including increasing the number of females (ibid.: 56). Moreover, it focuses on developing new programmes to strengthen the contribution of higher education to national economy.

The Energy Policy from 2003 focuses upon developing human resources, on encouraging 'commercialization and private sector participation', promoting economic energy pricing and develop domestic energy resources which are shown to be least cost options. Hence, it touches upon several issues that have been brought forward in the gas policy and which are important for petroleum-related education that takes into account the industry and the government's needs. In addition, there is *the Petroleum Act, (1980)* which is designed to create a conducive legal environment for oil exploration companies and provide for flexibility and stability of the oil exploration agreements.

The Public-Private Partnership Policy of 2009 and the PPP Act 2010: these two documents set out the framework for PPPs in Tanzania. The PPP national policy states that work is ongoing to review the TVET policy to encourage public private partnerships in the VETA system based on experiences from other countries.

2.3 Existing Petroleum-related education and training

This section describes existing petroleum-related education and training. In the cases where gender disaggregated data are not provided it is due to the unavailability of such data.

Higher education institutions

In general, the education offered at this level focuses on upstream activities and not on downstream and midstream activities that relate to domestic utilisation of gas.

The University of Dar es Salaam (UDSM)

The Department of Geology in the College of Natural and Applied Sciences has started offering a BSc. in Petroleum Geology degree programme in October 2013. The BSc in

Petroleum Geology offers the basic courses of a BSc. in Geology for the first year and then the students will start with petroleum courses in the second year.

The College of Engineering and Technology, Department of Chemical and Mining Engineering started offering a BSc. in Petroleum Engineering degree programme in October 2013. The department also has plans of starting a MSc. on Oil and gas within the next three years. This is dependent upon further training of the staff at the department. Moreover, the college collaborates with Norwegian Technical University in Trondheim's Department of Petroleum Engineering and Applied Geophysics through the ANTHEI programme (Angolan Norwegian Tanzanian Higher Education Initiative). 40 students have/are to graduate from this programme in Trondheim. The ANTHEI Program at MSc level run by UDSM and NTNU will be fully transferred to UDSM some time in coming years. The ANTHEI programme between UDSM and NTNU Norway is the only MSc currently offered in petroleum-related education in Tanzania.

The Chemistry Department will start offering a BSc. in Petroleum Chemistry degree programme from October 2013. As the university has well-established departments in all these three key areas for petroleum-related education, the university offers a good foundation for offering future petroleum-related education. UDSM is an important institution for training teaching staff at other universities and schools in Tanzania. Several of the staff at University of Dodoma have been trained at UDSM. UDSM has a human relation strategy in place, but it does not include needs related to upstream oil and gas.

Type of education	Institution	Estimated numbers per year (from 2013)
Bsc in Petroleum Engineering	UDSM	24 (5 female)
Bsc in Petroleum Chemistry	UDSM	23 (5 female)
Bsc in Petroleum Geology	UDSM	15 (3 female)
MSc level, ANTHEI/Petroleum geoscience and engineering	NTNU and UDSM	10 (each year, ongoing), will be transferred to UDSM in the future
Total students		72

Table3: Student enrolment at UDSM for petroleum-related education from October 2013.

Gender disaggregated data were not available for the MSc level at the time the report was prepared.

UDSM currently offers professional courses for the industry and is asked by the industry to have such courses. According to the university, they run such courses quite frequently. Top-up courses for existing engineers could be considered in order to meet some of the skills gaps. Moreover, top up courses for students in geology, in chemistry and engineering could be considered to meet some of the demands from the industry.

MEM has established a Marshall Plan for education that focus on education and training for all of government and has requested UDSM to follow up by establishing petroleum-related education courses (MEM, 2012).

University of Dodoma (UDOM)

University of Dodoma has a human relations strategy in place that includes upstream oil and gas. The University of Dodoma, college of Earth Sciences, School of Mines and petroleum engineering, Department of petroleum and energy engineering responded to the national need of training human resource in oil and gas in about four years ago. The UDOM has developed a four year program in BSc petroleum engineering. The programme was benchmarked by other similar programmes in the world, including Norway, USA, Saudi Arabia and India. The programme was approved by the relevant university organs and then approved by Tanzania commission for universities (TCU). The program is already in its third year and the first graduates will be awarded with a BSc petroleum engineering by mid-2014

Year (from 2013)	Total Number
------------------	--------------

	of students
1 st year	42
2 nd year	52
3 rd year	4
4 th year (starting Oct 2013)	17
TOTAL	115

Table 4: Student enrolment in petroleum-related education, University of Dodoma

Gender disaggregated data were not available at the time the report was prepared.

MEM has sponsored 10 students 'who were best in mathematics and chemistry in form six examination to pursue oil and gas degree at the University of Dodoma' (MEM, 2012: 7).

Tanzania Chamber of Commerce, Industry and Agriculture work with the College of Engineering in terms of finding opportunities for students to get practical experience in the industry (BG Tanzania/VSO International, 2013).

All existing education at the university level focus on upstream. Midstream, LNG and transportation, storage and distribution of gas are areas not covered in existing education. If the IOCs are excluded from future downstream and midstream parts of the value chain, as the gas policy outlines, Tanzanian education institutions need to offer a lot of education and training to realise the gas policy's ambitions in these areas. Such activities need engineers, too, but different ones than from upstream.

Moreover, mid and downstream activities need people with MBAs, economists, financial analysis. Downstream, sales and regulation, also needs other people than upstream. Sales are easier to train from existing commercial people, but regulation by government can be very challenging and needs staff with strong personalities as well as skills. However, for these skills, adding specialised courses would probably suffice

Engagement in higher petroleum-related education from development partners

Norway:

The Norwegian government provides funding for UDSM through funding NTNU scholarships (the ANTHEI programme). The ANTHEI programme includes funding for MSc, BSc and PhD scholarships. UDSM will get full responsibility for the programme within the next few years. Moreover, the Ministry of Education in Norway has a quota programme with scholarships for master and PhD students from Tanzania to study in Norway. So far, few of the Tanzanian students receiving scholarships from this programme have studied petroleum sciences. Hence, this programme remains an untapped potential for scholarships in these sciences. The programme is now under evaluation (e.g., UIB, 2013). In addition to these scholarships, the University of Oslo and UDSM have cooperated on research projects, which have included many Master and PhD students since 1978. These projects have been funded by the Norwegian government and Statoil.

Engagement from the industry

Statoil is the biggest funder of petroleum-related education at UDSM. Statoil took over the financing of the ANTHEI programme from mid-2013. This programme will run to the beginning of 2017 and Statoil will contribute with a total budget until 2017 of USD 2300000. For 2013 the estimate is USD 282 310. This programme is to send about 10 students to NTNU for MSc course in Petroleum Geoscience and Engineering for one year and then they spend the second year doing their project and thesis in Tanzania. Moreover, Statoil supports the students in giving them office space, data and supervision for the project and thesis. Statoil also contributes to ANTHEI programme with lectures during the yearly preparatory courses (in July).

Moreover, Statoil provides support to the Mandawa Basin project (1200000USD). This is a combined PhD and MSc geoscience program between UDSM and University of Oslo (UiO) (Norway). Statoil funds one PhD student from UDSM, four MSc students from UDSM in 2013, and is to provide full funding of two to four MSc students from UDSM every year from 2013-2017. The project started in 2012 and will run until 2017. In addition, Statoil supports the emerging program at UDSM Business School on Petroleum Finance & Economics. The company funds eight scholarships for MA students in Business at the UDSM Business School from 2013-2015. Collaboration with a Norwegian university is in progress to support these students and the emerging programme at UDSM. Moreover, Statoil has granted several individual scholarships to Tanzanian students: for one student in MSc in Petroleum Engineering in UK (2013-2015), two student scholarships in Sociology and Mass communication at UDSM, one student in Information Technology and computer engineering at UDSM, one student scholarship in Supply Chain (in France). Eight out of 15 local staff in Statoil's office is receiving support to take BSc/Diploma or MSc degrees in relevant disciplines.

In addition, Statoil has provided short courses on Reservoir and Production Technology, GIS and Remote Sensing at both UDSM and UDOM. They have also given guest lectures at UDSM and UDOM in 2012 and 2013. Internship for two petroleum technology students from UDOM in 2012 and 2013 at Statoil. The company sponsored transport for field trips for students from the Department of Geology students, UDSM in 2013. Moreover, Statoil contributed with three experts for a four days' seminar on petroleum industry at COSTECH in May 2013 for staff from UDSM, Dar es Salaam Institute of Technology, UDOM and SUZA.

Furthermore, Statoil supports the State University at Zanzibar within environmental science. The company has supported several workshops for staff there. They will also fund 10-15 trainers to be trained in Environmental Impact Assessment. Statoil has also funded the trained rangers at Mafia Island Marine Park in using oil spill containment booms that it has deployed there. They have provided equipment for oil spill containment and are continuing to train rangers on oil spill preparedness. The idea is that this project may provide the grounds for establishing a system for oil spill preparedness in Tanzania. The company, moreover, funds maintenance of boats and other equipment. The project is to last until 2018.

Two staff from TPDC are to be seconded into the Statoil Tanzania Gas Project Petroleum Technology team in Norway for one year.

Swala Energy is supporting 10 students at the Geology Department of UDSM.

BG Tanzania has an education pipeline approach towards supporting education. Hence, they provide support for various education institutions from secondary schools and to the university level. This section describes the support to higher education institutions. *BG Tanzania* provides four scholarships for Tanzanian students at masters level in Petroleum Engineering and similar subjects in UK (*BG Tanzania/VSO International*, 2013). *BG* has donated laboratory equipment to UDSM's Department of Geology and UDOM's Department Of Petroleum and Energy Engineering. Moreover, the company funds eight Masters/ PhD scholarships for Tanzania students at the Nelson Mandela African Institute of Science and Technology (*BG Tanzania*, 2013).

Petrobras is supporting 12 students with MAs and PhDs in Geoscience studies in Brazil.

Schlumberger has funded laboratory equipment at UDSM.

Halliburton has sponsored some events at UDSM and has provided feed back in curriculum development in Petroleum Engineering.

Gender disaggregated data were not available for the support detailed in this section.

Other related initiatives in business, energy, higher education

All companies contacted in this study, such as Statoil, Petrobras, BG Tanzania, Schlumberger, Halliburton, Pan African Energy (operator on Songo Songo Island), Maure et Prom (operator in Mnazi Bay) and Wentworth Resources (service company) send staff for internal training abroad, get trainers to come to Tanzania and sponsors higher education of staff abroad.

The World Bank's (WB) Finance & Private Sector Development Department (AFTFE) has recently set up a team to assist the government in enterprise development in relation to the gas industry. Moreover, the World Bank Education and Skills Development Project and energy sector capacity assistance project may provide future opportunities for work on gas. In addition, the World Bank provides capacity building to MEM, NEMC, TPDC, OSHA and VETA in its Energy Sector Capacity Building Project. This project has five components, including one on education and skills development (Ngejela, 2013:8). The former Science and Technology Higher Education Programme (STHEP) provided funding for related fields (PhD and MSc upgrading training). UDSM was the largest recipient of this project. The second round of the program, STHEP II, is currently in its planning phase and may include focus on petroleum-related education.

JICA provides scholarships for MA education in Japan, including in oil and gas (BG Tanzania/VSO International, 2013).

Assessment of practical and technical quality

University of Dar es Salaam (UDSM): The theoretical quality of the three departments offering petroleum education is deemed to be of high standard. For instance, most of the staff of the Department of Geology has been trained abroad. The curriculum is of an adequate standard, but some elements could have been updated related to oil and gas, according to interviewees. As regards petroleum engineering at College of engineering, NTNU has contributed to develop the curriculum of the new BSc in Petroleum engineering. The curriculum is seen as comprising main issues in petroleum engineering and is of good quality. In general, some new teaching staff have been recruited. However, the three departments to offer BScs all see the need for further training of current staff and recruitment of new staff to uphold quality of the new BScs. UDSM now relies on part-time teachers from TPDC.

The practical quality is more of a challenge. The university has basic laboratories, which enable good trials. They have received support from some of the oil companies and the international service companies to upgrade their facilities. They are, however, struggling with some of the equipment that needs to be preserved in a tempered climate due to improper air conditioning. The personnel at UDSM believes that there is a need for state of the art laboratories on drilling and production engineering, reservoir Laboratory, fluid Mechanics and Fluid Dynamics Laboratory; Rock Properties Laboratory, Petroleum Chemistry Laboratory, Petrological, Hydro-geological, Geophysical, Geochemical and Paleontological Laboratories. Moreover, there is inadequate space as student enrolment has increased a lot over years.

University of Dodoma: According to interviewees, it is too early to assess the quality of the theoretical work at University of Dodoma as the university itself has not existed for a long time and subjects related to petroleum are at a nascent stage. The current program and its curriculum was bench-marked by other similar programs in the world, including Norway, USA, Saudi Arabia and India. The program was approved by the relevant university organs and then approved by Tanzania Commission for Universities (TCU).

As to the practical challenges, the UDOM faces major challenges in recruitment of qualified staff. They have had to hire international staff, some with extensive language barriers for teaching in English. Moreover, there are challenges in further development of curricula for new courses as they have limited teaching staff. Moreover, the university does not have laboratory facilities for students and some are now in their fourth year. In addition, students

have inadequate opportunities for industrial practical training as there are only a few fully operating companies that can accept students for practical training (Statoil, BG Tanzania, Maure et Prom, Pan African Energy). Service companies will only accept students for practical training if there is something to do.

Existing petroleum-related education in Technical and Vocational education and training

In general, the technical and vocational education and training has been less prioritised than other parts of the education sector in Tanzania. It was not until 2013 that a government programme for technical and vocational education and training was developed (TVETP, 2013: 3). The TVET system is separated into technical schools and vocational education schools. Vocational education and training and technical education and training are managed by two different institutions. VETA manages the vocational and NACTE the technical. The dual system is unusual on a global basis and limits linkages between vocational and technical education (ATE, 2010). No national advisory body exists that links private sector and the schools in planning and assessing demands and supply. Only 20 of the vocational education schools are VETA schools. The petroleum-related education currently offered as concerns vocational education is concentrated in VETA Mtwara and VETA Lindi. The education started this year.

VSO international has conducted a study of the VETA system on behalf of BG Tanzania to assess 'availability of vocational skills training and the potential barriers which prevent Tanzanians from qualifying to international standards key vocational areas related to the Oil and Gas sector'. The study has been a solid reference for this part of the report. VSO/BG's report identifies 12 trades that are regarded as relevant trades for the oil and gas industry. Apart from the trade 'food production', which relates to indirect job opportunities outside the scope of this study, all trades are relevant and included in this report. The report shows that there are currently 17000 students enrolled in trades that are relevant for the industry. The key question is however the employability of the students as there are critical challenges in meeting the industry's standards in teaching and practical training of the students. As a response, some of the companies and the MEM have engaged in strengthening the education at the following schools. The findings from the report are currently being taken forward in collaboration with Ministry of Education, VETA and VSO to develop a strategy for enhancing O&G related training to international standards across the country.

Mineral Resource Institute of Dodoma (MRI): At the level of technical schools, the Mineral Resource Institute of Dodoma is the only school offering petroleum-related education at this level at the moment. The MRI started offering a technical degree in Petroleum Geosciences in the year 2012/2013. The school has 110 students on this subject; 56 students (female students = 1) in their first year and 54 students (female students = 8) in their second year.

VETA Mtwara: At the level of vocational education and training, the petroleum-related education mainly takes place in VETA Mtwara and VETA Lindi. The vocational education and training at VETA Mtwara that is petroleum-related was started in 2013 in collaboration with BG Tanzania and VSO International. BG Tanzania provides the funding and VSO provides professional tutors. This project is called the Employability EEVT project and aims to improve the employability of young people in Mtwara and Lindi region. The EEVT project is expected to generate about 500 employable vocationally trained people for the industry from 2013-2018. In addition, teachers and trainers are to receive further training and English training. Moreover, it is envisaged that VETA Mtwara will be capable of producing a steady stream of qualified craftsmen and teachers and will be able to roll out this model to other vocational institutes as required. In addition, VETA Mtwara collaborates with the *Ministry of Energy and Minerals* to train youth in Oil and gas support services and vocational training, in total 48

students. The total number of trainees enrolled in VETA Mtwara disaggregated by gender where data has been obtained and course is as follows:

COURSE (1-6 is defined as O&G related)	Female	Male
1.Carpentry and Joinery	1	33
2.Electrical Installation	8	33
3.Food Production	25	9
4.Motor Vehicle Mechanics	0	42
5.Plumbing	16	30
6.Welding and Fabrication	3	33
TOTAL BG Tanzania/VSO supported	53	180
Mechanical engineering top-ups (Petrobras)	4	21
Electrical maintenance-top ups (Petrobras)	3	22
Welding top-ups (Petrobras)	1	24
Painting top-ups (Petrobras)	4	21
TOTAL with gender data	65	268
TOTAL students with gender data	333	
Welding (MEM support)	24	
Industrial painting (MEM support)	24	
TOTAL without gender data	48	
TOTAL students	381	

Table 5: Trainees enrolled in VETA Mtwara in 2013.

Gender disaggregated data were not available at the time the report was prepared. The statistics show that the gender balance is uneven for some courses, but it is positive that there are a number of girls in traditionally male-dominated areas such as plumbing and electrical installation. The team has not been able to confirm the gender breakdown for the two latter courses.

Petrobras Tanzania Limited (PETAN) have cooperated with VETA Mtwara and made a three-month course which is top-up to existing courses at VETA. There have been two rounds of training supported: 1) 25 trainees in mechanical engineering and 25 trainees in electrical maintenance and 2) 25 trainees in welding and 25 in painting. Brazilian trainers have trained the students.

VETA Lindi: With regard to oil and gas sector, the MEM has sponsored enrolment of 64 trainees. These are from 4 leavers and they are divided into two groups. The first group of 32 is studying Welding and Fabrication and the last is studying Electrical Installation. In addition to their study they are also learning the Basics of oil and gas industry and its related Health and Safety issues. The centre has engaged an expert (Marunda A.R - a Field Gas plant Operator) from M & P Exploration Production (T) Ltd, Mnazi Bay Gas Project to provide training on basic of oil and gas industry and the associated health and safety issues to the 64 trainees. The training was conducted for two weeks in phase one and phase two will follow after industrial visit.

In addition, there have been industry visits to Songas gas plant for Electrical trainee, skills upgrading for 4 teachers to acquire City and Guilds qualification and processing registration of Lindi RVTSC to become City and Guilds certifier. Moreover, the BG Tanzania and VSO International supports VETA Lindi in the capacity building for teachers project (EEVT Project) and training of 32 students in welding and fabrication skills and 32 students in electrical installation. There have been no graduates yet.

Other general funding of TVET and lower level education

Association of Canadian Community Colleges provides support to the MOEVT in the project 'Skills Development for employability'. The project supports skills development in agriculture, mining, tourism and hotel services (ACCC, 2013).

JICA funds VETA tutors for courses from 3-6 months in Japan on a variety of courses. There is, however, no specific focus on petroleum related topics.

The Korean International Development Cooperation has provided funding for TVET on infrastructure and equipment (BG Tanzania/VSO International, 2013).

The Hamburg Chamber of Crafts is supporting VETA Mtwara in a programme on curriculum development and labour market connections (ibid.: 62).

ILO has provided funding for two studies on apprenticeships and skills gaps in Mtwara region which did not go into detail on oil and gas, but identified general challenges in terms of skills and apprenticeships (Smaji et al, 2009; REPOA, 2009). After these studies, ILO has provided supported the government in the development of the new TVET programme.

At the secondary school level, *BG Tanzania* is the chief sponsor of Young Scientist Tanzania. Moreover, the company provides institutional support (through VSO) for nine secondary schools in Lindi. It provides mobile laboratories to 13 schools in Mtwara as part of a wider initiative to stimulate science education at this level. Moreover, the company is collaborating with MoEVT, VETA and VSO to develop a strategy for enhancing O&G related training to international standards across the country (building on the scoping assessment undertaken with these partners, referred to in this report as the VSO/BG Tanzania, 2013 study).

Funding for business development

UNIDO has the Industrial Subcontracting and Partnership exchange programme in Tanzania together with Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA). This programme's vision is 'To promote and enable SMEs in Tanzania acquire suppliers knowledge, skills and information to undertake sub-contracting and partnership agreements with larger, domestic and international enterprises through matchmaking using promotion and supplier development tools with resources from UNIDO. This programme is established in several countries and it is the TCCIA, which serves as the local host of the programme in Tanzania. The programme has established a database for suppliers. It aims to link the local companies towards the international companies. The TCCIA sees that it could play 'a large role in supporting supplier preparedness for the oil and gas related sectors' (BG Tanzania/VSO International, 2013: 39).

Assessment of the quality of TVET

The petroleum-related education that has started in VETA Mtwara and VETA Lindi appears to have quality corresponding to international standards as the curriculum is in line with international standards and the external trainers are experienced trainers. However, when it comes to the practical quality of the education these schools offer in general, it is more limited. The report by BG Tanzania and VSO International (2013) assessed the quality in general terms. The report concluded that while the curriculum in schools 'appears strong in content', it may still be improved in terms of 'meeting industry standards and training delivery' (BG Tanzania/VSO International, 2013: 24). Moreover, the Health, safety and environment standards could be improved. Furthermore, there is inadequate specific gas and oil industry competencies among staff at schools and in the VETA head quarters.

The team asked leaders at VETA Mtwara and VETA Lindi as well as other key interviewees to assess the theoretical and practical quality and the challenges they face in delivering high quality education. As to the practical quality, all interviewees and the BG Tanzania/VSO International report highlighted the many challenges VETA schools face in terms of poor and outdated infrastructure (workshops and tools, non-availability of new technology like

simulators, e-learning), limited opportunities for apprenticeships and other types of practical exposure for students to the industry.

In addition, limited knowledge of English among students and teaching staff represents a challenge and a barrier for the employability of students in the oil and gas industry, which requires good English skills. Linkages between the formal private sector and the schools are weak, studies have found that vocational and technical education and training is deemed as not meeting the practical skills needs by many companies (ATE, 2010; URT, 2010). Recent studies conclude that only three Tanzanian vocational education and training institutions are regarded as having an acceptable quality (African Development Bank, 2010; Wort et al. 2008; IGC/LSE, 2011: 151).

When it comes to the technical schools, MRI is the only school offering petroleum-related education at the moment of writing the report. MRI's challenge is the lack of staff. They only have one permanent staff member to teach on their degree in Petroleum Geosciences and rely on external teaching by staff at UDSM, UDOM and TPDC. Moreover, a general challenge for the technical schools is the current financing system for technical education. Graduating students from vocational education institutions can continue at technical schools for higher level technical training. However, the technical institutions only receive funding from the skills development levy for training on level 7 and upwards (equivalent to bachelor's degree). Hence, there is a gap in financing for training for level 4-6. The industry and government is likely to need several people having education from level 4-6 (i.e. technician level).

Regional level education initiatives

No regional level education initiatives exist yet by universities, technical schools or international operators that the team was able to identify. The NMI-AIST is a regional institution and will be a regional programme when it starts. NMI has been approached by Makerere University in Uganda to see NMI's plans for petroleum programmes. When asked about the potential of training people in Mozambique, in the area of Pemba where VET training is offered, several interviewees saw the benefits of collaboration, but did not think that such regional cooperation on training would be feasible.

2.5 Future education plans

UDSM: The current MSc in petroleum engineering that UDSM offers in collaboration with NTNU, Norway will be fully transferred to UDSM next year. UDSM has made plans to establish a task team to coordinate capacity building to cover non-science and technology related areas. It is envisaged that this task team will have a coordinating function for the entire country in the future. The Dean of the Faculty of Law of UDSM chairs this work. Future enrolment numbers for the three BScs in petroleum engineering, petroleum chemistry and petroleum geology are expected to increase, pending on future support for further education of teaching staff, upgrading of laboratories and recruitment of additional qualified staff (UDSM, 2013).

Geology undergraduate and/or postgraduate curricula could, if supplemented by specific specialist courses, be developed and tailored to upstream exploration and reservoir. Mining engineering curricula, with an adequate chemistry and physics background, could be granted access to a petroleum-engineering postgraduate program. These postgraduates could be employed after adequate and in-depth training in wire line logging, well testing or reservoir operations. Mechanical engineering curricula could also be adapted to piping and rig engineering or well operations and so forth.

The School of business at UDSM is planning a MBA in oil and gas that will be both for economists and students with other types of background as well as for petroleum engineers and others with petroleum-related educational backgrounds. The university is also looking into how to offer education related to midstream and downstream activities.

UDOM: Future plans are there to include modules in the programme/s that will cater for midstream and downstream of the oil and gas industry. The university expects a substantial increase in numbers of students in the future. There are plans to strengthen the BSc petroleum engineering programme in terms of human resource (teaching staff) and physical resource (laboratory facilities).

The Nelson Mandela Institute- Arusha: NMI is planning a post-graduate degree in petroleum-related studies. The Nelson Mandela institute is to be regarded as a regional education institution offering post-graduate degrees. NMI advertises its education programs all over Africa and has students from other countries. The NMI has good facilities. In related issues, such as environmental management and some engineering subjects taught (e.g. model and flow engineering), there are students who could be potentially hired by the industry.

The NMI has engaged with BG Tanzania for apprenticeships for future students within BG Tanzania. All students will get an opportunity to go for such an apprenticeship.

Laboratory facilities have not yet been developed and funding has not been secured from the companies for such facilities. Some funding has been given from the World Bank STHEP 2 programme that is to start in 2014. Discussions have also been held with Beach Petroleum in terms of that they will be providing support for one MSc student.

Based on the assessment of the quality and the existing and future plans, University of Dar es Salaam seems to be best equipped to provide MSc level education in petroleum sciences. UDSM has staff in the key disciplines, have developed research capacity in these disciplines over a long period of time and may build on the existing ANTHEI programme that will be transferred from NTNU to UDSM within the next few years.

The Mineral Resource Institute: The Mineral Resource Institute has plans to continue enrolling about 50-60 students in their programme on Petroleum Geosciences every year. Moreover, MRI is looking into expanding their work in oil and gas with new programmes like Environmental Engineering and Management in Petroleum Industry; Petroleum Geophysics; Petrophysics; Environmental Geophysics; Reservoir Engineering; Sedimentology and Paleontology; Petroleum Geology; Petroleum Economics; Petroleum Production Engineering; and Oil and Gas Management. Several companies have seen people coming from the mining industry to apply for jobs in oil and gas. As several of the people employed in the mining industry have been exposed to international companies and their HSE standards, they might constitute a base for recruitment to the oil and gas industry.

Plans for the oil and gas companies

The international oil companies and the international service provider companies that the team has talked to in Tanzania have no plans as to discontinue their funding, so it is expected that the funding will be provided in the immediate future as well, but long term plans are not known.

Most of *Statoil's* current support for education will continue for several years as outlined in the section describing existing education. For instance, they will continue fund eight scholarships and support the emerging programme in Business and Economics at UDSM. Moreover, the funding for the research cooperation project between UDSM and UiO will continue. Statoil will provide funding for several scholarships and other funding to Tanzanians students at the MSc and PhD levels through this project, through the ANTHEI programme and through granting individual scholarships. Moreover, Statoil has plans to establish a research laboratory for tectonic modelling at UDOM. Furthermore, the company has plans for implementation of ZanSea GIS based system for monitoring coastal and marine environment in collaboration with the State University at Zanzibar, including extensive lectures and workshops on this topic.

BG Tanzania is in dialogue with various universities to develop a more substantive higher education programme. *Swala Energy* has plans for some practical training that a university degree will not give the students. International service companies: these companies have plans as the need arises and will use their in-house training for local staff that they hire if and when needed. *General Electric* is to provide funding for UDSM in oil and gas, but the specifics of the funding is not known (Daily News, 2013).

Development partners:

Norway: In the near future, it is envisaged that the ANTHEI programme will be included in the new Norwegian programme for capacity building in higher education and research for development within the fields of energy and petroleum (Energy and Petroleum). Funding from this programme can be used for PhD education and capacity building of teaching staff at the universities and may therefore contribute to strengthen staff capacity in teaching and further education.

The World Bank is to enter into the second programme on Science Technology Higher Education Project (STHEP). The bank is exploring opportunities for future funding through the new phase of this programme, which has not yet funded petroleum-related education. Moreover, the Bank is considering funding skills development related to business development and other types of arrangements in relation to local content and private sector development.

DFID supports the skills gap study on petroleum related education together with the World Bank, but has no other operations or plans for future support to such education. EU funds a study on higher education and project proposal for future funding of 2 million Euro for cooperation between Tanzanian and European universities on petroleum-related education.

GIZ is considering funding training of Tanzanian journalists on oil and gas subjects.

Moreover, several embassies are granting scholarships for studying petroleum-related education abroad. France is granting two scholarships (post-graduate level), Japan is granting postgraduate scholarships (number has not been verified), China is to grant 20 scholarships for post-graduate studies, Brazil is to fund ten students at MA and PhD level in geo-science in Brazil. This totals about 40 scholarships for Tanzanian students to study abroad, at higher levels.

Future support to TVET

Dar Institute of Technology offers technical training from levels four two six. They are currently looking into the potential of offering specialised courses on oil and gas.

VETA Dar es Salaam is the biggest vocational institution in Tanzania. The school is currently preparing curricula for piping and welding related to downstream operations (BG Tanzania/VSO International, 2013). *BG Tanzania's* current funding towards VETA Mtwara will continue until 2014. For VETA Lindi, BG's funding is from 2013-2015. *BG Tanzania* in cooperation with VSO International are continuing their programmes at VETA Mtwara and VETA Lindi. BG Tanzania is in the process of developing an industry linkages programme with VSO to be launched in the second quarter of 2014. Moreover, for 2014, VETA Mtwara plans to enrol the following students:

Skill	Male	Female
Food Production	10	10
Welding and Fabrication	10	10
Laboratory Assistant	5	15
Secretarial and Computer	5	15
Commerce and Computer	5	15
Painting and Signwriting	10	10
Food Beverage and Services	5	15

Table 6: Planned student enrolment VETA Mtwara 2014

Moreover *BG Tanzania* 'are in discussions with the African Development Bank to lead an oil and gas sector pilot project as part of the AfDB's multi-million dollar higher education programme' (BG Tanzania, 2012: 1) (see below).

African Development Bank has prepared a broad programme on TVET to strengthen education on skills needed in the labour market as such, including for oil and gas industry (AfDB, 2013). The project is expected to be approved by the Bank's board in early 2014. The main parts of the programme are to expand infrastructure in TVET institutions, expand ICT in instruction, provide training for teachers and support tracer studies, labour market surveys and other tools to strengthen knowledge management of the TVET sub-sector.

GIZ supports VETA, in particular the centre in Dar es Salaam. *GIZ* has started funding of training on electrical trade.

Petrobras is continuing its support to VETA Mtwara and will train 50 VETA tutors to enable them to run the top-up courses in mechanical engineering, electrical maintenance, welding and painting that *Petrobras* has supported (BG Tanzania/VSO International, 2013).

VSO: Volunteer Service International is providing support to the EEVT project that BG Tanzania is funding in VETA Mtwara and VETA Lindi. The *British Council* provides training in English language for specific projects (e.g. the BG/VSO/VETA Mtwara and VETA Lindi projects) and to private companies (BG Tanzania/VSO International, 2013: 45).

Other related funding in education and energy include the funding that CIDA has provided for the Canadian Community Colleges work on TVET in Tanzania. *CIDA* is currently considering a new period of funding for their work. Moreover, the Development Partners Group on Education has recently established a technical working group on technical and vocational education and training. *Sida* and *CIDA* have been active in establishing this group.

2.6 Other models for skills development outside the education system

Other models for skills development outside the education that are in place or could be considered include the following.

Short specialised courses based on internal courses currently offered in companies

All international oil companies and international service companies that the team met with in Tanzania provide their local employees with extensive training. In addition, some fund MScs, MAs and research cooperation, field trips, equipment, etc. One possibility to consider in order to increase skills among Tanzanian companies are to give them access to internal training. For instance, internal training on HSE could assist these companies in qualifying themselves as local service providers. One of the international oil companies had engaged in such training on one occasion in order to get the service provider to deliver according to international HSE standards.

SME development, registration database and youth entrepreneurship

THE TCIAA has plans for a youth entrepreneurship and preparedness programme. As TCIAA is much aware of the role it could play as facilitators in connecting international and

local companies in the oil and gas industry, this new planned programme could offer further assistance in this regard, connected to the SPEX programme funded by UNIDO that TCIAA implements. The World Bank programme on industry development may offer another opportunity for further work on this matter.

Cross-over or extending mining sector training programmes

The Tanzanian Chamber of Minerals and Energy implements the Integrated Technical Training programme, which consists of a basic course and specialised courses altogether for three years (BG Tanzania/VSO International, 2013). Most of the courses are relevant for the petroleum sector and the students receive four NACTE certificates, which implies that they are one level over the VETA trained students. This programme is deemed of high quality and sufficient on the job training in the mining companies (ibid.). The programme has been run in cooperation with African Barrick Gold and Anglo Gold Ashanti, from 2009 and onwards.

On the job training

Several of the oil companies and the service companies that operate in Tanzania offer on the job training for students. Such training is regarded as necessary from the industry's side. A system for ensuring systematic supply of training integrated in the education system does not seem to exist, but is pending the industry's willingness which is likely to vary over time as different companies come and go.

PPPs

The private sector could get involved in funding the workshops, equipment, laboratories on a larger scale than is currently done. Some international oil companies and service companies have and are providing funding for education institutions. Experiences of such arrangements, which also include PPPs between the cement company Tanasement and VETA Arusha and between the operators of Geita gold mine and VETA Moshi could be systematised and analysed as to how these experiences render best practices in terms of further work to strengthen the government's PPP policy and strategy.

PSAs and local content: Industry exposure for government

The PSAs allow government staff to get internships in the companies with which the government has a PSA. Few government staff have used this opportunity. The reason given by MEM and TPDC are that they are understaffed. Hence, it is difficult to let go of people for such internships. Industry exposure is important for the government in order to be able to meet the companies on equal terms in negotiations, development of work and in regulation and control.

Business development centers

A common issue identified in terms of local content is that there are few Tanzanian companies which qualify as local service providers to the oil and gas companies. An important reason is that the businesses do not fulfil the HSE standards by the industry. Moreover, they do not have sufficient infrastructure. One example given was the supply of tomatoes in a bucket rather than by a service company. In order for Tanzanian companies to benefit from the gas industry as suppliers of second and third tier services, a business enterprise development centre might be considered as an organisational tool to systematise training of Tanzanian businesses and adding necessary skills to qualify as local service providers and sub-contractors. The team is not aware of any existing business enterprise development centres in Tanzania. The World Bank and UNIDO both have development programmes that aim to support SMEs in general.

Training of local leaders, politicians and civil society organisations

In order for the Tanzanian population to understand what realistic expectations they can have and the time to expect some revenue to flow in to the population, it is important to provide some basic training. Local leaders and politicians at national, regional, local and

community levels (down to the lowest level, the 10-cell level) have to be trained in order for them to be constructive actors in the process. Moreover, civil society organisations, journalists and academics in several fields should be provided with short-term courses or training to understand the basics of expectations.

2.7 Organisation and coordination

The current and future organisation of the policy, planning and implementation work of the government is important to describe and analyse in order to give recommendations. No established division of labour for petroleum-related education within government exists. No joint forum for the industry and the government to plan according to demands and supply for the petroleum sector exists. The Ministry of Education and Vocational Education is the ministry responsible for education sector work. The ministry has so far advocated the importance of universities to establish oil and gas education and training. Moreover, the ministry has a memorandum of understanding with various countries on scholarships and other types of funding.

As to see the linkages throughout the education system it is positive that both higher education and technical and vocational education fall under the same ministry. Several interviewees in the ministries and other government units were asked about how to coordinate the work and who should take the lead role. According to interviewees in Tanzania, MOEVT does not have staff with knowledge about petroleum-related education. Hence, most interviewees believed that in the initial phase of planning petroleum-related education, MEM should take the lead while MOEVT builds knowledge among some staff on petroleum-related education. The current practice established seems to be that MEM works directly with the education institutions on petroleum-related education, and not through MOEVT. MEM sees petroleum-related education as the responsibility of MOEVT, but that in the initial phase, MEM needs to be involved as it does currently.

Moreover, other ministries that interviewees identified as important to involve in future planning on petroleum-related education were Ministry of Labour, Ministry of Science and technology, Ministry of Environment and the President's Office Planning Commission. In addition, the three institutions tasked with accreditation and quality assurance: VETA for Vocational education, NACTE for technical education and TCU for the universities have important roles to play in establishing oil and gas education. Moreover, Tanzania Commission for Science and Technology is an important actor, which advises the MOEVT and Ministry of Science and Technology on science issues. As COSTECH, moreover, advises on issue related to Small and medium-sized enterprises, they are important in assuring the wider linkages between oil and gas specific subjects and local content work.

At a more general planning level, the President's Office Planning Commission is pertinent to involve in ensuring overall government priorities for petroleum-related education and that these are in line with overall development policies and plans in the short, medium and long-term. PO-PC is currently conducting a national skills study that will provide more accurate numbers on skills available and needed, including on petroleum-related skills.

MEM has established links for Oil & Gas with the University of Dar es Salaam, UDSM. At the same time, the VETA schools collaborate directly with the oil and gas companies and the international service companies. This is positive, but there is a need to coordinate all actors and initiatives so that the education and funding for education, equipment and training together contribute to strengthen the system. Moreover, there is a need to think in broader terms in how existing educated people (i.e. engineers) can be trained to meet the specific needs of the O&G industry.

In addition, other skills are needed. The gas policy sets a number of institutional elements that needs to be integrated within the overall central government system on a wider level if the policy is to be realised. The gas policy sets out 'a coordinated utilization of gas on the basis of a National Gas Utilization Master plan'. This plan is to include technical and economic analysis in order to find the best project that will be of benefit for the investor and

the government. The government, moreover, wants to participated in selected investment projects, including GTL and LNG value chain. Moreover, the government is to ensure that 'domestic market is given first priority over the export market in gas supply'. However, to establish a domestic market is challenging and most interviewees believe that the companies will not be interested in a domestic market. This governance implies that the Ministry of Finance and other ministries must be involved in terms of investment and ensuring that the domestic market is developed. Moreover, the domestic market development would need a lot of investment in building infrastructure. Infrastructure in general is a major challenge for Tanzania.

Moreover, another issue is revenue management. The policy states that revenue management requires new mechanisms of governance. These mechanisms must ensure 'mitigate spending pressure and preclude rent seeking opportunities, fiscal management and economic diversification'. All these mechanisms require coordination among several government ministries. A Natural gas Revenue fund is to be established. This would need people who are trained in revenue management and related issues. Moreover, the government needs people with knowledge on natural gas pricing as the policy says that it will establish an appropriate pricing mechanism. There has been no discussion on gas in the Development Partners Group on Education. Most work and discussions in this group is on reading, writing, mathematics and teacher training. Most donors who fund education are involved in primary education as the Millennium Development Goals focus on primary education. The following SWOT sums up and analyses the current situation as to the petroleum-related education offered, the future plans and the surrounding policy environment and work within the government and the industry, as well as the coordination challenges:

SWOT ANALYSIS

<p>STRENGTHS</p> <p>Several initiatives have started and or are planned (i.e. University programs, scholarships provided by the industry)</p> <ul style="list-style-type: none"> -positive to education and view it as important -policies and strategies are in the tube -political-administrative Tanzanian culture of thinking before acting (Nyerere heritage) -government has an active understanding and interpretation of future gas resources to be used for the benefits of the society -progress with regards to flexible, decentralised decision and action by education institutions in relation to industry cooperation -strong internationally acknowledged university education at UDSM in related sciences -international acknowledgement of Tanzanian leadership -Tanzanian demographic labor force is mobile and young <p>Norway had a similar approach in its development of oil resources. Some years went by before the exploration activities started in order to develop a well thought out framework (Al-Kasim, 2010).</p>	<p>WEAKNESSES</p> <ul style="list-style-type: none"> -not enough sense of urgency in government with regard to critical strategic decisions to be made -Funding is fragmented and ad hoc -Limited coordination across all education activities -TVET has so far got less focus than higher education -Problems of knowing how to develop the petroleum resources for the benefit of society -Uncertainties as to how far local content will be stretched
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> -gas as a future alternative national energy source -downstream consumption will create positive changes in the economy -possible big revenues to government -funding seems available to skills development -employment and career opportunities with right skills 	<p>THREATS</p> <ul style="list-style-type: none"> -internationally: corruption -Kuwatification, -Political system strain and political instability, uncertainty as to future directions due to new constitution -lack of joint focus, planning and consensus among key actors

	<ul style="list-style-type: none"> -fragmentation of educational resources and, hence, of quality. -gas is old, but big volume gas and off-shore gas is new- government thinking too slow -gas development does not take place, or does not take place -funding is withdrawn -Expectation management and communication is not done properly -popular anticipation of big results now- while it takes time to generate employment opportunities -TVET is not prioritised as it is not part of the BRN -skepticism in civil society to sector practices -fear of resource curse -limited understanding in the Tanzanian society creates too many expectations on employment -government culture of waiting (for higher level light and decision)
--	---

Table 7: SWOT analysis

3. Skills gaps analysis

3.1 Introduction

A general observation based on international practice and seen in several countries is the following pyramid, which indicate where most people work in the oil and gas sector:

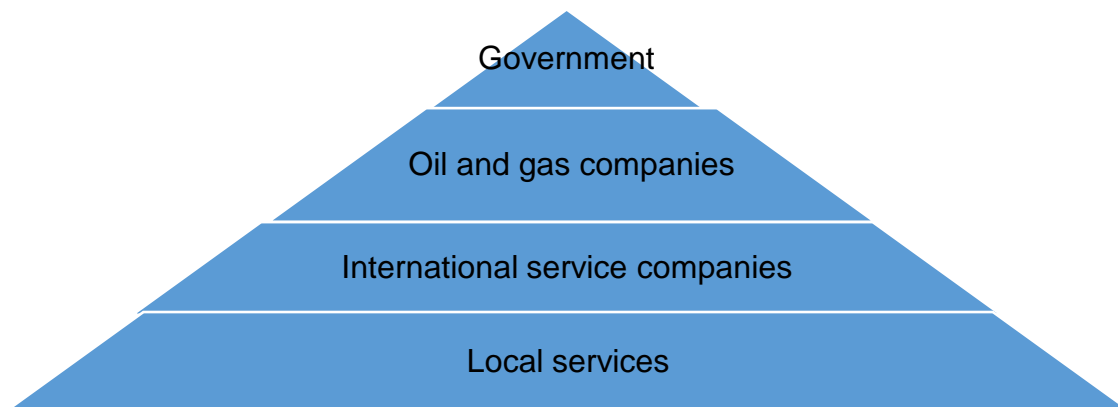


Figure 1: Skills needs at different levels.

The numbers of staff needed increases as one goes down in the system. For instance in Norway, the government only employs about 1 per cent of the total number of people employed in the sector. The rest is employed in oil companies and service companies. Most skills needs (in numbers of staff) are therefore expected to be seen in the international service companies that supply the international oil companies. The local services is most likely to imply companies which may provide additional services needed, i.e. 'indirect and induced jobs'.

3.2 Specific skills needed and activity levels

The estimated skills needed are based on the following scenarios/activity levels in a 25 years perspective:

- Low activity level
- Medium/moderate activity level
- High activity level
- Discovery of oil in addition to gas.

The most defining characteristics of the various activity levels are a) the number of fields, b) the number of LNG plants:

Number of fields	Number of LNG Plants		Common denominator
	1	2	
1	✓	Not considered	Local gas deliveries
2	✓	✓	

Table 8: Defining characteristics of activity levels

In this study, the consultants have arbitrarily selected a medium activity level to assess skills needed. In addition to our focus on medium/moderate activity level, we make some brief comments about a low activity level, a high activity level and discovery of oil in addition to gas. Moreover, the report gives a general analysis of skills gaps for domestic utilisation of gas in i.e. downstream and midstream activities.

Activity level	Assumptions
MODERATE	1 plant from 2 fields, 4 trains, prefabricated modules outside Tanzania
LOW	No LNG plant (only a floating LNG plant with a pipeline to mainland to satisfy the local market)
HIGH	2+ LNG plants and exploration activities on-shore and off-shore take place rapidly and allows for fast-track exploration activities.
OIL & GAS	High gas activity and exploration phase after commercial discovery of oil
Domestic utilisation of gas, downstream and midstream activities	A wide spectrum of activities and a domestic market

Table 9: Activity levels and assumptions made

3.3 Existing estimates

Most studies, including this one, identify three main phases of an LNG development project¹⁰:

- ✓ **Planning:** Takes several years. Mostly done by international staff and at head quarters. As there is limited skills in Tanzania now, it is not likely that the planning stage will represent a stage where many Tanzanians will be involved.
- ✓ **Construction:** 3-6 years. This could be the most difficult in order of getting skilled labour, in particular engineers, as many other LNG plant are being built and facing this problem – e.g. Australia, where some local and probably much foreign manpower will be used.
- ✓ **Operations:** 20-30 years. This needs fewer people but a large share specially trained for LNG with a high level of technological skills. (In addition, port facilities and perhaps trucking (if this is chosen instead of pipelines. We do not consider such extra activities in our estimates).

The following estimates compiled by the authors from existing studies give some indications of numbers and variations:

LNG Projects	Labour numbers in construction	Labour numbers in operations
PNG	Peak reached in 2012 with 21220, workers, ca 40%-45% of these have been PNG nationals. Women= 5%, 90% PNG nationals (PNG, 2013)	Expected approx. 450-500 (75-80% PNG nationals in the beginning, up to 90% over time).
Timor Leste	Not known, suggested 20% of 3500	Not known, very few in short term, more in medium and long term if training takes place
Atlantic, Trinidad and Tobago	Total 7000 workers year for the project, peak: 3500 workers	120 (1 train, 1999), 725 (4 trains, 2012)
Angola LNG	4-8000 (most short-term), maybe 50% of these Angolans	3-500 (ca 40% Angolans)
Snow White, Norway	1800	180 expected to be employed, 70-80 of these maintenance and clerical work, 10 for remote operation (numbers from 2001-no updated numbers)
Wickham Point, Darwin, Australia	1200 (first train), 1600 (trains 2 and 3)	120 projected jobs
Australia Pacific LNG	6000 (average non-engineering/non-management: 1665, peak: 3940) (Queensland Skills, 2013, assumes a 1:10 supervisor/worker ratio)	1000, no further breakdown made in the report

Table 10: Estimates compiled by the authors from existing studies (La'OHamutuk, 2008; Construction Skills Queensland, 2013; Grant and Thornton, 2013; Atlantic, 2013; Acil Tasman, 2009; PNG LNG, 2013).

The only study that provides concrete breakdowns on numbers per skill for construction of an LNG plant is on the Australia Pacific LNG project (Queensland Skills, 2013: 26). The staff numbers may be somewhat too conservative compared to the future in Tanzania as Australia is likely to have higher labour productivity than Tanzania. Nevertheless, the numbers give an indication of the range in numbers and variation of skills needed. These numbers do not take into account extra activities, such as building a support base.

3.4 Skills gaps at the professional level

3.4.1 Professional level skills gap for the government

The current supply of the various skills within the government of Tanzania is not fully known to the team. MEM has compiled information on this in a report. The consultants have only seen a draft, incomplete version of this report and has repeatedly asked MEM and the author for a copy of the final report which has been submitted to MEM. However, the team has been unable to get such a copy. Hence, it is not possible for the consultants to give comprehensive of the supply of various skills within the government of Tanzania. As MEM has this information in their system, the consultants suggest that MEM either use the table presented in this report and add their numbers or provide the consultants with the report and ask for an additional study on this particular aspect.

The government would need some more engineers and some more geo-scientists in TPDC and MEM. Moreover, edu-training in other government institutions (e.g., NEMC, OSHA, EWURA) on petroleum-related areas is necessary in order to fulfil their roles in monitoring the industry. There are hardly any available petroleum engineers in Tanzania. The few who have studied abroad have been absorbed by the industry and government in recent years. Key gaps at the professional level seem to be petroleum engineers and geo-scientists with Oil and gas skills and experience. However, if existing and planned education in these subjects continue as planned, the gap may be closed at the BSc level pending on the quality of the education. Hence, there does not seem to be a need for more universities to be

involved than those currently engaged in providing key technical education in petroleum engineering and other geo-sciences.

However, there is a gap in MSc level trained petroleum engineers and geo-scientists for the oil companies and the government. If M.Sc level education is started, some teaching staff at the universities currently providing education get trained abroad, then this gap may decrease a lot in 5-10 years perspective. However, the best option may be to ensure that the M.Sc degree is a twinning arrangement with universities in the North. In addition, exposure for staff to international research cooperation and training is needed. Some staff need PhDs and Master's level education at UDSM. UDOM need more staff in general.

It is not likely that more than one university needs to provide M.Sc degrees in petroleum-related fields (engineering, chemistry, geology) as the need for M.Sc educated people are mostly in the international oil companies and in government, while most people who will undertake the work in constructing and operating an LNG plant will work in the international service companies. International service companies in general often hire people with B.Sc.s and train them internally.

There is good supply of administrative staff. Professionals in support-services such as business, accounting, finance, marketing, law, economics, administration etc are available with some trimming for both government and the industry. The challenge is that these are not specialized in oil and gas issues (for example, there are very limited – if at all – oils gas MBAs, oil and gas lawyers, oil and gas economists, oil and gas accountants/auditors/tax administrators etc.). Adding modules of oil and gas on top of what they already know in specialised courses at one university is a good option. In addition, pure oil and gas courses such as engineering should get e.g., business, accounting, law, economics, administration components.

Government needs related to midstream and downstream activities

The planning and promotion of the right type of downstream activities should be given high priority by government now. The Gas Strategy document expresses a desire for active national engagement. However, it is difficult to envisage at this stage the final balance between export and local downstream projects. The skills required in the implementation and operation phases will therefore depend on the concrete development plans and cannot be predicted now. The best thing we can do is to comment briefly on skills needed on a general basis. MEM and TPDC have identified in general terms, skills and numbers needed for some downstream activities, including e.g. a fertilizer plant, an ammonia plant. The regulatory role of government will in any case be present and can be dealt with under different scenarios of downstream development. Thus, a conclusion from above: Government must be a major player in designing a strategy to meet the ambitions reflected in policy documents.

Government may also have to share the financial burden including risk. If government does not take the risk of investing, but at the same time demands high degree of local content in gas development, the investors will most likely be reluctant to invest. At the moment, the gas policy demands a high degree of local content. The private sector and the population has put high pressure on the government to demand local content of the international O&G companies as witnessed in the debate between the government and the private sector and in the tensions that appeared in Mtwara in 2012 and 2013 (e.g. Mafuruki, 2013; the Financial Times newspaper, the URT, 2013; the Mtwara incidents). The government must take the lead in assuring the companies that investments will be worthwhile and it needs competent people with skills to do this- both technical people and people who may communicate and engage with the local population and local leaders.

Moreover, regulation of the downstream and midstream activities are important for the government. Such regulation can be tricky and needs strong personalities as well as skills. Although this report does not go into details about downstream and midstream activities, this latter point on regulation is pertinent to consider for the government.

3.4.2 Professional level skills gaps for the industry

The industry has hardly any skills requirement before licensing. From licensing onwards, industry may have two distinct skills requirements; operator oriented and supply oriented. When it comes to requirements for performing operative tasks in the **upstream** the industry will continue to perform operations and will within their ranks requires all types and levels of skills in exploration, development, production, decommissioning etc. Their requirements will obviously include vocational skills, which they may partly cater for themselves but can be persuaded through legislation or contracts to contribute to a national programme or through local content policies.

The appraisal and development stage of an LNG project will mostly be done by staff at the headquarters of the companies and some international staff in the country and only some support staff from the country will be hired. The exploration phase- which is on-going - requires very specialised skills and is mostly performed by internationally hired people on the rigs. Some service companies are training Tanzanians to work on the rigs, but the number of people needed on the rigs is very limited and does not offer many job opportunities (about 60-80 people in international service companies per rig).

The licensees will in addition need, or can be persuaded (through legislation or contractual commitment) to seek local supplies and services in all phases of the **upstream** petroleum operations. The scope and degree of local content will depend on the success of two approaches. Government may enact certain rules and guidelines on local content which operators must comply with. But the actual mastering of tasks by local suppliers will most probably entail co-operation and/or joint venture agreements with renowned and established international companies. In any event, the process of experience transfer will be part and parcel of the business development between local firms and their international partners. Government's role is to legislate, regulate and inspire by indicating the right direction.

The same logic applies by and large to *mid- and downstream* operations. The tasks in these sub-sectors are not fully defined. The specific skills requirements of operators and/or local content are therefore difficult to assess fully at this stage. Accordingly, only general requirements that will prevail under all circumstances can be handled. Concrete measures for meeting skills requirements in these two sub-sectors must await clarification of projects and roles. It may be possible however to deal with the mid-downstream requirements under selected scenarios.

Skilled labour used for construction may find jobs in other industries that are envisioned to be developed as part of the ambitious goals of local content and additional industries envisaged in the gas policy (e.g. fertilizer plants, ammoniac plant, development of domestic infrastructure for the use of gas), etc.

There are hardly any available petroleum engineers in Tanzania. The few who have studied abroad have been absorbed by the industry and government in recent years. Key gaps at the professional level seem to be petroleum engineers and geo-scientists with Oil and gas skills and experience. ICT skills are needed, especially for operation of a LNG plant. It is, however, most likely that extra courses or additional training within companies or abroad may suffice to fill these skills needs.

As already noted, there is good supply of administrative staff. A general challenge for all companies, especially for the service companies, is however the low level of English skills and inadequate knowledge of the industry's HSE standards. However, these skills gaps are mostly closed through internal training in the companies.

As concerns the potential of using existing engineers and give them top-up courses, the challenge is that the quality of the skills present are below international standards. Some even compared the engineering degree given in Tanzania to a lower technical degree

elsewhere. Hence, several of the oil companies and international service companies invest in scholarships abroad for students, their professional workers and/or extensive internal training or further education for the people they hire in order to bring them up to the skills level they require. One company told us that they had to send the engineers they had hired for 2-3 years training in order to make them well trained to be used as engineers. The shortage of engineers is a global problem for the industry (CRES, 2008; Deloitte, 2008). In Australia, the shortage of engineers have caused LNG projects to be over budget and delayed. To sum up the skills gaps and estimates for the industry are roughly as follows:

Skills	Number currently trained (in training) in Tanzania	Estimated demand construction and operations	Gap identified
Petroleum geology	BSc in petroleum geology (20 graduating from 2015)	Need some more geologists, but not as high a demand for LNG plant construction as for petroleum engineers	MSc level education needs to be expanded at UDSM/NTNU. Demand mostly met now by international oil companies, but higher demand in future if high activity level on-shore and off-shore /and discovery of oil happens
Petroleum engineers	175 in education (ca 27 ready 2014, most graduating in 2015)	Approx. 100 engineers will be needed for planning, Approx. 250-300 will be needed for construction phase	MSc level education needed, but only oil companies and government needs MSc level engineers, gap may largely be met at BSc level if plans go ahead.
Process engineers	BSc in Petroleum chemistry, 23 students (graduating from 2015) likely to fill some of this gap O&G	Approx. 100 for operations phase. Petroleum engineers are likely to be most needed of all categories	
Operational engineers	No education on O&G		Could top-up training for existing engineers
Construction engineers	No education on O&G		Could top-up training for existing engineers
Law, economy, business, finance	7 (in Finance)	2-10 in each relevant organisation. Most critical for government (has few staff now), there is a good supply of administrative staff currently.	More need if downstream and midstream activities take place, especially on market and business, specialised in oil and gas issues.

Table 11: Summing up the skills gap at Professional level for the industry.

As concerns the skills gaps for domestic utilisation of gas, such activities would imply that a separate MA in finance and economics. Midstream, LNG and transportation, storage and distribution of gas, is not covered here – needs engineers, too, but different from upstream.

Moreover, downstream and midstream needs MBA/economists, financial analysts, etc. If the IOCs are excluded from this part of the value chain, as the gas policy outlines, a lot of training will be needed in these areas. In such case, there are experiences to be learnt from countries like Brazil and Australia.

Downstream, sales and regulation also needs other people than upstream. Sales people are easier to train from existing commercial people if they exist

3.5 Technical level skills gaps

3.5.1 Technical level skills gaps for the government

The government's needs are uncertain, at least it is a small need (less than 30 technicians estimated by MEM, 2013). If the downstream and midstream activities are realised, the gap may be bigger, depending on the government's involvement in the activities, production, etc.

3.5.2 Technical level skills gaps for the industry

The technical level skills gaps for industry are based on the study from a LNG project in Australia. The supply is based on the numbers of students trained at VETA Mtwara and VETA Lindi as referred to in the mapping section in chapter 2. Moreover, the table includes the number of trained people in the various skills in general based on data from VETA collected by VSO/BG Tanzania (2013). However, few of these students trained in these general skills are immediately employable in the industry. In some areas, there is no available data.

T-level Skills	Number currently trained with O&G component	Number trained in general, but few are immediately employable in the industry) (VSO/BG Tanzania, 2013)	Estimated peak demand (average demand) during construction phase	Gap identified
Labourer	-likely that several people trained have these skills	-likely that several people trained have these skills	450 (210)	No gap, transferrable skills likely with extra HSE/O&G courses
Rigger (incl.doggers, basic, intermediate, advanced include dual ticketed rigger)	0	Not known	375 (150)	Ca 375
Electrician (include special electricians and Electrical trade assistants)	73 (installations)+25+ (maintenance, Mtwara), not possible to estimate if these could serve as assistants or electricians	5263 (female:1000)	350 (135)+ 120 (50)	-likely to be met if people trained get extra O&G training and quality assured
Pipefitter	0	329 (female:30)	340 (135)	-likely to be met if people trained get extra O&G training and quality assured
Carpenters	34 (in carpentry and joinery)	2944 (female:23)	250 (100)	-likely to be met if people trained get extra O&G training and quality assured
Equipment Operator	0	54 (female:3)	160 (70)	Ca 110
Mobile crane operator	0	Heavy equipment operators could probably be further trained	160 (70)	-may be met if people trained get extra O&G training and quality assured
Concrete finisher	0	2657	120 (50)	Ca 120

		(female:443)		
Mechanical Fitter/Mechanical repairs	25 (students in mechanical engineering could probably be used)	542 (female:297)	110 (50)	Ca. 85
Sheet metal worker/steel fixer/steel worker/pipe welder	0 93 (not clear whether these could fill all requirements of special class welder)	1677 (female:256)	100 (50)(sheet metal worker) 190 (75) (steel fixer) Welders: 450 (150)	The gap is not possible to estimate in detail-depends on the use of general trained people + further training of these. Special class welders: gap expected to be bigger if high activity level and oil activity level kick in.
Industrial painting	25	148 (female: 43)	65 (35)	Around 50? Gap expected to be bigger if high activity level and oil activity level kick in.
Boilermaker	0	Not known	260 (100)	Ca 260
Scaffolders	0	0	160 (70)	Ca 160
Insulators (incl. Cryogenic operators)	0	Not known	215 (130)	Ca 215, but difficult to know due to lack of data.
TOTAL	275	Depends on how many trained in general skills are employable in the O&G industry	3755 (1630)	Ca. 3480 in peak, 1355 on average in construction years

Table 12: Skills gaps at technical level

In addition, the current supply consists of 88 students in related fields. VETA Mtwara train 42 students in auto mechanics and 46 students in plumbing. It is expected that these will be of use in the industry. Altogether, the existing supply of petroleum-related trained people in all skills are about 387 (from VETA Mtwara and VETA Lindi). Most gaps are found in welding, boilermaker, electricians, rigger, scaffolders, and insulators. In total, at peak of construction, the gap may be around 3500 if no more supply and education takes place. However, in the end the gap will depend upon whether people in transferrable general skills will be trained so that they may be used in the industry.

On average during the construction, however, the gap may be around 1350 people. This gap may be filled if education is provided in these areas in a few more schools and people already employed in the general skills are trained to be equipped for working in the O&G industry. Moreover, the gap depends upon the international support for quality assurance and curriculum development and practical training facilities in place. The number needed in the operations phase for these skills are very low, maybe less than 100 people are needed as operations require a high level of technical (ICT) skills. However, it is expected that the people trained at this level have transferrable skills and may be used in other industries—downstream and midstream activities—that the government plans to realise. Given that construction of a potential LNG plant is not likely to start until 2016-2017 at the earliest, there is some time for the TVET system to react towards the skills needed.

3.6 Skills gaps for other activity levels

3.6.1 For high activity level

A high activity level is envisioned to imply that two LNG projects are developed from two different fields. For each LNG project developed therefore, one may very roughly- as a

scenario- say that it requires doubling the skills needs from the medium/moderate activity level, assuming that the specifications of the project will be more or less the same.

In addition, the high activity level is assumed to involve a higher intensity of exploration, both off-shore and on-shore. The high activity level in general will create a market for well and production services, which in turn calls for some specialised technicians and selected professionals. Most in demand of professionals include: production engineers, drilling engineers, cementing engineers, completion engineers, construction engineers, HSE personnel. The technicians most needed are welding, pipe fitting, scaffolding, building, painting, work-over mechanics and maintenance mechanics.

For the *government*, the number and types of skills needed within the government is not likely to vary much between a moderate and high activity level. This is due to that the government will not need that many more people if the institutional framework is in place. If such a framework is in place, it is anticipated that each government unit works according to the division of labour as outlined in the gas policy.

3.6.2 Skills gaps for low activity level

For the *industry*, a low activity level implies that no LNG plant is not developed. Furthermore, this level assumes that few people with vocational education are needed. Some engineers may be employed in the companies in Tanzania, but not many. It is moreover, unlikely that many Tanzanians will be employed in exploration on the rigs as companies will be hesitant to invest in training local people due to uncertain investments and future work in the country.

The *government's* needs may not be much lower than for a moderate activity level.

3.6.3 Skills gaps for the commercial discovery of oil in addition to gas

For the *industry*, until they find first commercial oil, the number of active oil companies will probably remain at today's level. If, however, as a result of government's promotion campaigns– a commercial discovery is made– the new plays will most probably attract several companies. Further discoveries may then increase the demand for both geoscientists and engineers of various categories in connection with new field developments. If we assume that as many as ten companies operate on land in Tanzania, each may in average have, say 12 professionals in the exploration phase, including geo-scientists, drilling engineers, petroleum engineers, reservoir engineers and construction engineers.

It is difficult to be specific as to the number of technicians supporting the professionals is more or less equal to the number of professionals. Most technicians needed in both the exploration and development/production phase will be drillers, mud technicians, sample collectors, logging personnel, measurement personnel, metering. In the production phase, the number of professionals mentioned above may double. However, field developments during the production phase may increase the number of technicians involved in field measurements and/or field maintenance operations. This, of course, depends on the individual characteristics of the fields (e.g. their location, their challenges, complexities).

To sum up, in exploration phase some 120 professionals will be required once a discovery has been made. Out of these 60 could be Tanzanians. In the field development phase and the following production phase, with say two production projects, 40 professionals may be required to monitor and manage the field. These could all come from Tanzania making the total requirement 100 Tanzanian professionals and 100 technicians. It should be pointed out here that professionals in the mid- and downstream are not included as this is considered out of the scope of this report.

Government is likely to need more people at higher education levels who are geologists and within other types of geo-sciences. The main difference in skills needs is after reaching oil reservoir. At this stage, there are some differences in skills needs from gas to oil – but the same people can be easily trained/re-trained to perform oil related activities. The key issue is for these people to have the basic knowledge of the oil and gas broadly. These skills are lacking in Tanzania today.

4. Conclusions

This report demonstrates that there is a skills gap at the professional and technical levels in Tanzania. Moreover, educated workers with basic skills such as good working ability in English and awareness and knowledge of existing HSE standards is limited the country. Nevertheless, this report reveals that existing and future petroleum-related education in Tanzania is in place at all levels. At the vocational level, specialised petroleum-related education and training in addition to general training takes place in Mtwara and Lindi in particular. At the technical level, the Mineral Resource institute in Dodoma offers degree in petroleum geosciences. At the level of universities, UDSM and UDOM offers BSc degrees in petroleum-related subjects. The report shows that the BSc level gap may be met by existing education.

The need for M.Sc educated people are mostly in the international oil companies and in government, while most people who will undertake the work in constructing and operating an LNG plant will work in the international service companies. International service companies in general often hire people with B.Sc.s and train them internally.

At the MSc level, additional degrees are needed in petroleum geology and petroleum chemistry. UDSM seems best equipped to offer such education as it has staff in the key disciplines, have developed research capacity in these disciplines over a long period of time and may build on the existing MSC collaboration programme with NTNU (ANTHEI programme).

The challenge in existing and future education at all levels is to ensure high quality, including sufficient technical capacity of teaching staff, equipment and practical training opportunities in the companies. All education institutions need to recruit additional staff and junior staff need further education at MA and PhD levels.

Moreover, developments at UDSM are under way to cater for needs in finance and economics—supported by Statoil. In general, there is good supply of administrative staff. Professionals in support-services such as business, accounting, finance, marketing, law, economics, administration etc are available with some trimming for both government and the industry. The challenge is that these are not specialized in oil and gas issues. Adding modules of oil and gas on top of what they already know in specialised courses at one university is a good option. In addition, pure oil and gas courses such as engineering should get e.g., business, accounting, law, economics, administration components.

Moreover, if downstream and midstream activities are realised, there will be a need for several more people and additional education should be offered in sciences and economics. Midstream, LNG and transportation, storage and distribution of gas needs engineers, too, but different from upstream. Moreover, downstream and midstream needs MBA/economists, financial analysts, etc. Downstream, sales and regulation also needs other people than upstream. Sales people are easier to train from existing commercial people if they exist. If the IOCs are excluded from this part of the value chain, as the gas policy outlines, a lot of training will be needed in these areas. In such case, there are experiences to be learnt from countries like Brazil and Australia.

When it comes to addressing the gender imbalance in the sector, there are considerable gaps as to the gender disaggregated data. However, the data that exist as presented in this report shows that there is gender imbalance in enrolment of students in petroleum-related education at all levels. Strategic work to decrease this gap should be pursued by the government and the industry.

If education of Tanzanians to fill some of the gaps take place in the future, several of the technical skills are transferrable and can be used in other industries, but this depends on whether such industries are developed in the meantime. The gas policy outlines ambitious plans for downstream and midstream activities that could potentially offer trained people jobs. The number of jobs in other related industries and sectors are at least ten times the

number of jobs offered in petroleum operations. Hence, as a follow up to this study, additional work is necessary to estimate the skills needed in these related industries as such themes were outside the scope of this report.

Summing up, whether the gap between demand and supply of skills needed for the industry and government will be met in the future depends upon the quality of the general education offered and the extra skills development that will take place among existing professionals and technically trained people.

Recommendations

Recommendations for all actors involved:

- A joint coordination forum/organ between government, industry and education institutions should be established for overall coordination of education activities.
- Ministry of Education and Vocational Training should lead this forum as it is responsible for skills development. Members of the forum should include, but may not be limited to these institutions/actors: relevant companies providing support for petroleum-related education, MEM, Ministry of Gender, TPDC, Ministry of Science and Technology, the universities, the VETA Head office and selected schools, selected technical schools, NACTE, COSTECH, TCU, selected NGOs involved (e.g., VSO International).
- A small working group with administrative/ secretariat functions for this coordination forum should be established within the MoEVT to ensure smooth operations and make sure planning and decisions are followed up on by the respective organisations involved in between meetings.
- Sub-forums for coordination on the specific education levels should be considered:
 - Coordination Forum for higher education
 - Coordination forum for technical education
 - Coordination forum for vocational education and training
- The overall coordination forum and the sub-forums should work on these tasks:
 - Regular (preferably, monthly) meetings with identification and analysis of demands vs. supply in job market and in education
 - Assessment of quality in education by development and use of an M&E system to track quality over time
 - Identification of gaps in apprenticeships offered by the industry
 - Identification of needs and division of labour in funding to avoid overlaps and gaps- likely to result in improved quality of existing education.
 - Identification of gender barriers and measures to improve gender inequalities in education and employment in the sector.
- Collaboration between the two government-donor technical working groups on education and energy should take place in order to plan for how external funding can be utilised to strengthen petroleum-related education.
- The second round of Big Results Now should include the TVET programme in its focus and develop Key Performance Indicators on skills development for and related to the petroleum sector.
- *On the job training* for government staff should be reinforced. Government should make more use of the PSA obligations on training.

- The existing PSA funds should be more open to government staff outside MEM and be used systematically for education of staff in all government institutions.
- Apprenticeships system should be strengthened throughout the education system—from vocational level to higher education level. The government should consider to put minimum criteria for the number of field attachment offered to students in the industry. The current number of attachment does not match the demand.
- The government and universities should consider bringing in technical experts from abroad to solve capacity challenges in the short term in these institutions. Such experts can contribute with on the job training in critical areas. Donors may consider supporting the government in paying for the expenses for hiring such experts.
- Technical experts from abroad also includes highly specialized system and institution experts. This type of expertise must be used at important points in the national petroleum development.
- Top up courses should be considered for existing petroleum related disciplines. In some cases, with new learning technologies, top up courses can be quickly and easily implemented and scaled up. For example, MOOCs (Massive Open Online Course) providers could serve to help close the current gap in availability of qualified teachers and trainers at all levels in Tanzania.
- Leadership development for the sector. Petroleum sector leadership development should be initiated as a collaborative programme between international, regional and national actors. Donors should consider funding such a programme.
- English skills and education in English should be strengthened at all levels in the system.
- The Ministry of Gender in Tanzania needs to be included in future strategic planning and government activities to improve the gender balance in recruitment, ensure gender mainstreaming and gender perspectives in planning and operations of the sector.
- Regional focus, regional collaboration and regional knowledge transfer/capacity building in existing and planned education initiatives should be considered given the gas findings in other East African countries. One way of handling this is to pay attention to “change agent”-/ facilitator development as joint efforts with universities and consulting institutions.
- *Prioritisation on levels and type of education in general:*
 - In numbers: more people needed with TVET education than with higher level university education.
 - In time: TVET trained people (technicians) are mostly needed during a short period, the construction phase.
 - TVET skills are transferrable to other industries and thus these trained people may be used in downstream and midstream activities which may emanate from the petroleum activities.
- *Recommendations for professional level:*
 - For MSc level education in petroleum geo-sciences and engineering, it suffices with one university offering such education. UDASM is best equipped to offer such education.

- For skills that are less in need (law, finance, economics), additional courses to existing degree programs and/or give scholarships to some students for studying MA courses abroad in these fields suffice.
- Twinning arrangements with Northern universities should be considered on a broader basis than it is now in order to strengthen the petroleum-related education offered and further training of lecturers.
- Some scholarships to existing younger staff at the universities involved in petroleum-related education at universities abroad should be offered in order to give them exposure to international research and training in these areas.
- *Recommendations for technical level:*
 - Apprenticeships and other types of practical training at all levels should be strengthened.
 - The existing collaboration with companies and international guild organisations should be reinforced and put to systematic use throughout the system.
- *Recommendations for future studies:*
 - A follow-up study based on MEM's own work on identifying existing skills within government (referred to in this report) should be further analysed and combined with this study to make a comprehensive overview document on existing supply versus demand for all government institutions—in short, medium and long-term perspective. The matrix provided in this study can be utilised and expanded upon as a tool for such a study as it takes into account the time perspective.
 - A study is needed to establish in more detail the skills gaps with relation to downstream and midstream activities and the expansion of a domestic market and domestic utilisation of gas.
 - A study on local content, including an assessment of the indirect and induced job potential from a future LNG project should be done, including identifying in particular job opportunities to improve the gender balance in all types of jobs.
 - A study on the current situation regarding gender in the petroleum sector—identifying entry points and suggestions for how to operationalise the gas policy's ambitions regarding gender— should be undertaken. This study should in particular address how the current gender barriers could be addressed to facilitate change.
 - Future work involving relevant stakeholders in the Tanzanian government, civil society and the companies should be undertaken to identify the skills gaps of the Tanzanian government at the systems and leadership levels. There is a dire need to explore and define what systems and leadership skills are required to ensure that the petroleum involve and how it should be handled.

References

- African Development Bank (2013) PROJECT: Support to Technical Vocational Education and Training and Teacher Education. Country: Tanzania. Project appraisal report. TVET program. Dar es Salaam: African Development Bank.
- Al-Kasim, F (2010) Managing Petroleum Resources. The 'Norwegian Model' in a Broad Perspective. Oxford: Oxford Energy Studies.
- Association of Canadian Community Colleges (2013) *EFE Africa. Tanzania*
<http://www.accc.ca/xp/index.php/en/programs/int-partnerships/efe-intro/efe-africa/countries/tanzania>
- Atlantic (2013) Sustainability Report 2012. Port of Spain: Atlantic.
- BG Tanzania (2012) BG Tanzania- contributing to society. Dar es Salaam: BG Tanzania.
- BG Tanzania/VSO International (2013a) *Vocational skills gaps in the Tanzanian Oil & Gas sector. Report of findings 1.1*. Dar es Salaam: BGTanzania/VSO International.
- BG Tanzania (2013b): *Tanzania: Skills development programme to increase local involvement in oil and gas industry*. Available at: <http://www.bg-group.com/sustainability12/News/Pages/default.aspx>
- Chatham House (2013) Guidelines for Good Governance in Emerging Oil and Gas Producers. London: Chatham House.
- CRES (2008) Skills shortages in the global oil and gas industry. How to close the gap. Part I. Geneva: CRES.
- Deloitte (2008) Skills needs in the energy industry. Deloitte.
- DFID (2013) Business Case and Intervention Summary. Title: Big Results Now. Dar es Salaam: DFID.
- Education Development Partners Group (ED-DPG) (2013) Appraisal of the Tanzania Mainland Education Sector Development Plans February 2013.
- Grant Thornton (2013) *Employment Impact Review*. Ministry of Energy, Mines and Natural Gas. February 2013. Canada: Grant Thornton.
- Kahyoza, N (2013) Tanzania Gas Sector Economy in The light of Human Development. Paper presented at the National Conference on "Unleashing Growth Potentials in Tanzania: Making Natural Gas guarantee sustainable development", Bank of Tanzania, Dar es Salaam 20 October.
- Kibendela, E (2013) Plans and progress by Vocational Education and Training Authority to Prepare the Tanzanian Population to Engage In the Natural Gas Value Chain Process. Paper presented at the National Conference on "Unleashing Growth Potentials in Tanzania: Making Natural Gas guarantee sustainable development", Bank of Tanzania, Dar es Salaam 20 October.
- La' O Hamutuk (2008) Sunrise LNG in Timor-Leste: Dreams, Realities and Challenges. Chapter 5. Dili: Timor Leste Institute for Reconstruction and analysis.
- Lyimo, K (2013) 'Why the Big Results now can't work'. Accessible on:
<http://www.thecitizen.co.tz/oped/Why--Big-Results-Now--can-t-work-for-Tanzania-/1840568/1999204/-/ra290bz/-/index.html>
- MEM (2011) Strategic Plan 2010/11-2015/16
- MEM (2012) Human resource development plan on oil and gas.
- MEM (2013) National training needs on oil and gas.
- Ngowi, P (2013) Skills development to meet the needs of oil and gas industry in Tanzania.

Nilssen, I, (2010) Erfaringsstudie om ringvirkninger fra petroleumsvirksomhet for næringsliv og samfunnet forøvrig. Alta: FORUT.

Norwegian Ministry of Foreign Affairs (2008) Say no to corruption- it pays! Accessible at: www.regjeringen.no/en/dep/ud/documents/handbooks_brochures/2008/corruption.html?id499389

PNG LNG (2013) PNG sustainability report 2012. Accessible at: http://pnglng.com/media/pdfs/quarterly_reports/IESC-Report-July2013.pdf

President's Office Planning Office (PO-PC) (2013): Key Performance indicators for Big Results Now. Accessible at: <http://www.mipango.go.tz/kpi.asp>

PO-PC (2013a) KPIs for Energy. Accessible at: <http://www.mipango.go.tz/kpi.asp>

PO-PC (2013b) KPIs for Education. Accessible at: <http://www.mipango.go.tz/kpi.asp>

PriceWaterhouse Coopers (2013) Economic Impacts of the Oil and Natural Gas Industry on the US Economy in 2011. PWC, produced for the American Petroleum Institute.

Schlumberger Business Consulting (2012) Local content to fuel African growth. Presentation by Antoine Rostand at the 19th African Oil Week, Cape Town 29 October- 2 November 2012. Accessible from: http://www.sbc.slb.com/Our_Ideas/Executive_Presentations/Article_AfricanOilWeek_ARostand_1Nov12.aspx

Samji, W, Nsa-Kaisi, K, Albee A (2009) *Energy, Jobs and Skills: A rapid assessment of potential in Mtwara*, Tanzania Skills Gap International.

Statoil (2013) Re. Submission of Corporate Social Responsibility Activities. Letter to TPDC 08 August, 2013.

Statoil (2013) Tanzania Gas project. Presentation 22 August by Støve.

Statoil (2013) Re. Submission of Corporate Social Responsibility Activities, Clarification on Capacity Building. Letter to TPDC 28.10.2013.

TPDC (2013) Oil and gas operating companies in Tanzania. http://www.tpdctz.com/tpdc/Operating_companies.php

UDSM (2013) A proposal for Capacity Building to Enhance Teaching/Learning, Research and Expert Services in Petroleum Sciences and Engineering. Dar es Salaam: Departments of Chemical and Mining Engineering, Chemistry and Geology.

UNESCO (2012) Education sector analysis. Executive Summary. Dakar: UNESCO.

UIB (2013) The Quota Programme. Downloadable from: <http://www.uib.no/education/collaboration/the-quota-scheme>

UNIDO (2013) SPX Tanzania. Available at: http://www.tccia.com/spxtz/?page_id=94

United Republic of Tanzania (1980) *Petroleum Act*

United Republic of Tanzania (2003) *National Energy Policy*

United Republic of Tanzania (2008) *Education Sector Development Programme 2008-2017*

United Republic of Tanzania (2010) *The poverty reduction strategy paper (MKUKUTA II, 2010/11-2015/16)*.

United Republic of Tanzania (2012a) 5 year development plan 2012/13-2017/18

United Republic of Tanzania (2012b) Technical and Vocational Education and Training Development Programme (TVETDP). Situational Analysis Report.

United Republic of Tanzania (2013a) Natural gas policy. Final version.

United Republic of Tanzania (2013b) Technical and Vocational Education and Training Development Programme (TVETDP).

Warner, M (2012a) Local Content Policy in the Petroleum Sector in Tanzania: Core Issues, Expenditure Categories and Road Map.

Warner (2012b) Review of Public Policies, Legislation and Regulations Pertaining to the Formulation of a Local Content Policy in Tanzania in the Petroleum Sector.

World Bank (2013) Local Content Policies in the Oil and Gas sector. Written by Tordo, S, Warner, M, Manzano, O, and Anouti, Y. Washington DC: The World Bank.

Annex 1: Matrices for professional and technical skills gaps

Professional level skills matrix for government/public sphere

Urgency to act and execute: Red = top urg., Yellow = urg. Green = continue, Blue = dev.existing Black = stop

Skill	U R G E N C Y	Demand	Gap	Time/phases 2013-2016 2016-2021 2022-2038 Variation over time	Comments
P1. Geo-sciences (Geology, geophysics, petro-physics, petro-geo, geo-chemistry, petro-physics, petro geo-chem.)	G			2013-2016 especially, but a standing need to monitor and analyse situations.	
P2. Drilling engineering	G	-MEM: 5 + trainees TPDC: 1-2		When industry starts or TPDC becomes an oil company	GAP identified. Not sure if needed by/in government.
P3. Reservoir engineering	G	TPDC: 1-2.			
P4. Petroleum engineering	R	TPDC:11 MEM: 13?			
P5. Construction engineering	G	TPDC:3-4? MEM: 1-2?		2016-2021: For inspection of LNG plant construction	No number identified
P6. Chemical and process engineering	G	TPDC:16 EWURA:4		For down-stream only? 2013-2021	
P7. Operational engineering	G	Monitoring/supervision personnel		Depends on govt plans down/midstream	No Tanz. estimates exist.
P8. Monitoring of operations	G			Relevant in all phases	Important and classic government function. More people needed if increase in activities.
P9. Project management	Y				Generally useful skills for several situations along most of value chain.
P10. Trade and market analysis	R	MEM: 4?			Core group needed. Frequent fallacy is NOT to pay attention to this node in the chain
P11. Marketing	Y	MEM:11?		2018 onwards	Small core group needed.
P12. Procurement & logistics	Y				
P13. Monitoring	Y				Explicit monitoring functions
P14. Finance and economic management	R	TPDC: 7 MEM: 3			Important skills for Good Governance and Anti-corruption work Esp. important if down/midstream activities will take place.
P15. Accounting	R				Core skill for Good Governance and Anti-corruption work

P16. HSE	Y				Systems needs: Re-orientation and training of existing staff. Corporate culture change needed
P17. Soc. sciences & communication	Y			2013-2016	
P18. Environmental/ land/ geo.- disciplines	R	NEMC:3-4			NEMC and OSHA: needs training on O&G to improve assessments of EIAs and supervision activities they undertake.
P19. Legal disciplines	R	TPDC: 1-3?			-Training on negotiation capacity is important, some training is ongoing within the government in general

Table 13: Professional level skills matrix for government.

Technical-artisan level Skills Matrix for Government /Public Sphere

Urgency to act and execute. Code: Red = top urgency. Yellow = urgent. Green = continue as now
Blue = develop (existing) plans Noir/black = stop

Skill	Urgency	Supply	Demand	Gap	Timing/ phases	Comments
T 1. Mechanics/ Steel work	B		N/A	N/A		-no identified needs -if government engages in downstream and midstream projects without hiring companies may be applicable.
T 2. Welding	B		N/A	N/A		
T 3. Pipe fitting	B		N/A	N/A		
T 4. Metal sheet work	B		N/A	N/A		
T 5. Carpentry/ joining	B		N/A	N/A		
T 6. Scaffolding	B		N/A	N/A		
T 7. Masonry	B		N/A	N/A		
T 8. Brick work	B		N/A	N/A		
T 9. Painting	B		N/A	N/A		
T 10. Construction and building	B		N/A	N/A		
T 11. Asphalt & concrete	B		N/A	N/A		
T 12. Heavy equipment operating	B		N/A	N/A		
T 13. Well drilling and rigging (e.g., rough-necking, coiled tubing, completions, floor instl)	B		N/A	N/A		
T 14. Administrative support	R			TPDC+MEM: a few	2013-2016	A few more people needed in TPDC and MEM, not difficult to find

				more?		
T 15. Process technical matters	R			TPDC: a few more	2013-2016	TPDC est needs: 6+
T 16. Operator/operational skill	B		N/A			Not applicable if not down and midstream activities are realised
T 17. Electrical matters	B		N/A			TPDC estimates that there is a gap in electrical technicians
T 18. Electr.-technical matters	B		N/A			
T 19. Automatic techn. matters	B		N/A			
T 20. Laboratory techn. matters	B		TPDC:11	Some more in TPDC		
T 21. ICT technical matters	B		N/A			No estimates available
T 22. HSE support staff	R	?	OSHA:? MEM:? TPDC: ? NEMC:?			
T 23. Industrial installations	Y			??	2021-2038	-Not important before LNG plant is finished
T 24: Water supply and water treatment technical			TPDC: 12?	??	2021-2038	-TPDC estimates based on downstream and midstream activities realised

Table 14: Professional level skills matrix for government.

Annex 2: List of interviewees

MEM

Adam Zuberi, Principal Geologist

Priva Clemence Mramba, advisor MEM

Hosea Anael Mbise, participant in Policy Review Committee delegation to Norway

Mona Wahlen, Resident Programme Coordinator – Ministry of Energy & Minerals, Tanzania Oil for Development.

Marisa, Stanley Gilbert Mkwanda, participant in Policy Review Committee delegation to Norway

Mwanahamisi Mcheni Hassan participant in Policy Review Committee delegation to Norway

TPDC

Flora Marealle, Head of Human Resources

Kapulya Musomba, Project manager pipeline project

Mgaya, Bahati Tweve, participant in Policy Review Committee delegation to Norway

Danstan Msanga Mwaitafu, participant in Policy Review Committee delegation to Norway

Ministry of Education and Vocational Education and training

Thomas Dickson Katebalirwe, Director Technical and Vocational education and training

Pitalis Nathan Ambogo, Assistant Director, Vocational Education and Training

Dr. Steven Jonathan, Assistant Director, Higher Education

NACTE

Mr Manyaga, Quality Assurance Unit

President's Office Planning Commission

Nicholas Mbwaji, Consultant to PO-PC study on skills
Omari Athumani, engineer PO-PC

COSTECH

Dr. Gerald Kafuruku, Advisor
Andrew Mwaza, Advisor

OSHA

Dr Kayumba, Chief Executive of OSHA
Alex Nguli, Advisor
Dr AA Omar, Advisor
Benjamin Kisungwe, Advisor

NEMC

Dr. Robert Ntakamulenga, Director, Director of Environmental Compliance and Enforcement
Dr. Fadhila H.A. Khatibu, Ag. Director, Environmental Planning and Research
Simba- development and management officer
Rose Salema- involved in the oil for development project

VETA

Kibendera, Director for Labour Market Planning and Development Department
Rehema, VETA Head office, in charge of curriculum development
Lear Dotta, Coordinator of petroleum, VETA
Leonard Mley Malisa, Head of VETA Lindi
Kibehele, JM., Head of VETA Mtwara

Institution of Engineers Tanzania

Eng Kassera, Director

University of Dar es Salaam

Prof. Cuthbert Z. M. Kimambo, Principal, College of Engineering and Technology
Ambrose Itika, Head of Chemical and Mining Engineering
Shukrani Many Head of Geology Department
Quintino A Mgami, Ag Head Chemistry Department
Enok Masanji, Senior Lecturer

University of Dodoma

Professor Ntalikwa

Nelson Mandela Institute

Professor Mwamila
Professor Madundo Mtambo

USAID

Laura Kikuli, Education, Head of Development Partners Group on Education

World Bank

David Symington, Energy
Kaboko Kahiga, Education
Michael Hackenbruch, Urbanpol, consultant to World Bank on an education study

DFID

Annabel Charnock, advisor

EU

Peter Cameron, consultant for education study

Statoil Tanzania

Erik Holtar, Manager of technology and local content
Juliet Mboneko, Sustainability advisor

BG Tanzania

Kate Sullam, Social Performance Manager

Pan African Energy Tanzania Limited

Dave Roberts, Managing Director
Caroline Mawalla, HR person

Maure et Prom

Christopher Maitre, General Manager (Tanzania/Namibia)

Petrobras Tanzania Limited

Manuel do Silva, Managing Director

Heitor Garcia, Operations Manager

Swala Energy

Dr. David Mestres Ridge, CEO and Managing Director

Baker Hughes

Graham Hibbin, Country Manager, Tanzania

Schlumberger

Lilian Colman, Personnel Representative Tanzania

Halliburton

Janet Igoli, HR representative

Norplan Tanzania

Eng. Musa A. Nyamsingwa, Director, Infrastructure Division

Wentworth Resources

Baraka Nsemwa, HR representative

Norad

Anne Wetlesen, Senior Advisor, Higher Education

Svein Olav Svoldal, Advisor, Private sector Development

Helge Brochmann, Senior Advisor, Education

Silje Vevatne, Advisor, Education

Petrad

Bengt Hope, Assistant Director

INTSOK

Gulbrand Wangen, Regional Director Brazil, India and Africa

University of Oslo

Henning Dypvik, Professor, Department of Geology

NTNU

Jon Kleppe, Professor, Head of Department of Petroleum Engineering and Applied Geophysics, Norwegian Technical University (NTNU)

Egil Tjøland, Professor in Petroleum Engineering and Applied Geophysics, Norwegian Technical University (NTNU)

Annex 3: General observations on gas, markets and uncertainties

There are a number of general observations that condition the activity levels and need to be taken into account as surrounding factors. Gas is much more challenging than oil. In what ways gas is different than oil:

- Has no global price, like oil, but LNG has several markets with greatly varying prices – increasingly competing with spot markets, which depend on gap between supply and demand globally/regionally and locally for new sales – previous model of linking to oil prices is becoming less popular (and sustainable) for buyers
- Shale gas has upset the price map (USA \$4 to Japan \$15.00)
- Uncertainty on gas pricing – Japan prices, that the Tanzanian producers are aiming for, could well come down, with intense competition from new LNG in US, Canada, Australia, Mozambique, Russia and others.
- Large investments in LNG in addition to price uncertainty
- Fear of entering long term contracts in an unstable market
- Long transportation routes locally also increases development cost (especially if pipelines are chosen)
- Thin population raises cost of delivery for family consumption beyond reasonable/realistic level
- Investors need government commitment to mitigate instability in demand or in income – assurance that the plans are realistic and sustainable for all parts of value chain
- Citizens are affected as users and as inhabitants. Dialogue is essential. Replacing oil should also be considered from a national perspective

Moreover, there are some external factors that have to be taken into account for government and the industry in future decisions:

- The framework conditions and clarity regarding upstream activities have still to be settled from the government (in the new gas policy)
- On domestic market potential: Clarity and realism in the plans to develop a domestic market for the gas is needed:
 - Who is going to invest? The policy suggests that a national gas company is to be established. Will it have enough capital?
 - What is the realistic envisaged domestic market (i.e. electricity, transport, industry, services, households – what were the price assumptions in the government scenarios)? The potential of a domestic market- what kind of market and what volume? Price volatility and global market factors need to be captured in analysis. Market analysts need to analyse this. Tanzania might consider Chinese to give on the job training in assessing domestic markets.
 - LPG is talked about in the gas policy- but what does this imply in practice? Will there be LPG from the fields, or is this based on imports?
 - How much is to be invested in pipelines and have other logistical solutions, such as LNG or CNG been considered?
- How can gas contribute to Tanzania?
 - Export revenues – (the Norwegian model) – depend on competition and pricing, distance to markets and costs. Low or no profit is a possibility, due to lower prices, which implies limited proceeds for the Tanzanian state.
 - Gas for own use– in order to meet energy for all, cleaner energy than coal and oil and charcoal, but will it be cheap enough? It could improve Tanzania's foreign trade balance in terms of reducing dependency on importing oil, but gas infrastructure has to be built. There are, moreover, financial risks involved for Tanzania in investing in infrastructure (both LNG and pipelines).
 - What is plan B if the domestic and/or international markets do not develop in the current positive scenarios outlined by companies and government?

End notes

² Other studies that the TOR anticipated to having been finalised by the time this study was to be conducted, were not finalised. For instance, the TOR anticipated that a gap analysis by the World Bank was to be ready, but this study has been postponed.

³ Working with the S, L and E-issues requires a collaborative design involving external consultants like our group working closely together with a team of carefully selected Tanzanians. The Tanzanians might come from both ministries, institutions of higher education, training and research, civil society and business. The points of view intended as proposals for point of departure to look into S, L and E levels of skills needed are accumulated in a shadow document.

⁴ Downstream and midstream activities highlighted in the gas policy include: promoting production of natural gas based liquefied petroleum gas (LPG), Liquefied natural gas (LNG) and natural gas liquids (NGL). Moreover, the policy focuses on establishment of commercial parks and separate plants to use the gas, such as fertilizer plants, ammoniac plants, etc. Other government policies mention fertilizer plants.

⁵ There is no one solution for what constitutes an effective local content policy (World Bank, 2013). Too strict local content policies may discourage investor and impede development of the sector (Warner, 2012a, 2012b). For instance, a local content policy for Tanzania requesting for a certain percentage of the labour force to be Tanzanians might not be feasible due to the low skills level and lack of people with exposure to the industry.

6 The pillars of the vision are: 'peace, stability and unity; good governance; a well-educated and learning society; and a sustaining, strong, diversified, resilient and competitive economy capable of producing sustainable growth and shared benefits'.

7 The main bodies for coordination of the education sector are the 'Inter-Ministerial Steering Committee (IMSC), the Joint Education Sector and Thematic Area Working Group (JESTWG), Government Education Sector and Thematic Area Working Group(GESTWG);Ministerial Development Committees: (Education Sector Development Committee (ESDC) and Folk Education Development Committee (FEDC), Sub- Sector Task Force; and Sub-Sector Technical Working Groups (EDDPG, 2013).

8 The coordinating committee consists of the Commissioner for Labour, MoLE; Director of Policy and Planning, MCDGC; Commissioner for Local Government PMO-RALG; Director of Policy and Planning, MOEVT; Director of Science and Technology, MCT; Director of Policy and Planning, PO-PC; Executive Secretary of NACTE; Director General of VETA; representatives of the Development Partners (URT, 2013b: 31).

9 Petrobras in Brazil offers an interesting example as to how education and training was developed. Petrobras established an internal corporate university called SENAI with their own teachers. They hired people from the universities. This was training after the discovery. In the early beginning, most people came from abroad. 2% of total revenue was spent on training. The percentage now has not been confirmed. Petrobras has sent two Tanzanian drilling engineers to SENAI in Brazil and for working on the rigs there.

¹⁰ The industry has hardly any skills requirement in connection with the drafting of frame conditions but it may be called upon to comment on the draft policy and related processes by government before enactment. From licensing onwards, industry may have two distinct skills requirements; operator oriented and supply oriented. When it comes to requirements for performing operative tasks in the *upstream* the industry will continue to perform operations and will within their ranks requires all types and levels of skills in exploration, development, production, decommissioning etc. Their requirements will obviously include vocational skills, which they may partly cater for themselves but can be persuaded through legislation or contracts to contribute to a national programme or through local content policies. The appraisal and development stage of an LNG project will mostly be done by staff at the headquarters of the companies and some international staff in the country and only some support staff from the country will be hired.

Norad

Norwegian Agency for Development Cooperation

Postal address:

P.O. Box 8034 Dep, NO-0030 OSLO

Office address:

Ruseløkkveien 26, Oslo, Norway

Tel: +47 23 98 00 00

Fax: +47 23 98 00 99

postmottak@norad.no

www.norad.no

