

Community Perceptions and Experiences on the Use of Oil and Gas in Tanzania Mainland: A Triangulation Method Study

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Abstract

This paper employed a cross-sectional mixed design to explore community perceptions and experiences on the use of oil and gas through triangulation methods. Quantitative and qualitative research designs were adopted for data collection and analysis. The quantitative data collection strand comprised 403 individual respondents, while the qualitative part involved 8 focus group discussions. Village mapping was also undertaken to describe the community-level energy network and identify potential stakeholders. The paper applied the logistic regression model to convert response averages of selected impacts and contributions that reflect perceptions of oil and gas in the community. On the other hand, the study used a qualitative technique for theme identification. The results suggest positive perceptions of respondents about the use of oil and gas. Specifically, sex, highest level of education, average expenditure per day, and region and government initiatives predicted peoples' perceptions of continuous supply of electricity, conservation of the environment, and suitability on domestic use. Factors identified to be associated with contribution to employment and social infrastructure include sex, age, highest level of education, region, government enforcement of openness, and people's attendance of village meetings. It is recommended that efforts be devoted to providing people with adequate and relevant information that will equip them with knowledge about oil and gas. and thus empower them to manage uses of modern energy.

Keywords: *perceptions, oil, gas, mixed approach, Mtwara and Pwani*

1. Introduction

Tanzania is among third world countries with various potential natural reserves, including natural gas. Natural gas reserves were first discovered in two regions, namely, Mtwara and Lindi, in Southern Tanzania. The first discovery was in 1974 at Songo Songo Island in Lindi near the mouth of Rufiji River; and later in 1982 at Mnazi Bay (Roe, 2016). The production of the natural gas for domestic consumptions started in 2004 (Anyimadu, 2016; Mawasiliano, 2013; Pedersen & Bofin, 2015). New discoveries of several new gas reserves between 2009 and 2012 have put the country's natural gas reserves between 46TCF and 55TCF. These

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discoveries of natural gas reserves caused high optimism and expectations among the political leaders surrounding Mnazi Bay. Public speeches by the retired President Kikwete announced new hopes after decades of economic marginalization of the people of Mtwara. They expected access to uninterrupted electricity, factories, paved asphalt roads, dependable transport infrastructure, hospitals, schools, hotels and plentiful jobs for the youth, and ultimately sustainable poverty reduction (Ndimbwa, 2014).

The current Tanzania's president, Dr. John Magufuli, has also propagated the government's commitment to the gas project, including the proposed mega LNG processing plant in Lindi, an industrial park to promote industrial development and the country's Vision 2025 goals (Jacob & Pedersen, 2018). Thus, recent discoveries have radically changed the future aspirations of the government, multinational companies, local communities and citizens and the revenue from natural gas following recent discoveries that are expected to increase the country's wealth (Choumert-Nkolo, 2018). Economic, social and political development can easily be realized in a nation rich in natural gas if effectively harnessed (Bishoge et al, 2018). While the government expects to increase revenues and decrease its dependency on expensive imported diesel and use of unreliable hydro source; on the other hand the citizens expect their living standards to improve due to an increased access to oil and gas, anticipated low energy prices, and prospects of getting employment (URT, 2017). This was envisaged in the 'Big Results Now' programme, where it is clearly stated that electricity will be provided to five million more Tanzanians.

While the expectations of the government and the citizens rise with the continual discoveries of new gas reserves (Tumusiime et al., 2016), likewise multinational companies expect high returns from capital invested in oil and gas. While the Tanzanian government and multinational companies continue with exploration, production, processing and marketing, Collie and Hoeffler (2004) indicated that despite the abundance of natural resources in Tanzania, the majority of the people still live in hopeless poverty, while a few elites enjoyed the benefits of these resources. They also pointed out that local stakeholders are in the dark regarding future expectations from these natural resources. For example, citizen strikes were recorded in Mtwara region, whereby people advanced that the region had been marginalized in the gains arising from the natural gas discoveries (Ahearne & Childs, 2018). Although Ahearne & Childs' (ibid.) study uses mixed methods of data collection and alludes to perceptions, it emphasizes on the supposedly divisive element in the society, and the whole discussion is mainly on issues of resource politics and citizen in Tanzania. The study highly dramatizes the conflicts in the period 2012 and 2013 during the extraction of gas in Mtwara region.

Potterf et al. (2014) carried out a study designed to capture the perceptions of local community leaders on the exploration and development of oil and gas industry, and

the implications on community well-being. Through interviews with key informants they were able to establish that serious sustained communication and engagement between the oil and gas industry and the community was the exception rather than the rule. Consequently, they recommended the intensification of communication efforts since it is interaction that affects people's perceptions of the industry.

It is important to explore community and individual perceptions to understand social and economic processes resulting from rapid-growth of energy and boomtown communities. Several scholars argue that the sustainability of natural resources like natural gas, community awareness, and a sense of ownership by community is essential (Brasier, 2011; Greider and Krannich, 1985, Bishoge, 2019). The fact that Tanzania is still in its infancy in the exploitation of its potential reserves of oil and gas, we believe that a focused baseline study is required to inform appropriate interventions for sustainable engagement and advocacy to the local community. Thus, this study aims to investigate community perceptions on the access and use of energy in their daily lives, establishing what they think will be the impact of the use of oil and gas in their community, and the extent to which they are involved in decision-making on community issues, particularly those related to the use of oil and gas.

2. Methodology

2.1 Study Design

Several researchers use mixed methods designs in diverse field to corroborate findings through triangulation of data to minimize bias associated with superior methods (Onwuegbuzie & Leech, 2006); complement results to enhance findings in a wide scope (Onwuegbuzie & Collins, 2017); develop methods or research agenda; initiate new perspectives and contradictions to establish existing paradoxes; and expand scope of an investigation (Collins, 2010). Creswell (2015) presented convergent design that combine quantitative and qualitative data and results to provide in-depth personal perspectives of individuals. As a result, a cross-sectional mixed design was used to triangulate quantitative and qualitative methods, data and results, aiming to gather information about people's views and perceptions of the oil and gas industry in the region; and the associated costs and benefits to the community.

Quantitative data was collected using semi-structured interviews, complemented by qualitative data collected using focus group discussions (FGDs). A village mapping exercise was initially conducted to disclose a wide range of perceptions and experiences from different people. Figure 1 is a schematic representation of the research process.

Interviews were conducted to individuals (male/female), while FGDs were conducted with community groups, which included health workers, teachers, and local government leaders.

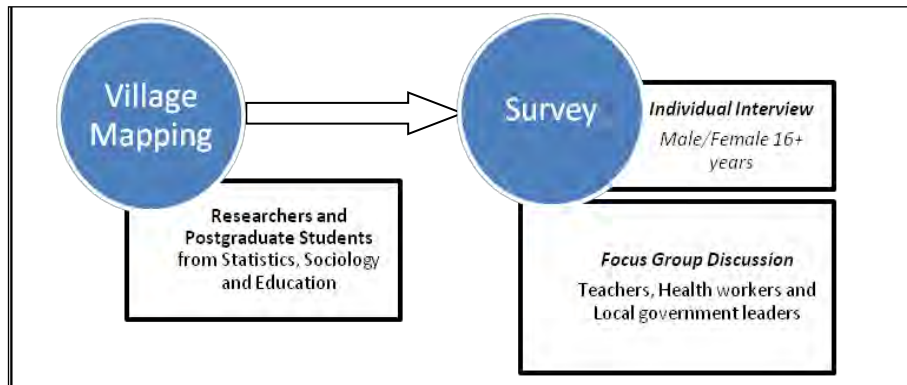


Figure 1: The Research Process

2.2 Sampling

A sample design was developed to obtain representation by gender and residential status. A four-stage sampling design was used. At the first stage, two regions -- Mtwara and Pwani -- were chosen purposively. Mtwara region is located in the southernmost region where natural gas has been discovered and operated. The regions bordering Mtwara region are Lindi region to the north, and Ruvuma region to the west. It also shares a border with the Indian Ocean to the east, and is separated by the Ruvuma river from Mozambique in the south. The operations of natural gas in the region brings high expectations to communities in terms of availability of low-cost power for domestic use, stimulate local industries, and offer employment opportunities to the local people. In contrast, the Pwani region, with neither gas nor oil, was selected as a control region. In the second stage, two districts -- Kibaha Town Council and Kibaha District Council -- and one district -- Mtwara Municipality, known as Mikindani, were selected. At the third stage, two enumeration areas from urban settings and two villages from rural settings were sampled. Random selection of twenty-five households from each sampled village or enumeration area constituted the fourth, and final stage of sampling. In total, 403 respondents -- both male and female -- were interviewed for this study.

Fieldwork administration was undertaken by postgraduate students and academic staff from the Departments of Statistics, Education, and Sociology of the University of Dar es Salaam, Tanzania. These research assistants started their activities by identifying community-level dimensions, and describing the energy network through village mapping. Ten (10) such village maps were produced and used. As a result of the random selection procedure, users and non-users of gas and oil were interviewed. More importantly, gender, diverse lived and/or professional experiences were considered to capture the envisaged

different perspectives. The quantitative strand comprised data from interviews of a sample of 403 people living in Mtwara and Pwani regions, while the qualitative part consisted of responses recorded during 8 FGDs conducted with community groups.

2.3 Data Collection

To triangulate quantitative and qualitative methods, face-to-face interviews and FGDs were adopted, based on semi-structured interviews. Data were collected between 21 and 31 August 2017 using face-to-face interviews at the household level and FGDs. Participants in these FGDs were teachers, health workers, and village government leaders. Teachers gathered at a nearby village school; health workers convened in a nearby health facility; and village leaders assembled in a village government office.

3. Results and Discussion

3.1 Descriptive Aspects of the Sample

Table 1 presents characteristics of 403 respondents, of whom 207 were from Pwani region; and 196 were from Mtwara region. This means that roughly the same number of respondents was interviewed from each region as initially planned. As regards residence, 51.12% of the interviewed respondents lived in rural areas, whereas 48.88% lived in urban settings. Considering that slightly more than 30% of the Tanzanian population lives in urban areas, the urban settings in this study are over-sampled. However, since no precise estimates were to be made, this finding should not cause any particular alarm.

Table 1: Some Selected Background Characteristics

Characteristics	Pwani <i>n (%)</i>	Mtwara <i>n (%)</i>	Total <i>n (%)</i>
Sex			
Female	110 (53.14%)	97 (49.49%)	207 (51.36%)
Male	97 (46.86%)	99 (50.51%)	196 (48.64%)
Total	207 (100%)	196 (100%)	403 (100%)
Age group			
16-35	77 (37.2%)	99 (50.51%)	176 (43.67%)
36-55	72 (34.78%)	70 (35.71%)	142 (35.24%)
56+	58 (28.02%)	27 (13.78%)	85 (21.09%)
Total	207 (100%)	196 (100%)	403 (100%)
Highest level of education			
No formal	35 (16.91%)	39 (19.9%)	74 (18.36%)
Primary/Elementary	125 (60.39%)	112 (57.14%)	237 (58.81%)
Over primary	47 (22.71%)	45 (22.96%)	92 (22.83%)
Total	207 (100%)	196 (100%)	403 (100%)
Residence			
Rural	109 (52.66%)	97 (49.49%)	206 (51.12%)
Urban	98 (47.34%)	99 (50.51%)	197 (48.88%)
Total	207 (100%)	196 (100%)	403 (100%)

Source: Extracted from fieldwork data

Results on sex record that 51.36% females, and 48.64% males were interviewed in this study. This departs slightly from the planned equal percentage of 50% of each sex. Actual fieldwork circumstances of getting respondents were the cause of this discrepancy. Age distribution captured in this study indicates that 43.67% were of ages 16–35, 35.24% were of ages 36–55, and 21.09% were of ages 56 and above. Youths, therefore, seem to be preponderant in this study. Finally, more than 80% of the respondents had at least a primary level of education. Interestingly enough, there seems to be only a very slight difference in the recorded level of education above primary level between the two regions of Pwani and Mtwara. This is perhaps a good indication that the country’s policy of providing at least primary education is well-implemented.

3.2 Socio-economic Factors

Based on the popularly used notion that a household with a daily expenditure of less than US\$2 (equivalent to roughly TZS4,600) should be regarded as poor (World Bank, 2015), most of the households covered were poor. US\$2 is considered to be on the high side for the areas covered in this study. Figure 2 presents the percentages of households by average daily expenditure groups for Pwani and Mtwara regions. Generally, Mtwara region households seem to be better-off than those in Pwani region. Roughly, more than 39% of the households in Mtwara region have an average daily expenditure of above TZS3,000, as compared to approximately 35% of the households in Pwani region. These results agree with those of the Tanzania Mainland 2017-18 Household Budget Survey, where the poverty incidence was higher in Mtwara region (29.1%), compared to 27.9% in Pwani region (NBS, 2019).

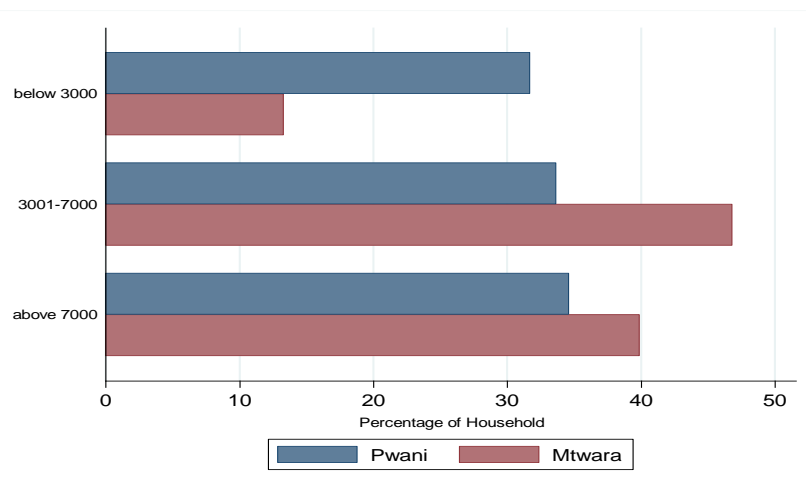


Figure 2: Percentage of the Households by Average Daily Expenditure for Pwani and Mtwara Regions

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As regards the priorities of day-to-day spending, the results showed that a significant majority (more than 75% in both regions) of the households had expenditure on basic needs as the number one priority, far followed by social services and energy (less than 15%) (Figure 3). This, indeed, reflects the low economic status of the households at which focus is simply on basic survival.

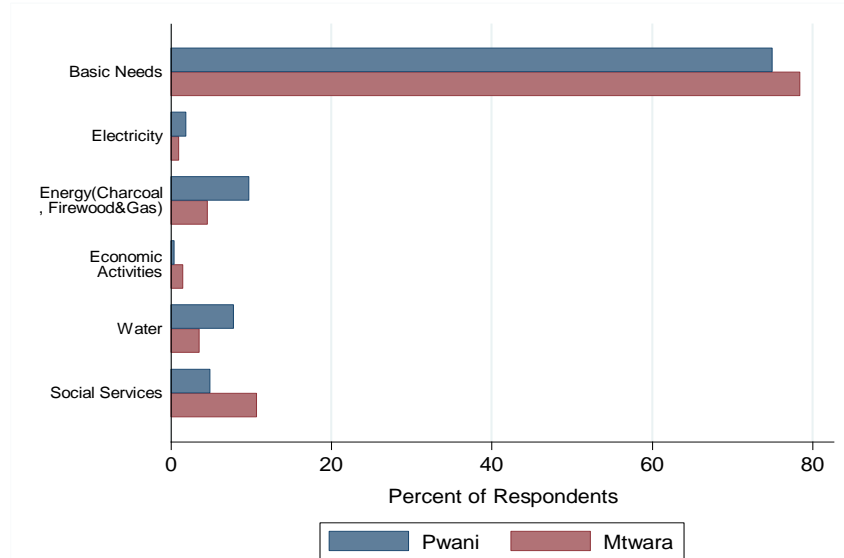


Figure 3: Percentage of the Households by Priorities in Daily Expenditure

3.3 Access and Energy use

3.3.1 Quantitative Data Findings

To solicit for information on household energy use, the field questionnaire posed multiple response questions: *What types of energy does your household use?* Table 2 presents the sources of the energy used in households by region and residential settings.

Table 2: Households' Sources of Energy by Region and Residential Settings

Sources of Energy	Pwani		Mtwara	
	Rural	Urban	Rural	Urban
Firewood	91 (33.83%)	35 (12.68%)	84 (32.94%)	17 (6.49%)
Charcoal	62 (23.05%)	91 (32.97%)	61 (23.92%)	94 (35.88%)
Kerosene	75 (27.88%)	31 (11.23%)	33 (12.94%)	31 (11.83%)
Gas	8 (2.97%)	34 (12.32%)	9 (3.53%)	35 (13.36%)
Electricity	17 (6.32%)	79 (28.62%)	58 (22.75%)	83 (31.68%)
Coal	2 (0.74%)	3 (1.09%)	2 (0.78%)	0 (0%)
Saw dust	0 (0%)	1 (0.36%)	0 (0%)	2 (0.76%)
Solar energy	14 (5.2%)	2 (0.72%)	8 (3.14%)	0 (0%)
Total	269 (100%)	276 (100%)	269 (100%)	262 (100%)

Source: Extracted and computed from fieldwork data

It is noted from the findings that charcoal is the most important source of energy in urban settings, closely followed by electricity. In the rural setting, on the other hand, firewood is the main source of energy, followed by charcoal. Kerosene also seems to be an important source of energy that is used mainly for lighting in rural settings. Mtwara rural households record a much higher percentage use of electricity than households in Pwani rural. This is mostly because the campaign of Tanzania rural electrification has reached more households in Mtwara region than in Pwani region. The same findings were also reported by Kaale (2005), Schlag and Zuzarte (2008), and NBS (2012, 2019): that a significant percent of households use charcoal in urban settings compared to rural settings that rely more on firewood.

Additional elaboration on energy use was through a multiple choice question: *What type of energy does your household use most of the time?* Table 3 presents the findings on this question.

Table 3: Type of Energy Used by Household Most of the Time

Region	Firewood	Charcoal	Kerosene	Gas	Electricity	Others	Total
Pwani	85 (41.06%)	92 (44.44%)	8 (3.88%)	17 (8.21%)	4 (1.93%)	1 (0.48%)	207
Mtwara	64 (32.65%)	106 (54.08%)	3 (1.53%)	10 (5.1%)	13 (6.65%)	0 (0%)	196
Total	149 (36.97%)	198 (49.13%)	11 (2.73%)	27 (6.7%)	17 (4.22%)	1 (0.25%)	403

Source: Extracted and computed from fieldwork data

It is clear from the findings that firewood and charcoal are used most of the time in both Mtwara and Pwani regions. However, some new information is also noted: Pwani region uses firewood more often than Mtwara region; whereas Mtwara region uses charcoal more often than Pwani region.

Incidentally, the results on the proposition that “*A switch from wood fuel (charcoal, firewood and saw-dust) to gas for cooking should be facilitated steadily for providing sustainable improvements for household cooking systems*” shows only a slight difference across regions. Whereas 88% of the respondents in Pwani region agreed with the proposition, also 86% of the respondents in Mtwara agreed. This means that people are eager and willing to change from the traditional sources of cooking energy to modern sources of cooking energy. This is similar to findings obtained by Nansior et al. (2011).

3.3.2 Qualitative Data Findings

FGDs in Mtwara and Pwani regions generated qualitative information from participants who freely expressed their opinions and experiences on the guideline question: *What is your experience of energy use within your community?*

The key phrases and words of on the discussions of this question are as given below:

Experiences depend on uses of energy. Gas, Charcoal and firewood are used for cooking, but the majority use charcoal and firewood. Kerosene, solar and electricity are used for lighting. Currently, motorcycles serve as local means of transport which use petrol. At the health facility level, gas and/or electricity is used for refrigeration.

Moreover, it was recorded in the discussions in Pwani region that saw-dust is also used for cooking chips in certain kiosks/restaurants. From this information, it may be reasonably concluded that there is no difference in energy use experiences across the regions of Mtwara and Pwani.

Again, in pursuit of elaborating information on energy use, other questions in the discussion guidelines were: *Why do you use those types of energy? Are they easy to use? Are there any challenges?*

The dominant ideas and opinions that emerged in Mtwara region FGDs on these questions are as follows:

Charcoal and firewood are reliable and straightforward to use, whereas gas and electricity are not reliable. The unreliable supply of electricity, frequent electrical outage damages appliances. Gas is easy to use, but is very expensive. However, the use of firewood and charcoal are not healthy and not environmental friendly; while gas is risky when it is not carefully used, and is especially difficult to use when you have children. There are government restrictions on obtaining charcoal and firewood to avoid deforestation and climate change.

In Pwani FGDs, the dominant ideas and opinions were:

Charcoal and firewood are the main sources available within the community and are easy to use. Gas is easy to use but is very expensive. In rural settings, gas is obtained from a distance of 5-10km, and it is required to pay for transport cost. Sometimes there are delays in obtaining it. No relevant knowledge on use of gas, which makes its use risky to families. Use of firewood and charcoal is not healthy and environmental unfriendly. There is electricity outage. Other than firewood and charcoal, the remaining energy sources are too expensive. Rented houses are a challenge when it comes to sharing electricity bills. Maintenance of solar power equipment is challenging with respect to the availability of experts and expensive spare parts.

In summary, findings from both regions indicate that charcoal and firewood are the primary sources of energy for cooking due to the availability of resources and affordability. Furthermore, the FGDs agreed that these sources are neither health-preserving nor environmentally-friendly, and that knowledge needs to be given for the use of gas.

3.3.3 Synthesis of the Quantitative and Qualitative Findings

The triangulation method of study show that the outcomes of the findings actually converged. Both quantitative and qualitative data findings indicate that firewood and charcoal are mostly used as energy sources, and that there is no visible difference in energy use experiences across the regions of Mtwara and Pwani.

3.4 Communication and Information

A number of questions were asked to elicit how the community were informed about oil and gas activities. Overall, the findings, as presented in Table 4, indicate that efforts need to be done to make people more informed on what is happening in the oil and gas activities, i.e., make them active participants in the desired

transformation. It is surprising, for example, to note that even though Mtwara is a leading region in the production of gas, most of the respondents in that region still believe that the government has not already started to take steps to enforce openness in development.

Table 4: Frequency and Percentage of Respondents on Steps Taken by the Government to Enforce Openness

The Government has already started to take steps to enforce openness in development	Pwani			Mtwara		
	Rural	Urban	Total	Rural	Urban	Total
Yes	54 (46.15%)	63 (53.85%)	117 (56.52%)	49 (50.52%)	48 (49.48%)	97 (49.49%)
No	55 (61.11%)	35 (38.89%)	90 (43.48%)	48 (48.48%)	51 (51.52%)	99 (50.51%)
Total	109	98	207	97	99	196

Meetings are usually good sources of information on several issues since they give ample opportunities to people to air their views on various issues of concern. Table 5 presents findings on the frequency and percentage of respondents who attended the last village/community/ government meeting. Again, most respondents in Mtwara region had not participated in previous village/community/government meeting.

Table 5: Frequency and Percentage of Respondents Attended the Last Village/Community Government Meeting

Attended the last village meeting	Pwani			Mtwara		
	Rural	Urban	TOTAL	Rural	Urban	TOTAL
Yes	59 (63.44%)	34 (36.56%)	93 (44.93%)	27 (44.26%)	34 (55.74%)	61 (31.12%)
No	50 (43.86%)	64 (56.14%)	114 (55.07%)	70 (51.85%)	65 (48.15%)	135 (68.88%)
Total	109	98	207	97	98	195

Airing of views, either at a formal meeting or any other forum, enables a person to achieve a number of things. Most often, views are needed as feedback on specific issues that affect the community. Feedback is essential if legitimacy and ownership of decisions are to be achieved. In other cases, the airing of views builds up the confidence of a participant and provides an opportunity to know what other people think about a view being expressed. New ideas and alternative ways of doing things emerge from airing of views. Accordingly, it is highly advisable to people to air their views whenever an opportunity arises. Table 6 presents the frequency and percentage of respondents that have ever aired their views on development matters in Mtwara and Pwani regions. It is noted that only a few people (less than 40%), had aired their views on development matters of their area. This is disappointing

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because there could be good ideas/views out there that have not been aired. People need to be sensitized and encouraged to air their views on various issues, especially those related to their own development.

Table 6: Frequency and Percentage of Respondents Have Ever Aired Their Views on Development Matters of their Area

Have aired views on development	Pwani			Mtwara		
	Rural	Urban	TOTAL	Rural	Urban	TOTAL
Yes	45 (58.44%)	32 (41.56%)	77 (37.20%)	35 (47.95%)	38 (52.05%)	73 (37.44%)
No	64 (49.23%)	66 (50.77%)	130 (62.80%)	62 (50.82%)	60 (49.18%)	122 (62.56%)
Total	109	98	207	97	98	195

3.5 Impact and Contribution

3.5.1 Response Average (RAs)

Response averages for the perception statements are presented in Table 7. It is noted that all response averages (RAs) are greater than 3; implying that respondents agreed that oil and gas would bring both favourable impacts (*J1.1/J2.1 “gas provides a continuous supply of electricity;” J1.2/J2.2 “gas can help to prevent deforestation; thus, it conserves the environment;” and J1.3 /J2.2 “it is suitable for domestic use compared to charcoal or firewood”*); and contributions (*K1.1/K2.2 “provide employment opportunities;” and K1.2/K2.2 “provide social infrastructure”*) to the development of their communities. These results show that the respondent’s perceptions about the impact of oil and gas on the community are positive.

Table 7: Response Averages (RAs) for Selected Impact/Contribution Statements by Region

Region /Statement	Selected Favourable Impacts						Selected Positive Contributions			
	Oil			Gas			Oil		Gas	
	<i>J1.1</i>	<i>J1.2</i>	<i>J1.3</i>	<i>J2.1</i>	<i>J2.2</i>	<i>J2.3</i>	<i>K1.1</i>	<i>K1.2</i>	<i>K2.1</i>	<i>K2.2</i>
Pwani	3.47	3.57	3.48	3.69	3.93	3.89	4.15	4.18	4.12	4.14
Mtwara	3.50	3.64	3.50	3.99	3.81	3.74	4.10	4.04	4.11	4.03

3.5.2 Logistic Regression Findings

Tables 8 and 9 present the binary logistic results of the selected impact statements of oil and gas on an individual, and of the selected contribution of oil and gas to the community, respectively.

Based on the 5% level of significance, the findings in Table 8 reveal that males, individuals with primary education, and those living in Mtwara region are 1.955, 2.452, and 7.72 times more inclined to agree with the statement that oil provides a continuous supply of electricity. This is in contrast to female individuals with no formal education, and people living in Pwani region, respectively. Furthermore, it is

noted that the perceptions on the impact of the oil and gas sector in preventing deforestation differ significantly according to sex, education level, daily average expenditure, and attendance in village/community government meetings.

Table 8: Logistic Regression Results of Selected Impact of Oil and Gas on Demographic and Socio-demographic Characteristics

Variables	Categories	Oil			Gas		
		J1.1	J1.2	J1.3	J2.1	J2.2	J2.3
Sex	Female	1	1	1	1	1	1
	Male	1.955*	3.050*	0.747	3.134*	1.658*	0.629*
Age group	16-35	1	1	1	1	1	1
	36-55	1.329	0.848	0.839	1.047	0.802	0.784
	56+	0.978	0.989	0.810	0.548	0.655	0.716
Highest level of education	No formal	1	1	1	1	1	1
	Pr./Elementary	2.452*	2.108*	2.480*	0.801	1.185	2.503*
	Over primary	2.992	2.974*	3.476*	1.163	1.906	2.382*
Average expenditure per day /TZS	below 3000	1	1	1	1	1	1
	3001-7000	0.786	1.779	1.633	0.637	1.175	0.520
	above 7000	1.766	2.806*	2.253*	0.919	1.157	0.697
Region	Pwani	1	1	1	1	1	1
	Mtwara	7.720*	1.689	1.325	1.486	1.393	1.754*
Residence	Rural	1	1	1	1	1	1
	Urban	0.674	1.075	0.903	0.864	0.737	0.730
The Gvt. enforce openness in the energy sector	No	1	1	1	1	1	1
	Yes	1.418	1.109	1.817*	0.939	1.389	1.601*
Attended the last village/community government meeting	No	1	1	1	1	1	1
	Yes	1.188	0.530*	0.902	1.370	0.805	1.169
Constant		0.486	0.684	0.742	1.255	1.452	1.571

Note: * means significant at 5% level of significance

In particular, it is noted that individuals who had attended the last village/community/ government meeting had negative perceptions of the prevention of deforestation through the use of oil and gas. Specifically, those who had participated at the last village/community/government meeting were 0.530 times less inclined to disagree with the statement that “oil can help to prevent deforestation thus it conserves environment” compared to those who had not attended the meeting. This could be either because the issue of deforestation was not discussed at the meeting, or village/community government meetings have not been very effective in sensitizing individuals on the use of alternative energy sources to reduce deforestation. Still, on the same statement, it is noted that individuals with an average daily expenditure of over TZS7,000 are 2.806 more inclined to agree with the statement than individuals whose average daily expenditure is less than TZS3,000. This is not surprising because individuals with high income can afford alternative energy sources other than firewood and

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charcoal. Again, it is noted that education, average daily expenditure, and government openness, play a significant role in promoting the use of alternative energy sources.

As regards the gas sector, the findings show that males are 3.134 times more inclined to agree with the statement that “*gas provides a continuous supply of electricity*” than females. Again, males are 1.658 times more inclined to concur with the statement that “*gas can help to prevent deforestation; thus, it conserves the environment*” than females. Males, on the other hand, are 1.590 less inclined to agree with the statement that gas “*is suitable to use for domestic use compared to charcoal or firewood*” than females. In contrast, education, region, and government openness make individuals inclined to agree with the statement than individuals who do not believe so.

Findings presented in Table 9 indicate that the perceptions of the people on the oil sector contributing to employment opportunities in the study areas differ statistically and significantly according to the level of education, region, and their perception on government openness at the usual 5% level of significance.

Table 9: Logistic Regression Results of Selected Contributions of Oil and Gas on Demographic and Socio-Demographic Characteristics

Variable	Categories	Oil		Gas	
		K1.1	K1.2	K2.1	K2.2
Sex	Female	1	1	1	1
	Male	0.920	1.907*	1.130	1.574
Age group	16-35	1	1	1	1
	36-55	1.867	2.045*	1.309	0.946
	56+	1.310	1.356	1.572	1.237
Highest level of education	No formal education	1	1	1	1
	Primary/elementary education	1.254	1.096	1.660	2.164*
	Over primary education	3.109*	1.254	2.271	2.935*
Average expenditure per day / TZS	Below 3000	1	1	1	1
	3001-7000	0.876	0.902	1.407	0.925
	Above 7000	1.511	1.240	1.429	1.680
Region	Pwani	1	1	1	1
	Mtwara	1.783*	1.798	2.248*	2.069*
Residence	Rural	1	1	1	1
	Urban	1.662	1.249	1.546	0.782
The gov. enforce openness in the Energy Sector	No	1	1	1	1
	Yes	1.903*	2.136*	2.085*	1.644
Attended the last village/community government meeting	No	1	1	1	1
	Yes	1.492	1.911*	1.392	2.100*
	Constant	0.894	0.969	0.675	0.990

Note: * means significant at 5% level of significance

As regards infrastructure, individuals' perceptions differ statistically and significantly by sex, age group, government openness, and attendance of last village/community government meetings at the usual 5% level of significance. The perceptions on the contribution of the gas industry differ statistically significantly according to region and perception of government's openness. For social infrastructure, perceptions differ statistically significantly according to the level of education, region and attendance at the last village/community government meeting at the usual 5% level of significance.

Generally, people living in Mtwara region have higher expectations on the contribution of oil and gas sector in the provision of employment opportunities and infrastructure development. Other authors have also found that the discovery of oil and gas leads to economic growth, which in turn creates employment opportunities and improvement of social infrastructures to local communities (Nakkazzi, 2012; Nalubega, 2013; Potterf, 2014).

3.5.3 Qualitative Data Analysis

Information on the impact and contribution of oil and gas to the development of an individual and the community were solicited by posing follow-up questions to the main question *“Do you think the use of oil and gas is important in your community? Can you give examples for why you think it is ‘Yes’ or ‘No’?”*

This was followed by the questions: *“If yes, what might some of the benefits be? Do you think there might be people with a different point of view?”*

Analysis of the discussions on the followed questions produced the following findings:

Mtwara FGDs

Provision of employment for gas distributors and sellers, increase in student studying, simplifying cooking, quicker and protect natural resources. Oil and gas are better than using firewood and charcoal.

Pwani FGDs

Provide employment opportunities to gas supplies, gas is a reliable source, save time and money, preserve tree/forest conservation. Income, life-style and educations are among the benefits mentioned. Others disagree with the government restrictions on kerosene and firewood uses because most cannot afford to use oil and gas.

The gist of these findings is that people in both Mtwara and Pwani regions can identify various benefits, including employment opportunities, increase in study time, and improvement of the general lifestyle.

Another question that was posed with special reference to the community was: *“Do you think the life in the community might change through access to oil and gas?”*

Responses to this question revealed the following:

Mtwara FGDs

Life-style has to a small extent changed infrastructure but no innovation to other structures. Currently, villagers have access to energy sources regarding light, an increase in income and employment opportunities. Expected that much could be done if the majority could be empowered to access gas and oil, plus securing opportunities from these discoveries.

Pwani FGDs

Electricity brought several innovations like pubs, chips, the presence of bars and other economic activities. Currently, business centres increased, provide employment opportunities, life-style changed, people stay long hours for economic activities and access to mass media. Changes are in slow motion because of a low level of education to secure available opportunities.

Generally speaking, the people are aware and appreciative of the changes taking place in the community and, indeed, expect more positive changes.

3.5.4 Synthesis of the Quantitative and Qualitative Findings

Again, the quantitative and qualitative findings converged based on the impact and contribution of oil and gas on both the individual and the community. Both quantitative and qualitative data findings indicate that there are opportunities for employment, and that social infrastructure is improving.

4. Conclusion

This study had four specific objectives, and all have been investigated. For objective one, it has been determined that firewood and charcoal are mostly used as energy sources, and that there is no appreciable difference in energy use experiences across the regions of Mtwara and Pwani. Furthermore, it has been established that other sources of energy are expensive and are, therefore, not easily accessible to most people, especially those in rural areas. Lokina and Mapunda (2015), Mensah and Adu (2013), and the World Bank (2003) pointed out several reasons for households using multiple sources of energy, and concluded that households might choose a combination of fuels based on their budget, preference and needs.

As regards objective two, it has been established that people think that oil and gas provide a continuous supply of electricity; and can help prevent deforestation and thus conserve the environment; and that oil and gas are suitable for domestic uses compared to charcoal or firewood. On objective three, the assessment of peoples' perceptions is that oil and gas will provide opportunities for employment and improve social infrastructure in their communities. Finally, regarding objective four, the findings show that very few people are informed about and involved in the whole process of exploiting gas and oil in the region. For example, the findings show that most of the respondents in both Mtwara and Pwani regions still believe that the government has not already started to enforce openness in the development process through their village meetings. Findings indicate that most respondents in both regions had not attended the last village/community/government meeting; thus they have had no avenues to air their views on development matters of their areas, including gas and oil.

During FDGs, a number of issues that are of great concern to the people were raised. The issue of education or lack of knowledge was mentioned several times. Respondents referred to the lack of relevant knowledge on the use of gas, which makes its use risky to families; low level of education to secure available opportunities, and the need for the government to provide education on the future impacts of modern energy use to the community. Other issues raised included the need to have energy sources available at nearby shops; ensuring reliable and reasonable subsidized prices; and a review of the seemingly low compensation rates of the land used for oil and gas infrastructure/activities.

5. Policy Implications

There is a need to improve the wellbeing of the people to empower them to manage uses of modern energy sources. This can be done by improving the remuneration of workers and by providing good prices for produce by farmers and the self-employed.

Also, there should be efforts to increase awareness on the use of modern energy to the community. Reasonably educated and well-informed people, as corroborated by the study findings, are likely to be more responsive to modern sources of energy than the uneducated and uninformed. Education about energy can be given through a number of channels including the radio, television, and the print media. Fliers and leaflets to grass-root areas might also be an effective means of providing knowledge to the people.

Among the key objectives of the government of Tanzania is to ensure the availability of sufficient, reliable and affordable modern energy for use in a rational and sustainable manner to support the economic and social development of her people. Accordingly, it has to ensure that this objective is closely pursued. Approaches for measuring accessibility and affordability need to be strengthened.

Also, there is a need to hold more frequent community meetings, and similarly to sensitize people to attend those meetings to discuss burning issues of mutual interest. Through participation in such community gathering, people can actively be engaged to participate in development initiatives by the government to achieve their needs.

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