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Original article

The socio-economic and environmental implications of oil and gas exploration: Perspectives at the micro level in the Albertine region of Uganda

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ABSTRACT

The recent oil and gas exploration activities in the Albertine region of western Uganda has raised a debate on the plight of the local people at various scales. We used local perspectives on the socio-economic and environmental impacts of oil and gas exploration activities as a lens to examine the extent to which the "resource curse" and "resource blessing" theories are applicable in the oil and gas exploration sites in Uganda. Data was collected from Kyeihoro and Kaiso villages in Hoima district, western Uganda. Exploratory research design in which a total of 285 households randomly selected participated in a survey. The most mentioned positive socio-economic impacts were not directly linked to oil and gas exploration and these included: construction of roads and increased business opportunities. Direct positive impacts such as employment and increased wage rates were the least mentioned. The views of proponents of the "resource curse" theory were also reflected in the perspectives and these included: price inflation, increase in social ills and environmental degradation especially noise pollution, soil erosion and wildlife disturbance. The perceptions of local people indicate that oil and gas exploration activities can be both a "blessing" or "curse".

1. Introduction

The literature on the impact of extractive industries on local livelihoods, economy and environment is still inconclusive (Gamu et al., 2015; Schrecker et al., 2018). Some authors have posited that extractive industries can lead to a scenario referred to as "resource blessing" (Ablo, 2015) by reducing poverty through creation of employment, promoting local businesses, income, infrastructure development and provision of public facilities such as health centres and schools through corporate social responsibility programmes, economic growth, better institutions and rapid economic growth (Dashwood, 2012; Aragón and Rud, 2013; Mawejje, 2018; Brunnschweiler and Bulte, 2008). This has however been challenged by other authors who contend that extractive industries can lead to negative impacts on natural ecosystems (Aniefiok et al., 2013), cause negative socio-economic impacts (Karl, 2007; Brake and Addo (2014); Boohene and Peprah (2011)) and ultimately lead to a phenomenon commonly known as " resource curse" (Auty, 2002). The symptoms of resource curse are, instability, corruption, low women participation in the labour market and wide income disparity (Ross, 2013; Gilberthorpe and Papyrakis, 2015; Sachs and Warner, 2001; Davis and Tilton, 2005; Ross, 2008).

In this paper, we interrogate the extent to which the "resource blessing" theory applies in the Albertine region of Uganda where commercially viable oil and gas deposits were confirmed in 2006. The proponents of this theory posit that the development of extractive industries is a "blessing" because it leads to increased economic benefits and stability to the local populations because of higher wages, additional incomes through new employment opportunities, profits emerging from industries supplying inputs to extractive activities and local procurement (O'Faircheallaigh, 2013). They also contend that extractives can be a catalyst to industrialisation (Roberts, 2015). On the contrary, critics argue that extractive industries are associated with poverty rather than rising incomes and they undermine the existing economic activities (O'Faircheallaigh, 2013; O'Faircheallaigh, 2013). They further suggest that extractive industries cause instability in employment, income inequality, housing shortages, food insecurity (Karl, 2007; Brake and Addo (2014); Ebegbulem et al., 2013; Boohene and Peprah, 2011; Brasier et al., 2011) and aggravate environmental degradation and conflicts (Gonzalez-Vicente, 2011; Karl, 2007).

We chose to examine the "resource blessing" and "resource curse"

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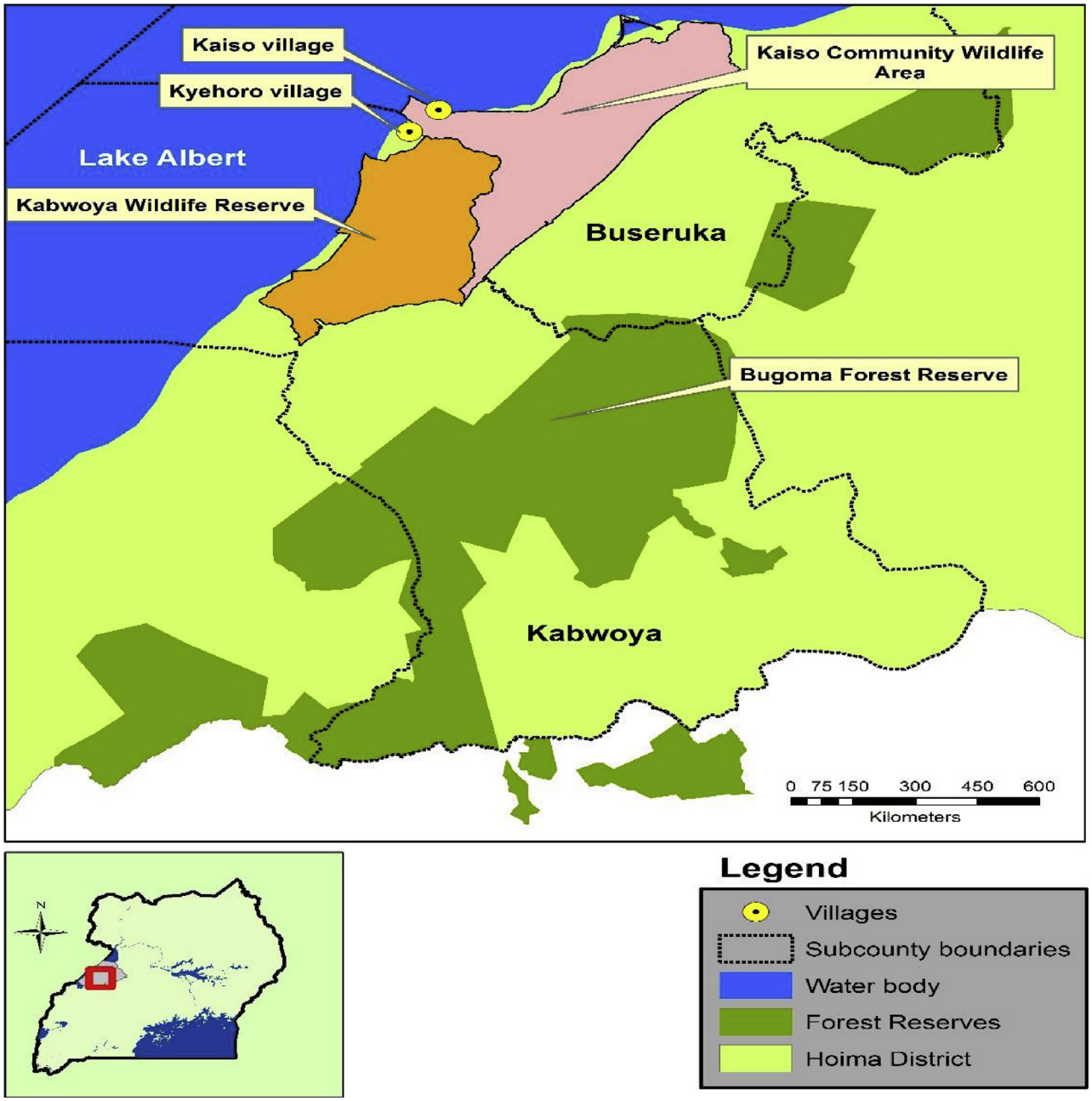

Fig. 1. Location of sites studied.

theories in assessing perspectives of the local communities in areas which had experienced oil and gas exploration activities in the Albertine region in Uganda.

This is because Uganda's policy and legal framework is premised on ensuring that the oil and gas sector leads to improved livelihoods, poverty eradication, protection of the environment and creating lasting value to society (GoU, 2008, 2013; GoU, 2018). More so, it is widely accepted as a good practice that extractive wealth should provide social and economic benefits to local people and promote equitable development (Desai and Jarvis, 2012; Roberts, 2015; Aragón and Rud, 2013).

We sought to determine the extent to which these aspirations have been achieved using the lens of local perspectives on the socio-economic and environmental impacts of the oil and gas exploration activities in two fishing villages in the Albertine region in Uganda where they have been implemented. We observe that most studies that have interrogated the "resource blessing" and "resource curse" theories have been done at macro-level focusing mainly at the midstream and downstream phases of extractives (Hajkowicz et al., 2011; Sachs and Warner, 2001; Gilberthorpe and Papyrakis, 2015; Alexeev and Conrad, 2009). The nuances in local perspectives during the exploration phase are not well-known (Brown, 2014) yet understanding the impacts at micro level is critical considering that local communities live in close proximity to extractives and therefore their perspectives are crucial in acquiring a social licence which is critical for successful implementation of subsequent phases of the oil and gas value chain (Prno and Slocombe, 2012).

The purpose of this paper is not to resolve the debate on the views of proponents and critics of the "resource blessing" and "resource curse" theories, but to provide perspectives of local people to enrich the debate and also determine the extent to which the aspirations of Uganda's policy and legal framework governing oil and gas have been achieved at a local scale where oil and gas exploration activities have so far been implemented. We applied exploratory design (Jaeger and Halliday,

1998; Nardi, 2018) because our focus was to get insights from local community perspectives and not to conduct any confirmatory studies on impacts of oil and gas exploration activities. We envisage that the insights acquired may be used to develop hypotheses to conduct confirmatory studies on the socio-economic and environmental impacts of oil and gas exploration activities at a local scale.

We acknowledge that other studies have been done in the Albertine region that are related to what we studied (e.g. Tumusiime et al., 2016; Kiiza et al., 2011). It is evident that these studies focused on documenting expectations of local people on oil and gas exploration activities. Other studies (Manyindo et al., 2014; Vokes, 2012) focused on understanding resource governance dynamics in the oil and gas sector at national and local level. There are a few studies that have attempted to understand the socio-economic impacts of oil and gas industry in the Albertine region (e.g. (Ogwang et al., 2018; Bybee and Johannes, 2014), but these only used qualitative tools and data collection was done before some other activities that can potentially affect local perceptions (e.g. construction of new roads, establishment of oil and gas waste management sites) were implemented yet studies elsewhere (Brasier et al., 2011) have shown that the stage of energy development define the perceptions of local people on impacts.

There are no studies in this region that we are aware of that used a combination of both quantitative and qualitative tools to be able to determine the perceptions of local people, formal and informal leaders on impacts of oil and gas industry at community and household level thus limiting their use to generalise for the entire population. The paper shows the extent to which socio-demographic and economic characteristics of the respondents influence perceptions on the impacts of oil and gas exploration activities. It also shows the extent to which oil and gas exploration phase is perceived as a blessing or curse at a local level thus contributing to the body of knowledge on the two theories ("resource blessing" and "resource curse") that have dominated the debate on natural resources.

2. Study Area, sampling strategy and data collection methods

2.1. Study area

The study was carried out in the Albertine region of Uganda where oil reserves were first reported in the 1920's (Anderson and Browne, 2011). The Albertine region is regarded as a global biodiversity hotspot with high level of plant and animal endemism (Plumptre et al., 2007; WCS, 2016). It hosts more species of vertebrates than any other region on the African continent, hosts more than half of continental Africa's bird species and nearly 40% of its mammal species (Winterbottom and Eilu, 2006). This region has numerous protected areas (forest reserves, national parks and wetlands) used for ecotourism and Lake Albert which is the second largest fresh water lake in Uganda that is famous for its unique fish species (Plumptre, 2002; Wandera and Balirwa, 2010). Kyeihoro and Kaiso villages located in Hoima district (Fig. 1), western Uganda were purposively selected for the study because these were the areas that had experienced most oil and gas exploration activities in the whole Albertine region at the time of the study. Such activities include: seismic surveys, exploratory drilling, pad construction, movement of drilling rigs, construction of support camps and oil roads connecting exploration sites to trading centres and major towns and establishment of collection, treatment and disposal of waste site.

2.2. Sampling strategy

Sample size was determined using Slovin sampling formular $n = N/1 + N(e)^2$ where n is sample size, N is total population and e is the acceptable error tolerance i.e. allowed probability of committing an error in selecting a small representative of the population (Tejada and Punzalan, 2012). Error tolerance was determined by subtracting the desired confidence level from 1. In the current study, the confidence level selected was 95% (acceptable for such studies) hence e was determined by 1-0.95 = 0.05. A 95% confidence level and 5% error tolerance were used in sample determination as recommended by Tejada and Punzalan (2012) when using Slovin formular to have a fairly representative sample. We could not use other approaches for sample size determination because of lack of prior adequate information on the study population. We acknowledge weaknesses that have been linked to use of Slovin formular but still consider it to be the most optimal option in situations of inadequate information on the study population. We addressed the weaknesses of Slovin formular by using of focus group discussions and key informant interviews in order to be able to generalise the information generated from the household survey. According to the Hoima district household survey of 2014, Kaiso village had 555 households and Kyeihoro village had 442 households respectively. Of these, a sample of 285 households was randomly selected consisting of 159 households from Kaiso village and 126 from Kyeihoro Village.

Key informants and individuals who participated in focus group discussions were selected purposively. Individuals can qualify to be key informants because of their personal skills, or position within a society to be able to provide more information and a deeper insight into what is being studied (Marshall, 1996). The criterion used to select key informant was the individual had to have expert knowledge on the themes of study based on their position in the community or workplace. The key informants included local leaders, opinion leaders, traditional leaders linked to Bunyoro-Kitara kingdom, oil and gas industry representatives, representatives of government agencies, ministries and departments, local business owners, farmers, land owners, fisherfolks and members of civil society organisations operating in the area. Informed consent was obtained from all participants in the study.

Membership in focus group discussions was predetermined based on social categories that were predicted to be affected differently by oil and gas exploration activities based from environmental and social impact assessment reports, literature and through snowballing sampling.

2.3. Data collection methods

Data were collected using mixed methods specifically key informant interviews, focus group discussions and household survey using questionnaires starting from the month of April in 2017. Key informant interviews and focus group discussions were held to enrich the information that would be generated from the household interviews. Key informant interviews were conducted until saturation. Data saturation was reached when the ability to obtain additional new information had been attained i.e. no new information, findings and themes were being added even with additional key informants (Fusch and Ness, 2015; Bowen, 2008). This was done after coding information collected from key informants. The key informant interviews took between 30–50 min and were conducted by all the three authors using face-to-face. An interview guide was used, but participants were at liberty to divert as long as the comments they made were within the interests of the study objectives.

Seven focus group discussions among different categories of respondents within each village that included men, women, youth, elderly, fishermen, pastoralists and Uganda Wildlife Authority staff were held. Environment and social impact assessment reports and publications indicate that they are the different social categories which can be potentially affected by oil and gas activities. Focus group discussion were used to get ideas of different social categories and also determine whether there are any variations in perspective between groups. Studies done elsewhere (e.g. Ross, 2008; Pantuliano, 2010) and Environmental and Social Impact Assessment conducted in the study sites have shown that the selected categories can be affected differently by oil and gas exploration activities and therefore may have different perspectives and this informed our choice. All key informant interviews and focus group

Table 1
Perceptions on socio-economic impacts of oil and gas exploration activities.

Socio-economic impacts	Frequency	Percent of cases (%)
Construction of roads connecting exploration areas to small towns	285	100.0
Increase in business opportunities due to increased demand for commodities by oil exploration crews and migrants	285	100.0
Increase in household income	117	41.1
Increase in employment opportunities	73	25.6
Capacity building of local communities in special skills by Non-Government Organisations and oil companies	92	32.3
Increase in labour wage rates	59	20.7
Increased local taxation	98	34.4
Emergence and strengthening of social networks	220	77.2
Increased cost of land	283	99.3
Price inflation of household commodities	285	100.0
Decline in fish catches	198	69.5
Construction and rehabilitation of primary schools	260	91.2
Increased incidences of disease out-breaks (HIV/AIDs, diarrhoea)	243	85.3
Establishment of health centres	264	92.6
Increased incidences of intermarriages	243	85.3
Increased land conflicts	232	81.4
Increased fear of displacement due to new oil and gas discoveries	187	65.6
Increased spread of social ills (prostitution, drug abuse, child abuse, petty crime)	285	100.0

discussions were tape-recoded (with the consent of the respondents) and later transcribed during data analysis.

Questionnaires were administered to randomly selected households in each village using the local language spoken by the respondent or where there was a language barrier, an interpreter was sought. The target was the head of the household, however in the event that he/she was absent at the time of the survey, the spouse was the next best alternative.

In cases where the household head and spouse were both absent, the next adult person in the household was selected.

2.4. Data analysis

The coding of all the responses in the questionnaire was the first step of data analysis. This was followed by categorisation of responses into socio-economic and environmental impacts of oil and gas exploration activities following the Environmental Impact Assessment Regulations, 1998 (GoU, 1998) and validated by environment officers, community development officers, and representatives of the National Environment Management Authority operating in the study area. They were entered into SPSS software as categorical nominal data under the two pre-selected categories of impacts. Frequencies and percentages were derived to determine the local perceptions on the socio-economic and environmental impacts associated with oil and gas exploration activities in the area studied. Cross-tabulations were conducted between the responses and socio-demographic and economic characteristics of the respondents to determine whether each cell had at least 5 counts to be able to conduct chi-square test analysis. This was to test whether there was any association between the responses and the socio-demographic and economic characteristics of the respondents.

Chi-square test was preferred because we only had categorical data for both the dependent and independent variables and the data did not fulfil the assumptions for parametric tests. We acknowledge that with this test, it may be difficult to make accurate estimates, however for the purpose of the paper (providing insights), the test is adequate. The assumptions that had to be fulfilled for the chi-square test included: random selection of households, categories of the variables being mutually exclusive, study groups being independent, number of observations in each level of the variable being at least 5 and the data being nominal (McHugh, 2013). The test was done for each socio-economic and demographic category of respondents that is known to be affected by oil and gas exploration activities and socio-economic and environmental impact independently. It is only in situations where there was a frequency of at least five in each cell of the cross-tabulation that chi-square test of independence was applied to test the hypothesis of no association between the social categories and responses on socio-economic and environmental impacts of oil and gas exploration activities using Minitab software. The significance level used was $p < 0.05$.

Qualitative content analysis using manifest approach of transcribed data was used to determine key messages from focus group discussions (Halkier, 2010; Stewart et al., 1990). The data was first transcribed and organized based on questions in the interview guide. It was then further organized based on categories or themes of a response on the question and patterns of response generated. The most dominant patterns of responses from each question were considered as the key message from each category (Ritchie and Spencer, 1994; Rabiee, 2004) and used to enrich findings from the household survey. Thematic analysis of interviews was applied in the analysis of data collected from key informants (Huggins et al., 2016; Miles and Huberman, 1984). It was used to identify common themes. We started by sorting all the transcribed data followed by re-reading and grouping the interview responses into themes (Huggins et al., 2016). The sentences were examined to identify the characteristics and dimensions (Charmaz, 2006; Strauss and Corbin, 1990) from which quotes were obtained to enrich findings from the household survey and focus group discussions.

3. Results

3.1. Perceptions on the Socio-economic impacts of oil and gas exploration activities

Construction of roads connecting exploration areas to small towns and trading centres and increase in business opportunities due to increased demand for commodities by oil exploration crews and in-migrants were the most mentioned positive socio-economic impacts of oil and gas exploration activities (Table 1). The least mentioned positive impacts were increase in labour wage rates (20.7%) and increase in employment opportunities (25.6%). Price inflation of household commodities and increased spread of social ills such as prostitution, drug abuse, child abuse, petty crime were the most mentioned negative socio-economic impacts. Other socio-economic impacts mentioned by the respondents are listed in Table 1. There was a significant association between sex of the respondent and the responses on perceptions on socio-economic impacts of oil and gas activities ($p = 0.045$). The cross-tabulations of socio-economic impacts and sex showed that there were many men who mentioned increase in household income, decline in fish catches and increase in local taxation than women. The village where one lived, age, main source of income and education of the respondent did not significantly influence the responses on the socio-economic impacts of oil and gas activities.

There was a significant association between household average monthly income of the respondent and the responses on perceptions on socio-economic impacts of oil and gas activities ($p = 0.04$). The cross-tabulations showed that increased household income was mostly mentioned by households that had higher monthly income. Increased cost of land, increased land conflicts and increased fear of displacement due to new oil and gas discoveries were mostly mentioned by low income earners (those that earned less than 50,000/= shillings approximately $14).

All the focus group discussions (FGDs) revealed that the oil and gas exploration activities had led to increased opening of businesses in the area. The Men and Youth FGDs listed mobile money kiosks (mini banks that use mobile phones for transactions), retail shops, carpentry workshops and fishing as the businesses that had grown in the area during oil and gas exploration phase. The women FGDs revealed bar businesses, hair dressing salons, charcoal vending, hotel and lodges, market for agricultural products, restaurants, bakeries, pharmacies and selling of crafts as business opportunities that had emerged because of oil and gas activities in the area. All the FGDs indicated that there were more businesses established in Kaiso village than in Kyeihoro.

From all the FGDs held, the participants mentioned that oil and gas exploration activities had led to paving of the Hoima- Kaiso-Tonya road by government of Uganda, sinking of boreholes for domestic water, construction of Kaiso Primary School and Kyeihoro Health Centre III by Tullow Oil Company (one of the companies involved in oil and gas exploration in the study area). One of the Local Council Committee members of Kyeihoro was quoted to have said that, "*the Kaiso-Tonya road is part of several other infrastructural developments in preparation for oil production.* The women FGD revealed that the Kyeihoro health centre provided free medical care including medicine, routine check-ups and antenatal care which improved health services in the area.

In a focus group discussion of men held in Kaiso, it was revealed that a number of projects such as tree planting, beekeeping, first aid training on water transport and rescue services in case of accidents on Lake Albert had been introduced by Tullow Oil company and other "not for profit" organisations operating in the area due to oil and gas exploration activities. This was considered important in building the capacity of local people to harness benefits from oil and gas industry.

While all FGDs indicated that oil and gas exploration activities had created jobs, the youth in Kyeihoro village, indicated that very few local people had acquired jobs related to oil and gas activities in their area. They mentioned that the few who acquired jobs were mainly casual labourers during road construction, exploration, drilling or establishment of camps. One of the participants said, "*If 100 jobs were available, only 20–30 local people would be hired from this area. The rest came from other parts of Uganda*". The men's FGDs indicated that the men who were employed were mainly involved in sand mining, mowing grass at the camps established by oil companies, guarding equipment used in exploration activities, skipping speed boats during oil exploration offshore, operating oil and gas exploration equipment and working as foremen and porters at road and pad construction sites.

The women FGDs showed that women were hired majorly to carry out the following activities: cleaning roads, maintaining the lawns at the camps and planting grass and trees along the newly paved road (Kaiso-Tonya) that was constructed to improve access to the two villages studied. A Community Development Officer from Hoima district local government was quoted to have said: "*Women were involved mainly in jobs that did not require professional skills since most of them were illiterate. There were no lucrative jobs for women. The majority were involved in cooking for workers, washing and cleaning at the camps of oil companies"* A local leader interviewed in Kyeihoro village said. "*There were very few job opportunities created by oil in this area. The few available ones were dominated by particular ethnic groups and a few men*."

A Community Development Officer was also quoted to have said that, "*Employers got employees from elsewhere. Every stage of oil development requires different types of people, surveyors came and went, drillers came and went, and now we are waiting for the production phase.* One of the local government leaders at the village level mentioned that as part of their capacity building programs, Tullow Operations Pty Ltd and civil society organisations such as Africa Institute for Energy Governance (AFIEGO) had sensitized the local people on health, sanitation, safety on water, HIV/AIDS awareness and sensitization, environmental protection, oil and gas development and livelihood improvement. He observed that these were important in improving the livelihood of the community members.

All respondents mentioned that oil and gas exploration activities had led to certain negative socio-economic impacts. Price inflation of household commodities was the most mentioned impact by all respondents (Table 1).

A key informant, who was born and had lived in Kaiso village for approximately 60 years, was quoted to have said: "*the cost of land has almost tripled and the rent for houses in this area has increased by nearly 30%" as a result of oil discovery in this area. Local ordinary people cannot afford land now, and mostly investors from outside who have lots of money can afford to buy land in this area*".

Another key informant said: "*much as there are a variety of commodities in the market, their price has increased leading to a high cost of living.*

A participant in a women's focus group discussion held in Kyeihoro said; *charcoal prices increased from Uganda shillings 18,000 ($5) per bag to 35,000/= ($ 10) per bag which is an increase of almost 50% since oil activities started in this area. This has made life very expensive in this village*.

Most the participants in the FGDs of fishermen mentioned that their income had reduced as a result of low catches due to restrictions from fishing in oil and gas exploration areas on Lake Albert. They also claimed that the noise from blasting of rocks during exploration scared away the fish to distant areas that they could not easily access. One of the fisheries officers working in the area indicated that fish catches had reduced during oil and gas exploration activities because of the increased demand for fish that led to increased number of fishermen and illegal fishing on Lake Albert. He indicated that this was the major reason for the decline in fish catches.

Additionally, some key informants at Hoima district local government headquarters observed that there were increased incidences of domestic animals being knocked by over speeding motorists along the Kaiso-Tonya road such as goats, cattle, dogs, and sheep thus causing losses to households in the area. This loss was attributed to oil and gas because the road was paved to improve access to oil and gas exploration areas.

The chairperson of Kaiso village said: *The incidences of crime such as theft increased due to population increase and high levels of unemployment of the youth during exploration*. The FGDs of men, women, and youth indicated that there was increase in conflicts between indigenous Banyoro and immigrant Alur communities because of competition over employment opportunities linked to oil and gas activities.

Land conflicts were mentioned as a phenomenon that had become common majorly because of oil and gas in all the FGDs held. A participant in FGD of men in Kaiso said: "*rich people from Kampala and neighbouring towns bought land without local people knowing and claimed the land had been bought 10 years ago yet we don't have a practice of privately-owned land in this area. Land in this area is customarily owned and access is communal. They are grabbing this land in anticipation of this area developing due to oil*".

In all focus group discussions, most participants mentioned that there was a surge in the number of sex workers into the area especially during road construction and oil exploration activities. These were considered to be a threat to values of the local residents. One of the local leaders was quoted to have said: *majority of the sex workers who came during exploration and construction of Kaiso-tonya road have become residents thus increasing the risk of HIV/AIDS and other sexually transmitted diseases*. This was also confirmed by Community Development Officers who indicated that the number of sex workers increased in the

Table 2
Perceptions on environmental impacts of oil and gas exploration activities.

Environmental Impacts	Frequency	Percent of cases
Air pollution due to dust and fumes from vehicles/machinery used in exploration	196	68.8
Water pollution from waste generated during exploration	36	12.6
Soil erosion due to clearing of vegetation during road/camp/pad construction	282	98.9
Noise pollution due to blasting of rocks during exploration	283	99.3
Wildlife disturbance due to increased human activity in the wildlife reserve and noise from blasting of rocks	252	88.4
Rangeland loss due to infrastructure development	236	82.8
Increased mortality of domestic animals due to road accidents	162	56.8
Wetland loss due to infrastructure development and settlements	53	18.6
Forest loss due to infrastructure development and settlements	137	48.1
Encroachment of the wildlife conservation area by pastoralists due to loss of grazing areas to oil exploration	250	87.7

area especially during the time of constructing Kaiso-tonya road and during exploration.

The FGD of men and fishermen in Kaiso revealed that a cultural site was destroyed near Ngassa exploration area and at the camp site. They mentioned that this site was important for rituals carried out by the local people. An elder and cultural leader from Bunyoro-Kitara kingdom confirmed that there were several cultural sites of various clans located in the exploration area that were affected by oil and gas exploration activities.

3.2. Perceptions on the environmental impacts of upstream oil and gas activities

Noise pollution due to blasting of rocks during exploration, soil erosion due to clearing of vegetation during road/camp/pad construction and wildlife disturbance due to increased human activity in the wildlife reserve and noise from blasting of rocks were the most mentioned environmental impacts (Table 2). Plate 1 shows a site with erosion features along Kaiso-tonya road that was paved to improve access to oil and gas exploration areas. Sex, age, average monthly household income and main source of income of the respondent did not influence the response on perceptions on environmental impacts of oil and gas exploration activities. The village in which a respondent lived significantly influenced the perceptions on environmental impacts ($p = 0.002$). The cross-tabulations of environmental impacts and village in which the respondent lived showed that forest and rangeland loss, soil erosion due to clearing of vegetation during road/camp/pad construction and noise pollution due to blasting of rocks during exploration were mostly mentioned by households in Kaiso village compared to Kyeihoro.

In all the FGDs of men, women and youths, participants observed that soil erosion especially along the Kaiso-Tonya road had intensified since the road was paved.

Plate 1. An eroded area along Kaiso-Tonya road (Photo credit: Third Author).

Some of the key informants mentioned that establishment of access roads had resulted into land fragmentation and loss of forage for both domestic animals and wildlife.

Other key informants working for the Uganda Wildlife Authority stated that the construction of the Kaiso- Tonya road had led to increased human access into Kabwoya Wildlife Reserve thus making wild animals vulnerable to poachers.

According to one of the managers of an eco-lodge located in Kaiso, there was increased disturbance to wildlife during exploration, drilling and road construction. He mentioned that majority of the animals moved further away from operational areas. He said: *"during surveys, some endangered species of animals were "wiped off" such as "the rid buck." However, the number of animals has not changed much apart from a few that are being knocked down by vehicles on the road". Motorists do not respect the regulations on speed limit while driving in areas designated for wildlife conservation*.

Participants in all FGDs observed that air pollution mainly resulting from dust during road construction and exhaust fumes from moving trucks and machinery used in oil and gas exploration increased.

They also revealed that establishment of camps, residential and business centres led to changes in herbivore grazing patterns and loss of communal grazing areas. One of the members of the FGD of men in Kaiso said: *The camps of oil companies were put where pastoralists graze their livestock. They cannot access these places and some of them are forced to graze their livestock in the wildlife reserve*. In the FGD of youths and pastoralists in Kyeihoro, participants revealed that pastoralists had started grazing their livestock in parts of Kabwoya wildlife game reserve illegally because of scarcity of grazing land. This was further confirmed by one of the local leaders in Kaiso who said: *The number of cattle that are found grazing in Kabwoya Wildlife Reserve is increasing because community grazing land reduced because part of it is where one of the oil companies set their camps and pads for exploration.*

4. Discussion

4.1. Perceptions on the socio-economic impacts of oil and gas exploration activities

The findings on the positive socio-economic impacts ("resource blessing) of oil and gas exploration activities are in agreement with other authors (Anderson and Theodori, 2009; Brasier et al., 2011), who found that economic rejuvenation including increased business activity are largely perceived among the primary positive impacts of development linked to oil and gas industry. However, its noticeable that the most mentioned positive socio-economic impacts were not directly linked to oil and gas exploration but rather indirect impacts suggesting that during exploration of oil and gas, direct benefits may be limited.

The extractive industries development is often linked to employment of local people (Wilson and Stammler, 2016), however the study showed that relatively few people mentioned it as a benefit associated

with oil and gas exploration in their area suggesting that probably not many of them had acquired jobs during the exploration phase. The notion that oil and gas exploration is associated with direct increases in employment (Munasib and Rickman, 2015) was not highly reflected in the local people's perceptions. The findings show that local content policy instruments that would have ensured that local people access employment opportunities in exploration of oil and gas were not effectively implemented in the two villages studied. This would have promoted local participation in the oil and gas sector thus catalysing positive synergies between the extractive industries and the local economy (Ablo, 2015). The current scenario may be a recipe for conflicts because the sector did not create the expected employment for majority of the local people (Omofonmwan and Odia, 2009).

Increase in wage rate was mentioned by relatively very few respondents compared to other benefits suggesting that the oil and gas exploration activities did not affect the labour market in the villages studied. This is contrary to studies (e.g. Davis and Tilton, 2005; Brasier et al., 2011) which suggest that wage rates increase with discovery of extractives to attract the labour it needs. The findings therefore suggest that the view that wage rates increase due to increase in labour demand in areas where there is oil and gas (Brown, 2014) may not be the case in the exploration phase. This scenario puts the local people in a precarious condition considering that there was a surge in prices of commonly used commodities but with no wage increase in the two sites studied.

Perceptions of the socio-economic impacts were consistent across all categories of respondents except gender and average household monthly income. Increase in household income was mostly mentioned by men suggesting that it's mainly men whose income may have improved in the two villages during the time of implementing oil and gas exploration activities. The two sites where the current study was conducted are fishing villages where women mainly rely on buying and selling of fish. It was observed in the FGDs of fishermen that fish catches had reduced during the exploration phase because some parts of Lake Albert were inaccessible because oil companies were carrying out their exploration activities. This therefore could have negatively affected their income during the period of oil and gas exploration.

This shows that oil and gas exploration can have asymmetric effects on men and women in relation to income benefits (Cust and Poelhekke, 2015). In his paper, (Ross, 2008) found that the oil industry reduces the participation of women in the labour force by crowding out the economic sectors that employ women thus negatively affecting their income. Elsewhere in Africa, oil and gas exploration has been found to disrupt the most important economic livelihood options for women thus negatively affecting their income (Adusah-Karikari, 2015). This if not addressed will perpetuate patriarchy and eventually hinder women from making a significant contribution to the local and national economy (Ross, 2008).

Increased household income was mostly mentioned by households that had higher monthly income suggesting that households that can be categorised as low-income earners did not improve their income during oil and gas exploration activities. This further shows that extractive industries can sustain disparities in income as postulated by proponents of the "resource curse" theory (Ross, 2007; Karl, 2007) and if not addressed may lead to inequality in the distribution of wealth amongst citizens (Gamu et al., 2015). This raises some questions on the view that incomes of low earners can improve with discovery of oil and gas that is postulated by the proponents of the "resource blessing" theory.

It was also noticeable that more low-income earners mentioned increased cost of land, increased land conflicts and increased fear of displacement due to new oil and gas discoveries. This shows that land tenure rights of the poor may be more threatened in areas of oil and gas exploration than high income earners. Earlier studies by Byakagaba et al. (2018) in the same area found that land rights abuses among poor households increased during the period oil and gas exploration activities were being implemented because they did not have adequate finances to secure their land. It is therefore important that land rights especially of the poor are first secured before oil and gas exploration activities are implemented to minimize loss of land rights.

Price inflation of household commodities was one of the most-mentioned negative socio-economic impacts of oil and gas exploration activities.

This is similar to what Brasier et al. (2011) found when they studied local people's perceptions on oil and gas industry in Pennsylvania and New York, USA. Other authors (Van Der Ploeg and Poelhekke, 2017; Gamu et al., 2015) found that price inflation is acute in areas where extractive resources are located. In the current study, price inflation was attributed to the influx of in-migrant communities that were anticipating an avalanche of jobs in the oil and gas sector by the key informants. They increased the aggregate demand for commodities thus causing price inflation because the demand was higher than the supply of commodities. This further provides evidence of spikes of commodity prices that is associated with "resource curse" theory on extractives (Van Der Ploeg and Poelhekke, 2017) in the upstream phase of the oil and gas value chain. While most studies tend to associate price inflation with later phases of the oil and gas value chain, the findings provide some insights that it can also occur during the exploration phase. This if not addressed may negatively affect non-oil and gas businesses and exert pressure on individuals not directly employed in the oil and gas sub-sector due to reduced purchasing power.

Spread of social ills such as prostitution, drug abuse, child abuse, petty crime was mentioned across all social categories of the respondents suggesting that this was more or less universally recognised. Social ills especially prostitution have been reported to be common in mining and oil exploration areas by several authors (Laite, 2009; Darkwah, 2010; Pegg, 2006) and are linked to in-migration and pull of oil wealth that may attract individuals with deviant behaviours (Karl, 2007). Other studies (e.g. Chindo, 2011; Kasimbazi, 2009) reported increased abuse of alcohol, prostitution, crime, violence and banditry as some of the negative socio-economic impacts of oil and gas exploration activities. The findings from the current study further show that oil and gas exploration activities can result into breakdown of the social fabric in the area. This potentially can make the areas where oil and gas exploration activities are being implemented to be less attractive for permanent settlement because of the fear of social ills.

4.2. Perceptions on the environmental impacts of oil and gas exploration activities

Noise pollution, soil erosion and wildlife disturbance were the most mentioned environmental impacts. Similar observations have been made by other authors (Jones et al., 2015; Laurance and Gomez, 2005; Opukri and Ibaba, 2008; O'Rourke and Connolly, 2003). This further shows that oil and gas exploration activities are associated with environmental degradation (Kadafa, 2012).

Oil exploration involves moving of relatively heavy equipment such as mobile rigs that may affect the soil structure thus increasing erodibility and clearing of land for pad construction (Epstein et al., 2002). These may have occurred in the study area thus contributing to the perceptions that were generated from those individuals that participated in the study. In their paper, Espinosa et al. (2014) stated that placing roads within protected areas can seriously reduce their capacity to sustain wildlife populations. Exposure to noise can contribute to hearing impairment, heart diseases, annoyance, sleep disturbance and poor performance in school (Passchier-Vermeer and Passchier, 2000). Soil erosion may affect the sustainability and productivity of arable land (Pimentel et al., 1995), reduce soil biodiversity (Lal et al., 1999) and can cause food insecurity (Pimentel, 2006). Wildlife disturbance can cause changes in behaviour and locally affect temporal and spatial distribution of wildlife (Bejder et al., 2006). This may increase human-wildlife conflicts in areas of oil and gas exploration in case the wild animals stray into people's settlements and gardens.

Socio-economic and demographic characteristics of the respondents were not associated with the responses on environmental impacts of oil and gas exploration activities except the village in which a respondent lived suggesting that almost all social categories in the study area had more or less similar perceptions on the environmental impacts. However, there were relatively more respondents from Kaiso village who mentioned forest and rangeland loss, soil erosion and noise pollution than Kyeihoro. This is probably because Kaiso village had more exploration sites (Mputa I, Mputa II and Waraga) than Kyeihoro. One of the key informants from an oil company that operated in that area confirmed that there were more exploration activities in Kaiso than Kyeihoro. This was corroborated by representatives of the Ministry of Energy and Mineral Development. These exploration activities in Kaiso may have caused more forest and rangeland loss, soil erosion and noise pollution as shown by the relatively many respondents from Kaiso compared to Kyeihoro that mentioned these impacts.

5. Conclusion

The study has shown that the views of the proponents and critics of the "resource blessing" and "resource curse" theories in relation to oil and gas industry were reflected in the local people's perspectives on the socio-economic and environmental impacts of oil and gas exploration. "Resource blessing" theory was reflected mainly by infrastructure development and increased business opportunities. The positive socio-economic impacts that are directly linked to oil and gas exploration activities such as increased labour wage rate and employment were the least mentioned suggesting that not many people had experienced them. Perceptions of the socio-economic impacts were more or less similar across all social categories of respondents except gender and household monthly income. Increase in household income was mostly mentioned by men and high-income earning household suggesting that there may be inequality in terms of opportunities that can enhance income between men and women and high- and low-income earners in the areas of oil and gas exploration.

The views of the "resource curse" theory were also reflected in the perspectives provided by respondents that participated in the study and they include: price inflation, increase in social ills and environmental degradation especially noise pollution, soil erosion and wildlife disturbance. These may negatively affect local residents' view on oil and gas thus causing tension with government or companies involved in exploration and other phases of oil and gas value chain.

While the findings may not be conclusive on the socio-economic and environmental impacts of oil and gas exploration, they provide insights on the perceptions of the local people which may be important in designing policies and strategies that will ensure oil and gas improves local livelihoods as reflected in Uganda's policy and legal framework governing the oil and gas sub-sector. This will require strengthening of the infrastructure and human resource of agencies mandated to enforce social and environmental safeguards in areas of oil and gas exploration to prevent and mitigate social and environmental impacts. It will also be important to implement local content policy instruments and building capacity of local people to enable them to effectively participate in various components of oil and gas exploration. There is need to address price inflation through fiscal incentives and infrastructure development that will increase supply of commodities in areas of oil and gas exploration.

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