

# Assessing the Impacts of Energy Developments and Developing Appropriate Mitigation in the Uganda portion of the Albertine Rift



## Report of findings

prepared by  
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## Photographs

Cover photo: Kingfisher-1 drill site.

All photographs in this report should be credited L.Johnson unless otherwise stated.

## Disclaimer:

Unless otherwise stated, the findings, interpretations and conclusions within this report are those of the author and do not necessarily represent or reflect the views of any of the sponsors of this work. Similarly, any errors are purely the responsibility of the author.

## Abbreviations

bopd – barrels of oil per day  
 DWD – Directorate of Water Development  
 EDW – emissions, discharges and wastes  
 EIA – Environmental Impact Assessment  
 EIS – Environmental Impact Statement  
 EOR – Enhanced Oil Recovery  
 IPCC – Intergovernmental Panel on Climate Change  
 kWh – kilowatts per hour  
 mbbls/mbopd – thousands of barrels/per day  
 mmbbls – millions of barrels  
 mmscfd – millions of standard cubic feet per day (gas volume)  
 MW – megawatts  
 MWh – MW per hour  
 NFA – National Forestry Authority  
 NEMA – National Environment Management Authority  
 NGO – Non-Governmental Organisation e.g. Conservation charity  
 PEPD – Petroleum Exploration and Production Department  
 PSA – Production Sharing Agreement  
 SEA – Strategic Environmental Assessment  
 TVD – Total Vertical Depth  
 UWA – Uganda Wildlife Authority  
 WID – Wetlands Inspection Division

# 1) Executive Summary

Uganda currently finds itself in a dire yet privileged position. Energy shortages are widespread - 97% of the population is without access to electricity. The majority of energy use by Ugandans is sourced from fuel-wood and charcoal, with the associated negative consequences this has on forestry, biodiversity and equitable social development. On the other hand, there is an abundance of natural energy sources which can be found within Uganda's borders, with rich geothermal, hydro-power and solar potential, alongside potentially large oil reserves in the geological structures of the Albertine Graben area of western Uganda.

The Albertine Rift is the most species rich eco-region for vertebrates in Africa. It has high species diversity, including 39% of Africa's mammal species, 51% of its bird species, 19% of its amphibian species and 14% of its plant and reptile species. It harbours more endemic species than any other region in Africa and also contains 79 threatened terrestrial vertebrates according to IUCN Red Data book listings<sup>1</sup>. As such it is one of the most important conservation eco-regions in Africa.

As a result of this coincidental geographical overlap of natural resources, both energy and wildlife, a study has been undertaken to review approaches taken in assessing and minimising likely impacts associated with energy development in this biodiversity-rich area. This report summarises the findings of the study, and recommendations for further work or attention are provided.

Licensing of hydrocarbon exploration areas has been undertaken by the Petroleum Exploration and Production Department. Several of these blocks have already been leased to international oil companies, with those not currently under license being the topic of discussion between the government and potential explorers. The various stages inherent in obtaining and holding an exploration/production license are presented, and an assessment is made of the current status of development within each exploration area in Chapter 4.

There have been several environmental impact assessments developed within Uganda as part of the development of potential energy resources. Uganda has EIA regulations, and guidance was developed by the National Environment Management Authority in 1997. A summary of good international practice is presented, compiled from various sources but focussing on the inclusion and effective assessment of several categories of information: description of the activity and associated environmental aspects; the main environmental and social alternatives to the proposed activity; a thorough description of the environmental baseline; a description of EIA process used to assess and evaluate impacts, which should include impact identification, thorough assessment (including synergistic, cumulative, secondary and indirect impacts) and analysis of those which are considered significant; how these impacts might significantly effect the baseline situation; a description of measures to be taken to eliminate, reduce and mitigate impacts; how any residual impacts will be managed; how consultation will (and has) played a part in the project assessment; and a description of any technical difficulties or data gaps encountered that might influence the decisions made in the assessment.

Three separate Uganda hydrocarbon development EIA reports were assessed against good international practice as part of this study. The EIA's included: the Kaiso Tonya exploratory drilling EIA, the Kingfisher exploratory drilling EIA (and post EIA Addendum), and the Butiaba-Wanseko seismic survey EIA. In reality any study on the quality of EIA's would need a larger number of reports to be able to adequately comment on a general situation, but even studying these three provided useful indications of the different philosophies and methodologies used by the different companies and EIA teams. There were substantial differences in level of detailed information provided and the impact assessment between the three. Some good work had been done but two of the EIA's in particular indicated there were several areas for improvement required to bring them up to the standard of assessment accepted elsewhere. Although these EIA's have already been approved, having undergone a level of consultation, the report identifies several specific technical concerns with methodologies used and practices suggested (e.g. determination of significance, mitigation approaches, scope of EIA's based on non-specific activities, etc.). The report acknowledges that exploration for hydrocarbons is a relatively new phenomenon for Uganda, and that experience of individuals involved in EIA development and approval will gain further knowledge and experience over time. Nevertheless, there is a need for increased understanding of oil and gas operations, their likely impacts and significance, and what mitigation measures might be most appropriate in each case. It is suggested that there is a need for international representation on EIA teams during an interim period whilst Ugandan EIA professionals continue to develop to international standards. The

Guidelines which back up the EIA regulations are a good start, now EIA practice needs to strengthen and further develop so that additional protection against impacts becomes the reality.

As part of this study, representatives from various organisations involved in EIA approval undertook a fieldtrip to visit several geothermal, hydropower and hydrocarbon sites, which were either yet to be explored or developed, currently undergoing exploration or having already been explored and now abandoned. Our fieldtrip party contained representatives from several statutory agencies involved in EIA approval, in addition to a representative from PEPD and an international wildlife conservation NGO. The objective of the trip was to assess current and potential impacts from energy development, and to discuss mitigation, compliance and monitoring. In addition, it was a valuable learning experience for trip participants, some of whom had not been directly involved in monitoring. This was particularly valuable as they may not necessarily get the opportunity to visit such project sites, although they may be expected to advise during the approval of EIA's, and even suggest Licence Conditions that be placed on the company as part of governmental approval of the EIA. Locations visited included several national parks, protected areas and areas of biodiversity sensitivity in the Albertine Rift area, as much of Uganda's energy resources lie in areas where its natural wildlife wealth also exists.

The trip provided ample opportunities for discussion of potential and real observed impacts. Two of our site visits to current drilling sites were hosted by oil company representatives (Hardman and Heritage), which to a greater or lesser extent allowed participants to engage directly with those personnel with environmental responsibilities. Where this was not adequately possible, follow up meetings in Kampala were made where appropriate. During our visits, it was apparent that not all conditions set out in the EIA's and licence conditions had been fully implemented. It also highlighted some confusions on monitoring roles and responsibilities between departments and authorities, and some good suggestions were made on how the current situation could be improved. One site visit included some time spent in the very sensitive Nile Delta area at the north of Lake Albert – this area was about to be the subject of public consultation due to an EIA for proposed seismic activities in the area. This provided a valuable opportunity to discuss what impacts the fieldtrip representatives would anticipate from oil development. In addition this will hopefully allow for more robust input to the stakeholder consultation on this, and future, EIA's.

Companies had taken steps to apply licence conditions, although this had not been undertaken in a systematic fashion and many key environmental principles were approached on an ad-hoc fashion, with very little documentation on process and activity. Where companies were supposed to develop monitoring plans, these were not visible. There was some acknowledgement that environmental priorities and management systems would develop as hydrocarbon reserves were proven, and the onset of the production phase would require environmental issues being taken up a notch. On the other hand some good work was being undertaken, for example in providing boreholes for local communities, recycling of certain wastes, and employing techniques for waste water treatment. Resources of the authorities involved in monitoring and site visits should be re-assessed to reflect the importance of this undertaking, and additional collaboration and tracking of site investigation findings should occur to ensure that all licence conditions are put in place in a timely fashion. In addition, more onus should be placed on the companies to provide documentary evidence of compliance.

Both companies intend to perform seismic and exploratory activities of the geological formations under Lake Albert. Threats which were discussed in particular focussed on the change in impacts as the terrestrial exploration phase moves into lake-based ("offshore") exploration, with all the additional associated impacts that need to then be assessed. Indeed the current proposal for seismic survey of the Oil companies operating internationally can and should apply international best practice and conform to best industry standards. Expecting this from international companies operating in Uganda is a minimum requirement. Information on such standards and guidelines developed by the international oil industry are provided in Chapter 7, along with tools and techniques developed by companies in conjunction with international NGO's. Part of responsible operations includes effective stakeholder involvement. An initial stakeholders list is provided in Chapter 8, but each EIA should develop its own appropriate list as part of its stakeholder analysis. It is imperative to ensure that not only do stakeholder consultation events occur, but that the stakeholders involved are sufficiently aware of the potential negative impacts that come with some activities.

Existing and potential forms of cleaner lower-carbon forms of energy are considered in assessing the potential for geothermal and hydropower energy exploitation. There is ample resource within Uganda for cleaner energy, which needs full feasibility assessment, and further development has and should involve a thorough EIA process. In addition a strategic environmental assessment should be conducted to

ascertain the best mix of energy for Uganda to fulfil both its immediate energy shortfall and long term energy supply. In addition to the more direct impacts usually associated with oil and gas development, the impacts from use of these fossil fuels on our changing climate is stressed, and this should play an important part in the SEA discussion. An Integrated approach is required in expanding Uganda's capability to source her own energy efficiently, effectively and in an environmentally sound way.

Whether the development of energy resources can happily co-exist with effective wildlife protection is considered in Chapter 10. Exploitation of the variety of different energy resources found in Uganda can result in different potential impact scenarios, and some may be less severe than others. These impacts need to be a fundamental consideration in any SEA-based energy-benefit comparison. Some companies are deciding that certain areas are just too sensitive for energy extraction industries. There is a push by some for IUCN management category areas to be deemed as no-go areas. In one example provided, both Rio Tinto (minerals/mining) and Shell international (oil/gas) have voluntarily pledged not to explore or develop extractive resources in natural World Heritage Sites. As part of their sustainable development approach, and working in conjunction with international companies and NGO's, governments are identifying areas where the needs of wildlife must attain a higher priority. In addition, these discussions allow improved understanding of how energy resources can be managed using the best design and technology, allowing the dual benefits of energy provision and wildlife protection. Offsets are a useful tool to enable these dual benefits to grow in harmony. Many countries have already developed offset programmes to provide financial resources for conservation activities that in some way are able to compensate for residual, unavoidable harm. It is vital that informed stakeholder consultation feeds into this process, but offsets can generate direct benefits via the establishment of environmental trust funds for both conservation and social benefit. A discussion on how offsets can best work to achieve the right goals in Uganda is urgently required, whilst we are still at this current stage of energy exploration.

A series of recommendations based on the findings of this study are made in Chapter 11, highlighting suggestions on how to improve current environmental impact assessment, mitigation and monitoring. These recommendations focus on core themes of communication and transparency, developing further capacity, the process of impact assessment, monitoring, impact mitigation, and responsible energy development. The author proposes these recommendations be taken forward into an action plan, and addressed as soon as possible.

## 2) Introduction

Oil and gas development is entering an exciting new phase in the Republic of Uganda, as recent well tests have identified seemingly commercial quantities of hydrocarbon trapped in the geological structures of the Albertine Rift. Hydro-power and geo-thermal energy resources are also being evaluated and developed, as Uganda attempts to rectify the restrictive energy shortages it currently faces. This situation will only be improved by careful exploitation of the country's naturally rich energy resources, but this must only be undertaken with due regard to the beauty and vulnerability of the environment within which they are found.

The Albertine Rift is the most species rich eco-region for vertebrates in Africa. It has high species diversity, including 39% of Africa's mammal species, 51% of its bird species, 19% of its amphibian species and 14% of its plant and reptile species<sup>2</sup>. It harbours more endemic species than any other region in Africa and also contains 79 threatened terrestrial vertebrates according to IUCN Red Data book listings<sup>3</sup>. As such it is one of the most important conservation eco-regions in Africa.

This report summarises the findings of a study which has been undertaken to review the approaches taken to assess the likely impacts and mitigation requirements associated with this situation. The Terms of Reference for this work is included in Appendix 1.

As exploration continues, the importance of Uganda's indigenous oil and gas resources will only become more important, not only on a national scale but also perhaps on the international arena. Uganda is already well aware of the amazing natural resource she holds in her wildlife and wilderness, and the associated financial benefits this is contributing to the economy. Ensuring that the environmental and social impacts from development of her other main natural resources are managed effectively, namely hydrocarbon, hydro and geothermal, is crucial to responsibly maximising their potential too.

### ***Uganda's energy shortage***

The current energy shortages experienced in Uganda make for dismal reading, and the reality is even more depressing. Mbendi<sup>4</sup> summarises the situation as:

Much of the electricity network in Uganda is at present poorly maintained and the country experiences frequent power cuts. Just 3-5 percent of the population have access to electricity and many towns, especially in the north of the country are without electrical power. In the rural areas only about 2 percent have access to electricity, of which less than half is provided through the national grid, the remainder coming from household generators, car batteries or solar photovoltaic (PV) units. Therefore about 97% of Uganda's population do not have access to electricity.

Uganda will require 2,000 Megawatts (MW) electricity by the year 2025 to run its industries and homes. To achieve this, more than \$3.5 billion (about Shs623 billion) will have to be sourced and spent in the energy sector. Within 20 years from now the country must generate an additional 1700MW to meet its demand capacity. Uganda is currently facing a huge electricity supply deficit.

The installed capacity in Uganda is about 300 MW, over 98 percent of electricity is generated by the hydroelectric plant at Owen Falls (the 180 MW Nalubaale station and the 200 MW Kiira station with five 40 MW units of which three have been installed) on the Victoria Nile. There exists a small hydro power station at Maziba with an installed capacity of about 2 MW and independent power generation at Kilembe Mines and Kasese Cobalt Ltd with a combined capacity of over 15 MW. It has been estimated that there is another 80 MW of privately installed captive generation capacity

(May 2006)

As part of the Millennium Development Goals, Uganda is required to increase its use of clean energy rather than an over-reliance on fuel-wood. According to the State of the Environment Report for Uganda 2004-5, 82% of the energy consumed in Uganda is from fuel-wood (2003), with charcoal making up a further 6%. In a situation where forest cover is shrinking, forest habitats disappearing and fuel-wood becoming more scarce, it looks very unlikely that Uganda will meet its goals.

Hence exploration and exploitation of Uganda's natural energy resources is fundamental. As will be detailed later, Uganda is lucky to have a wealth of hydro, geothermal and hydrocarbon potential within its borders. But we have to remember that even though 97% are without access to electricity, over 90% of the population cannot yet afford energy at today's prices, even if it were available to them. Therefore provision of more realistically priced energy has to play an important part in these priorities.

### 3) Existing oil and gas agreements

#### *Licensing*

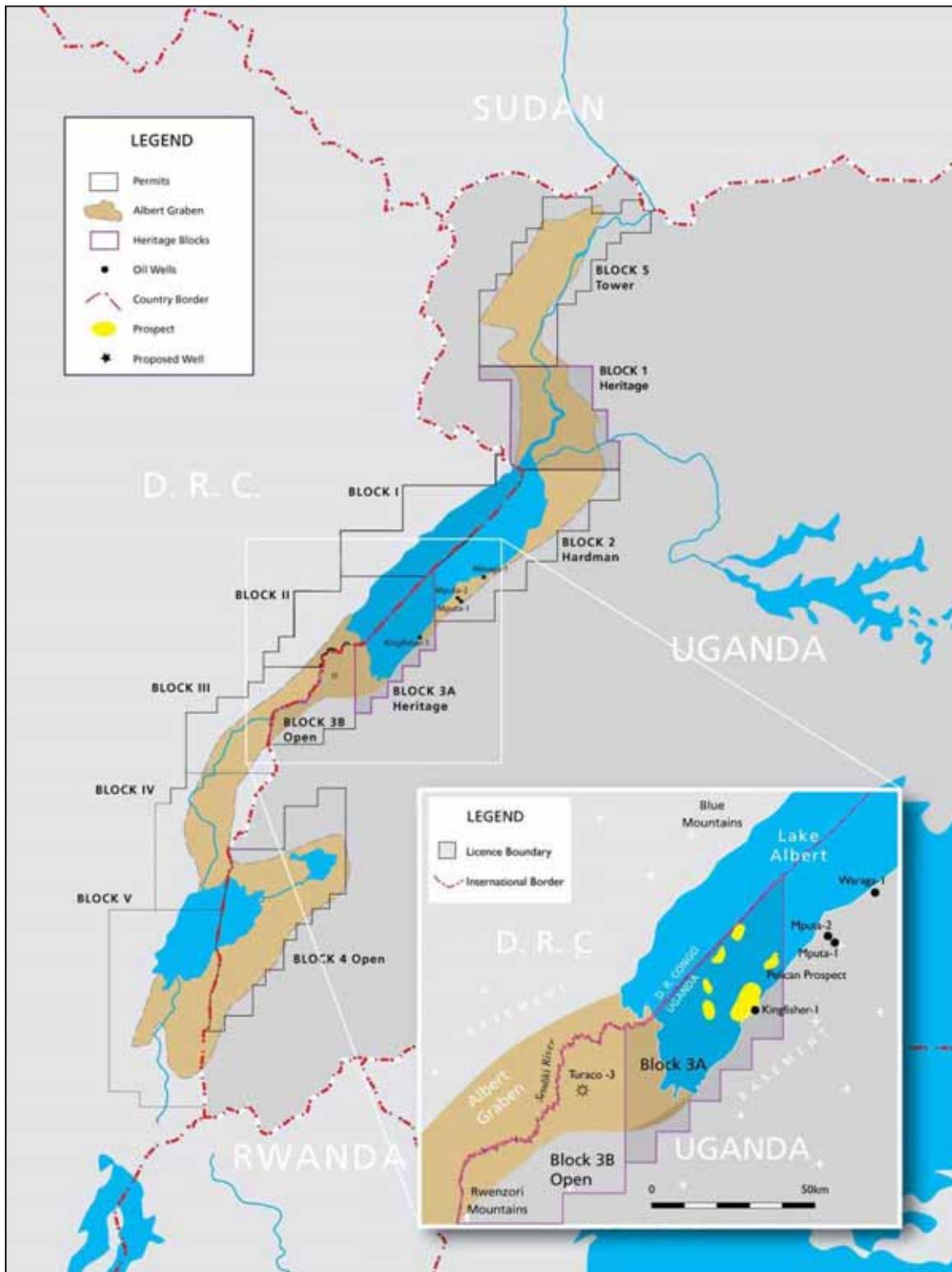
Areas with the greatest potential for hydrocarbon exploitation are split into blocks or 'Exploration Areas' which are allocated to companies through licensing of exploratory operations in those blocks. The Ugandan Albertine Rift area has been split into 6 exploration areas by the Government's Petroleum Exploration and Production Department (PEPD). Several of these are already licensed to oil/gas companies, but for those not yet licensed: one is currently under discussion and another awaits completion of the new Oil and Gas policy which is expected to provide for open bidding. These blocks are shown in Figure 1, and the existing agreements which licence them, are listed in Table 1. The information in the Stage of Licence column is explained more fully later on in Table 2.

**Table 1: List of licence exploration areas and companies**

Block	Exploration Area name	Geographical location	Current operator	Other partners	Date licence awarded	Stage of licence (see Table 2)
1	Pakwach Basin	Victoria Nile delta & Albert Nile	Heritage	Tullow	2004 July 1st	I
2	Northern Lake Albert Basin	mid & northeast Lake Albert	Hardman*	Tullow	2001 Oct 8 <sup>th</sup>	II
3A	Southern Lake Albert Basin	southeast Lake Albert	Heritage	Tullow	2004 Sept 8 <sup>th</sup>	II
3B	Semliki Basin	south of Lake Albert	open	-	relinquished in 2005 from Heritage	Currently not licensed
4	Lakes Edward and George Basin	area around Lakes Edward & George	open**	-	-	-
5	Rhino Camp Basin	north Albert Nile to Sudan border	Tower	-	2005 Sept	I

\* Hardman was taken over by Tullow in Sept 2006.

\*\* Two companies have expressed interest in Block 4, and the Government is currently in negotiation.<sup>5</sup>



(map courtesy of Heritage Oil Corp)

**Figure 1: Map of Albertine Rift area showing exploration areas and the status of oil and gas licensing**

When the Government awards a licence, a Production Sharing Agreement (PSA) is signed between the Government and the Company following confidential discussions – this concept originated in the oil boom days of Iran and Indonesia to ensure the host country had greater control over the development of these resources. The PSA stipulates a variety of licence specific items which have been discussed and agreed as part of the contract. The company becomes the Operator (in essence the company that manages day-to-day operations and decisions), but the risk of development may eventually be shared with one or more additional companies interested in the potential of the block.

Each PSA is unique and details exactly how the company and Government intend the development to be planned, how the development will be paid for and how profits will be shared – as such, these remain confidential documents. But usual PSA financial stipulations require the company to carry all initial exploration costs and the associated financial risks. Then, if exploration is successful and as production starts, complex financial arrangements previously agreed within the PSA allow the Govt to recoup royalties, tax and their share of the profits. At the same time the Company may recoup its Capital expenditures from the produced hydrocarbons over time (sometimes over the lifetime of the field) via tax discounts.

When a licence is awarded, the companies are obliged to complete certain exploration and development tasks within particular timeframes. The Oil and Gas Policy<sup>6</sup> currently being developed by Government provides further information, but Table 2 provides some summary information on these requirements

**Table 2: Licence stages<sup>7</sup>**

Licence stage	Duration	Requirement
pre-licence	N/A	PSA discussed and agreed with company/companies
I	4 years	Period within which the company should perform seismic operations and drill at least one well
II	2 years	Period within which the company should drill at least two exploratory wells
III	2 years	Period within which the company should conclude exploration and commit to production
IV	25 years	Licence duration for production, with the possibility of a 5 year extension

### **Companies with current interests**

Companies who currently hold hydrocarbon interests as operator or partner in Uganda include Hardman, Heritage, Tower and Tullow. Their contact details are listed in Table 3. In addition, PEPD are currently in discussions with an (as yet) unannounced companies regarding the remaining open blocks. It is anticipated that following the publication of the Oil and Gas Policy, licensing is expected to be by open bidding.

**Table 3: Company contacts**

Uganda Office	Head Office(s)
<b>Hardman Petroleum Africa Pty Ltd</b> John Morley, In-Country Manager 22 Kitante Close Nakasero Kampala Tel: +256 (0)752 221002 email: <a href="mailto:jmorley@hpa.co.ug">jmorley@hpa.co.ug</a>	<b>Hardman Resources Ltd</b> Level 1 50 Kings Park Rd West Perth PO Box 869 Western Australia 6872 Tel: +61 8 9261 7600 <a href="http://www.hdr.com.au">www.hdr.com.au</a>
<b>Heritage Oil &amp; Gas (Uganda) Ltd</b> Bryan Westwood, Director/General Manager Uganda 36 Musoke Road,	<b>Heritage Oil Corporation</b> 312, 407 – 2 Street SW Calgary Alberta

Bunga P.O. Box 23051 Kampala Telephone: +256 (0)751 767663 +256 (0)751-767670 (cellphone) email: <a href="mailto:bw@heritageoilcorp.com">bw@heritageoilcorp.com</a>	Canada Tel: +1 403 234 9974 <a href="http://www.heritageoilcorp.com">www.heritageoilcorp.com</a>	
<b>Tullow Oil plc</b> no Uganda office at present  Contact through Hardman Uganda office	<b>Tullow Oil plc</b> 3 <sup>rd</sup> floor Chiswick Park 566 Chiswick High Road London W4 5YS UK Tel: +44 (0)20 8996 1000 <a href="http://www.tulloil.com">www.tulloil.com</a>	<b>Tullow Oil plc</b> Airfield House Airfield Park Donnybrook Dublin 4 Ireland Tel: +353 1 260 2611 <a href="http://www.tulloil.com">www.tulloil.com</a>
<b>Tower Resources Ltd</b> no Uganda office at present  Contact through BMS Uganda office	<b>Tower Resources plc</b> 5 Charterhouse Square London EC1M 6PX UK Tel: +44 (0)207253 6639 <a href="http://www.towerresources.co.uk">www.towerresources.co.uk</a>	

### ***The importance of competition in licensing***

A healthy licensing system requires competitive bidding between companies to promote better standards. This occurs as different companies each bid to attain involvement in a licence over their competitors, with bid offers differentiated through a variety of different offers. These can include varying financial shares with the Govt, proposals for environmental mitigation, approaches to field development planning etc. The Govt then can make an informed choice of developer taking these into account alongside company reputation and competency – the decisions made between the Govt and developer then form the basis of the Production Sharing Agreement.

Unfortunately in Uganda, as only a few companies have so far shown interest (at time of writing), competition has yet to effectively take hold. To exacerbate this, one of the operator companies, Hardman, has recently been taken over by Tullow (a company with existing interests in the Rift) thereby effectively reducing the number of companies involved further still. The Government needs to actively target other responsible oil and gas businesses into the country, so as to expand the current pool of companies. A larger pool of international operating and partner resource investors can promote increased revenue for the country plus higher environmental standards, and therefore should be actively encouraged.

Heritage and Tullow now also hold licences for the Democratic Republic of Congo side of Lake Albert, with Tullow as operator. Heritage and Tullow also own Eagle Drill between them (which drilled the three well program in Block 2<sup>8</sup>). Future offshore drilling (drilling on Lake Albert) will possibly be timed to allow the companies to make best use of a suitably equipped drill rig, and hence there may be financial pressures to use the rig on both sides of the border subsequently.

## **4) Current status of oil and gas exploration**

The first exploratory well was drilled in the 1930's in Block 2, encouraged by the presence of several land-surface oil seeps. The well, Waki-1, found oil in 1938 but further interest did not materialise until 1997 when Heritage was attracted to do seismic survey in Block 3. Since that time, magnetic and seismic surveys have occurred across much of the prospective area and exploratory wells have been drilled in 3 of the 6 licence blocks. The current status of exploration (at 15<sup>th</sup> Nov 2006) in each of the blocks is summarised in Table 4.

To maximise the potential for energy provision from these resources, the Government in conjunction with Hardman and Tullow have developed a plan to fast track the production of oil in Uganda – known as the Early Oil Production Scheme (see Chapter 10) for further information).

**Table 4: Current status of exploration in the licence blocks of the Albert Rift**at 15<sup>th</sup> Nov

Block	Current licence awarded	Partners	Seismic undertaken or planned	Exploration Well(s)	Drilled	Tested	Flow	Reserves estimate	Current status
1 (4285 km <sup>2</sup> )	2004 July 1st	Heritage (Op) 50% Tullow 50%	2D planned but overdue (450km) (EIA ToR submitted to NEMA Aug 2006)	none yet	-	-	-	-	EIA work completed and submitted to PEPD.
2 (3900 km <sup>2</sup> )	2001	Hardman (Op) 50% Tullow 50% - now Tullow 100%  (Tullow purchased Hardman Sept 26)	2D over lake (2003 & 2005) 2D over land (2005)  3D seismic is planned to further appraise Mputa and Waraga to better define reserve volumes	Waki-1 <sup>9</sup>	1938		oil show noted		
				Waraga-1		July 2006	12,500 bopd max	combined Waraga-Mputa estimated recoverable volumes of 30mmbbls (oil in place of 100-300 mmbbls)	Suspended, awaiting completion. 3 zones of oil bearing sands
				Mputa-1 <sup>10</sup>		Aug 2006	810 bopd sustained rate, 1120 bopd maximum flow		3 layers tested, one showed no-flow. Well suspended.
				Mputa-2	May 2006	no test (appraisal of extent)	-	Drilled to 1500m and abandoned, well-cellar backfilled	
				Nzizi <sup>11</sup> up dip of Mputa-2	3 <sup>rd</sup> Nov 2006	oil found	-		Drilled to 1065m, oil shows found, running wireline logs
				Ngambwa <sup>12</sup>	tbc	-	-	-	-
				Butiaba-Wanseko area <sup>13</sup>	-	-	-	-	currently planning seismic (to occur Dec 06/Jan 07) based on recent gravity surveys by PEPD. EIA with PEPD & NEMA for approval
				N'gassa <sup>14</sup> (probably offshore)	tbc 2007	-	-	-	plan to drill offshore during 2007
3A (1991)	2004	Heritage (Op) 50% Tullow 50%	lake, land and transition zones	Kingfisher-1	15 <sup>th</sup> Aug 2006	early Nov 2006	4120 bopd test (exp. 5600 bopd)	500mm bbls or >1bn STOOIP <sup>15</sup>	Two upper zones tested early Nov 2006 at approx 2125m (secondary zone). Now sidetrack drilling to

km <sup>2</sup> )							under production conditions		primary zone target drill depth of 3-4000m.
				Pelican (offshore)	tbc 2007				plan to drill offshore during 2007
<b>3B</b> <b>(1786 km<sup>2</sup>)</b>	Open, (previously held by Heritage, but relinquished)	Currently under discussion	2D 400 line km 3D 390 km <sup>2</sup>	Turaco-1	2003-2004	-	-	-	All wells abandoned.  Turaco-3 discovered 350m of pay ("excellent reservoir sands") but Heritage deemed non-commercial due to high CO2 content (which decreases the more north you go). The Lower zones which are thought to be oil prone, were not tested.
				Turaco-2	2003-2004	-	-	-	
				Turaco-3 <sup>16</sup>	2003-2004	2004	60mmscfd		
<b>4</b> <b>(5910 km<sup>2</sup>)</b>	Open	Currently under discussion	none (but gravity-magnetic, surface geology & geochemistry surveys done)	-	-	-	-	-	-
<b>5</b> <b>(6040 km<sup>2</sup>)</b>	Sept 2005	Tower (100%) The company is actively seeking a partner	none (but gravity-magnetic, surface geology & geochemistry surveys done)	-	-	-	-	-	-

## 5) Environmental Impact Assessments

Environmental Impact Assessment (EIA) is a globally recognised and accepted methodology for identifying and assessing the significance of impacts associated with developments considered likely to have negative impacts on the environment. The EIA process results in the development of an Environmental Impact Statement (EIS), which summarises the project, the impact assessment and the mitigation actions required to eliminate or minimise those impacts.

In Uganda, EIA Guidelines were published by NEMA in 1997. As a result, there have been several EIA's developed specifically for hydrocarbon seismic survey and exploratory drilling so far. The Ugandan Guidelines provide clear direction on what detail should be included, and the level of detail of assessment, and what action should be taken post approval. It also provides the opportunity for the authorities to reject an EIA that does not meet the criteria or quality required in the Guidelines. Two suggested areas where the guidelines could offer improved advice is in promoting a more quantified systematic methodology for determining impact significance, plus encourage practitioners to determine significance prior to taking mitigation into account. The current situation assumes mitigation will be effective whereas this is regrettably not always the case. It is perhaps better practice to assess all impacts, and then provide mitigation to those deemed significant. Further assessment can then follow to determine if mitigation actions are sufficient and successful in reducing the impact.

The EIA's obtained for the purposes of this assessment include:

- EIA for Kaiso-Tonya area exploratory drilling (Block 2) – Hardman Sept 2005
- EIA for Kingfisher-1 exploratory drilling (Block 3A) – Heritage April 2006
- EIA for Butiaba-Wanseko seismic exploration (Block 2) – Hardman Sept 2006

Following successful exploratory drilling, and the award of those licence blocks still open, further EIA's will be developed focussing on additional seismic survey, further exploratory drilling, the longer-term production stage, pipelines, then ultimately decommissioning plans and audits.

An EIA for exploratory drilling at Turaco (Block 3) was also developed, but was not accessible during the course of this study. An EIA for seismic survey in the very sensitive Wanseko-Pakwach (Block 1) has recently been finalised and has just been submitted to NEMA, so will be open for public consultation shortly<sup>17</sup>. EIA's for the Karuma Falls and Bujigali hydro-power projects were reviewed briefly as part of this study to be able to compare between different sectors the quality of baseline survey and impact assessment work undertaken.

### ***Good international practice in EIA and associated EIS reports***

The following list provides what the author deems to be a summary of good international practice of required information and assessment to be incorporated into an environmental impact assessment and statement. This is a collation of requirements from a variety of sources and has been drawn primarily from UK EIA regulatory guidance<sup>18</sup>, the International Association of Oil and Gas Producers (OGP)<sup>19</sup>, the Energy and Biodiversity Initiative<sup>20</sup> plus multi-national industry environmental assessment documents. Of course the level of detail required within the EIS should be commensurate with the potential impacts from the project, but in developments like hydrocarbon drilling or production, detail to the level listed here is not an unreasonable expectation.

#### **1. Non-technical summary of the EIS**

- detail sufficient to allow the non-specialist reader to understand the main environmental impacts (can be a separate, standalone document)
- summary of the description of the activity and the receiving environment
- the main alternatives considered
- the aspects of the environment likely to be significantly affected by the development
- a summary of the assessment process
- the likely significant impacts
- the mitigation measures to be implemented

- references to maps and diagrams

## **2. Characteristics of the activity:**

- purpose & objectives of the activity, and its timescale
- description of the activity: physical characteristics of the activity, what practices the operation or construction will involve, the location, design and size of land or seabed area taken during construction and operation
- identification of environmental aspects such as emissions & discharges (including wastes) that can cause environmental impacts, plus identify any materials to be used if considered an important resource
- where techniques or technologies to be applied are as yet unknown, the EIS should indicate possible methods to be applied, and use worst-case scenario to predict and assess impacts
- if the project is likely to occur in stages, identify the full extent of operations, and predict their anticipated effects as far as presently available information will permit
- provide a brief experience of the operator and the operation
- identify the Regulations under which the EIA is required.

## **3. Description of the main environmental and social preferable alternatives to the proposed activity** e.g. no activity at all, alternate sites, timing, construction practices, operating processes, routes, etc

- advantages and disadvantages of each, with environmental implications
- outline reasons for selection of the preferred option(s)
- state factors influencing choice e.g. feasibility, costs, reasonableness

## **4. Description of the environmental baseline, including all aspects of the environment likely to be affected.** Information should be specific to the actual area, not a generic description of the local environment:

- include latitude/longitude locations, and maps of appropriate scales
- details of other relevant plans, designations or protections in place at the site(s) or surroundings
- describe current condition of environment emphasising aspects likely to be affected (baseline conditions), taking into account all existing activities, contamination and impacts.
  - human population and other users of the area
  - tangible property (including archaeology)
  - fauna & flora
  - geology and soil or seabed
  - surface water and aquifers
  - landscape or seascape
  - air quality & climatic change factors
  - the interaction between any of these
- data: state sources of existing data (use only recent data), methods used in collecting data, quantitative where possible
- describe how the impacted feature might develop if proposed activity were not to take place
- state gaps or limitations in environmental information e.g. non-availability, out-of-date, further work required, etc

## **5. Description of the EIA Process used, and findings:**

- methodology used to identify and rank the key impacts
- impact identification
  - considering all aspects likely to be affected (as identified in the baseline), and all aspects of the proposed activity, both during normal and abnormal (e.g. emergency) operations
- cumulative effects assessment
  - assess all potential impacts and effects from this activity
  - set these in the context of all other activities taking place (determining the 'additive' effects of the new activity)
  - state which effects have and have not been included, how this decision was reached, and the spatial/temporal scope of the assessment
- prediction of impact significance, likelihood and magnitude
  - discussion of likely significant impacts (with definitions of likelihood and significance)
  - the magnitude should be evaluated as a deviation away from the established baseline condition, and provided with the data and methods used to establish magnitude

- quantification of significance, likelihood and magnitude for ease of ranking
- where assumptions or unsupported data have been used in calculations, their reliability/confidence should be indicated
- the EIA should
  - evaluate any direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects, resulting from the existence of the development, the use of natural resources, the emission/discharge/ disposal of pollutants/wastes, and the creation of nuisance/behaviour change.
  - take into account feedback from pre-submission consultation (e.g. Terms of Reference)

**6. Description of the likely significant effects** from the activity on the baseline environment, including:

- physical presence of the operation
- use of natural resources
- emissions and discharges, including disposal and elimination of wastes
- creation of nuisance or behavioural change
- description of forecasting methods used to assess these effects.

**7. Description of the measures proposed to eliminate, reduce or mitigate** potential significant adverse impacts or manage residual impacts, indicating:

- how impacts will be designed out of the process
- how and when the measures will be put in place
- the intended effectiveness of each measure
- a clear commitment to implementation of these measures
- the management plan and monitoring programme required to track their effectiveness and the resulting effect on the environment, with associated responsibilities for each element
- how these measures will integrate into an Environmental Management System (EMS) for the lifetime of the activity.
- details of the EMS such as: environmental policy, monitoring of impacts, auditing, plus responsibilities for control, management, mitigation and review (and how these will be achieved).
- the appropriateness of offsetting any residual impacts, and how offsets could work for this project

**8. Description of how consultation has and will play a part** in development of the EIA and decision-making process of the activity.

- The consultation process should be transparent and well publicised
- How stakeholders and representatives were determined should be included, as finding the correct representative can be difficult
- Consultees should be fully informed of how the intended project could adversely affect their behaviour and /or way of life, and the possibility of employment and benefits should not form the emphasis of the discussion. This should involve explanation of oil and gas practices which the consultee may never have come across before, but should allow better informed understanding of potential negative impacts.
- Consultees should be informed how their input will be taken into account.

**9. Description of any technical difficulties or lack of know-how or data gaps** in compiling and assessing the information.

### ***The three EIA's reviewed***

The three EIA's reviewed as part of this study cover some or most of these points in a varying degree of detail. Further analysis on each of these is detailed below, highlighting positives and negatives of the approach taken and information provided in each. Page numbers of the EIA documents are provided (in brackets) to provide references for clarity, or where follow-up may be appropriate.

#### **A. Kaiso Tonya Exploratory Drilling EIA**

Published: Sept 2005  
 Company prepared for: Hardman  
 EIA Team: James Gilmour, drilling specialist

Luyima Eddie, environmentalist  
 Gertrude Binta Magezi, sociologist  
 Dr Twongo Kairania Timothy, senior ecologist  
 Julius Nyakaana, quality controller

## 1. Executive summary

- No non-technical summary included

## 2. Project characteristics

- Map of Uganda provided with Hardman block marked, plus Kaiso Tonya area map with main camp, Mputa and Waraga sites labelled with arrows. No latitude/longitude co-ordinates provided for any locations.
- Objectives of the EIA are stated (p.6). Scope includes access roads, main camp and all onshore drill sites. The scope should be more specific on how many wells, and where they should be. As this generic EIA has been approved, Hardman can essentially drill any number of wells to access identified prospects, and can in theory drill anywhere in the Kaiso-Tonya area in the near future.
- Onshore (on land) drill sites:
  - Well-sites are stated as Mputa-A, Mputa-B, Waraga, Nzizi, Ngambwa (all onshore) and N'gassa (near-shore). The scope also states "including any other onshore drill sites identified in the future which are similar to those listed" – as only the Mputa well location had apparently been decided at the time of writing the EIA, this means that the focus of the whole EIA is primarily the area where Mputa will be drilled. In addition, by focussing the EIA on one well when in reality it covers five onshore wells, does not allow for an effective cumulative assessment.
  - Timescale of 2 months is stated for drilling Mputa and Waraga (p.12) – does not state any timeframe for drilling of the further onshore wells.
- Offshore (off lake shore) drill site:
  - States N'gassa well would be subject to an addendum to this EIA, as unlikely to be drilled from the shore. If offshore (off the Lake shore) drilling is required, a new EIA will be required, not just an addendum as stated in EIA, as risks and impacts from a well drilled on the water will differ from a well drilled onshore.
- Some repetition of basic information – project activities and components are contained in Section 3 (Methodology) and Section 4 (Project components and impacts), and then impacts are provided in both Section 4 (Project components and impacts) and Section 7 (Project attribute impacts). A clearer structure and demarcation of detail between sections would provide the reader with a more succinct understanding of the project, and make it easier to locate specific detail.
- Main project components stated as access roads, main camp and drill sites.
  - Big focus on access roads. States some roads may need upgrading or realignment. Main generic impacts listed.
  - Main camp to be located at Kyehoro, the camp used during the seismic programme. 80-100 people (30-40% to be locals). Approx 5 acres footprint.
    - Sanitary water to be extracted from lake, and potable water to be trucked into site until borehole drilled at camp
    - Fuel storage to be buried, chemicals/lubricants to be stored in drums in banded/sealed areas
    - Typical wastes are listed
    - Suggests there may be other camps required but is not specific why or where.
    - Again, main generic impacts listed
  - Drill sites: the EIA states the focus is on a generic onshore location which represents the five anticipated plus and more similar locations. This is not good EIA practice. Individual drill-sites can have huge impacts depending on where they are sited.
    - The EIA states that ground water levels across the area have not yet been determined yet this type of information is critical to feed into an EIA when selecting sites, as the likelihood of impacts and mitigation actions chosen depend upon it
    - States that waste pits will usually be un-lined unless oil based mud used, the groundwater level is shallow or the site is close to surface waters. But the EIA does not state the criteria thresholds when a liner would be required. For example, how shallow does the aquifer need to be before the company deems an impermeable liner is required? PEPD & NEMA should require this kind of information before approving the EIA. [Note: all pits are now required to be lined, irrespective of depth of water table].

- A good factual explanation of the drilling mud system is provided with useful diagrams (p.24-26).
    - States that drill cuttings will be left in-situ in the sump when the pits are buried (p.23) unless tests indicate they need to be containerised and disposed offsite at an appropriate disposal location (p.27). An approximate volume of 50m<sup>3</sup> of cuttings are expected per well.
    - Anticipated that both Mputa and Waraga will each take 1 month to drill, and if appropriate, each take 2 weeks to well-test. No mention of the other wells.
    - EIA states that during a well-test the gas will be flared, and the oil and formation waters will be containerised and disposed of at an appropriate waste disposal centre [Note: Because the Waraga oil had a lower gas/oil ratio than anticipated, some of the oil was flared following urgent discussions with certain stakeholders, and the remaining volume is in the flare pit awaiting disposal].
  - Intentions regarding decommissioning of camp and drill site are stated, but actions are a little vague and lack technical detail.
  - Legislation and the policy framework is listed.
3. Environmental and social preferable alternatives
- No assessment of alternatives has been made
4. Environmental baseline
- Although the EIA is for exploratory drilling, the EIA in theory covers all potential prospects of the Kaiso-Tonya flats (the terrestrial part of the full 3900km<sup>2</sup> Exploration Area). Waraga and Mputa well-sites are labelled on a map of the area (Fig 1b), but no other well sites are located. No lat/long co-ordinates provided.
  - Field surveys occurred during 1 week (25th July- 2nd Aug 2005) (p.6) – unless exceptional baseline data was already available. 1 week is a very short timeframe in which to understand the ecosystem processes and environmental and socio-economic sensitivities. Also does not allow for incorporation of seasonal variability in baseline – as the survey team visited during the dry season, all of the rivers and surface waters were essentially dry.
  - As groundwater quality data will not be obtained until sites are chosen and taken just prior to drilling commences, this information is not available for inclusion in the environmental assessment.
    - Mention is made of the potential for contamination of River Hohwa from drilling trials – not sure what is meant by this as no further detail is provided, and the river was dry when the team visited so no sample was taken.
    - The EIA states water quality data from the mouth of the R.Hohwa as it enters Lake Albert is included in Table 1, but there is no Table 1 in the EIA.
  - Regarding habitats, as only the Mputa well location had been decided by the time the EIA was written (does not say if this was Mputa 1 or Mputa 2), the baseline team concentrated their efforts on the Central zone where this well will be located. Only a brief description is provided of the north-east and south-west zones. As the EIA does not include locations where the other wells will be drilled, all zones should have been subjected to a proper baseline survey.
    - The Central zone comprises open savannah grassland, thick and bush vegetation and riverine vegetation. Main vegetation types are noted.
    - There are no species lists, and no linkages to conservation value or vulnerabilities, even though the Kaiso-Tonya area comprises a Community Managed Wildlife Area and Kabwoya Wildlife Reserve. There is only 12 lines of text describing the fauna of the Kaiso Tonya area (p.30 & 33) – this really is insufficient for an area approximately 30km by 10km, which allegedly is home to Uganda Kob, baboons, warthog, oribi, duiker, bushbuck, black & white colobus monkey and hippopotamus, and contains protected areas.
  - Socio-economic situation is provided e.g. population characteristics, ethnic composition, settlement patterns etc. Isolated fishing villages are the primary types of habitation.
    - The EIA states that some of the fishing villages are now opening up because of the improved roads built by Hardman e.g. now refrigerated trucks are transporting fish all the way to Kampala (but these secondary impacts are not included in the impact assessment).
    - The report does not inflate the employment opportunities
  - The positive impact of leaving boreholes in community spaces are highlighted

## 5. EIA process

- There is quite a bit of repetition on general impacts
- Evaluation of potential impacts is of a very generic nature and is more descriptive than assessment.
  - Impacts are indicated as positive or negative, direct or indirect, short and long term (or both), and reversible and irreversible (or both).
  - As most impacts are listed as both long and short term, and both reversible and irreversible, there is no way the reader can assess the impact using the information provided, neither can they be confident of the quality of assessment undertaken.
  - There is no information on magnitude, frequency, likelihood or significance.
  - Effective analysis of potential impacts on fauna is lacking. One example is “if the area of activity at the drill site and camp extends to the wetlands, amphibian fauna may be permanently displaced”. The EIA is supposed to identify impacts upon which an environmental assessment can be performed, then provide options on how to eliminate, mitigate or compensate for that impact. The purpose is not to identify potential impacts as a warning of future eventuality. In this respect, the philosophy of the EIA is inadequate.
  - The EIA states that vibrations, noise, dust and atmospheric emissions from the drilling activities and vehicles “may result in pollution of nearby wetlands especially at Sites B & D with seasonal and permanent wetlands adjacent to the drilling sites” (p.58). This causes concern, because wetland pollution should not be allowed to happen, plus no mention has been made anywhere else in the EIA where Sites B & D are located, or which well names they might equate to. This alludes to the fact that perhaps more drilling locations have been decided than the information in the EIA provides.
- How do they deal with impacts from flaring?
- No sense of scale of impact: no km’s of access roads, no bunding area sizes, no volumes of emissions, discharges or wastes (EDWs) are included. If the EDWs of a typical well had been determined, this would allow for scaling up of impact and thus more effective assessment.
  - The EIA states the estimated volume of cuttings is 50m<sup>3</sup> per well,
  - The EIA says cuttings will be left in the sump and buried, but the site is actually land-spreading them - what land area does 50m<sup>3</sup>/well of cuttings equate to when spread out? How will they determine the appropriate locations to spread? This has not been assessed.
- Scope of EIA is just exploratory drilling, but mention should be made of potential long-term lifecycle impacts

## 6. Significant effects

- No assessment of significance included.

## 7. Measures to eliminate, reduce or mitigate

- States all members of the workforce are required to undergo safety and environmental induction (p.13) – does not state what this would contain.
- States a safety and environmental audit of the drilling rig will be carried out from time to time (p.13) – this should be more systematic e.g. how often will this occur, who has competency to complete this, what happens to the audit findings, etc.
- There is a clear commitment to rehabilitate and restore within two years of drilling as per requirements of PEPD, NEMA and UWA (p.15).
- As there is no assessment of significant impacts, there is therefore no priority placed on which mitigation measures are most important to achieve or complete first.
- Project mitigations measures are stated for each of the main areas of impact previously described, including:
  - Soil (contamination and erosion), ground and surface water, climate and air quality, fauna (including habitat destruction, hunting, air noise and wastes), flora (loss of vegetation, and interference with pastureland) and socio-economic (human environment, cultural characteristics, population and demographics, health and education) and waste handling.
  - There is some good information here, all of which should be incorporated into the mitigation and monitoring plan, along with more detail on the specifics of the mitigation action, responsible persons, timeframes when actions need to be instigated and completed, etc.
  - Within the mitigation measures, there is perhaps an over-reliance on **doing things properly** to mitigate impacts. For example, to “properly install the sanitary seal”, to “properly cement the annular space”, to have “proper maintenance procedures”, fugitive

emissions minimised by “the proper storage and handling of all fuels”, etc. Doing things properly is good operational practice (which should be a minimum requirement), not a requested mitigation action to minimise the potential for harm.

- On a site visit, a site inspector or PEPD monitor should be able to request to see evidence (hopefully documentation evidence) of how each of these mitigation measures are being implemented and achieved.
- The section on environmental monitoring, evaluation and management planning is titled “Seismic” and makes reference to a similar plan put in place for the seismic EIA submitted previously. It suggests this section has perhaps been pasted in from the previous EIA undertaken for seismic survey in the area.
- The “Contents of Environmental Monitoring, Evaluation and Management Programme” lists a series of wishes – there is no accountability or timeframe within which they should be actioned or achieved – to be an effective monitoring plan this needs a quantifiable framework, and greater explanation of how this will be used on site.
- There is no mention of how this monitoring plan will fit into a site EMS.
- There is the recommendation to “regularly hire” an Environmental Practitioner, and a list of tasks they must perform. The importance of this role and what they need to achieve cannot be stressed too highly. This role will be paramount in ensuring Hardman attains compliance within the shortest possible timeframe, and the person fulfilling this role must work with the on-site PEPD monitor to ensure this occurs.

#### 8. Consultation

- Lists consultative meetings held with authorities and local communities (Section 5.6). Community meetings held at local landing sites. Lists issues and concerns raised by various organisations and residents (Table 4), but does not indicate how their input will affect decisions made. Does not state what information was provided to local residents to allow them to better understand the risks and impacts.

#### 9. Technical difficulties/information gaps identified

None identified.

## **B. Kingfisher Well Exploratory Drilling EIA & Addendum**

Published: April 2006

Company prepared for: Heritage

EIA Team: N. Lewis, project leader & field manager, RPS Energy Group plc

Jon Perry, peer review / project quality control

Robert Kityo, mammalian specialist

Thomas Otim, ornithologist

Edward Kabuchu, MSL manager \*

Shamamba Nguba, civil engineer, Heritage

Rob Skene, field supervisor, Heritage

Moses Kagoda, aquatic/fisheries specialist

\* (MSL is contractor to build drill-site and support infrastructure)

The Addendum to this EIA is covered in the pages following the assessment of the original EIA here.

#### 1. Executive summary

- Executive summary present, with a good level of detail stating the major sensitivities and issues of significance
- The tone of the report is independent, instructing Heritage what to do.

#### 2. Project characteristics

- EIA is to drill one well, Kingfisher-1. Any further wells would need further EIA's, or addendum to this.
- Legislation is included in summary form, and in more detail in Appendix C. Also includes the main agencies and their roles within EIA.
- Mbegu jetty mentioned, but Mbegu camp is not. This is located within Hardman's acreage in Block 2, but needs to be subject to EIA as part of Kingfisher operations as the Mbegu is a component of the Kingfisher-1 operation

- Exact latitude & longitudinal co-ordinates of Kingfisher main base camp provided
  - Drilling operations site for Kingfisher-1 latitude and longitude is provided.
  - Much useful information provided to feed into environmental assessment, for example:
    - Drilling duration of 94 days, intend to drill approx 50m/day
    - Total footprint will be 198,000m<sup>2</sup> (rig-site, camp, roads, helipad, airstrip) plus jetty, separated out
    - Construction for 60 days, involving 100 people (30 from MSL contractors, 70 locals)
    - 100,000 litres fuel to be used during construction. Diesel storage of 2 x 30,000 litre tanks, usage/day and total usage. Re-supplied by 2 tankers (via barge) twice a week.
    - Diesel usage of 200 litres/day by camp generators. Rig use 3-5,000 litres/day Bund sizes given (110% tank volumes).
    - 100,000 litres water during construction (drinking and industrial uses). Drinking water will be bottled and brought in with other supplies by barge), volumes of industrial water from lake or shallow water well (36,000 litres per day for drilling).
  - Indicates areas of design where decisions are yet to be made e.g. whether diesel storage tanks to be underground, or what spill protection will be).
  - No indication of flaring during well-testing.
  - No indication of this phase in whole life cycle of development of field, just focuses on drilling of one well. Some acknowledgement of impacts from this phase as part of a cumulative assessment would have been useful e.g. how many wells are Heritage intending to drill?
  - Intend to store drill cuttings in sump (cement lined), siphon off water based mud into liquid waste pit (cement lined) for evaporation. Expect to generate 490m<sup>3</sup> of cuttings from a well of approx 4000m TVD (total vertical depth).
  - Other wastes – packaging and metal wastes to be removed to Kampala. Hazardous waste disposal had not yet been decided. EIA states Heritage or MSL don't have specific procedures for waste management.
  - EIA states neither Heritage or their sub-contractors have any corporate environmental management procedures in place.
3. Environmental and social preferable alternatives
- Makes note of alternative access options to barge i.e. road, but acknowledges the cumulative impacts that can occur as a result, and hence why less preferable.
  - Says to time activities to avoid sensitive times for species, but does not say when these times are. Does mention fish spawning times.
  - The EIA states that if drilling does not go ahead, there would be less potential for social improvement. Therefore, in the event of oil being produced, social improvement will need to be demonstrated.
4. Environmental baseline
- Block size and well locational latitude and longitude (p.8), plus maps of a variety of scales, a labelled aerial photo, and a satellite image.
  - Groundwater level is extremely high, less than 1m in some areas.
  - Details on Phragmites marsh surrounding large lagoon, with photo's
  - The EIA states the flora and fauna were surveyed as part of the 2005 survey (Bugoma pre-seismic EIA), but resurveyed for this drilling EIA. Sample sites (GPS locations provided) were randomly chosen for baseline assessment, over a few days during field visits (4-6 April and 1-2 May 2006) (p.3). It would have been preferable to assess the baseline over several different seasons to include as much seasonal variation as possible, but this is acknowledged in the report. Longer field visits would have provided more time to study in detail, but the random sampling approach at least manages to allow extrapolation between sites
  - Species lists of terrestrial vertebrates & invertebrates, including reptiles, mammals birds. Good information on use of birds as indicator species, with specific lists of birds seen and where – this is very good for follow up in subsequent surveys to ascertain impact over time.
  - Conservation status was provided for each species listed (global or regional or IUCN status).
  - States detail on history of Buhaka Community Wildlife Area, even though de-gazetted in 2002
  - Village sizes and main occupations (fishing & some pastoral) provided
  - Details on previous archaeological finds made at camp used for seismic, stating a full archaeological survey is yet to be completed (p.27).
  - Baseline water quality sample results included from lake and boreholes

## 5. EIA process

- Evidence of learning from drilling experience with Turaco wells regarding depth to set casings taking into account need for sufficient well control, and reasons why (p.36).
- Good qualitative assessment criteria: nature, duration, scope, persistence, intensity, probability, importance and description of effect. This also takes into account assessment of direct, indirect and cumulative effects. A good tabular framework to aid assessment. For each aspect, impacts and mitigations are provided. For example:
  - Fuel spill from lake operations classified as Very High importance, and between 25-75% likely, indicating the potential severity of such an incident.
  - The physical destruction itself is small, but the indirect impact from quarrying materials and the associated effects (i.e. road access to Bugoma) could become serious on a cumulative basis.
  - Because of shallowness of water table, proximity to lagoon/wetland, and intended drill cutting disposal option (leave buried in pit), the EIA states no biocides to be used in drilling or circulating fluids – clear and unambiguous instruction.
- Although air emission loads are included (p.60) and fugitive emissions are stated, there is no assessment of impacts from anticipated well tests included in the EIA, which is an oversight. Perhaps well testing was not considered for this well, but this is unlikely considering this is the first well to be drilled in the block - some assessment should have been included in the original EIA. An addendum was generated and submitted for fast-track approval just prior to well-testing<sup>21</sup>.

## 6. Significant effects

- Significance (used as “importance” in the report) is indicated for each impact, and those effects considered most significant are clearly highlighted i.e. oil spill to water.

## 7. Measures to eliminate, reduce or mitigate

- Includes information in industry standards e.g. OGP Waste Management Standards (see Standards & Guidelines, Section 8 of this report).
- Restoration – EIA states Heritage have no written policy regarding restoration of the drill-site, camp or jetties. This should be rectified and full restoration undertaken as and when areas of the site are no longer utilised, in conjunction with decommissioning plan agreed with NEMA and UWA, etc as appropriate.
- Identifying oil spill to water as the most significant impact from the whole operation, the EIA emphasises the importance of developing an oil spill contingency plan.
- Specific operational controls and procedures to be developed are detailed and fully encompassing, although timeframes should be included. Examples include:
  - For waste management, segregation, labelling, and inventories are required, hazardous and non-combustible wastes to be disposed of at an appropriate facility (yet to be decided) and reliance of evaporation of waste water.
  - Air emissions: idling of vehicles to be kept to a minimum, maintenance of engines, use of clean technology and fuels, only non-hazardous, combustible materials to be burned.
  - Spill containment: recommendation on prevention and clean up, planning, reporting, training, bunding of storage and fuel dumps, waste oil disposal, refuelling procedures and practices, and use of impermeable membranes to protect aquifers.
  - Appointment of an on-site HSE Manager and Environment Advisor, with specific roles.
  - States an Environmental Monitoring Programme should be developed to include:
    - Oil and fuel spills: records kept including photos
    - Water resources: biologist to design and undertake water sampling strategy, and record of all water extracted from the lake or shallow wells
    - Archaeological sites and findings
    - Waste disposal areas and inventories
  - In addition, the EIA states an Environmental Management Plan needs to be developed, recognising the fact stated earlier that neither Heritage or its contractors has a corporate environmental management plan for use at site.
    - This defines roles and responsibilities of Heritage, the drilling contractors and the statutory agencies.
    - Includes general environmental management activities prior to, during and following drilling, including activities causing potential impact, the impact itself, mitigation actions, responsible parties, monitoring and timing.

## 8. Consultation

- Stakeholders identified and listed – insufficient detail on consultation findings and how community concerns will be addressed (p.31).

## 9. Technical difficulties/information gaps identified

- Acknowledgement is made that in the little time available for field study, it was not possible to thoroughly survey, especially for small mammals (p.22)
- Stated use of helipad not included in assessment as will only be used for emergency.

## **Addendum to original EIA – for flaring during well-testing Kingfisher-1 well**

- Does not indicate extent or duration of intended tests.
- Includes details of older technology being used (states that newer equipment exists but is apparently not globally available)
- States flare-pit to be fenced off, with opening left for directing the flare towards the lake. Considering the sensitivities of the lake area mentioned within the original EIA, it would have been sensible to design the flare direction to be away from the lake and the community.
  - The lagoon is only 200m away from the rig-site, and the wetland/marshes only 50m - the potential for fallout of non-combusted oil droplets using the burner technology stated can occur up to 150m from source. This is a very small margin for error to eliminate the impact of oil contaminating the sensitive wetland and lagoon area. It would perhaps have been more prudent to wait until the cleaner technology (Ever-Green) burner was available, as the EIA does state the importance of use of clean technology in this sensitive environment.
  - The prevalent wind direction is given as coming from the lake to the rig, therefore this means the wind would blow any unburned hydrocarbons back towards the rig-site. This does not coincide with information in the original EIA which states the two predominant wind directions are from the north and from the south (p.57).
  - The community lives approx 120m away. The addendum states the houses will be moved to at least 400m away, and villagers kept away for the duration of the test. Moving houses is something that needs to be done in consultation with the community and takes time and effort to perform sensitively.
- States that atomisation will be controlled by potentially adding diesel if the oil produced during well-test is too heavy to combust effectively.

## **C. Butiaba-Wanseko Seismic Survey EIA**

Published: Sept 2006  
 Company prepared for: Hardman  
 EIA Team: Luyima Eddie, environmentalist  
 Gertrude Binta Magezi, sociologist  
 Julius Nyakaana, quality controller  
 Dr Tim Twongo, senior ecologist  
 Jean-Guy Tarin, seismic expert  
 Chas Sheen, geophysicist, Hardman

### 1. Executive summary

- Executive summary present containing information on major environmental and social impacts and their mitigation measures. Also includes a Monitoring and Management Plan table.
- There is less 'independence' in writing-style than the Kingfisher EIA, as if been written by the company.

### 2. Project characteristics

- Objectives of assessment are stated along with a summary of the EIA process and methodology (over simplified).
- Includes brief details of EIA team members (full CV's provided in Annex).
- A map of Uganda is provided (fig.1) pointing out the area to be surveyed. A larger scale map is used in fig 2 to show survey line grid pattern – this map did not photocopy well.
- No latitude or longitudinal grid references used to identify start/end locations for survey lines. This would be useful to enable UWA/NEMA to provide location specific technical advice on sensitivities.

- Useful general description of terrestrial seismic operation to help the non-seismic specialist to better understand.
  - Information on drill equipment to be used – portable auger drills and/or truck mounted rigs. For the latter, the EIA specifies the Polaris drill machine designed specifically for use in sensitive areas or where access is restricted. Check to ensure this is used. States the drill holes will be 1.5m deep and 0.5kg of explosives used in each hole (contradicts both of these elsewhere in report).
  - Camp establishment info is provided, anticipating it will be close to Kigoya-Bugana, but no locational co-ordinates are provided. Instead a big arrow on a map marks the spot in Annex 3. The EIA states that if a water well needs to be drilled, the site will be selected with input from UWA. There is also mention of a sub-camp, but no location co-ordinate information is provided. States that the camp will be used for exploratory drilling if seismic is successful – this needs to be subject to a further EIA for exploratory drilling, and cannot be assumed at this stage. But note the presumption is usually that a ‘temporary’ structure for seismic will continue to be the ‘temporary’ structure for drilling, and it could possibly become the more permanent structure for the production phase. Therefore professionals involved in EIA approval need to be conscious of the future impacts of decisions made now.
  - Survey line grid preparation – states “no trees will be cut”; survey lines will be ‘crushed’ not cut unless grasses are over 2m high (to allow line of sight), and bulldozer lines will ‘weave’ along natural contours. It also states that cleared lines will need to be 3m wide (for security/safety reasons) but it is ambiguous as to whether this means all ‘crushed’ lines, or those lines cleared of tall grasses (p.25). Lines will be cleared of debris and any damage restored post-seismic.
  - Regulations and policy are summarised.
  - There is much repetition of information, and some mitigation discussion is mixed in with the project characteristics (p.22). The information could be better structured, allowing the reader clearer indication of what project element is being discussed at any one time i.e. the section jumps from description of the seismic method and equipment, to information about how the camp is set-up, back to survey line grid preparation. The writing style is over-generalised, without sufficiently detailed information.
3. Environmental and socially preferable alternatives
- States there is no other option than seismic survey to accurately predict hydrocarbon reserves
  - Temporal/seasonal alternatives are not discussed.
  - Does not assess alternatives for any individual aspects of the project with advantages or disadvantages for each. The section titled Project Design Alternatives provides information on aspects of the planned project but does not assess alternatives.
4. Environmental baseline
- No latitude/longitudes provided. Does not state land area to be covered by survey, or linear length of survey.
  - Generalised habitat types. Survey made at end of dry season, which does not take in full seasonal change in the baseline that would be experienced. Grass & bush types listed.
  - Part of the survey area lies within the Bugungu Wildlife Reserve but there are no adequate species lists or links made to conservation status of species likely to be encountered. Most information was gleaned through interview with UWA rangers. No bird lists, although mention of 3 bird types heard whilst the team was in the field. States a detailed baseline survey (similar to that carried out in Kaiso-Tonya area) will be carried out prior to the seismic survey – but this is too late to incorporate the findings into this risk assessment.
  - Water samples taken of lake and rivers and, usefully, the results are provided alongside the National Standard for potable water, for reference purposes.
  - Socio-economic details are good (presumably reflecting the presence of a sociologist on the EIA team). A Stakeholder Analysis was performed, but seems to be lacking the Directorate of Water Development and the Wetlands Inspection Division – these two organisations should be consulted on operations in this lakeside area.
5. EIA process
- No information is provided on an impact assessment, or how this might have been performed. No quantification of significance, likelihood or magnitude. There is a Risk Assessment table included (Table 5 p.84), but this is contained within the Environmental Monitoring, Evaluation and Management Programme section, and seems divorced from the process used to identify impacts and mitigation measures.

- Environmental and Social Impacts are listed in only general detail. No mention of secondary or cumulative impacts. Positive impacts are listed as well as negative impacts – care should be taken not to over-emphasise the positives, e.g. the EIA states that local residents will benefit from a decrease in unit prices of some consumer products because of the increased hospitality industry servicing the oil projects.
  - There is repetition of statements, and a certain lack of clarity, i.e. the section on impacts from noise and vibration includes statements on observations of all-day drinking in fishing communities (p.64).
  - On land use impacts, the EIA states UWA needs to take note of land take – suggest that Hardman instead work collaboratively with UWA to choose sites of least impact.
6. Significant effects
- No significance determined for the impacts listed.
7. Measures to eliminate, reduce or mitigate
- Measures suggested to mitigate impacts should be more specific, targeted and timeframes provided. For example:
    - There is inadequate information on how to mitigate impacts on fauna (p.67).
    - Generic statements such as “tanks will be leak-proof” is not a sufficiently detailed mitigation action (p.69).
    - What is the “environmentally acceptable manner” that will be used for storage and disposal of chemicals, fuels and lubricants (p.69)?
    - Plastics should be sent for recycling, not burned, as Hardman practices at its Kaiso-Tonya operations (p72).
    - Regarding impacts from explosives “Survey lines to be manned” – by how many people? What distances along survey lines? How will they be trained? (p.74)
    - “Source of water for human use at the camp will be well planned”. How? (p.78)
  - It states “areas of particular sensitivity will be avoided if advised by UWA and Bulisa District Administration” – although these two stakeholders should be involved in the EIA approval process as part of effective consultation, it would be prudent to specifically seek their input on this point in particular.
  - Regarding impacts to soil, the EIA states “only a small number of blowouts will be experienced” – as these will cause a negative impact not only on the soil but surrounding vegetation (and potentially animals if in the area), there should be some quantification of how many blowouts can be expected, with some reference to previous experiences or likelihoods.
  - No effective mitigation to specifically minimise harm to wildlife, apart from “guarding cables during data acquisition is essential”
  - Some contradictory statements:
    - Explosive charge sizes stated as 0.5kg (p.20) or between 0.5 to 2.0kg (p.75) ?
    - Explosive charge depths stated as 1.5m (p.19) or 3 to 6m (p.75) ?
  - The EIA states an environmental monitoring, evaluation and management programme be put in place, along with a self-audit process. The contents of such a programme are included. This list of intentions could be improved by the inclusion of responsibilities and timeframes by which they need to be instigated and completed. Some intentions could be clarified with a little more detail and converted into specific actions, and include details on how they will be achieved. For example, “Hardman will ensure that in all it’s activities, account is taken to protect and maintain the natural environment”.
    - Table 5 includes a Risk Assessment table, included within the environmental monitoring, evaluation and management programme. This is a good attempt to summarise risks but does not directly correlate with the impacts listed previously, nor does the list of controls & prevention measures include all the mitigation actions mentioned elsewhere in the text e.g. guarding cable lines, only hand-cutting allowed in clearance of lines, no bush cleared for vehicle access, etc. It is not clear how the risks have been derived.
    - The EIA states “Hardman will avail the Environmental Management Plan to sub-contractors prior to start of operations” – in which case the Plan should be revised to include all mitigation options stated elsewhere in the EIA, and be accompanied by further detail as appropriate.
8. Consultation
- Photos of communities being consulted are included, with signed attendee lists. Open meetings were held in the Butiaba-Wanseko region. Useful summary of concerns raised with communities (land

issues major concern, hope for jobs major benefit). Meetings with PEPD, NEMA and UWA were conducted, presumably in Kampala.

9. Technical difficulties/information gaps identified

- None highlighted

## **Discussion**

This was only a very short timeframe study with only three oil and gas EIA's assessed, but there is a distinct variance in depth of study and quality of assessment between the EIA's reviewed. There is some very good practice, but also some area for improvement. The one EIA team led by an international EIA professional displays a better quality of detail and impact assessment. In general, standards need to improve, and this will occur as more Ugandan EIA professionals gain experience on impact assessment projects, and become more familiar with the level of detail required in the EIS. Oil and gas projects are likely to have significant impacts, and effective assessment and mitigation needs a thorough understanding of operations and hazards. Increased numbers of Ugandan EIA professionals are required to contribute towards the assessment of oil and gas development, and specific training in oil and gas operations will assist this process, as part of the continuing development of EIA practitioners.

In the interim, companies could preferentially choose EIA teams led by an international EIA professional (from an organisation with a positive international reputation) working with several Ugandan EIA professionals on the project team. This would allow on-the-job experience to be gained under a team leader knowledgeable of international best practice. As EIA becomes a more established profession within Uganda, less international input would be required. The oil and gas companies will benefit from having high-calibre technical input and assessment from their EIA teams. In conversation with the EIA Professional Association of Uganda<sup>22</sup> there are plans in place to consider develop competency standards which will include oil and gas experience.

The NEMA EIA Guidelines provide a very good framework on which to build a good EIA, although assessment of significance could be expanded a little. For example, the checklist in Annex 5 suggests assessing impact significance once mitigation has been incorporated – this infers that all mitigation is successful. The author suggests that assessing significance without considering mitigation is a more effective way of truly assessing which impacts are likely to be the most significant, then apply appropriate mitigations and assess again.

## **Specific technical concerns**

Each of the three reviews contains indications where follow up might prove useful, and are too many to summarise and repeat here. But a few specifics are worth highlighting.

Some of the practices suggested and approved within the EIA's could be reassessed e.g. reliance on land-spreading of drill cuttings in sensitive areas, and application of aluminium sulphate to soil where cuttings have already been spread to lower the pH (but thereby generating sulphuric acid in the process). Scientists may have been contracted to find solutions to some of these situations, but need to have operational experience and site-specific knowledge to ensure further environmental impacts are not caused by trying to minimise them in the first place.

Hardman was very fortunate to get such a generic EIA approved to cover all onshore drilling in the Kaiso-Tonya area, regardless of where and how many wells will be drilled, whether already planned or yet to be evaluated. This would not generally be considered good EIA practice, and certainly not an approach to be recommended in the future.

Kingfisher-1 EIA states that cuttings and muds would collect in the pits; the water would be allowed to evaporate off, then the drill cuttings left in the pit (sump) and covered over (p.36) i.e. buried in-situ. Whilst at site, we were told the site management team were currently waiting on waste water analysis to see if the cuttings can be spread onto land beyond the airstrip – this is not included in the EIA and it needs to be established if this would be a breach of licence approval condition. [Note: NEMA approval was apparently sought<sup>23</sup>]

Similarly Kaiso-Tonya EIA states the pits are normally buried with the drill cuttings in place (p.23 & p.27). Need to check how and why Hardman are land-spreading all of their cuttings

Alternative 'disposal' options should be considered as part of the EIA, including finding more resourceful and alternative uses for these cuttings e.g. once treated, they could be used as aggregate material on roads that need surfacing or strengthening (through villages or other appropriate locations).

Check that no biocides are being used in drilling or circulating fluids for Kingfisher-1 well (Note: informed that biocides are only used to preserve geochemical samples<sup>24</sup>).

## 6) Impact mitigation, compliance and monitoring

A company commits to certain actions as part of its EIA to ensure that impacts from its operations are eliminated or mitigated. In addition, as part of the EIA approval process, conditions associated with award of approval must also be actioned. Ensuring these actions are carried out is critical in minimizing the resultant impact on the environment.

The International Association of Oil and Gas Producers (OGP), in discussing components of environmental and social assessment, states that<sup>25</sup>:

Following impact assessment, measures to control effects are evaluated. During this step, impact mitigation, management and monitoring plans are developed and alternatives considered. These plans are an integral part of SEA\* and are commitments to actions during project development.

The goal of control measures is to avoid, eliminate or bring to acceptable levels potential environmental and social impacts. Close interaction with project engineers and consultation with stakeholders is critical for the development of successful, low-cost mitigation. Strategies to control effects are usually considered in the following order:

1. Prevention – avoid the potential impact
2. Minimisation – decrease the spatial/temporal scale of the impact
3. Remediation – apply rehabilitation techniques after the impact has occurred
4. Compensation – accept the impact or residual impact, and compensate, as appropriate.

Selection of control measures is an iterative process based upon agreed technical, economic and public acceptability criteria.

(\* *Social and Environmental Assessment*)

This hierarchy of approaches to minimise environmental and social harm is one way of ensuring an operation manages its impacts responsibly. A typical operation may involve a few or all of these approaches, depending on what is deemed appropriate not only by the company and the Govt, but also by the public.

EIA's contain a variety of mitigatory control measures which the company commit to put in place as part of their application for approval. Once these EIA's are reviewed and sanctioned by NEMA and statutory stakeholders, a Certificate of Approval is provided listing certain additional requirements to which the company must also adhere, as these are conditions of its licence approval.

But even the most thorough EIA's don't necessarily provide adequate protection when undertaking high risk operations in sensitive environments. Monitoring of practice against approval conditions and mitigation actions is vital to ensure that the environmental and social impacts are managed effectively, and is the responsibility of the Government and it's associated authorities to ensure this occurs. Without mitigation and systematic monitoring, compliance with regulations and confidence in responsible operations management may never be achieved.

### **Field Assessment**

A seven-day fieldtrip was undertaken during Nov 2006 to the Albertine Rift area of Uganda, visiting several abandoned, current and future energy resource sites with representatives from a variety of organisations, listed here:

- Uganda Wildlife Authority (UWA)
- National Environment Management Authority (NEMA)
- Petroleum Exploration and Production Department (PEPD)
- National Forestry Authority (NFA)
- Wetlands Inspection Division (WID), and the
- Wildlife Conservation Society (WCS)

All but the WCS, are statutory agencies, and therefore representatives of their expert area of government. In addition, these organisations should all have had the opportunity to provide input and make recommendations as part of the existing EIA approval processes, including those reviewed within this study.

The intention of the fieldtrip was to visit several oil & gas, hydro-power and geo-thermal sites, to assess current and future impacts, how impacts are being (or should be) mitigated and monitored, and provide an educational opportunity for the representatives to discuss how energy-related impacts are relevant to their own organisational work – this being specifically relevant in their roles as consultees for EIA approval. The work-plan and itinerary of the fieldtrip is included in Appendix 2. Eight sites were visited briefly including:

- Katwe-Kikorongo - Queen Elizabeth National Park
- Semliki - Semliki Community Wildlife Area
- Sempaya hot springs - Semuliki National Park
- Kaiso-Tonya - next to Kabwoya Wildlife Reserve
- Kingfisher (Bugoma) - next to wetland and lagoon
- Butiaba-Wanseko - includes Bugungu Wildlife Reserve
- Buligi - Murchison Falls National Park, delta area is international Ramsar wetland site
- Ayago - Murchison Falls National Park
- Karuma Falls - Murchison Falls National Park

As can be seen, many of these areas lie within or next to areas deemed worthy of national and international protection designation. This immediately told us that great care is required when considering the potential for development in these areas, and expectations were rightly high regarding the management and mitigation measures put in place to minimise impacts from operations.

Much of the time visiting Kaiso-Tonya and Kingfisher drill sites were spent with representatives of the oil and gas companies exploring in these blocks, and acknowledgement to them for allowing us access to their sites, and spending valuable time speaking with us.

The main findings from each site are summarised below, including impacts and mitigation methods, and monitoring or compliance seen or discussed with either trip participants or stakeholders we met. It must be stressed that only a few hours maximum was able to be spent at any of the sites, so the findings represent those most obvious from visual inspection and discussion.

## **Katwe-Kikorongo – potential geothermal site**

*Importance for wildlife: located within Queen Elizabeth National Park*

Potential for geothermal energy in the Katwe-Kikorongo area lies within the western boundaries of Queen Elizabeth Park. The area has undergone some feasibility and resistivity survey work, but has not yet been developed; hence there is no monitoring plan in place. The purpose of visiting the site was to visually assess the potential impacts that could occur as the geothermal potential is realised, and to better understand what mitigation could be required.

Some drilling had occurred at a site just south of the main road between Kabirizi and Kotogo. The site had not been cleared or decommissioned properly, with evidence of down-hole cuttings materials piled up adjacent to the drilling area, along with discarded rubbish and some kind of spilled oil (smelled like diesel, perhaps from a generator) – see Photo 1. As this site is within the boundaries of Queen Elizabeth National Park, the UWA rangers stated they had already cleared up most of the rubbish discarded at the site, but a variety of plastic debris and batteries were still obvious.

Potential impacts expected from further feasibility testing and site construction were discussed, focussing on the location of the eventual working drill-site where the well(s) would tap into the steam/brine reservoir, and the size and location of surface infrastructure. The areas visited showed several signs of wildlife use, including elephants, and was up-slope of the wetlands around western Lake George. As the site visited was less than 500m from the road, visual impacts of the site would need to be carefully managed as would noise impacts on wildlife from construction or operation. During operation, disposal of the produced formation water will need to be managed so as not to discharge to surface waters – perhaps there is the

potential to re-inject the formation water back down (once heat has been extracted from it) to the geothermal reservoir to maintain pressure.



**Photo 1: suspected diesel leak remaining from geo-thermal survey work at Katwe-Kikorongo site**

Appropriate use of protected area management zones (including buffer areas) will be required to ensure that minimal short-term disruption occurs in those areas within the national park deemed most important for the protection of species and habitat.

### **Semliki (Block 3B) – Turaco wells**

*Importance for wildlife: located in Semliki Community Wildlife Area*

This is the site of three abandoned wells, Turaco-1, -2, and -3. As mentioned previously, the original EIA was not available during this study, but an Environmental Audit Report and Abandonment Plan<sup>26</sup> had been developed which contained numerous actions on how the site should be decommissioned and restored. This plan had been submitted to NEMA and was awaiting authorisation. The majority of the actions contained timed deadlines of Oct 2006 – our visit occurred during Nov 2006 and many of these actions had obviously not occurred (including ~apparently~ payment of compensation to the site owner for a cow killed via a roofing structure falling on it during strong winds).

Whilst at the site we were able to make a visual assessment of how the site has been left. Past drilling operations are still very much apparent;

- concrete hard-standing covers the majority of the area,
- waste pits and flaring pits are still present and uncovered. Some pits remain filled with liquid waste, others which appeared empty of waste now have contaminant-tolerant plants growing within them ~ *Typha* species),
- the camp still contains discarded equipment (including pipes, cookers and air conditioning/fuel pump unit - see Photo2) and lots of litter (plastics, paperwork with workers names, bottles, laundry baskets, etc), and
- large sections of the perimeter fence have fallen or disappeared i.e. not adequately restraining entry to the site, either by people or animals.



**Photo 2: abandoned camp equipment at Turaco-3 (Photo: I.Owiunji)**



**Photo 3: cattle drinking from abandoned waste pit at Turaco-3 (Photo:I.Owiunji)**

In fact whilst there, a small herd of cattle were observed drinking from the liquid waste in one of the pits – see Photo3. We were told that people from the local communities try to keep their own cattle away from these pits (citing animals falling ill) but as the cattle we witnessed drinking apparently belonged to a different community, they were not ushered away. Latrines were still at the drill-site, as were unearthed septic tanks. The septic tank in the camp had also been left uncovered (the family of the site owner had covered it temporarily). No onsite restoration had yet been attempted at the drill-site.

Drill cuttings, and the water-based muds associated with them, have apparently been disposed of by distributing on the areas surrounding the drill site. Muds from Turaco-1 and -2 were treated before disposal, but muds and cuttings from Turaco-3 were apparently not treated prior to disposal<sup>27</sup> - by then a different drilling contractor was used (Dafor) with different practices. The EIA apparently stated that cuttings and muds would be spread on the surrounding land after being treated<sup>28</sup> – therefore spreading

non-treated cuttings was in breach of the EIA approval. One slightly alarming entry in the aforementioned Abandonment Plan, cites that aluminium sulphate is intended to be mixed with the soil containing the cuttings, to neutralise the pH increase caused by the amount of lime previously added to the drilling muds. This would create sulphuric acid, which it states will reduce the pH to a more neutral level. Efforts should be taken to stop this action occurring if it has not already happened, and less harmful ways of neutralising the area be sought (if still appropriate) - vegetation is now growing on these areas, and hopefully natural restoration occurring.

As this area is part of the Semliki catchment and flood plain, seasonally high waters could potentially flood the area. All waste pits appeared to be lined with concrete, but they did not have raised edges or "lips" to prevent increased volumes of surface waters encroaching into the pits.

Wood paper and plastic bottles should not be burned as suggested in the Abandonment Plan, but a recycler found who will manage not only the waste from Turaco, but also that of Heritage's Kingfisher operations as well.

As wells drilled at this site showed large proportions of CO<sub>2</sub> gas, development would be more technically difficult and expensive. Nevertheless, if production was deemed essential, the produced CO<sub>2</sub> gas could be diverted for use elsewhere, either in industrial applications or as part of enhanced oil recovery (EOR) where gas is re-injected to maintain reservoir pressure.

PEPD had been here to inspect in April, but had expected actions to be complete by now. NEMA have visited the site to monitor, but less often recently. There seems to be room for improvement in how such a site was allowed to reach this state and remain like this for so long. Following discussion between trip participants, it appears that although abandonment issues are handled by NEMA<sup>29</sup>, some confusion in monitoring roles between agencies allows situations such as this to slip between the gaps. It was emphasised that all agencies should include financial expenditures into their budgetary planning processes where appropriate, to take all aspects of monitoring into account.

Compensation for leasing the land had been paid to the father of the family owning the land – there had been much argument following this award as other family members disputed the right of the father to be awarded such a relatively large amount of money without their input. Future land leasing needs to take land ownership rights fully into account to try to prevent situations such as this occurring again, acknowledging that it can be difficult during land leasing discussions to establish the rightful owner.

#### Follow-up discussion with Heritage post site visit:

- The Environmental Audit Report and Decommissioning Plan had not yet been approved by NEMA, hence why none of the actions stated for Oct 2006 had been attempted. The company is just awaiting NEMA approval then the actions can be instigated straight away, and restoration actions initiated.
  - o Suggested that Heritage work with NEMA to apply required timeframes on actions, to enable easier monitoring of decommissioning action
  - o Actions should be more specific and less general
  - o Why did it take so long to produce the Decommissioning Report following site abandonment?
- The site was leased from the land holder, and Heritage states that as soon as they get Plan approval and allowed to clear up the site, they will complete their involvement in Block 3B and move on.

## **Sempaya – potential geothermal site**

*Importance for wildlife: in Semuliki National Park*

This site contains hot springs connected to a steam/brine reservoir beneath the Ruwenzori Mountains (see Photo 2). It is situated south-west of Lake Albert, just inside the Semuliki National Park. The site already attracts between 150-320 visitors per month<sup>30</sup> to the Springs and nearby forest, but has the potential to attract many more once UWA's plans of introducing visitor facilities is put in place. As part of UWA's 10-yr management plan, they intend to install bathing facilities to allow visitors to benefit from the therapeutic qualities of the waters.

The likely impacts from development of the site as a geothermal energy resource include the potential that once steam and heated water are utilised for generating energy, this may impact the surface show at Sempaya if reservoir pressure is diverted or diminished. Maintenance of reservoir pressure could occur through re-injection of formation water, once the heat has been extracted for power generation use. In addition, surface facilities (drill-site, turbines, maintenance cabins, etc) need to be sited in a non-sensitive area, both outside of the national park and away from visual impact. In fact, a positive feature could be made of the power generation capabilities of the site, with an education facility constructed near to the intended hot-springs visitor site, to inform and educate visitors and tourists about one of Uganda's natural energy resources.

As the site is not yet developed, no impact monitoring takes place apart from regular UWA ranger work.



Photo 2: Sempaya hot spring

(Photo:L.Owiunji)

## **Kaiso Tonya area (Block 2) – Nzizi, Mputa-1, Mputa-2 and Waraga well-sites**

*Importance for wildlife: next to Kabwoya Wildlife Reserve, some area in Community Wildlife Reserve*

At the time of our visit, Hardman were drilling the Nzizi well, and were at approx 770m depth, with some oil shows occurring. Water based mud is being used with the addition of bentonite (natural clay) and barite (low toxicity hydrostatic pressure regulator). The water table is at 75m and therefore the mud pits had not been lined, relying on bentonite from the mud to suspend and line the pit internally.

There was some unresolved discussion about the traffic which occurs as a result of the roads constructed by Hardman for Kaiso-Tonya hydrocarbon development. The roads have been strengthened and widened in places to allow for equipment to have safe access to the drill sites and camp. But secondary impacts such as increased traffic volume, and increased traffic speed was occurring and causing a negative impact – for example, large trucks were now able to descend the escarpment to access the fishing villages on the lake shores and transport fish to more distant markets. These vehicles were causing concern amongst some members of the community and UWA not only because of their speeds and frequency, but also because the indirect impact of increased (perhaps non-sustainable) volume of fishing was now able to occur. In addition, UWA and some in the community reported wildlife kills from traffic driving at speeds too fast to allow effective reaction when animals ventured onto the roads. Hardman restricts all of its vehicles to only driving during daylight hours, but there is no physical or visible restraint to traffic not subject to Hardman restrictions. UWA have called for speed bumps to be placed on the roads, whilst Hardman have been liaising with the local district to suggest the erection of speed-limit signs. There is also the issue of safety of the trucks and drivers – previous accidents have proved fatal when trucks have come off the roads, especially down the escarpment. The erection of an entry-post staffed with a (UWA?) guard is a possibility, but should this be placed at the bottom of the escarpment where UWA jurisdiction starts, or at the top of the escarpment to stop drivers before they drive down the escarpment?<sup>31</sup> Roads to the various drill sites had apparently been developed using the same routes as

previous cycle tracks, although concern was raised that there had been no strategic routing of these roads, thereby incurring more km's of roadway than was necessarily required. All of these matters remain unresolved, but whilst there are reports that wildlife kills are still occurring<sup>32</sup>, the issue needs further discussion urgently.



**Photo 3: lighter grey bentonite layer in sample from excavated waste pit at Mputa-1**

At Nzizi, drilling was occurring with water based muds, and cuttings were being stored in liquid waste pit, with muds separated off and reused within drilling re-circulation. The company provided a breakdown of constituents currently being added to the mud<sup>33</sup>, with the largest volume being potassium carbonate (inhibiting K ion), bentonite (refined clay for suspension and viscosity), starch (processed potato/corn starch for fluid loss control) and citric acid (reduce and control pH and reduce water hardness). The mud pit had not been lined with cement or a plastic permeable liner, relying instead on the bentonite to suspend out of the liquid and form a blocking layer at the base of the pit.



**Photo 4: example of on-site soil erosion inside Mputa-1 perimeter fence**

At Mputa-1, the well-site space was now being used for storage of drill/casing pipes and rig equipment. The mud pit had been plastic lined along with relying on bentonite (presumably due to a higher water table here than at Nzizi) and the remnants of the dug up pit were heaped up on-site (see Photo 3). Surface runoff had been a problem, so Hardman had constructed channels to divert water flow during heavy rains around the site to the natural water course downslope of the site. Nevertheless there was evidence of significant on-site soil erosion within the perimeter fence. Areas where the ground had collapsed had been backfilled when the site was operational - Photo 4 shows how these eroded areas appear now. Muds and cuttings had once again been spread at this site, but attempts to restore seedlings and aloe vera were being made outside of the perimeter fence.

In fact there is an active site restoration program in place at all sites where drilling had taken place – as all wells drilled so far are exploratory or appraisal, decisions have not yet been made as to where the production facility will be located. At the Mputa-2 and Waraga sites, restoration efforts were evident where the original site size of 100m<sup>2</sup> had been reduced to approx 50m<sup>2</sup>, with the released areas now being replanted with grasses and aloe – the timing of the rainy season had currently hampered re-growth at Mputa-2. At Mputa-1, -2 and Waraga restoration was also being undertaken at areas outside of the site where drill cuttings and muds had been previously spread and were now being replanted. Hardman were monitoring the restoration in conjunction with the PEPD monitor – any future permanent site abandonment and restoration would be subject to further assessment and approval. Movable concrete slabs were used in preference to foundations beneath rigs, along with steel cubes under rig cellars, so as to aid site decommissioning

Storage and disposal of the remaining Waraga crude not flared off during well test was a concern. It is located outside of the perimeter fence of the now-smaller site, so there is no restriction to access if animals or children approached the pit (see Photo 5). There was discussion by the company that they may need to install an incinerator on-site to cope with future hazardous wastes quantities as the waste company recommended by NEMA had been unable to accept the quantities Hardman had produced/generated. No estimate of waste oil volume at Waraga was available, but the company did say the volume was such that it would require burning 6hrs a day for 4 months when mixed with murram and soil (so as to allow burning at a higher temperature).



**Photo 5: the open waste pit containing non-flared oil at Waraga**

As a result of flaring during the Waraga well-test without prior consent, a collaborative monitoring approach has been used at times by a team comprising NEMA, Directorate of Water Development, UWA, etc to monitor operations and impact mitigation at these well-sites. A PEPD representative is located on-site full-time and their documented observations should feed into this collaborative approach.

Management of domestic waste was evident – recycling of plastic bottles & aluminium was apparent with special bins at both drill and camp sites, as was disposal of scrap metal. Paper and cardboard were being burned in pits in the camp.

The minimum oil spill on-site for reporting purposes is 80 litres. The company admitted that testing of water quality in boreholes is being done, but not regularly. They are about to install a water pumping system from Australia to better facilitate water dispensing in the local village.

The company requested assistance with an idea they have for constructing a 'false' wetlands to aid with biological cleanup of discharged water. Our trip participant from the Wetlands Inspection Division was able to provide some general assistance, and further collaboration should be encouraged to assist the company with innovative, low-tech, low impact solutions such as this.

Not aware of any non-drilling monitoring taking place at any of the sites at Kaiso-Tonya. There was no environmental record keeping or procedural documents, although there was visible evidence of specific environmental issues being managed. No sampling records were available or waste management strategy developed. The sites need an environmental management system developed so that approaches to minimising environmental impacts are prioritised and systematic, not approached on an ad-hoc basis. The General Manager stated there would be no more flaring at any of their well-sites, and hazardous waste containers sought to dispose of hazardous waste.

### **Bugoma area (Block 3A) – Kingfisher-1 well-site**

*Importance for wildlife: drillsite is 200m away from wetlands, and lagoon containing hippo's and crocodiles*

At the time of our visit, drilling was currently re-starting following a well test the previous week proving hydrocarbon potential in the Kingfisher-1 well (see photo on front cover). Operations at Bugoma are serviced via barge and plane, as there are no roads down the escarpment to the drill-site. The site is 200m away from a wetland, and a lagoon with hippos and crocodiles present. The EIA for exploratory drilling at Kingfisher-1 details many mitigation actions Heritage committed to perform to minimise their impacts. An addendum had been submitted to PEPD a few weeks earlier to cover the operation for testing the well.



**Photo 6: the damaged flare pit following the Kingfisher-1 well test, showing damaged steel sheets**

The well test had concluded the previous week, and the flare pit surrounds showed definite signs of wear as several of the corrugated steel sheets had been blasted into the adjoining wetland, as wooden struts holding the steel sheets had burnt during flaring (see Photo 6). As sidetrack drilling will continue at the site to allow further testing of deeper reservoirs, it is intended to replace the flare pit wall structure with wood-less fixing structures.

There was some discussion about the recent well test which had been the subject of an Addendum to the original EIA. As part of the well-test, to minimise any risk to the local community, Heritage included a mitigation action to move the community out to a location 400m further away from the flare burner. During our visit to the site, the community housing was still in its original location (some members of the community reside approx 100m away from the perimeter fence just outside the perimeter track ~ see Photo 7), although individuals had been encouraged to leave their homes during testing by way of compensation payment. Movement of community homes is no small task and would take some time to arrange if done with proper consultation with the community. This had not been done and so was in effect a breach in a condition of approval - such a breach should be actively discouraged and investigated with the company. A representative of PEPD was on-site at all times. [Note: PEPD later informed us that arrangements were made for these communities to move if and when the need arose, but this is not how it is stated in the approved EIA, so in future needs to be more clearly explained<sup>34</sup>].



**Photo 7: the community housing close by the Kingfisher-1 site perimeter track**

Unfortunately whilst at the site, we were unable to speak with a company representative with specific environmental impact & mitigation responsibilities, so although we were able to talk about general good practice at the site, specifics of mitigation and monitoring were left unanswered. The individual who had previously held responsibilities for on-site environmental issues had been sacked due to lack of relevant competence<sup>35</sup>. A consultant was assisting from Kampala, making site visits when necessary. Water and soil samples had been taken in previous weeks, but results were not available from on-site staff. A spill contingency plan was in preparation, but was awaiting internal approval so was not able to be shared. The waste water pit (lined with cement and impermeable liner, but uncovered) was full of liquid which had recently been sampled, but there was very little space remaining to take in further liquids. Evaporation was intended to reduce the volume, and apparently the volume had noticeably decreased. Columns of bubbles were apparent at several places across the surface of the liquid - integrity of the liner should be checked to ensure no leakage is occurring [Note: PEPD subsequently advised that "leakages were minor and have now been sealed"<sup>36</sup>]. A plan was not yet in place of how to dispose of the liquid – this was decided following analysis of the samples. Whilst at the site, we were told the solids were extracted with a JCB-like scooper. One option the company is exploring is to discharge on the escarpment-side of the airstrip, further away from the wetland. The EIA states this will be evaporated off and the cuttings left in the solid waste pit/sump and covered over. It also states that no biocides will be used in drilling or

circulating fluids, but we were unable to speak with the mud-man whilst on site to check the composition of the drilling muds.

One of the items mentioned in the approved EIA was that Heritage would establish a systematic waste inventory to identify the types of waste, quantities and disposal methods, all managed via use of a spreadsheet. At our visit, we were informed that no waste inventory had yet been developed or was in place. Recyclable wastes (e.g. plastics) were apparently being stockpiled until a suitable facility could be identified but none had been found yet. (Note: refer Heritage to Hardman, who have identified waste handlers who can take their recyclable wastes.)

In addition to the waste inventory, as part of implementation of a wider environmental management plan detailed in the approved EIA, the company were also supposed to have developed a water sampling strategy, hold records of volumes of water extracted from water wells or the lake, provide weekly or monthly reports detailing progress on environmental actions, and be working through a plan for monitoring the implementation and effectiveness of mitigation measures (p.67 EIA). Although we were assured that water sampling (of surface runoff waters and from the stream down dip of the site) had been taken place, documentary evidence of this or plans and procedures used were unfortunately not available. Although the finalised oil spill contingency plan was still being developed and not available on-site, there was a stockpile of emergency spill equipment on the site suitable for containing and managing a water-borne spill of approx 20,000 litres. We were told one supervisor and six staff have been trained in deployment and use. [Note: the Kingfisher-1 oil spill contingency plan has subsequently been finalised<sup>37</sup>].

Implementation of the environmental management plan really is crucial when operating in an area such as the site where Kingfisher-1 is being drilled. The proximity of the lagoon, wetland and shore of Lake Albert requires that management of environmental risks is conducted in a much more systematic way than what we perceived during our visit.

The company utilises a camp and jetty at Mbegu located further north in (Block 2 – apparently the location used to be part of Hardman's airstrip). The camp and jetty had not been included as part of the EIA for Exploratory Drilling at Kingfisher (Block 3). As all supplies and equipment for Kingfisher-1 get to the site via barge from Mbegu jetty, the Mbegu camp and jetty should have been included as part of the impact assessment. [Note: project briefs for the jetty were submitted to NEMA<sup>38</sup>, but this was separate from the EIA].

Environmental monitoring had occurred, but not regularly or systematically. NEMA & Directorate of Water Development are only able to visit when a particular event occurs e.g. they would do a site visit during and after a well test. PEPD has someone on site full time.

#### Follow-up discussion with Heritage post site visit<sup>39</sup>:

- As many questions on implementation of environmental actions were left outstanding, we visited with Heritage's chosen consultant and the country manager upon returning to Kampala. The company acknowledges that the temporary "scattered" approach to environmental matters we witnessed will be replaced with more systematic approach to environmental management systems e.g. including records of waste, soil and water samples, training and site induction requirements, permits, mini-EIA Mbegu camp, etc
- A 'mid-term' environmental audit will be performed by the company's chosen environmental consultancy team (approx early Dec) who hopes to formalise much of the environmental mitigation approaches contained within the EIA, and will consider the applicability of the findings from this study.
- A different burner will be utilised for the next well-test from the sidetracked well. An Evergreen burner will be installed (instead of the Green Dragon), thereby improving hydrocarbon combustion. This is newer, more efficient technology which was requested via consultee feedback to the EIA Addendum, perhaps learning from the Waraga well-test experience.
- The results from testing the waste water pit will be known within one month, then an effective disposal route will be decided i.e. if the water will not cause environmental impact it will be applied to the soil on the escarpment side of the airstrip. The interim problem of what to do with the water in the pit exists – how will Heritage cope with further liquid wastes from continued drilling until the water sampling results are known, the pit emptied and disposed of responsibly.

- The company is currently gathering consultants with sufficient expertise in identifying the environment condition of certain locations within the Lake, so as to perform a baseline survey prior to developing an EIA for exploratory drilling on the Lake.

## **Butiaba-Wanseko area (Block 2) – potential hydrocarbon development**

*Importance for wildlife: includes Bugungu Wildlife Reserve*

Hardman is currently preparing for onshore seismic operations in this area, covering the northern end of Block 2. As no hydrocarbon-based development has occurred yet, no monitoring is currently taking place.

During our trip we visited both Butiaba and Wanseko villages to discuss potential impacts associated with the future development of hydrocarbons in the area. At Butiaba, the sensitivity of the shoreline was discussed regarding the wetland area surrounding Butiaba Point (see Photo 8). The area is used by the local community for fishing and washing, and previous port development structures are still apparent. A hotel development is currently being undertaken on the point, and as this is where the previous hydrocarbon-assessment camp had been located, additional locations will be needed to site future camp requirements. Offshore drilling could be used to develop any reserves found in this area, as offshore seismic has already been undertaken and looks promising<sup>40</sup>. Any offshore or onshore development on the 200m next to the shoreline will need to be subject to EIA approval and because of the particular wetland sensitivity on this coastline, the Wetlands Inspection Division needs to provide input to the EIA approval process. Offshore drilling brings its own particular set of potential impacts, including drill cuttings disposal, solid and liquid waste treatment and disposal, spill risk assessment and mitigation, increased boat traffic, landing sites, and fishing and visual impact.



**Photo 8: the waterfront near Butiaba Point looking out over Lake Albert**

During seismic operations in the area, approx 310km of line seismic will be undertaken. Primary impacts from onshore seismic operations were discussed as the majority of trip participants had not previously been made aware of what the operation involves. The EIA states drilling machines will be pulled across lines of flattened vegetation, and holes drilled for the placement of down-ward charged explosives approx every 30-60m apart. In addition, geophones would be placed on the surface along the lines to listen for sound waves returning from geological rock layers below. For trees/bushes with trunks of width >10cm, the EIA states the survey line will be diverted around them. The EIA also states that portable auger drills or truck mounted drills will be used, or mechanised hydraulic drill rigs may be utilised where access allows.

At Bulisa, we were fortunate to meet the team brought in to ascertain pre-seismic baseline condition along the lines where seismic will occur. They intended to work in the area for about 3 weeks, walking each of the survey lines, performing a detailed wildlife survey<sup>41</sup>. They will also take soil samples along the line and at 10m control sites away from the line. They will then return immediately following seismic to assess the operation, any residual impact and clear the area of any remaining seismic-associated debris. The team leader was a consultant brought in from Australia by Hardman who had performed a similar task in the Kaiso-Tonya area, and was leading a team of primarily Ugandan environmental, health and social professionals (some of whom had contributed to the EIA). The species lists they develop as part of this survey will feed into the EIA for exploratory drilling subsequent to the seismic.

## **Buligi & Nile Delta area (Block 1) – potential hydrocarbon development**

*Importance for wildlife: the majority of the area overlies the western extent of the Murchison Falls National Park, plus the Nile Delta area from Murchison Falls to the confluence with Lake Albert has recently been designated as an internationally protected Ramsar wetland site. In addition, the site has been proposed as a World Heritage site. The following is an extract from the recent Ramsar designation:*

Murchison Falls-Albert Delta Wetland System. 15/09/06; Masindi, Gulu; 17,293 ha; 01°57'N 031°42'E.

National Park (partly), Important Bird Area.

The site stretches from the top of Murchison Falls, where the River Nile flows through a rock cleft some 6m wide, to the delta at its confluence with Lake Albert.

The convergence between Lake Albert and the delta forms a shallow area that is important for waterbirds, especially the Shoebill, Pelicans, Darters and various heron species. The delta is an important spawning and breeding ground for Lake Albert fisheries, containing indigenous fish species; the rest of the site is dominated by rolling savannas and tall grass with increasingly thick bush, woodlands and forest patches in the higher and wetter areas to the south and east. It forms a feeding and watering refuge for wildlife in the National Park during dry seasons.

Murchison Falls are one of the main tourist attractions and recreation areas in Uganda, and the site is of social and cultural importance to the people of the area: livestock grazing; fishing, with fish exported to DR Congo and also used to feed the refugees in camps in northern Uganda; illegal hunting for game, etc. Conflicts between fishermen and crocodiles are common.

The site has been proposed for UNESCO World Heritage status. Ramsar site no. 1640. Most recent RIS information: 2006.

Our visit to parts of Block 1 encompassing the Nile Delta and area to the north very quickly confirmed the special sensitivities this area holds - very few of these pristine places remain around the world, and they hold such importance because they remain more or less untouched by adverse anthropogenic influence. No hydrocarbon development yet exists but we've been advised that the EIA has just been submitted by Heritage to NEMA for the purposes of seismic exploration (unfortunately there was insufficient time to obtain or assess this EIA as part of this work). This area falls within the Murchison Falls National Park which is one of the most visited areas by national and international tourists alike. The regular wildlife encounters and views of natural splendour provides Uganda with a reliable source of income from international travellers seeking a special experience of the true African wilderness (see Photo 9).

In anticipation of the seismic EIA approval process, discussions were held about how the views of the organisations present on our field trip can influence the development of conditions put in place on the companies wishing to develop. Issues such as wild animal infringement onto seismic lines were discussed, with concerns focussing on keeping animals away, animals pulling surface wires from explosives, misfiring explosives causing harm to animals or humans encroaching into the area.

Will tourism need to be curtailed? Although seismic over the whole Block will take several months, the time spent in the Buligi circuit may only take 3wks. Is there the option of restricting seismic survey to

tourism low-season? Is there a low-season? Will the circuit need to be closed to tourism to stop people drifting into the area whilst line-laying and detonations are ongoing? It could be argued the cost of lost tourism (or a restricted 'diluted experience' for the tourist) should incur financial compensation for lost earnings by UWA and local enterprises.

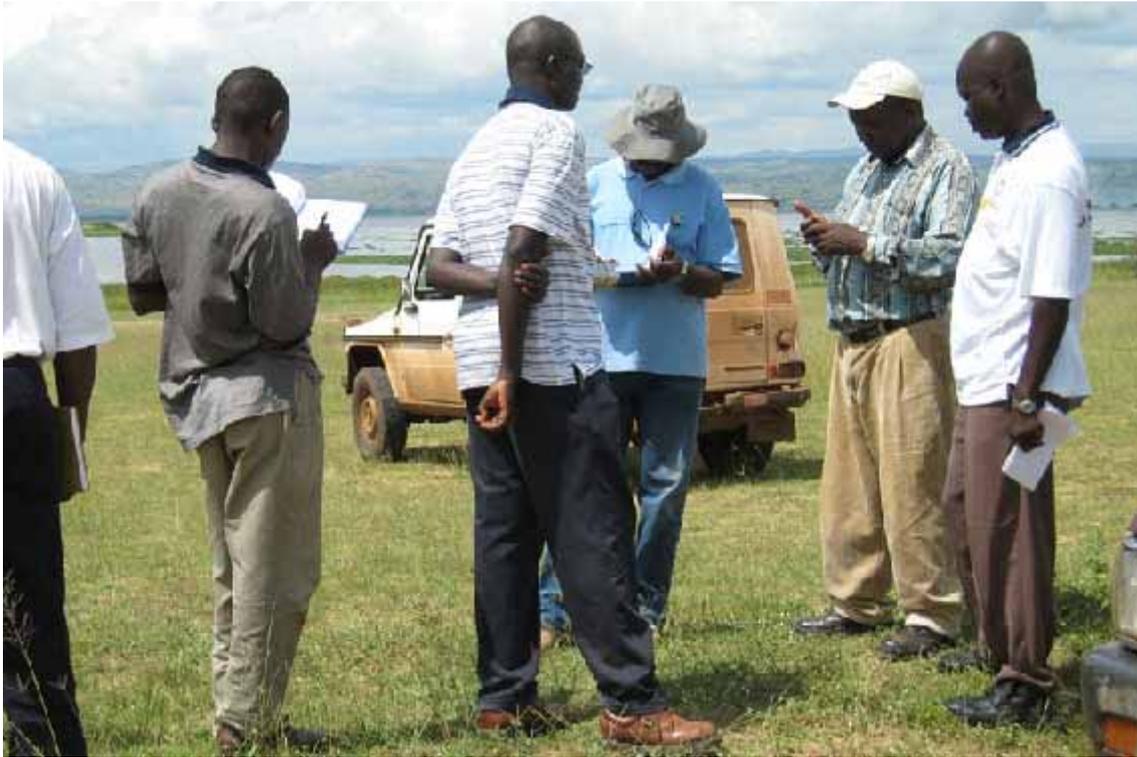


**Photo 9: what impact would development have on the wildlife and wilderness of Buligi?**

The provision of additional UWA rangers (at cost to Heritage) could assist the situation with rangers patrolling the survey lines during firing (at a safe distance) armed with tranquilisers – that is assuming that sufficient numbers of trained rangers can be sourced, and if so, who is performing their original role in the places from which they've come? Another option would be to restrict the length of line fired at any one time, so that smaller areas are impacted at any one time, allowing more intensive patrolling along that length – this could have the negative side-effect of prolonging the overall length of time taken to survey. Seismic should only be allowed during daylight hours so that effective line patrolling can take place. Effective risk assessment comparing the variety of alternative approaches should be performed to determine the best option available.

As seismic operations will also occur across the delta, additional impacts from boat-based survey also should be understood. Presumably, channels will need to be cut across the papyrus within the Nile delta, and the choice of boats used will determine the depth and lateral extent of channels e.g. if the papyrus needs to be cut down to 2m under water line to allow boats through, will this in effect cut up the floating mass, causing one block of papyrus to become two? Also boat based seismic survey causes extensive noise propagation through water, so what would this impact be on animals using the water body? Important considerations that need to feed into the EIA approval process include specific seasonal and temporal restrictions such as crocodile shore-based egg laying, incubation and hatching, and fish spawning seasons and locations.

As magnetic surveys already performed indicated the best hydrocarbon prospects to be around Buligi and other near-shore areas, barge-based development should be preferred to minimise the requirement for additional road access or increased use of tourist routes around the circuit. There is an existing camp at Pakuba, but this is some way from the shore and already contains dilapidated buildings which would involve deconstruction before construction could occur. There is the option of setting up main camp at Pakwach, outside of the Murchison Falls National Park, which can then service any barge-based development in the Block 1 area (40km max distance). But barge-based development brings its own set of risks which must be fully analysed and managed e.g. all equipment and fuel oils need transportation by barge, thereby increasing the potential for oil spill.



**Photo 10: the fieldtrip team contemplating potential development and the sensitivity of the Nike Delta**

Agency professionals involved in EIA approval should note that although a seismic operation might suggest a temporary camp for the duration of the seismic survey, they should also bear in mind once the camp is established this will also likely be the location for the permanent camp if exploratory drilling or production goes ahead. Therefore consideration of the impacts of camp location should be considered even at this early stage – useful information in World Bank Environmental Assessment Sourcebook (Chapter 10)<sup>42</sup>.

There has been a delay in performing seismic in this area (from the terms within the original license), but this delay has been due to additional environmental surveying<sup>43</sup>, and has been approved by the Government<sup>44</sup>.

Follow-up discussion with Heritage post site visit:

- Discussed the feasibility of directional drilling options, to keep the circuit as pristine environment for paying tourists
- That exploration and development in the delta area could be serviced via barge from an area outside of the delta (Pakwach), to minimise impacts from road development
- Heritage are very concerned to keep impacts to a mitigatable level, hence why they ordered a second round of environmental baseline surveys this year before finalising the EIA for seismic survey ~ Heritage say they have to keep their company happy that responsible development should not cause international outcry...

## **Ayago – potential hydro-power site**

*Importance for wildlife: within Murchison Falls National Park*

North of the Victoria Nile, the Ayago river was visited to discuss the potential impacts from a hydro-power development along the waterway. There is currently no development, hence no monitoring. Although there has been mention of hydro at Ayago North and Ayago South<sup>45</sup>, no plans were available to direct our visit to a particular location. Therefore the team trekked to a site on the river near a UWA camp (along the Wangkwar Gate to Karuma Falls track), which contains a natural fall in water level. This riverine forest is habitat for antelopes, hippos and other large mammals and is part of the Murchison Falls National Park.



**Photo 11: view of the Ayago River**

Hydro-power is a clean form of power as it generates very little carbon dioxide and thus does not contribute to climate change. But short-term impacts from establishing the site for power generation must still be managed. If this were to be the location of the hydro-power site, access for equipment and personnel would be an issue as the site has no track access presently. Sections would need to be cleared for the temporary construction camp, along with areas for turbines and other power generation equipment – transmission lines would also need to be constructed to export the energy to the nearest grid connector, which would obviously impact the forest. The attraction into the area of an increased human population would cause a negative impact on the locations' wildlife population, as food and fuel were likely to be extracted from the forest, unless effective mitigation planning was put in place at an early stage.

### **Karuma Falls – potential hydro-power site**

*Importance for wildlife: within Murchison Falls National Park*



**Photo 12: a view of Karuma Falls (taken from an area that would suffer from reduced water volume once flow diversion is in place)**

Planning for the development of hydro-power at Karuma is at a much more advanced stage than at Ayago, and construction is due to commence shortly. There has been an EIA developed but apparently this will need to be revisited due to the amount of time lapsed since it was originally approved. This site is just within the Murchison Falls National Park, and as such comes under UWA's jurisdiction – we visited Karuma Falls approx 2km north of the Karuma bridge (see Photo 12). According to the EIA, water will be diverted up stream to flow through an underground tunnel with a drop of 50m - thereby harnessing power from the water that would descend a similar distance naturally. The diverted flow would then re-join the river downstream of the Falls, requiring a length of 2.1km tunnel bypass.

Several impacts were discussed, but one primary concern was that by diverting a certain amount of water flow around this Karuma Falls area (diverted volume yet to be determined), the potential for attracting tourists could be adversely affected if the Falls no longer look as spectacular – diminishing the all important “wow” factor. The EIA does not state the proportion of volume that is expected to be diverted from the overall river volume, but does state that a significantly reduced flow will result, with the greatest proportion of flow being diverted for power production. This will be most noticeable in the dry season, with greatest impact felt during this period<sup>46</sup>. The location where the de-energised water from the by-pass rejoins the natural river flow could potentially suffer from adverse turbulence in an area where previously there was only natural flow, contributing to river erosion and increased sedimentation. Careful flow regulation of river water through the tunnel could help to minimise these perceived and potential impacts.

A potential positive impact is that in diminishing the natural flow around the Falls, this could increase the feasibility of white water rafting in the area where it is currently considered possibly too rough.

## ***Overall assessment of mitigation and monitoring***

The EIA's reviewed contained many company actions specifically designed to mitigate against the anticipated adverse impacts, and the EIA's are approved on the condition that these actions will be implemented. On the whole, our site visits proved many good practices were occurring, but this seemed to be on an ad-hoc basis and not in a systematic, managed way. There was no documentary proof available of systematic sampling programmes or waste management strategies at either of the company hosted site visits. There was a distinct lack of mitigation actions being incorporated into environmental management systems – if this were to be undertaken, it would allow more effective environmental impact consideration & strategic planning by the company. In addition a systematic approach to implementing these licence conditions would provide the regulatory authorities with more confidence of the company's intention of protecting the environment.

Both companies were keen to stress the positive social advantages of their presence in the areas e.g. support to local HIV/Aids clinics, provision of boreholes, building of schools, etc which are all fantastic contributions and to be commended. But this highly visible, beyond-boundary philanthropy should not be undertaken instead of implementing responsible environmental management practices that would in other countries be considered standard procedure.

Many of the sites visited were not actively being monitored yet, as no industrial development has occurred. What activity is occurring, namely at Semliki (Turaco), Bugoma (Kingfisher) and Kaiso-Tonya, regulatory and approval condition monitoring is not happening on a regular basis, but more so on an as-needs basis i.e. monitoring teams will visit a site when a high-risk activity is planned, for example, flaring. Collaborative approaches to monitoring are to be commended when representatives from NEMA, PEPD, UWA, the Directorate of Water Development, etc, work together to provide a wide-ranging assessment of company performance.

There is a reliance on site visits to monitor company compliance as opposed to requesting progress reports from companies. Unfortunately regular site visits are not commonplace due to lack of resources in the districts. This includes a lack of vehicles required to cover the distances between district bases and operational sites. NEMA has insufficient funding to provide the function of a national or regional monitoring organisation. This makes regular monitoring of compliance against regulation or licence conditions nearly impossible.

A forum meeting attended by representatives of each of the companies along with PEPD and NEMA (and other agencies and NGO's) for review of company progress against requirements, and allow open discussion of issues that affect all companies operating in the country. This would ensure more accountability to be placed on the company i.e. commit to do it through EIA approval, tell us when you are doing it, tell us when you've finished doing it, then we'll visit at various times to ensure you are doing what you tell us. This would promote better record keeping by companies, ensuring an accurate auditable trail of actions and decisions (where company-confidential issues needed discussion, these could be held separately so as to ensure appropriate discretion). This would also provide a useful forum for presentation of concerns by statutory authorities and engaged non-governmental organisations (NGO's) (e.g. Wildlife Conservation Society and others) and an opportunity to discuss these issues openly. A regular meeting such as this has proved invaluable in the UK to discuss exploration and production issues in relation to environmental impact - a six-monthly Offshore Forum meeting is organised by the Department of Trade and Industry (Petroleum Department) government department, with representatives of each of the major companies operating in the UK offshore environment, along with representatives of approx 4 international NGO's<sup>47</sup>. A variety of topics are discussed, but with oil and gas being so new in Uganda, this would be a very useful opportunity to openly talk about concerns, challenges and collaborative solutions.

Following the approval of an EIA, a company is supposed to develop a monitoring plan. A useful complementary process would be for the compliance and monitoring representatives of the various Govt agencies to develop an "EIA/Certificate of Approval Monitoring Plan" which lays out agency actions, roles, accountabilities, financing arrangements and timeframes for each element of the licence approval. Then each separate agency knows exactly what is expected of them, and who else is ensuring the other elements are being managed. This would ensure against a blame culture being suggested when uncertainty on responsibilities sometimes allows actions to fall between the gaps.

Competency of authority staff involved in assessing and approving EIA's needs to be further developed. Training in the basics of hydrocarbon exploration and production is required, which will then allow better understanding of the impacts associated with such projects. Unless a process is fully understood it is difficult for any environmental professional to effectively comment not only on the impact but on the relevance of the mitigation action offered to minimise that impact.

#### Site specific actions:

- both Hardman and Heritage need to urgently introduce a management systems approach to better manage their environmental impacts and mitigations, detailing specific actions, accountabilities and timeframes
- initiate decommissioning of Turaco well-site and camp as soon as possible
- halt the addition of aluminium sulphate to the soils around Turaco site, as stated in Decommissioning plan
- collaborate to find an effective solution to the traffic speed and frequency problems discussed with Hardman
- investigate potential leakage of waste water at Kingfisher [Note: PEPD subsequently advised these leakages were minor and have now been sealed<sup>48</sup>].
- conduct a mini-EIA for the camp site at Mbegu (left out of Kingfisher EIA as located in Hardman block)
- both Hardman and Heritage should demand the best standards be used within the development of their EIA's and use only experienced personnel certified to work on EIA's
- investigate alternative methods for disposal of drill cuttings. Land-spreading of muds and cuttings can cause short-medium term damage (smothering, contamination, etc), and can consume vast areas of otherwise useful land. Look into alternative uses such as using cuttings as aggregate materials for road building. Onshore treatment facilities may be required once drilling starts in the lake, so look into development of appropriate treatment facilities and use for land-based drilling also.
- The Kaiso-Tonya EIA states cuttings are to be left in the sump and covered over (buried in situ p.23) or containerised and disposed of at an appropriate facility (p.27) – need to clarify why Hardman are instead land-spreading their cuttings.

## 7) Standards and Guidelines

There is a vast library of good practice developed not only by the international oil and gas industry for themselves, but also in collaboration with NGO's and inter-governmental organisations. There are too many references to include in detail in this report, but a summary of the main standards and guidelines considered to be good practice are listed below. Some of these are available free for download from the websites of the various organisations, but usually paper copies are also available, although there may be a small charge for some.

### **OGP (The International Association of Oil and Gas Producers)**

The OGP have over several decades developed guidance materials to help companies incorporate good engineering, environmental and social practice into their operations. They have a wide range of technical material on a variety of topics. These are available in booklet format which are available for a fee, but most are also available for free download from their website at [www.ogp.org/publications/](http://www.ogp.org/publications/). A few useful publications include:

- Environmental management in the oil and gas industry, 1997
- Environmental and social impact assessment, 1997- includes consultation guidelines
- Flaring and Venting Guidelines, 2000
- Produced Water Re-injection, 2000
- Oil Industry operating guideline for tropical rainforests, 1991 – (as E&P Forum) with IUCN
- Exploration and production waste management guidelines, 1993
- Fate and effects of naturally occurring substances in produced water, 2005
- Environmental aspects of the use and disposal of non-aqueous drilling fluids associated with offshore oil and gas operations, 2003
- The physical and biological effects of processed oily drill cuttings, 1996
- Waste management guidelines, 1993

### **IPIECA (The International Petroleum Industry Environment and Conservation Association)**

IPIECA (The International Petroleum Industry Environment and Conservation Association) discusses specific environmental and social issues and tries to suggest solutions. They too have a variety of informative brochures and interactive tools, available from [www.ipieca.org](http://www.ipieca.org) (go to 'Publications'):

- Key Biodiversity Questions in the oil and gas lifecycle (interactive tool), 2006 – encourages incorporation of wildlife and habitat issues at all stages of the oil and gas operational life-cycle
- Partnerships in the oil and gas industry, 2006 – features many case studies on biodiversity, capacity building, oil spill response, transparency, community development, etc
- Guide to developing Biodiversity Action Plans for the oil and gas sector, 2005
- Guide to the Biodiversity Conservation Negotiations, 2000 – details how the Convention on Biological Diversity applies to countries and companies
- Industry as a partner for sustainable development, 2002 - with OGP & UNEP,
- Water resources management in the petroleum industry, 2005
- Biological Impact of Oil Spill Pollution Series: providing documents on general guidelines on spill contingency planning, impacts on corals, mangroves, dispersants and their roles, salt-marshes, rocky shores, fisheries, sedimentary shores, decisions during oil spill response, waste minimisation and management and oil wildlife response planning.
- In addition, in collaboration with the International Maritime Organisation, they have developed guidance on developing sensitivity mapping and oil spill exercise planning

### **The Energy and Biodiversity Initiative**

Integrating Biodiversity Conservation into Oil and Gas Development [www.theebi.org](http://www.theebi.org) – this comprises a wealth of good-practice guidance and advice, as was developed by a team of representatives from both international oil and gas companies (BP, Shell International, Chevron Texaco and Statoil), but also international conservation NGO's (IUCN, Fauna and Flora International, Conservation International, the Nature Conservancy, and Smithsonian Institute). Topics include:

- Integrating biodiversity into the business case
- Integrating biodiversity into management systems and operations
- Mitigating impacts (primary and secondary)

- Deciding where to work (site selection flowchart)
- Measuring impacts and actions on biodiversity

## **IUCN & UNEP**

IUCN (The World Conservation Union) is an international collaboration between NGO's and Governments. Between IUCN and The United Nations Environment Programme, they have developed several useful publications on best practice and working collaboratively:

- Oil exploration in the tropics: guidelines for environmental protection
- Biodiversity Offsets – Views, Experience and the Business Case, in conjunction with Insight Investment<sup>49</sup>

## **Others**

- International Finance Community (IFC) Performance Standards on Social and Environmental Sustainability, along with Guidance notes on many topics and industry-sector environment, health and safety guidelines [www.ifc.org/enviro](http://www.ifc.org/enviro)
- World Bank Industry Sector Guidelines: Oil and Gas Development Onshore – Pollution Prevention and Abatement Handbook
- Conservation International - Reinventing the Well: Approaches to minimising the environmental and social impact of oil development in the Tropics<sup>50</sup> - very useful background document on issues to consider when oil and gas is being developed.
- WWF – To Dig or Not To Dig<sup>51</sup>

## 8) Main stakeholders

Each EIA should identify their project-specific input requirements, and conduct appropriate and effective consultation processes. A stakeholder analysis should be performed for each EIA to ascertain who and which organisations should be involved – this includes not only who should be kept informed of project initiation and progress, but also who should have input into decision making and approval. Therefore it should be established who should be informed and when, what their role is, how often they should be consulted and how, and how their input will inform decision-making.

The following is a generic list of organisations and agencies that should be involved, depending on the characteristics of each different EIA project. Some organisations and agencies are highlighted because of their role in ensuring mitigation actions are developed or monitored, as this is crucial to protection of the environment and as such need to be aware of all aspects of the project.

**Table 5: Stakeholders in oil and gas developments, and their main areas of interest**

Stakeholder	Interests	Required to secure mitigation?
The oil company and block partner(s)	Business developer and principle financial benefactor	x
Contractors employed on behalf of the company	Should work to standards required by the developer, may be the representative of company	x
Petroleum Exploration and Production Department	Regulator for petroleum affairs, on behalf of the Ministry for Energy and Mineral Resources	x
National Environment Management Authority	Main authority for environmental protection and compliance	x
Uganda Wildlife Authority	Authority to ensure wildlife and habitat issues are managed	x
National Forestry Authority	Authority with remit to manage and secure protected forests and forestry areas	x*
Wetland Division	Authority with remit to manage and secure protected wetlands and wetland areas	x*
Directorate of Water Development	Authority with remit to manage and protect surface and aquifer resources	x
Department of Fisheries Resources	Authority with remit to manage and protect sustainable production of fish and fisheries products	x
Local NEMA reps	District level representation of NEMA obligations	x
Land owners	Personal investment in property which may be impacted, either directly or indirectly	
District Administration	Provides local governance and representation of local communities	
Local community	Variety of local interests, including local environment impacts, employment, benefits	
Police and security forces	To provide security of the development area and ensure staff and equipment are protected	
Governments of neighbouring countries	Where trans-boundary impacts and issues are likely, or collaborations possible	
National and international non-governmental authorities	Provide advice/assistance on particular ecological/environmental/social issues and solutions	
National press	To inform the nation on progress of energy provision and important issues that arise	

\* = depends on particular sensitivities of the development location

## 9) The potential for hydro-power and geothermal

The following is an extract from Mbendi<sup>52</sup> on electrical power potential and details the governments plans for maximising hydro-power within Uganda (as of May 2006).

The installed capacity in Uganda is about 300 MW, over 98 percent of electricity is generated by the hydroelectric plant at Owen Falls (the 180 MW Nalubaale station and the 200 MW Kiira station with five 40 MW units of which three have been installed) on the Victoria Nile. There exists a small hydro power station at Maziba with an installed capacity of about 2 MW and independent power generation at Kilembe Mines and Kasese Cobalt Ltd with a combined capacity of over 15 MW. It has been estimated that there is another 80 MW of privately installed captive generation capacity.

The Bujagali hydropower project is a 250MW hydro-electric power plant that is in the process of being constructed in the Jinja district. Since there is presently a 100MW shortfall in electrical power, the plant will serve to improve this. The project was initially proposed to commence in January 2003, but was delayed due to various constraints. However, in February 2005, the Ugandan government, with financial backing of the World Bank had given the go-ahead for the project and construction is to commence in December 2006. The cost of the project will be US\$ 500 million and is due to be operational in 2008<sup>1</sup>.

The Bujagali power plant was originally proposed to be powered by four turbines located on a rockfill dam. The power plant is planned to be built 1,100m above sea level at Bujagali Falls, about 8km north of Lake Victoria, which is the source of the Nile. The low-pressure river power plant will hold a vertical drop of 30m and total installation capacity of 250MW. It is envisaged to be linked to the existing Owen Falls plant, as well as to the capital city of Kampala over the grid. A 100km transmission line to Kampala and Owen Falls with two substations is also planned for the project.

The Bujagali hydropower project upon its completion would be one of a number of hydroelectric power plants scattered along the upper reaches of the Nile. There are also hydro-electric projects at Owen Falls, Busowoko, Kalangala, Karuma, Ayago North, Ayago South and Murchison Falls.

Uganda stands to benefit under the West Nile Electrification Project, whereby the West Nile Rural Electrification Company (WENRECo) has implemented an 18-hour electricity supply to Arua and Nebbi districts. With a population of about 1.5 million, this area is set to receive a boost to its economic activities through enhanced adequate and affordable electrical power supply. The company would take advantage of operational characteristics of the newly-installed 1.5MW heavy fuel oil plant as well as apply prudent load management practices with a view to extending supply. Kenya is also exporting 10 megawatts of electricity a day to Uganda to alleviate power rationing that has hit the neighbouring country.

The Ugandan Government has set aside US\$100m (about sh180b) for the construction of another hydro-electricity power station and will provide about sh2.6b to Kilembe Mines Investment to extend power to rural areas in the Kasese district. A power line would start from Kikorongo to Mpondwe on the DR Congo border and another one would begin from Kiburara to Kisinga and other mountainous sub-counties. The sh2.6b will be 50% of the costs of the power project. Uganda's Kanungu district will get a 150-kilometre power line worth Shs2.6 billion, in May 2005. This will be the first time Kanungu gets electricity from the national grid, and will encourage increased economic activity in the district, supporting processing of coffee, maize and rice, the main cash crops in the district. It will also boost industries like Kayonza Tea Factory, which currently spends over Shs500 million a year on a generator, and Kambuga Hospital, which spends over Shs200 million. The line is being connected from the main power grid in Rukungiri district and would pass through the sub-counties of Kayonza to Kanyantorogo up to Kanungu district headquarters. Another line will go through Kanyantorogo, Kihhihi and Kambuga sub-counties, and connect back to the main grid in Rukungiri.

<sup>1</sup> Updated information shows that construction is likely to take 4yrs, so will not be operational until approx 2010 at the earliest. Source: Bujagali Hydropower and Interconnection Projects Newsletter Sept 2006 no.1.

The Japanese government is to construct small hydropower projects in Uganda especially in rural areas so as to develop the country. Japan is also considering investing in larger hydropower projects in Uganda, but would first look for financiers.

The construction of Karuma hydropower project is underway and is to commence in September 2007, as well as a 10-12 MW hydropower station is also planned at Muzizi.

With the help of the World Bank, the Ugandan government have established the Fourth Power Project which aims to improve power supply and meet rising demand by supporting least-cost investments. The project comprises a power system expansion and rehabilitation programme, whereby an installation of two 40 MW generating units (units 14 and 15) will take place at the existing Kiira hydro power station, a rehabilitation of Nalubaale (formerly Owen Falls) sub-stations will also take place, as well as a rehabilitation of existing transmission sub-stations.

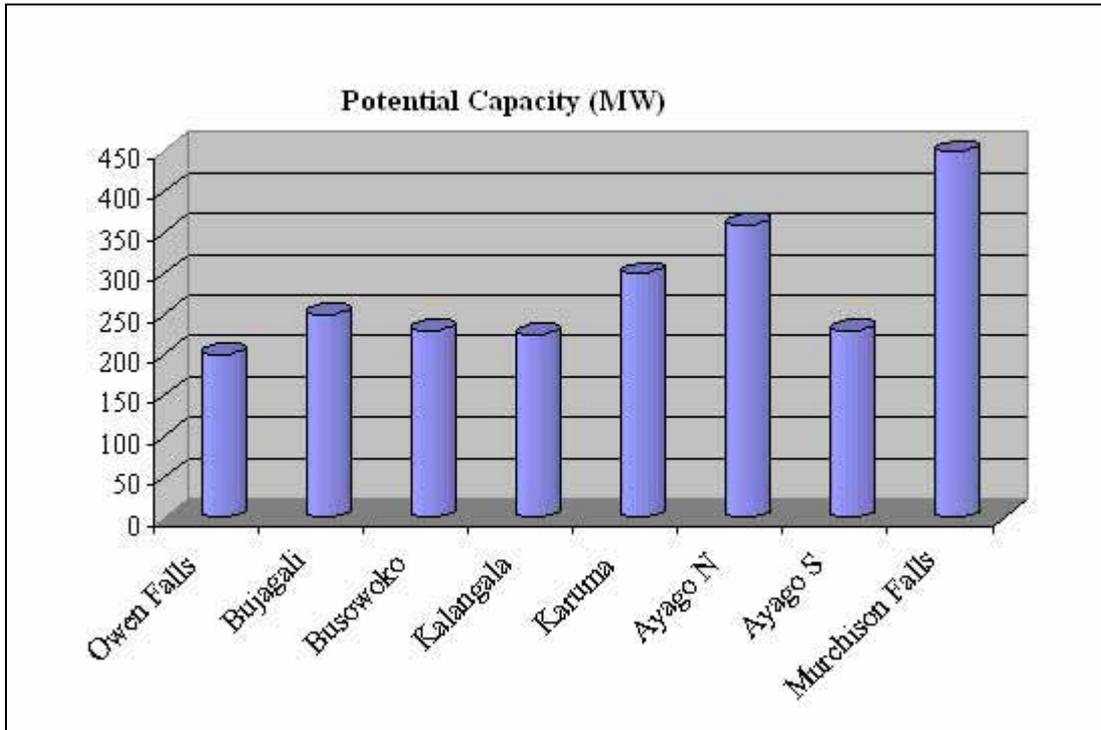
Uganda has begun the process of supplying 480,000 rural residents with electricity by 2012 with the help of the Energy for Rural Transformation programme. With the financial support of the World Bank, rural households will be able to receive an increased access to adequate and reliable power supply.

A Strategy released by the Energy Minister in Oct 2006<sup>53</sup> states that for the short term, energy efficiency measures should be put in place, and fuel to meet the needs of the population will be met from thermal power i.e. burning hydrocarbons in thermal power plants. In the medium term, hydro plants yet to be built include the controversial 250MW Bujagali Dam (expected on-stream 2010 at the earliest<sup>54</sup>) and Karuma Falls. In the longer term, hydro-power at Ayago and Uhuru will be developed in addition to geothermal in the Albertine Rift.

The potential for Uganda to further develop its energy derived from hydro-power is very large. But the recent fall in Lake Victoria, and droughts affecting the East Africa region, have caused power production from the hydro plants at Nalubaale and Kiira to drop from 300MW in 2004 down to 120MW today<sup>55</sup> - hence why load-shedding is a part of life for those Ugandan residents who usually have power on tap.

Although considered 'clean energy', hydro-power projects still have the potential to cause long-term environmental damage. Projects such as that planned for Karuma Falls, which use the natural water drop of rivers, are preferable to the damming of water, which causes flooding and land-take of sometimes valuable wildlife/human habitats (including sites with established tourism potential e.g. Bujagali). In Figure 2, several sites with the potential for harnessing energy from water are represented, but Karuma, Ayago North, Ayago South and Murchison Falls are all within the Murchison Falls National Park (it should be noted there has been little discussion about utilising the Falls at Murchison for hydropower, but is included here as initial feasibility has obviously been considered by Power Technology). Obviously when undertaking feasibility studies, life-cycle environmental risks and impacts will need to be fully understood and carefully assessed, especially when considering the impact on wildlife and local communities who survive through reliance on the natural flow of these waters.

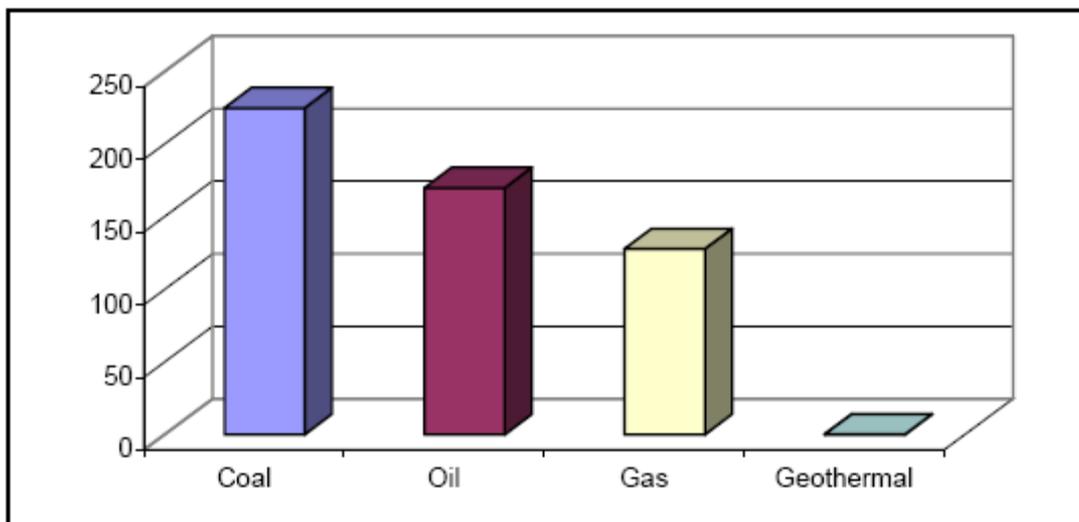
Even though drought and ongoing climate change have unpredictable influences, nevertheless the potential for hydropower in Uganda is still large. Hydro-power has the potential to be an exciting solution for Uganda, and should be encouraged as a clean, renewable resource as long as its impacts are managed carefully.



(from Power Technology<sup>56</sup>)

**Figure 2: Potential contribution of hydro to Uganda's power portfolio**

Geothermal energy provides an important alternative to oil & gas, and even hydro-power, as it won't be unduly influenced by water shortages or contribute to further climate change. The geothermal resources of the country are estimated to be about 450MW which includes Katwe-Kikorongo, Buranga and Kibiro. These represent an important source of energy for communities in the vicinity of the sites, as well as having the potential to contribute towards a national grid of electricity. Geothermal power requires less land area per megawatt than virtually every other form of energy production (400m<sup>2</sup> per MWh), and unlike hydro-power can be brought online incrementally as demand increases. Figure 3 shows how little damaging CO<sub>2</sub> emissions are associated with geo-thermal when compared to other non-renewable sources of energy.



**Figure 3: Comparison of CO<sub>2</sub> emissions between geothermal and hydrocarbon power generation in kg per kWh<sup>57</sup>**

It is important to note that as several of the sites for macro and micro geo-thermal and hydro-power exist within already established protected areas, these prospects should only be progressed if planned in

conjunction with UWA and other environmental statutory agencies, to ensure due regard for wildlife, community and the wider environment. In addition, impacts from resources used in the establishment of these sites (e.g. quarrying for aggregates used in hydro flow diversion) should also be included within the full life cycle environmental risk assessment.

### ***The benefit of lower-carbon energy sources***

Development of renewable and low-carbon energy sources, can have minimal impact on the environment if managed carefully. Emissions of greenhouse gases, inherent with the provision, distribution and use of fossil-fuels, are much lower when utilising hydro-power or geo-thermal sourced energy, and this must play an important role when strategically considering the best sources of energy for Uganda.

The Intergovernmental Panel on Climate Change (IPCC) has recently released its latest assessment<sup>58</sup>, with dire indications of our ongoing impact on our climate. It states clearly “the primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period results from fossil fuel use”. The future development of further oil and gas energy sources can no longer be separated from the harmful consequences of climate change that are already apparent across the globe. The box below contains just one example of how the unprecedented build up of greenhouse gases in the atmosphere are impacting resources. Therefore both the direct and indirect impact of fossil fuel development must be included in any strategic environmental assessment.

**Impacts of Climate Change on Ecosystem Productivity in Lake Tanganyika, East Africa**

Although the effects of climate warming on the chemical and physical properties of lakes have been documented, biotic and ecosystem-scale responses to climate change have been only estimated or predicted by manipulations and models. Here we present evidence that climate warming is diminishing productivity in Lake Tanganyika, East Africa. This lake has historically supported a highly productive pelagic fishery that currently provides 25–40% of the animal protein supply for the populations of the surrounding countries. In parallel with regional warming patterns since the beginning of the twentieth century, a rise in surface-water temperature has increased the stability of the water column. A regional decrease in wind velocity has contributed to reduced mixing, decreasing deep-water nutrient upwelling and entrainment into surface waters. Carbon isotope records in sediment cores suggest that primary productivity may have decreased by about 20%, implying a roughly 30% decrease in fish yields. There is evidence that the impact of regional effects of global climate change on aquatic ecosystem functions and services can be larger than that of local anthropogenic activity or over-fishing.

Source: O'Reilly *et al.*, (2003): *Climate change decreases aquatic ecosystem productivity of Lake Tanganyika, Africa*. *Nature* 424, 766 - 768

Considering the extent to which the IPCC determine Africa in particular will suffer from climate change<sup>59</sup>, Africans have to confront how their decisions may worsen this situation further. Africa's high vulnerability to the impacts of climate change is exacerbated by other factors such as wide spread poverty, recurrent droughts and floods, a dependence on natural resources and biodiversity, over dependence on rain fed agriculture, a heavy disease burden and the numerous conflicts that have engulfed the continent<sup>60</sup>.

Provision of the volumes of energy required within Uganda should be subject to a high level strategic environmental assessment to ascertain all possible ways of addressing the power shortage problems, and ensure that Uganda produces its energy in as clean, affordable and efficient a way as possible (see Chapter 10 for further information).

## 10) The future of energy development in Uganda

### *The energy mix: the need for a balance of sources*

Uganda urgently needs additional energy at both a local and national level. The provision of energy to the people of Uganda is desperately required, so power needs to be affordable and obtained without incurring (or exacerbating) environmental damage.

Renewable resources such as hydro and solar, and low-impact resources such as geothermal, need to be more fully developed, with the expansion and encouragement of many local micro-generation opportunities as well as larger scale projects with input into the electrical grid. In parallel, once hydrocarbons have been responsibly produced and refined, energy needs to be provided to those communities who until now have had no energy, or have had to rely on expensive and dirty diesel generators. Oil and gas power generation plants bring their own environmental implications, but the installation of electrical grids further into rural areas will allow for a more diverse range of resources to feed into this energy mix.

As mentioned earlier, an integrated approach to solving Uganda's energy problem is required – a Strategic Environmental Assessment (SEA) should be conducted (if it has not already done so) to ensure there is better alignment of Uganda's needs with her own resources. For example, as part of an integrated energy solution, the country will likely exploit her hydrocarbon reserves and refine them for her own use, not to sell to neighbouring countries to maximise revenue generation. Another example is the fact that production of Uganda's hydrocarbon reserves may address short to medium term needs, but at what cost? The cumulative effects of ongoing oil and gas development around the globe are having disastrous consequences on our climate, and this situation will only worsen before it gets better - reliance solely on hydrocarbons would be missing the vast opportunity that Uganda has in her hydro, geothermal and solar potential. The problem of energy shortages we are currently facing can only be solved by provision of energy at the right place at the right price, not by exporting vast quantities and recouping financial benefits. Announcements made at the end of Oct 2006 by the Minister for Energy highlight the need for diversity of energy provision, stating that a multi-faceted approach is required on the short-, medium- and longer-term, utilising hydrocarbon, hydro, geo-thermal and solar<sup>61</sup>. Performing an SEA will confirm the parameters within which this should happen, and minimise overall environmental impacts that can only be addressed at the strategic level.

The Early Oil Production Scheme introduced by the government will allow intensification of efforts by the companies to bring oil production on-stream within the next few years. The companies are equally excited about this prospect - the following is taken from Hardman's 2006 3<sup>rd</sup> Quarter Report to Investors<sup>62</sup>:

The joint venture has recently signed a Memorandum of Understanding (MOU) with the Ugandan Government which includes commitments by both the joint venture and the Government to advance exploration, appraisal and development activities to realise the full potential of the existing Block 2 discoveries and to provide time for the full evaluation of the exploration potential in the block.

The joint venture and Government have agreed to determine the optimal early development potential of the oil already discovered by commencing commercial and technical concept studies for an Early Production System. Subject to these studies, the demands of the local power market suggest an early production scheme would be both feasible and commercial, as well as a high priority for the Ugandan Government. The first steps of any such development could comprise production and processing facilities to fuel a local power station (of around 50MW capacity) and potentially also supplying a mini-refinery.

The President of Uganda sees the positive potential that hydrocarbon exploitation can bring. In his Independence Day Speech this year, he stated his enthusiasm for progressing with exploration and development of Uganda's oil resources.

The early Oil Production Scheme will involve the following:

- i ) Setting up a mini-refinery to process a moderate amount of crude oil to produce diesel, Kerosene and heavy oil.
- ii) Developing a heavy fuel oil-based power plant for producing cheap electricity since we shall be using heavy oil instead of diesel; this heavy oil will, moreover, be our own, devoid of high transport costs, etc. We shall, therefore, be able to produce oil-based electricity that is almost comparable to hydro-electricity at a cost of about six American cents per unit. This is a far cry from the present 24 American cents per unit of electricity using imported diesel without subsidies.

We are aiming at producing between 6,000 and 10,000 barrels of oil per day. At this level of production, the 30 million barrels of recoverable oil from the Mputa and Waraga fields can last around 10 years. At the moment, Uganda is consuming the equivalent of 10,313 barrels of oil per day and our import bill of petroleum product stands at US\$443,312,640 per year. Much of this money will, therefore, stay here as soon as our refinery is commissioned. Construction of the mini-refinery will commence in 2007 and commercial production will be attained in 2009.

In the next five years we shall concentrate on the drilling of more potential oil fields in both the northern and southern parts of the Lake Albert exploration areas and in the Pakwach Basin so that we can establish their petroleum potential as we have done at the Mputa and Waraga oil fields. Heritage Oil has already embarked on the drilling programme in the Buhuka areas (Kingfisher prospect) at the boarder of Hoima and Kibaale districts.

The PEPD is preparing itself for the increase in activity by building the capacity of its workforce through targeted training. In March 2005, a variety of senior managers in PEPD participated in a consultative seminar titled Assessment of the Future Role of PEPD in Uganda<sup>63</sup>.

There were several objectives and actions as a result of the discussion at the seminar, including:

- development of policy, legislative and institutional reform
  - includes EIA Guidelines for the oil and gas sector
- development of an oil spill contingency plan
  - includes development of capacity, identification of specific roles and actions prior to and during a spill response with associated importance and priority, and compilation of a directory of sensitivities, equipment, experts and contractors
- development of a sensitivity atlas for the Albertine Graben, in conjunction with NEMA and UWA
- redefining the role and structure of PEPD, and linkages to other key stakeholder institutions
  - including greater emphasis on environmental monitoring, and training up of staff as environmental inspectors, along with inclusion of other key skills e.g. law, economics, natural resource management, etc.
- raising awareness in the general public of oil and gas processes, activities and issues
  - including greater use of media and information exchange opportunities
- closer collaboration with Makerere University to ensure better informed graduates and research/consultancy/information sourcing opportunities

It must be noted that the current companies operating in Uganda are just that – current. The oil industry works so that companies who prefer to focus on exploration may not necessarily wish to focus on the longer term production phases, and may sell their interests as soon as commercial reserves have been proven. This may very well be the case in Uganda, so although it is important to establish effective relationships with the current operators, the regulatory and monitoring systems put in place should be robust enough to be adaptable to which ever current or future company will have future responsibilities.

For example, Hardman's plans at the moment hang a little in the balance until full takeover discussions have been finalised with Tullow. Hardman are working hard to inform Tullow senior management of the potential for commercial success and commitment to work already progressing, but the next few months will prove what their intentions hold.<sup>64</sup>

## ***Can energy development co-exist with effective wildlife protection?***

As has been shown earlier in this report, much of Uganda's natural energy resources lie in areas vitally important for wildlife and their habitats. Even if using the best planning, design techniques and technology, any development allowed in areas such as the Nile Delta has the potential to cause impacts against which it may be difficult or impossible to adequately mitigate. In addition to the Nile Delta, areas such as Semliki, Queen Elizabeth and Murchison Falls are all nationally and internationally protected - therefore they must be proactively protected against negative impacts, and thus large-scale development which can bring such impacts. Any development which is permitted, needs to be undertaken with the utmost regard to minimising its effect on the environment and local communities, and only following extensive and intensive consultation opportunities.

As discussed during our visit to the Wanseko-Pakwach (including the Buligi circuit), development should be strictly controlled within protected areas. Many in the international conservation community, although supportive of responsibly managed mining and hydrocarbon development, are against development in important protected areas e.g. World Heritage areas, and areas with IUCN Management Category status I to IV<sup>65</sup>. The IUCN (The World Conservation Union) is an international network comprising governments and non-governmental organisations, and has developed a series of management categories so that protected areas around the world can be classified and managed more easily. Some international extraction companies have been working with IUCN to strengthen this system of protection, and there is an increasing intention for certain areas to be deemed as "no-go". For example, the International Council on Mining and Metals (ICMM) and its members (led by Rio Tinto) has already committed to not developing within World Heritage sites<sup>66</sup>, and Shell International Oil and Gas Company has made a similar commitment to not develop in these areas.

There is no ranking priority within the top four IUCN categories, as all are deemed to have important roles to play, each category being determined by the reason an area was protected in the first place. During our fieldtrip conversations, we were advised that the Queen Elizabeth and Murchison Falls National Parks are IUCN Category II. The following information on IUCN categories is extracted from the To Dig Or Not To Dig report<sup>67</sup>.

IUCN's World Commission on Protected Areas divides protected areas into six categories. Four refer to more strictly protected areas and IUCN policy is that these should not be used for mineral extraction. "Exploration and extraction of mineral resources are incompatible with the purposes of protected areas corresponding to IUCN Protected Area Categories I to IV, and should therefore be prohibited by law or other effective means" \*\*.

IUCN defines a protected area as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. The five most strictly protected categories are defined below .

- **Category Ia:** Strict nature reserve/wilderness protection area managed mainly for science or wilderness protection: an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring;
- **Category Ib:** Wilderness area: protected area managed mainly for wilderness protection: a large area of unmodified or slightly modified land and/or sea, retaining its natural characteristics and influence, without permanent or significant habitation, which is protected and managed to preserve its natural condition.

- **Category II:** National park: protected area managed mainly for ecosystem protection and recreation: a natural area of land and/or sea designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
- **Category III:** Natural monument . protected area managed mainly for conservation of specific natural features: an area containing specific natural or natural/cultural feature(s) of outstanding or unique value because of their inherent rarity, representativeness or aesthetic qualities or cultural significance.
- **Category IV:** Habitat/Species Management Area - protected area managed mainly for conservation through management intervention: an area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats to meet the requirements of specific species.

In addition to the five most strictly protected categories, there are also these two important (but less strictly protected) areas:

- **Category V:** Protected Landscape/Seascape - protected area managed mainly for landscape/seascape conservation or recreation: an area of land, with coast or sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
- **Category VI:** Managed Resource Protected Area - protected area managed mainly for the sustainable use of natural resources: an area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance

\*\* The IUCN position was agreed at the World Conservation Congress in Amman in October 2000.

Useful tools to help determine if development *is* appropriate in or around protected areas can be found in the Energy and Biodiversity Initiative (EBI) Site Selection tool<sup>68</sup> and WWF's To Dig or Not to Dig<sup>69</sup> report. Of course, there are concerns that to undermine this intention of protection, governments can just de-gazette areas so that their protected status no longer hinders exploitation. But with Uganda's national parks and reserves having such international importance, and being so important for international tourists, this situation should not be allowed to arise here

Uganda needs to decide whether exploration and exploitation of hydrocarbons is viable, taking into account the full cost to the environment. Are there some areas that are just too sensitive for such development? This is only something that can be determined by government in conjunction with informed stakeholder input. But in the authors opinion, the area containing the Nile Delta and Buligi circuit are indeed areas that are just too sensitive for development. If any justification can be made for accessing the reserves underneath this area, planning and risk assessment needs to ensure the best technology available is utilised for developments from surface infrastructure outside of the park area, accessing the reservoir below the park through directional drilling for example. Any wastes (especially oil based muds) that are required in conjunction with directional drilling will need to be disposed of effectively with a registered hazardous waste handler agent to be nominated by NEMA.

## Offsets

One way to ease the sometimes controversial issue of significant impact-development alongside conservation priorities is through the use of offsets – to ensure “no net loss” in biodiversity. The usual mitigation hierarchy moves from prevention being the highest priority, through minimisation, through mitigation, down to compensation. An offset is defined as “a conservation activity to compensate for residual, unavoidable harm”. Many different countries use offsets as a way to alleviate those impacts that are acceptable but only just tolerable, acknowledging that compensation for loss is a real requirement. In fact, in the US, wetland and conservation banking is part of the regulatory regime and has co-existed with responsible development for decades. Other countries that have stipulated offsets as part of a regulatory

compensation scheme include Brazil, Australia, Canada and Switzerland. Countries who are considering their policies in this area include New Zealand, Mexico and Uganda<sup>70</sup>. But in addition to a regulatory approach, there is increasing interest in voluntary offset schemes, as companies seek to establish 'good neighbour' credentials, and prove to the government and society that they take their overall environmental impact seriously.

**Some rules:**

- Offsets are only appropriate when all other mitigation actions are insufficient.
- On the other hand, offsets are not appropriate when development should not go ahead in the first place.
- Offsets are not a licence to trash.

IUCN in conjunction with a London-based investment firm, Insight Investment, developed a discussion paper recently on how offsets could work with business. The report contains many examples of how business considers the advantages and challenges of offsets, with numerous case study examples of how they can work. The following text is taken from this report:

**No net loss in Uganda**

According to Alice Ruhweza of Uganda's National Environment Management Authority, NEMA sees biodiversity offsets as a means of ensuring "no net loss" of habitat, while until recently, development projects in the country resulted in loss of biodiversity. Projects were established in sensitive wetlands or other gazetted areas but little was done to address impacts on biodiversity. In such cases, even when mitigation measures were included in the project agreements, Environmental Impact Assessment Condition of Approval Certificates and the Environmental Compliance Agreements between government and the developer, the relevant clauses did not explicitly require the purchase of land or support for a protected area as a form of compensation. (See section 4.3.1 of this report.)

As she explains, "Today, for the first time, NEMA is more actively pursuing alternative restoration measures than the traditional on-site mitigation of the past. NEMA is basically saying that you can't have a project without trying to do compensation. Now, when NEMA gives out concessions, there are conditions. For example, telling developers that they need to buy land and plant trees or gazette land as a Protected Area or take some other action to compensate for the damage caused to biodiversity by the development project. That's the new part. NGO's involved in environmental advocacy have also played a huge role in raising awareness of the dangers of unquestioning commitment to huge projects, without taking into consideration the effects on the environment or setting up adequate alternative restoration or compensation measures."

An 'environmental trust fund' can be set up in a number of different ways to manage offset spending, depending on how the fund management committee source the financial resources and intentions on expenditure. In 1998, the Global Environment Facility (GEF), making a review of Environmental Trust Funds in existence around the world, found<sup>71</sup>:

- new national parks have been created or existing protected areas expanded or upgraded as a result of environmental fund support
- environmental funds have generated substantial financial resources that would not otherwise have been available for nature conservation
- environmental funds have helped devolve responsibility and decision-making about environmental priorities and programmes to the local level

- a broad array of stakeholders has often been involved in the creation of environmental funds, increasing participation of civil society in environmental issues
- important scientific work has been carried out through environmental funds, including inventories, zoning and mapping, that will help measure changes in biodiversity
- some funds are having an upstream impact on broader environmental policies

In operating an environmental trust fund to manage offsets, GEF have stipulated the following as important operational conditions<sup>72</sup>:

- clear and measurable goals and objectives, and a results-oriented management culture that learns from experience and is open to changes in approach based on feedback.
- a governance structure with appropriate checks and balances, conflict of interest provisions, and succession procedures.
- members of governing bodies who are prepared to commit their time, engage in Fund policy-making and leadership, and build support with varied constituencies.
- linkages between the Fund and any national environmental strategy or action plan.
- an ability to attract dedicated competent staff, especially a strong executive director. Basic technical and other capabilities that permit the Fund to become a respected and independent actor in the community.
- access to and effective use of training, mentoring, and technical assistance resources to build capacity.
- harmonious and productive board-staff relationship.
- constructive relationship with relevant government agencies, intermediary organisations that provide services to clients, and other organisations in the environment community. The Fund should avoid becoming an executing agency itself.
- financial and administrative discipline, combined with programme flexibility and transparency, and procedures that support this and are consistently applied.
- mechanisms for continuing to involve a wide range of stakeholders in the Fund's programmes and direction, tempered with enough strategic direction and leadership to avoid programme fragmentation.
- asset management competitively selected, a diversified portfolio of investments, financial expertise to provide regular reporting, and oversight by Fund boards comparing actual performance to benchmarks.

Offsets are seen as a valuable tool in many countries, and are being used for significant conservation benefit. But there is much still up for discussion regarding the logistics of how offsets can work on a case by case basis. How do you measure significant impact? By what criteria is one area deemed worthy as compensation for damage of another area? Should these sites be like-for-like? Should they be in close proximity to each other? For example, if there is the potential to damage a wetland near an oil drilling site, should the offset only focus on another wetland 20km along the lake shore? Or if a nearby forest was deemed a higher conservation priority, should that be an acceptable offset?

Most offset projects in operation at the moment use multiples of habitat impacted as their currency<sup>73</sup>. Most are established as external fund management bodies, so not run directly by the company but by a variety of stakeholders, ensuring continuity and strategic direction. One suggestion to ensure offsets are considered early enough in the process is to integrate them into the EIA process, when the initial risk assessment is conducted.

There is a group called the Business and Biodiversity Offset Programme (of which the Wildlife Conservation Society is a member) who is trying to articulate some of these questions and find suitable solutions. There is the definite need for offsets to clearly identify a real conservation gain – in this Programme, the Mgahinga and Bwindi Impenetrable Forest Conservation Fund is used as a case study for a successful conservation outcome through a well managed fund committee and award structure<sup>74</sup>. To build experience of offsets as a viable and sustainable solution, more projects are needed.

There seems to be ample potential in Uganda to trial their use, and develop a compensation model worthy of export to the rest of the hydrocarbon producing world. In Uganda, for offsetting residual impacts from hydrocarbon exploitation, there could be one central fund that all oil and gas companies contribute to, or each company could contribute to a standalone fund. An analysis of the most effective trust fund mechanism should be explored – this should include consideration of a regional versus national-level

fund, identification of governance issues/challenges, and what existing institutions should the trust fund build on. Whatever form the offset programme comprises, stakeholder input into how the financial resources are distributed is essential to ensure independent prioritisation and process transparency. Stakeholders can help arrive at a general policy and approach appropriate for valuing the residual impacts – this will allow a crucial initial determination on the financial amount of offsets that are appropriate.

## **Pipelines**

Once commercial reserves have been proven, and it might not be long before that happens, there needs to be some way to get the oil to market. As President Museveni has hinted, he intends a mini-refinery to be developed to process crude oil to produce diesel, kerosene and heavy fuel oil. Therefore a pipeline/pipelines will possibly be the preferred route for movement of the crude oil, depending on where the mini-refinery will be built and how much crude can be refined.

Of course, pipelines themselves can cause major environmental impacts if not constructed or restored properly, and an effective EIA must be completed prior to design and planning of the pipeline route. Pipelines are long linear structures, even once buried, and access along the route can cause negative impacts (e.g. increased traffic along cleared route) as well as positives (e.g. providing wildlife corridors where there previously may have been none). Depending on the route, the pipeline may have to traverse (horizontally and vertically) very difficult terrain, and cross rivers, streams and seasonal lakes. Construction can cause siltation, river erosion, slope instability and fish-kill. Spills and integrity failures should always be high on the managements priority list, as security can be an issue. It is better to design a route to avoid sensitive wildlife habitat areas right at the start, thereby enable less requirement for expensive mitigation.

There is a wealth of international experience in identifying the right practices to apply. Basic good practice includes the following stages<sup>75</sup>:

- Plan a draft route linking where the hydrocarbons are refined, to where they are required as product. Avoid sensitive areas. Undertake stakeholder consultation meetings to gain input on issues and sensitivities along the proposed route. Design and amend the route according to learning's and feedback.
- Conduct habitat and wildlife inventories along that route
  - It is critical to properly determine the baseline condition
  - Determine how habitats can regenerate and be enhanced during reinstatement
  - Design and implement a monitoring programme including performance evaluation indicators e.g. how to define that a site has been restored effectively.
- Ensure all staff and contractors are trained so as to minimise environmental disturbance or hunting during construction phase
- Ensure the timing of construction is aligned with wildlife natural cycles to ensure minimal disturbance
- Restoration and re-vegetation
  - Should be closely based on findings from the baseline survey
  - Soil preparation and application
  - Timing of planting and seeding
  - Could utilise plant nurseries developed from seedlings gathered from sites prior to construction
  - Ensure invasive species do not use the opportunity to colonise areas whilst regeneration is taking place
  - Control of erosion
- Manage impacts and monitor for success
  - Increased monitoring traffic, location of pump stations down-pipe (if required)
  - Monitoring results should feed into a management plan designed to minimise medium- and longer term impacts.

## **11) Recommendations to improve current assessment, mitigation and monitoring**

As a result of discussions and evidence gathered as part of this study, there are numerous actions which should be considered for implementation to ensure environmental risks and impacts are properly managed. These have been highlighted in various sections of the report, but are grouped and summarised here for convenience:

### ***Communication and transparency***

- An Oil & Gas Development Forum should be established so that the companies, governments, monitoring agencies & NGO's can meet to discuss environmental issues around hydrocarbon exploration and production, including EIA's, mitigation and monitoring. These could initially be conducted on a 6-monthly basis and frequency amended as required.
- Public consultation opportunities to review EIA's currently awaiting approval could be better advertised.
  - Information on where the public can access the EIA (and the timeframe available for feedback) could be posted on both the PEPD and NEMA websites. Additional copies could be made available for people to take away with them (maybe for a nominal fee),
  - Consultation with local communities needs to focus on information regarding oil and gas processes, activities and issues. Unrealistic expectations of compensation and employment opportunities should be discouraged.
- PEPD should consider adopting and maintaining Table 4 and keep it on their website, so that current information is always available to stakeholders in a transparent way.

### ***Developing further capacity***

- Oil and gas issues are a relatively new phenomenon in Uganda, and so training, capacity and experience building needs additional focus in the short term.
- NEMA is under-funded and under-resourced. If this organisation is supposed to be the lead agency in ensuring that environmental risks are effectively mitigated and managed, they need more funding, more vehicles and more staff. This finding reflects a recommendation made in the recent State of the Environment Report 2004/5 which also acknowledges a required increase in resources.
- Need for technical petroleum operations training during undergraduate study, so that all graduate environmentalists who choose to work in the oil and gas sector have some basic awareness of the main impacts of oil and gas exploration and development
- PEPD needs to increase environmental competency, and a closer collaboration should be encouraged with specified Directorate of Water Development, NEMA & UWA representatives on site visits and in post-visit follow-up.
- There should be improved understanding of how to value natural resources (including biodiversity). Economic assessment should take into account the threat from loss of the natural resource base (e.g. loss of ecosystem services, loss of tourism dollars, etc), instead of focussing on the potential benefits from hydrocarbon development

## ***Impact assessment***

- Some good EIA practice has occurred in Uganda, and opportunities should be sought by Ugandan EIA practitioners to work with international EIA professionals.
- Additional structured training to be made available to EIA practitioners to raise the competence levels further, and increase oil and gas experience of in-country professionals – this to be undertaken with the Ugandan EIA Professional Association.
- Statutory agencies involved in EIA approval need training in oil and gas operations and impacts, to ensure a better understanding of
  - the impacts associated with the various stages of hydrocarbon development, and
  - which actions would be most effective in mitigating those impacts.
- Improved quantitative impact assessment, and methodologies used to determine significance, would improve the standard of some EIA's

## ***Monitoring***

- Collaborative monitoring has been started sharing site visits with colleagues from other agencies e.g. PEPD, NEMA, UWA, etc, but monitoring visits and progress checks need to become more systematic and frequency increased. Documented observations and findings from on-site PEPD monitors should feed into this collaborative approach.
- Mitigations actions in the EIA and in the Certificates of Approval should include reference to when the mitigation action should be undertaken/completed by, and who specifically has the responsibility to ensure the action is undertaken.
- An EIA-specific monitoring progress team should be established when an EIA is approved to ensure that mitigation actions stated in the EIA and associated Certificate of Approvals are achieved within the timeframes set. Responsibilities between agencies need to be stipulated and actions given timeframes for completion.
- Meetings between the monitoring progress teams and the senior company management should occur, based in Kampala, in addition to site visits – it is not always necessary to rely on visual inspection. If the companies were prompted to be more systematic in their management systems and record keeping, documents of progress could be reviewed in meetings with head office personnel as opposed to only site personnel.
- Further resources are required to ensure that an adequate monitoring programme can be implemented and maintained with all the relevant agency personnel. Agency budgets should include year-on-year commitments for ongoing monitoring actions.

## ***Impact mitigation***

- Sensitivity maps/atlasses should be developed to allow better information to be immediately available on wildlife and habitat sensitivities, whether on the lake, along the shoreline, or on land. These should include seasonal variations. The maps would better inform licensing decisions, project EIA approval specifics, and oil spill contingency planning and response. These should be GIS based electronic systems with full print and zoom functionality.
- Ecologists should be included as part of the seismic line placement team and detonation team in Buligi, not just as part of pre- and post- team but there as the seismic operators drive the tractors through vegetation, and as the boats move around the delta. Their input on temporal and spatial sensitivities will be crucial to minimise impacts from seismic.

- Further consideration is required on methods to ensure animals such as elephants etc don't stray onto explosive lines during seismic survey... possibilities include more rangers (paid for by company), or over-flights to deter animal encroachment, or shorter seismic lines fired at any one time. UWA and conservation NGO's should have maximum opportunity to apply their expertise to solving these issues.
- Wetlands Inspection Division staff should continue to assist Hardman in construction of a wetland at Kaiso Tonya to enable natural bioremediation of discharged water. If deemed successful, this technique should be a required standard for other operations if appropriate, in preference to untreated discharge, or treatment involving toxic or non-biodegradable materials.
- Integrity of the liner at Kingfisher waste water pit should be investigated – bubbles seen escaping at several places on surface of liquid waste, and reports of liquid volume diminishing.
- Both Hardman and Heritage need to urgently revisit the conditions upon which they have been awarded licence or approval to explore, and systematically ensure that these conditions are complied with, in collaboration with NEMA, PEPD and UWA where appropriate.
- Companies must develop site-specific environmental management systems to ensure that compliance with mitigation actions is managed more effectively. This will also help to minimise any environmental risks not predicted or planned for e.g. a system-led approach, with inherent risk assessment and analysis. Waiting for commercial quantities of oil to be discovered before implementing such systems is no justification for delaying the development of an EMS, and should be developed as soon as the EIA flags up significant issues.
- The outstanding road traffic issues at Kaiso-Tonya need further urgent discussion with all stakeholders, including landowners. A meeting between Hardman, the district council, UWA and landowners should be sought to find an amicable solution.
- Within the EIA approval process, UWA, WID and NFA need to identify any particularly sensitive areas within the EIA areas, and any specific actions required by the companies as a result of these sensitivities – this will help PEPD and NEMA restrict potentially damaging activities to less sensitive locations where appropriate. This information could form part of the data held within the sensitivity atlases.
- When development approaches the production stage, and a number of production wells are being drilled, drill cuttings re-injection should be utilised to minimise the amount of waste requiring treatment and disposal. Alternatively find productive uses for treated drill cuttings.
- The sections of this report concluding 'Review of EIA's – specific technical concerns' and 'Field Assessment - discussion' (p24 and p.37) contain actions which require follow-up.

## ***Responsible energy development***

- A Strategic Environmental Assessment (SEA) should be undertaken to assess the relative merits and impacts from all sources of energy within Uganda – if we know the amount of energy Uganda requires now and in the future, a comparative assessment can determine which energy sources are best to provide the required amount, and which are highest priority for development.
- Acknowledging the extreme sensitivity of some of the protected areas, when development is approved in a such an area, best available technology should be applied to ensure minimal environmental impact occurs within the protected area and its buffer zone e.g. directional drilling, mud and cuttings treatment and disposal off-site, etc. Best use of barges instead of building new roads should be encouraged, as long as risks associated with barge-based servicing are effectively addressed.
- The government, in collaboration with all stakeholders, needs to assess whether some of the protected areas within Uganda are just too sensitive to withstand development, and exclude these areas from licensing or development.

- An Environmental Trust Fund should be established to progress offsets as a viable way of compensating for residual impacts – in Uganda, because of the sensitivity of the locations where hydrocarbons are found, there will be residual impacts that cannot be mitigated against. As these residual impacts will probably occur in protected areas, it is only fair that some positive advantage is offered where wildlife and protected areas can benefit.
  - A workshop should be arranged to gather all stakeholders (including the companies) for a discussion on how oil and gas offsets could operate in practice in Uganda. There seems general agreement on the concept, so a workshop would generate a list of prioritised outcomes to ascertain how offsets could work effectively.
  - The stakeholders should agree to a general policy and approach for valuing the residual impacts to determine the amount of the offsets that must be provided/paid.
  - An analysis of the most effective trust mechanism needs to be explored – including development of a regional versus national-level fund; building on existing institutions, identification of governance issues/challenges.
  - Carry out an assessment to determine the cost of addressing residual impacts and how effectively a trust with specified endowment levels would cover those costs.



civil society have a clear understanding of the likely impacts that oil development will have on the region's natural resource and non-oil economy. This information will form the basis for discussions between the oil companies and stakeholders regarding realistic and effective mitigation plans and funding that ensure the protection of biodiversity and the sustainable development of local communities.

## **Work Plan**

In anticipation of the biodiversity and social impacts of these developments and the importance of establishing appropriate mitigation early in the development process, the Wildlife Conservation Society, along with the Uganda Wildlife Authority and Advocates Coalition for Development and Environment, have come together to contract a consultant to assist with an assessment of the likely impacts of the oil exploration and provide guidance dealing with the impact of proposed developments through the establishment of an effective and workable mitigation plan.

In achieving these desired results, the consultant will undertake the following specific tasks:

- Meet with relevant Government officials and international donors in Uganda to obtain up to date information regarding oil development. Review all available documentation including contracts, reports, EIA's and other documents related to the development of oil exploration program in Uganda.
- In coordination with UWA review plans for development of both hydropower and geo-thermal power and visit sites where that development may occur. Outline steps that UWA should take now, along with stakeholders to address mitigation issues.
- Visit exploration sites and compare findings from these documents and recommendations with actual implementation on the ground. Outline potential biodiversity and social impacts from current operations and recommend further analyses and studies which companies should carry out and detail any on-going mitigation.
- Once impacts are known, assist in making contacts with management of oil companies to discuss proactive approaches they could take now to assist with mitigation of current environmental and biodiversity impacts. Explore possibility of organizing meetings of stakeholders with company Executives so that mitigation options can be explored. Recommend, to the extent possible, the type of payment schemes or mitigation for protection of biodiversity may be most appropriate given current conditions.
- To the extent feasible, based on anticipated production levels and information gleaned from studies and discussions, outline likely scenarios for future oil development in the region in order to assist stakeholder to plan an appropriate course of action.
- Identify all likely stakeholders in Uganda and their interests and outline who needs to be involved to secure effective mitigation. Make recommendations for engaging all parties around mitigation efforts.
- Recommend approaches for monitoring impacts and for maintaining relationships with oil companies – what kind of management, advisory or collaborative organization should be established to oversee efforts?
- Hold meetings with UWA, the Department of Petroleum and other stakeholders to brief them on findings and educate them on relevant issues, especially why environmental monitoring is necessary for oil, what systems need to be put in place and the role of the companies in funding such efforts. Provide meeting with recommendations for offsets and payments during this phase of development and outline how any next phase is likely to develop (e.g. international funding, Equator Principles, future mitigation options, etc.)
- Develop a plan of action to address issues and meet mitigation and funding objectives, including identification of possible next steps. This could include recommendations to meet with the Executive Staff of Tullow/Hardman Oil, along with representatives of WCS.

## ***Time Frame***

The work will take place in Uganda over a period of 23 work-days starting in October 2006. The consultant will work from the offices of WCS and will meet with stakeholders in Kampala. At least one week of travel to the field site will be required to meet with local stakeholders and the oil companies. Some work may be carried out from Europe or the US to conduct research or make contacts with company representatives.

The consultant will report directly to a team comprised of the WCS Albertine Rift Program Director, the Director of the Uganda Wildlife Authority, and the Director of Acode.

## ***Outputs***

The Main output of this consultancy will be a report that summarises the findings based on the terms of reference above. In particular it will provide information on the following areas:

1. Provide a summary of existing agreements with different oil companies and concessions in Uganda with contact information of each company both in Uganda and their head offices
2. Summarise the current state of exploration and development of each of the concessions in Uganda, what is known about existing oil reserves and what is thought to be potentially available.
3. Assess the current EIA reports that exist and whether they meet international standards for oil prospecting.
4. Assess the compliance of existing interventions with the EIA's and the extent to which monitoring of compliance is taking place.
5. Assess the potential impacts of plans for hydro power and geothermal power in existing protected areas in the Albertine Rift
6. Provide some suggested standards and guidelines for oil exploration and extraction that have been recommended as 'good practice'.
7. List the major stakeholders and their interests and who needs to be involved to secure mitigation.
8. Outline likely scenarios for the future of oil, geothermal and hydro power exploration in Albertine Graben in Uganda and make recommendations about how the Conservation Community could engage with the petroleum/energy industry to minimize impacts on the environment and off set biodiversity impacts.
9. Suggest a plan of action to address issues and meet mitigation requirements as well as specific follow up to engage the directors of oil companies operating in the region.

Two meetings to educate the Department of Petroleum, Uganda Wildlife Authority, Ministry of Tourism, Trade and Industry and Conservation NGO's will be held. One near the beginning of the consultancy to inform people of the assessment and why it is needed and one larger meeting at the end to educate people about the main findings.

The Consultant will be housed at the WCS Albertine Rift Director's house in Kampala and ARA while there and costs of transportation, food other incidentals will be covered by WCS in country. Flight costs will be reimbursed by WCS on receipt of the receipt for the tickets. WCS will also cover all internal travel costs.

**Appendix 2: Fieldtrip Itinerary, Workplan and Participants**  
**Assessing the Impacts of Energy Developments and Developing Appropriate Mitigation in**  
**the Uganda portion of the Albertine Rift.**

**Fieldtrip Itinerary and Workplan (as of 6th Nov)**

<b>Day</b>	<b>Logistics</b>	<b>Workplan</b>
<b>Tuesday</b> 7 <sup>th</sup> Nov	Depart: UWA offices at 0800 Lunch: on route Evening: Fort Portal, hotel TBC Contact Person:	<b>Visit Katwe on Lake Edward, Kasese</b> - visual assessment of geothermal site - discuss impact and on local environment and communities, and mitigation
<b>Wednesday</b> 8 <sup>th</sup> Nov	Depart: Fort Portal at 0800 Lunch: packed lunch Evening: Fort Portal, hotel TBC Contact Person:	<b>Visit Turaco-3 (abandoned well-site), Semliki</b> - visual assessment of state of abandoned well site - discuss future development of hydrocarbon reserves in area, impacts and mitigation - meet Jonathan Wright (Semliki Lodge) if time allows (contact to be established) <b>If time permits</b> , visit Sempaya Hot Springs in SNP - visual assessment and discussion of potential impacts from development of geothermal power and mitigation
<b>Thursday</b> 9 <sup>th</sup> Nov	Depart: Fort Portal at 0700 for Hardman visit Lunch: Lake Albert Safari Lodge Evening: Hioma, Kolping Hotel (LJ stay at Lake Albert Safari Lodge) Contact Person: Angela at Kolping	<b>Visit Nzizi (drilling well-site) and Mputa-1 or -2 (suspended wells), Kaiso-Tonya</b> - after lunch, drive to Kyehoro camp (2km from Lodge), meet John Morley - visual assessment of operations and well-site - discuss operations, mitigation, monitoring and future oil development - meet company personnel, John Morley will accompany us
<b>Friday</b> 10 <sup>th</sup> Nov	Depart: Hoima at 0800 for Heritage visit Lunch: packed lunch Evening: all at Hoima, Kolping Hotel Contact Person: Angela at Kolping 0772-516421	<b>Visit Kingfisher-1 well-site, Kaiso-Tonya</b> - meet Frank McCarter at Mbego Gateway camp at 0930hrs - airplane to well-site (20 mins) - visual assessment of operations and well site - discuss operations, mitigation and monitoring - meet company personnel, Bruce Westwood will accompany us
<b>Saturday</b> 11 <sup>th</sup> Nov	Depart: Hoima at 0730 Lunch: on route Stay: all at Red Chilli Lodge Contact Person:	<b>Visit Butiaba-Wanseko area, Masindi</b> - assess potential locations of drilling - discuss likely impacts on local environment and communities, and mitigation - drive onto Red Chilli for 1300hrs, to allow drivers to get around to north of Nile <b>Trip up Nile on launch</b> - enjoy the experience!
<b>Sunday</b> 12 <sup>th</sup> Nov	Depart: Red Chilli Lodge at 0700 Breakfast: snack Lunch: on route/packed lunch? Evening: all at Red Chilli Lodge	<b>Visit Buligi circuit, Murchison Falls National Park</b> - boat to north shore, pick up our vehicles - visual assessment of Buligi peninsula and shoreline regarding potential hydrocarbon exploration - Explore whether drilling can be done on the western side of the Nile or L. Albert - discuss potential impacts on environment, communities and tourism

<b>Monday</b> 13 <sup>th</sup> Nov	Depart: Red Chilli Lodge at 0800 Lunch: packed lunch Evening: Masindi, hotel tbc	<b>Visit Ayago</b> - boat to north shore, pick up vehicles - visual assessment of site for hydropower development - discuss potential impacts on environment, communities and mitigation <b>Visit Karuma Falls</b> - visual assessment of site for hydro power development - discuss potential impacts on environment, communities and tourism, and mitigation
<b>Tuesday</b> 14 <sup>th</sup> Nov	Depart: 0800 Lunch: on route	Return to Kampala (UWA offices)

**Trip participants:**

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	UWA Driver		

## References

- <sup>1</sup> IUCN Red Data Book Lists. Latest database available from [www.iucn.org](http://www.iucn.org)
- <sup>2</sup> Terms of Reference, Assessing the impacts of energy developments and developing appropriate mitigation in the Uganda portion of the Albertine Rift – final version, 2<sup>nd</sup> November 2006. Wildlife Conservation Society.
- <sup>3</sup> IUCN Red Data Book Lists. Latest database available from [www.iucn.org](http://www.iucn.org)
- <sup>4</sup> Mbendi Electrical Power Overview [www.mbendi.co.za](http://www.mbendi.co.za) (downloaded Oct 2006)
- <sup>5</sup> President Yoweri Museveni's speech on the 44th anniversary of Uganda's independence
- <sup>6</sup> Oil & Gas Policy draft version 2, September 2006
- <sup>7</sup> Adapted from Uganda Oil & Gas Policy Draft 2 (Sept 2006)
- <sup>8</sup> Heritage AGM presentation June 2006 (available [www.heritageoilcorp.com](http://www.heritageoilcorp.com))
- <sup>9</sup> Hardman 3<sup>rd</sup> Quarter Report to Shareholders, released 26<sup>th</sup> October 2006
- <sup>10</sup> Hardman 3<sup>rd</sup> Quarter Report to Shareholders, released 26<sup>th</sup> October 2006
- <sup>11</sup> Hardman 3<sup>rd</sup> Quarter Report to Shareholders, released 26<sup>th</sup> October 2006
- <sup>12</sup> Hardman AGM Presentation, May 2006 (available [www.hdr.com.au](http://www.hdr.com.au))
- <sup>13</sup> EIA for Butiaba-Wanseko Seismic Operations, Sept 2006
- <sup>14</sup> Hardman 3<sup>rd</sup> Quarter Report to Shareholders, released 26<sup>th</sup> October 2006
- <sup>15</sup> Heritage AGM presentation June 2006 (available [www.heritageoilcorp.com](http://www.heritageoilcorp.com))
- <sup>16</sup> Heritage AGM presentation June 2006 (available [www.heritageoilcorp.com](http://www.heritageoilcorp.com))
- <sup>17</sup> Personal communication LJ with Moses Kagoda
- <sup>18</sup> UK legislation - SI 360 - Offshore Petroleum Production & Pipelines (Assessment of Environmental Effects) Regulations 1999, Schedule 2 Annex H & associated guidance materials
- <sup>19</sup> OGP Principles for Impact Assessment: the environmental and social dimension, Aug 1997
- <sup>20</sup> The Energy & Biodiversity Initiative report, Aug 2003. [www.theebi.org](http://www.theebi.org)
- <sup>21</sup> Personal communication LJ with Jurgens Bence, Kingfisher-1 on-site Manager of Medic Services/HSE Manager.
- <sup>22</sup> Personal communication LJ with Moses Kagoda, EIA Professional Committee (correct term??)
- <sup>23</sup> Informed by PEPD comments on draft of this report
- <sup>24</sup> Informed by PEPD comments on draft of this report
- <sup>25</sup> OGP Principles for Impact Assessment: the environmental and social dimension, Aug 1997
- <sup>26</sup> Heritage Environmental Audit Report and Abandonment Plan, Sept 2006
- <sup>27</sup> Personal communication with Dozith Abeinomugisha, PEPD.
- <sup>28</sup> Email from Dick Lufafa, NEMA 24<sup>th</sup> January 2007
- <sup>29</sup> Informed by PEPD comments on draft of this report
- <sup>30</sup> Visitor analysis display, UWA Ranger Office at Sampaya Hot Springs at November 2006
- <sup>31</sup> Personal communication LJ with Bruce Martin, Lake Albert Safari Lodge
- <sup>32</sup> Personal communication LJ with UWA
- <sup>33</sup> Printout of mud recipe used around the 9<sup>th</sup> Nov 2006, provided to LJ from Tyne Lander, Site Mud Engineer
- <sup>34</sup> Informed by PEPD comments on draft of this report
- <sup>35</sup> Personal communication LJ with Bryan Westwood, Heritage
- <sup>36</sup> Informed by PEPD comments on draft of this report
- <sup>37</sup> Informed by PEPD comments on draft of this report
- <sup>38</sup> Informed by PEPD comments on draft of this report
- <sup>39</sup> Personal communication LJ with Moses Kagoda and Bryan Westwood, Heritage
- <sup>40</sup> Personal communication LJ with Dozith Abeinomugisha, PEPD
- <sup>41</sup> Personal communication LJ with Jemaville Tarin Lim, Environmental Team Leader, Seismic Baseline team for Hardman
- <sup>42</sup> World Bank Sourcebook – Chapter 10
- <sup>43</sup> Personal communication LJ with Bryan Westwood, Heritage
- <sup>44</sup> Informed by PEPD comments on draft of this report
- <sup>45</sup> From Power Technology website <http://www.power-technology.com/projects/bujagali/bujagali6.html> (downloaded Oct 2006)
- <sup>46</sup> Email from Dick Lufafa, NEMA 24<sup>th</sup> January 2007
- <sup>47</sup> UK Offshore Forum Oil & Gas meetings, information from: [www.og.dti.gov.uk/environment/meetings/ukofffor.htm](http://www.og.dti.gov.uk/environment/meetings/ukofffor.htm)
- <sup>48</sup> Informed by PEPD comments on draft of this report
- <sup>49</sup> IUCN & Insight Investment, Biodiversity Offsets – views, experience and the business case, 2004. Executive summary available from <http://biodiversityeconomics.org/offsets/execsum.htm>
- <sup>50</sup> Conservation International Policy Paper, Reinventing the Well: approaches to minimizing the environmental and social impact of oil development in the tropics, 1997. Written by Amy Rosenfeld, Debra Gordon and Marianne Guerin-McManus.

- <sup>51</sup> WWF – To Dig or Not to Dig: criteria for determining the suitability or acceptability of mineral exploration, extraction and transport from ecological and social perspectives, Jan 2002
- <sup>52</sup> Mbendi Electrical Power Overview [www.mbendi.co.za](http://www.mbendi.co.za) (downloaded Oct 2006)
- <sup>53</sup> New Vision article “Sorting out the power problem”, October 28<sup>th</sup> 2006
- <sup>54</sup> Bujagali Hydropower and Inter-connector Project Newsletter Sept 2006 No.1 (available from <http://www.bujagali-energy.com/default.htm>)
- <sup>55</sup> New Vision article “Sorting out the power problem”, October 28<sup>th</sup> 2006
- <sup>56</sup> From Power Technology website <http://www.power-technology.com/projects/bujagali/bujagali6.html> (downloaded Oct 2006)
- <sup>57</sup> Karekezi, S. and Kithyoma, W. (2005). Sustainable Energy in Africa: Co-generation and geothermal in the East and Horn of Africa.
- <sup>58</sup> IPCC Climate Change 2007: The Physical Science Basis. Summary for Policymakers, Contribution of Working Group I to the 4<sup>th</sup> Assessment Report to the Intergovernmental Panel on Climate Change
- <sup>59</sup> IPCC Climate Change 2001: Impacts, Adaptation and Vulnerability, Working Group II to the 3<sup>rd</sup> Assessment Report
- <sup>60</sup> Economic, Development and Livelihood Implications of Climate Induced Depletion of Ecosystems and Biodiversity in Africa, Dr Anthony Nyong (Coordinating Lead Author, Africa Chapter, IPCC 4<sup>th</sup> Assessment Working Group 2) & WWF. Feb 2005.
- <sup>61</sup> New Vision article “Sorting out the power problem”, October 28<sup>th</sup> 2006
- <sup>62</sup> Hardman 3<sup>rd</sup> Quarter Report to Shareholders, released 26<sup>th</sup> October 2006
- <sup>63</sup> Consultative seminar on the Assessment of the Future Role of PEPD in Uganda – Description of Actions, held at Mousa Court, 15<sup>th</sup> March 2005
- <sup>64</sup> Personal communication LJ with John Morley, Hardman
- <sup>65</sup> IUCN Management Categories information at [http://www.unep-wcmc.org/protected\\_areas/categories/eng/index.html](http://www.unep-wcmc.org/protected_areas/categories/eng/index.html)
- <sup>66</sup> International Council on Mining and Metals position statement on mining and protected areas, 20<sup>th</sup> Aug 2003 [www.icmm.com](http://www.icmm.com)
- <sup>67</sup> WWF – To Dig or Not to Dig: criteria for determining the suitability or acceptability of mineral exploration, extraction and transport from ecological and social perspectives, Jan 2002
- <sup>68</sup> Energy and Biodiversity Initiative – Framework for integrating biodiversity into site selection, 2003?
- <sup>69</sup> WWF – To Dig or Not to Dig: criteria for determining the suitability or acceptability of mineral exploration, extraction and transport from ecological and social perspectives, Jan 2002
- <sup>70</sup> Presentation by Kerry ten Kate, for Business and Biodiversity Offsets Programme, Conservation International Global Symposium, Madagascar June 2006
- <sup>71</sup> GEF review of environmental trust funds 1998, quoted in Sustainable Financing for environmental projects in Africa: some ideas for consideration, by Alain Lambert, UNEP. Prepared for the 11<sup>th</sup> regular session of the African Ministerial Conference on the Environment, Brazzaville, Congo, May 2006
- <sup>72</sup> GEF review of environmental trust funds 1998, quoted in Sustainable Financing for environmental projects in Africa: some ideas for consideration, by Alain Lambert, UNEP. Prepared for the 11<sup>th</sup> regular session of the African Ministerial Conference on the Environment, Brazzaville, Congo, May 2006
- <sup>73</sup> Presentation by Jon Ekstrom, Birdlife International “CCF seminar April 2006”
- <sup>74</sup> The Mgahinga and Bwindi Impenetrable Forest Conservation Trust, quoted in Sustainable Financing for environmental projects in Africa: some ideas for consideration, by Alain Lambert, UNEP. Prepared for the 11<sup>th</sup> regular session of the African Ministerial Conference on the Environment, Brazzaville, Congo, May 2006 (p.6)
- <sup>75</sup> Based loosely on an unpublished document within developed by the Wildlife Habitat Council