WWF

REPORT

2013

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

A report for WWF by

Dalberg

WWF

WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by consering the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

Dalberg Global Development Advisors

Dalberg Global Development Advisors is a strategic consulting firm that works to raise living standards in developing countries and address global issues such as climate change.

Dalberg works with governments, foundations, international agencies, non-governmental organizations, and Fortune 500 companies to make sustainable improvements in the lives of disadvantaged and underserved populations around the world.

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Virunga National Park (Virunga) is recognized globally as a uniquely rich site for wildlife, but it is much more than that. Virunga is also a vital resource to local residents living in and around Africa's oldest national park. Under present circumstances, Virunga's estimated annual economic value is US$48.9 million. In a stable situation conducive to economic growth and tourism, the park's value could be higher than US$1.1 billion per year and it could be the source of more than 45,000 jobs, including existing positions.

Based on the findings of *The Economic Value of Virunga National Park*, WWF urges governments, oil companies and non-governmental organizations (NGOs) focused on conservation, human rights and development to take immediate steps to protect the park from oil exploration. WWF also encourages all stakeholders to work together to unlock Virunga's potential as a sustainable source of direct income to local communities, the park management and the Democratic Republic of the Congo (DRC) government.

WWF calls on all governments to:

- Use appropriate legal and political mechanisms to ensure that resident oil companies respect the current boundaries of the park and stop all exploration and exploitation plans in its vicinity;
- Hold accountable those companies proven to circumvent national laws and international treaties in the pursuit of unsustainable financial gains;
- Publicly declare support for the protection of Virunga from oil exploration and exploitation through official statements, enforcing existing agreements and increased commitment to funding sustainable conservation and economic development of the surrounding region.

WWF calls on Soco International PLC and its DRC-registered company Soco Exploration and Production DRC Sprl (Soco) to:

- Publicly commit to stopping permanently all exploration and exploitation within Virunga and to respecting the park's current boundaries;
- Publicly commit to respecting all World Heritage Sites and appropriate buffer zones;

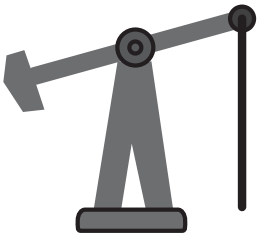
- Publicly demonstrate its commitment to adhering to Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises.

WWF urges Soco investors to:

- Leverage their rights and obligations as investors to require Soco to commit publicly to withdrawing from Virunga and stopping all exploration activities in and around the park;
- Caution Soco about investment risks of stranded assets, reputational risk and operational risk;
- Encourage Soco to state publicly its commitment to never enter a World Heritage Site.

WWF calls on the DRC government to:

- Uphold and respect DRC law and regulations that prohibit environmentally harmful activities such as oil exploration and exploitation in protected areas including Virunga, and close existing loopholes in the draft hydrocarbon and conservation laws that allow for the exploration and exploitation of natural resources in national parks and World Heritage Sites;
- Promote tourism by addressing the systemic failure that has allowed all five DRC World Heritage Sites, including Virunga, to remain on the United Nations Educational, Scientific and Cultural Organization (UNESCO) "in Danger" list for more than a decade;
- Affirm Article 53 of the DRC national constitution that states: "All persons have the right to a healthy environment that is favourable to their development. They have the duty to defend it. The state ensures the protection of the environment and the health of the population".



WWF CALLS ON SOCO TO COMMIT PUBLICLY TO RESPECTING ALL WORLD HERITAGE SITES

WWF urges all conservation, human rights and development NGOs and religious leaders to continue to improve our coordination to ensure the people of the DRC are accorded their rights to a safe, healthy, informed path to sustainable development.

TROUBLE ON THE HORIZON

Since becoming Africa's first national park in 1925, the savannas, lakes and mountains of Virunga National Park have seen more than their share of trouble. Even through times of armed conflict, the park has survived. But now Virunga itself is under attack. Oil concessions covering 85 per cent of its territory have been designated, and exploration companies are on its doorstep. With oil come risks from pollution and destabilization, which could destroy this extraordinary place forever.

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

EXECUTIVE SUMMARY

In response to the granting of oil concessions in Virunga National Park (Virunga), WWF launched a campaign to raise awareness of Virunga's economic value and the implications of oil development for local communities and the environment. As part of the campaign, WWF commissioned Dalberg Global Development Advisors to study Virunga's current and potential social and economic value and to indicate the implications of oil exploration and exploitation.

Located in eastern Democratic Republic of the Congo (DRC), Virunga is Africa's oldest national park. One of DRC's five United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites, the park is known for its wildlife-rich network of forests, savannas, rivers, lakes, marshlands, active and dormant volcanoes and permanent glaciers. It is also famous for being home to about 200 critically endangered mountain gorillas.

In December 2007, the DRC government granted oil concessions covering 85 per cent of the park. To date, Soco International PLC (Soco) is the only oil company that has indicated that it will explore for oil within park boundaries. Despite DRC's law prohibiting environmentally harmful activities in protected areas, Soco's exploration licence exploits an exemption in that law that allows for "scientific activities" in protected areas.

PLANS TO DEVELOP OIL EXPOSE THE SOCIAL AND ECONOMIC VALUE OF THE PARK TO RISKS

Plans to develop oil expose the social and economic value of the park to risks, the likelihood and impact of which is demonstrated by cases such as the Bas Congo and Niger Delta. These risks include the following:

- **Exploration** activities like seismic surveys and exploratory drilling have localized environmental impacts. Infrastructure requires clearance of vegetation and often leads to the development of illegal human settlements along access routes. This can set a precedent for activities that threaten conservation, and lead to the introduction of invasive plants, fragmentation of natural habitats, and an increased likelihood of poaching, which threatens the survival of local species.
- **Exploitation** in an area prone to conflict and lacking systematic government legislation and enforcement would make pollution-free extraction extremely difficult, if not impossible to guarantee. The longer the pipeline and the more remote the location, the more difficult ensuring pipeline maintenance and protection becomes. Further, drilling close to Virunga's eight volcanoes poses risks to the size and frequency of eruptions.
- **Pollution** from oil extraction is likely because minimum requirements for pollution-free drilling, such as pipeline maintenance and protection from sabotage, cannot be met in a conflict-prone area. Additionally, oil extraction is likely to fuel further conflict over resources and to hinder pollution

PROTECTED AREAS REPRESENT A LONG-TERM SOURCE OF INCOME IF MANAGED SUSTAINABLY

mitigation efforts. Environmental degradation and human rights abuse can result from pollution.

- **Economic and social development** could be impacted negatively due to the "oil curse" – a phenomenon resulting from oil exports. Under the oil curse, the source country's currency appreciates causing a decline in the competitiveness of existing export sectors, oil price volatility destabilizes government revenues prohibiting long-term planning, and large cash flows increase the risk of misallocated resources. In the case of the Niger Delta, poverty and inequality indicators have worsened since the discovery of oil.

Oil development could also threaten the park's status as a World Heritage Site, which if lost, could in turn have negative effects on the value of the park.

In the current situation, Virunga's value is approximately US$48.9 million per year. In a stable situation characterized by the absence of conflict, secure access to the park, and sufficient resources to protect the ecosystem, the park could increase in value to more than US$1.1 billion per year. The value of the park may be far higher if additional factors were to be taken into consideration. The methodology used in this report calculates Virunga's value based on the following three components:

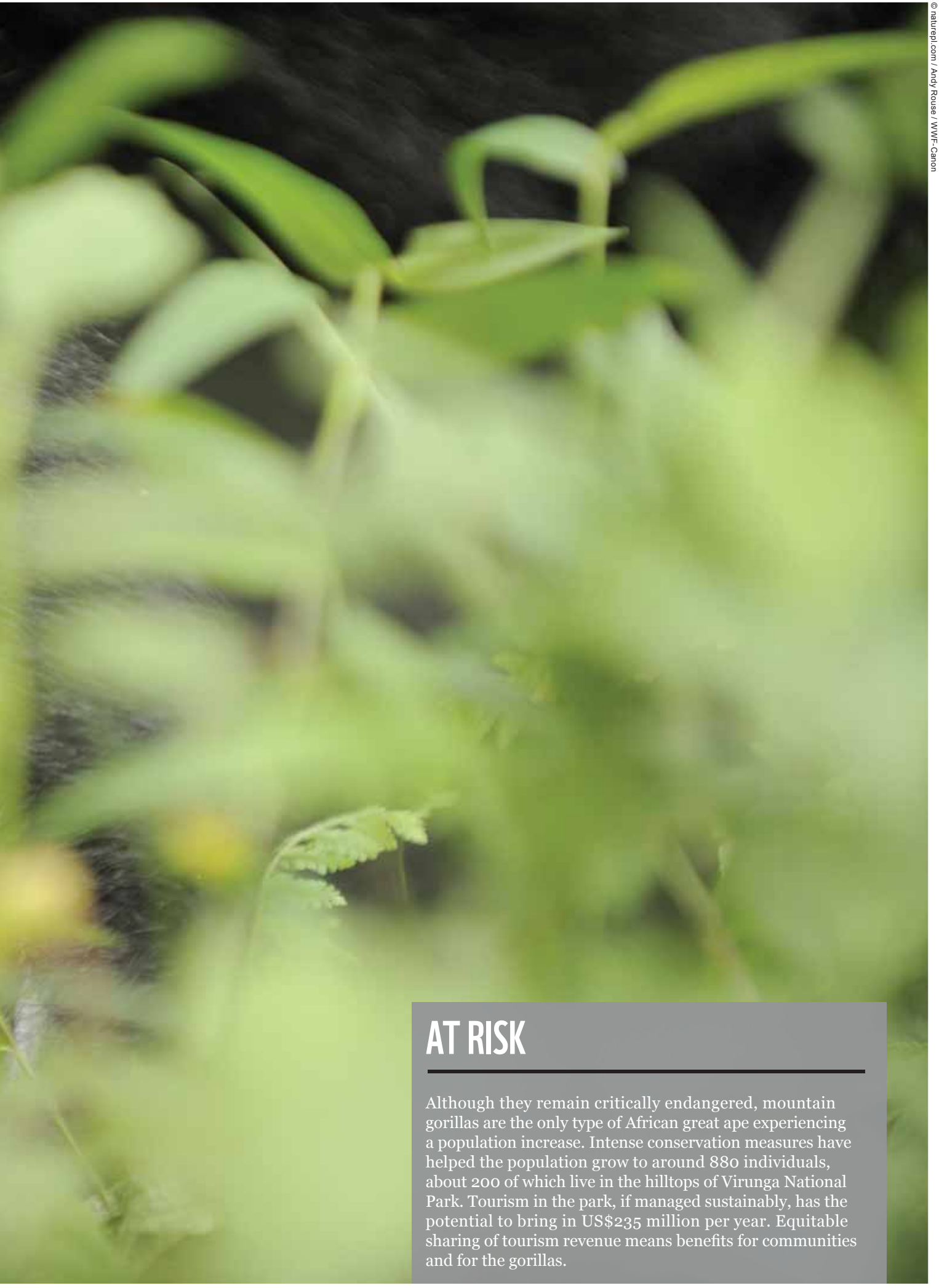
- Potential future **direct use** of Virunga's ecosystem could generate US$348 million per year and help diversify DRC's economy. The main contributors to this value are tourism at a potential value of US$235 million, fisheries at a potential value of US$90 million, and hydropower at US$10 million.
- Potential future **indirect use** of the park through the provision of ecosystem services can generate US$63.8 million. The main contributors to this value are carbon sequestration at US$55 million, water supply at US$1 million, and savings from erosion control at US$7.8 million.
- Finally, the **non-use value,** or the value represented by knowing that park's resources can be used in the future, could be as high as US$700 million per year.

DRC is not only home to Virunga, Africa's most biodiverse park, but also contains four other World Heritage Sites recognized for their outstanding natural value, as well as a variety of other national parks. These protected areas represent a long-term source of income if managed sustainably. Virunga alone has the potential to provide for the livelihoods of 45,000 people through the provision of job opportunities.

Sustainable management of the park's resources would help diversify the DRC's economy, which currently relies on mostly natural resources, making it vulnerable to the destabilizing effects of an oil curse.

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

INTRODUCTION



AT RISK

Although they remain critically endangered, mountain gorillas are the only type of African great ape experiencing a population increase. Intense conservation measures have helped the population grow to around 880 individuals, about 200 of which live in the hilltops of Virunga National Park. Tourism in the park, if managed sustainably, has the potential to bring in US$235 million per year. Equitable sharing of tourism revenue means benefits for communities and for the gorillas.

WWF has launched a campaign to raise awareness of the risks associated with oil development in Virunga National Park (Virunga), a World Heritage Site. As part of the campaign, WWF commissioned Dalberg Global Development Advisors to study Virunga's current and potential social and economic value and how these could be impacted by oil development.

Dalberg consulted local and international stakeholders in Virunga to understand the value of the park. Dalberg also interviewed an oil company that has been granted an oil concession within the borders of the park. More than 50 stakeholders have contributed to this report, including:

- 20 stakeholders from local communities in and around Virunga
- 12 stakeholders from WWF
- 12 stakeholders from other local and international NGOs
- 2 stakeholders from international organizations
- 3 stakeholders from local and international universities
- 4 stakeholders from the private sector, including an oil company that has been granted an oil concession

This report starts with a short overview of the park and the background of the oil concessions, followed by two main parts. Firstly, it explores the risks that are associated with developing oil in Virunga based on experiences in other parts of the world. Secondly, it identifies the current and potential value of the park in a situation of sustainable management of its resources. At the end of the report, it draws conclusions for consideration by all stakeholders with an interest in the park.

MORE THAN 50 STAKEHOLDERS HAVE CONTRIBUTED TO THIS REPORT

This report would not have been possible without the continued support of the following institutions, listed in alphabetic order: Commission on Natural Resources of the DRC Bishops' Conference, Fauna & Flora International, Frankfurt Zoological Society, Global Witness, International Council on Mining and Metals, International Crisis Group, International Gorilla Conservation Programme, International Union for Conservation of Nature, London Zoological Society, NGO ADEV, Ruwenzori University, United Nations Educational, Scientific and Cultural Organization (UNESCO), University of Queensland, Wildlife Conservation Society, and WWF.

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK VIRUNGA – AN OVERVIEW

COMMUNITIES ON THE LINE

Virunga National Park's fishery industry is an employment source for about 27,000 people and has the potential to triple its production. Sustainable, well-managed uses of park resources, like fishing, provide stable, long-term economic benefits to local communities.

Found in the oil concession dubbed Block V, Lake Edward could soon be the site of oil exploration activities like seismic testing and exploratory drilling, which can have negative impacts on the environment.

VIRUNGA IS AFRICA'S OLDEST NATIONAL PARK AND A WORLD HERITAGE SITE

Located in eastern Democratic Republic of the Congo (DRC), Virunga is Africa's oldest national park. It is a UNESCO World Heritage Site and is known for its wildlife-rich network of forests, savannas, rivers, lakes, marshlands, active and dormant volcanoes and permanent glaciers. It is also famous for being home to about 200 critically endangered mountain gorillas.

The park "contains more species of mammals, reptiles and birds than any other protected area in Africa, and possibly in the world," the DRC Ministry of Environment says.[1] More than 2,000 plant species have been identified, of which 10 per cent are endemic to the Albertine Rift, which includes Virunga.[2,3] The park contains 218 mammal species, 706 bird species, 109 reptile species and 78 amphibian species.[4] It is the only national park in the world that shelters together the mountain gorilla, eastern lowland gorilla and eastern chimpanzee.[5]

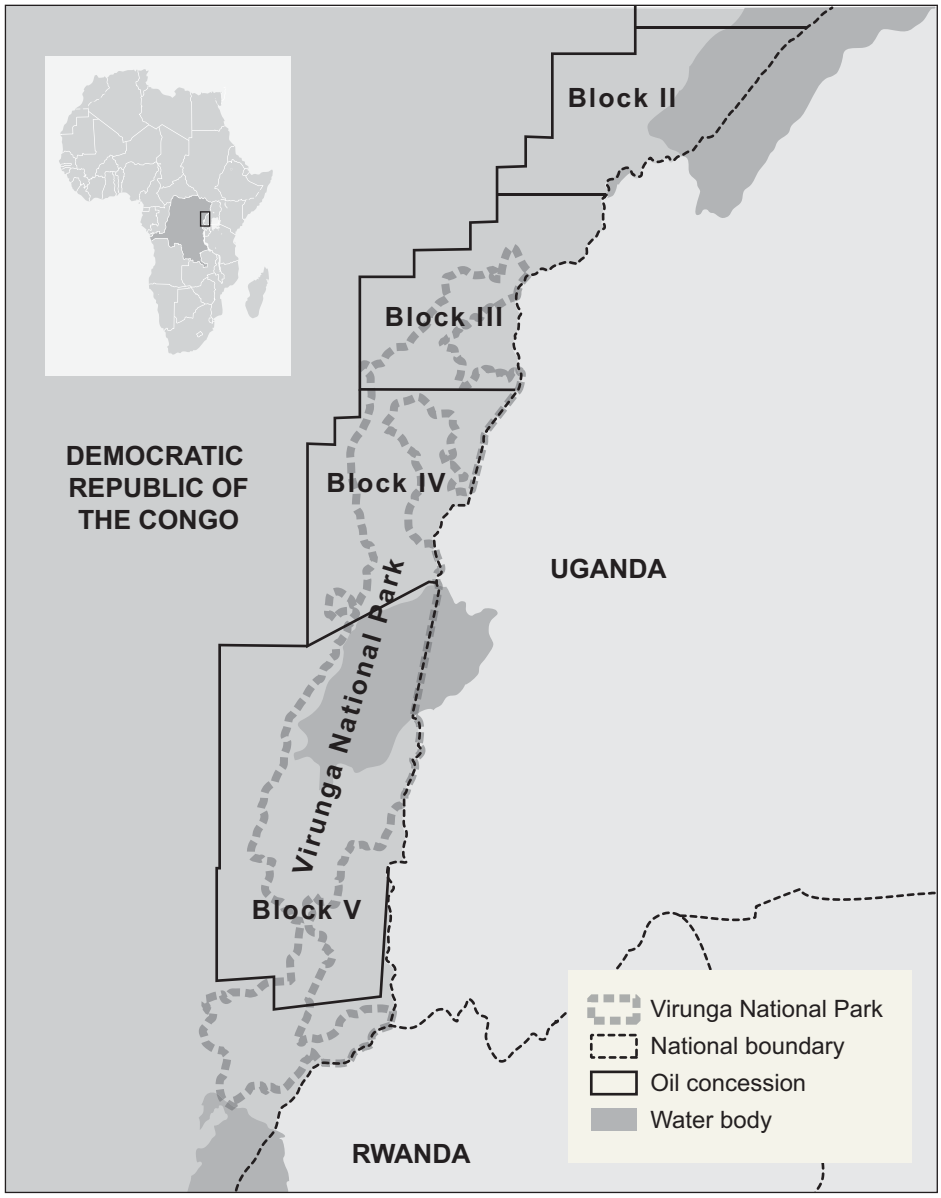
Virunga was one of the first parks to obtain the status of a UNESCO World Heritage Site, being inscribed in 1979. In 1996, Virunga was included on the Ramsar List of Wetlands of International Importance. Despite its status as protected wilderness, the park has been under threat for more than two decades by armed groups that engage in poaching, deforestation and other unsustainable and illegal resource exploitation. As a result, Virunga has been included on the List of World Heritage Sites in Danger. Currently, all five of DRC's World Heritage Sites are listed as in danger.

In 2006, the DRC government signed a production sharing agreement granting an oil concession to UK-based Soco International PLC, through its DRC-registered company, Soco Exploration and Production DRC Sprl (henceforth referred to as Soco), Dominion Petroleum and the DRC's state oil company, Congolaise des Hydrocarbures. This concession, called Block V, covers an area of 7,500 square kilometres,[6] more than half of which lies within Virunga's boundaries.[7] In July 2012, Dominion Petroleum transferred its 46.75 per cent interest to Soco.

Anne-Marie Fleury, Director, Environment and Climate Change, International Council on Mining and Metals (ICMM)

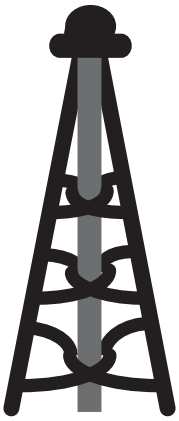
"ICMM has a position statement on mining and protected areas which outlines a commitment not to explore or mine in World Heritage properties. This is recognition that mining sometimes takes place in areas of high natural value and that in some cases these areas are incompatible with mining operations. The commitment is about ensuring that mining operations do not put at risk the integrity of the outstanding universal value for which World Heritage properties are listed."

Figure 1
Virunga and the blocks allocated for oil concessions



Deric Quaile, Manager, Environmentally Sensitive Areas, Shell

"For many years Shell has been endeavouring to make good business choices while contributing to responsible conservation. We were one of the first companies looking at biodiversity implications of our activities. In the early 2000's a decision was made to step forward on the global debate on protected areas and extractive activities. In 2003 we introduced a standard for the management of biodiversity that included the preparation of biodiversity action plans where company activities take place in areas of high biodiversity value; and at the same time we took the 'no-go' decision for World Heritage Sites."



UK-BASED SOCO IS THE ONLY OIL COMPANY CONDUCTING ACTIVITIES WITHIN VIRUNGA'S BORDERS

The government has granted other concessions within the park to the French firm Total and to the South African firm SacOil, which are now operating in Block III.[8] In all, 85 per cent of the park has been designated for oil concessions.[9] During its annual meeting on 17 May 2013, Total's chairman and chief executive stated that the firm "confirms its commitment to respect the current limits" of Virunga and respects the boundaries of all UNESCO World Heritage Sites.[10]

To date, Soco is the only oil company that has indicated it will go into the park to explore for oil. Soco justifies its position by saying that all activities have been approved by the DRC government: "Soco's involvement in Block V is at the express invitation of the DRC government, formalized through a production sharing contract signed in 2006 and ratified by presidential decree in 2010."[11] Soco's area of interest is the Virunga's lowland savanna area around Lake Edward and the lake itself.[12]

Additional information regarding the legal context is included in the annex.

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

RISKS ASSOCIATED WITH OIL DEVELOPMENT

A MESSY BUSINESS

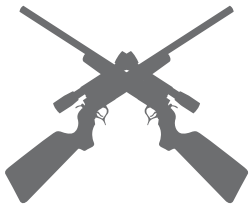
The process of locating, extracting and transporting oil can be a dirty job. In Nigeria's Niger Delta, pollution of the air, water and soil linked to oil exploitation have been reported. Farms and rivers have been contaminated by leaks and spills. Oil has not delivered on its economic promises, instead it has fuelled ethnic and political tensions.

This section investigates the risks associated with oil development in and around Virunga. The likelihood and impact of these risks is informed by past examples such as oil development in DRC's Bas Congo province and in Nigeria's Niger Delta. Many of the risks described below can be applied to other DRC national parks and World Heritage Sites considered for oil development. International Crisis Group's July 2012 report, *Black Gold in the Congo: Threat to Stability or Development Opportunity?* argues that an oil rush in the context of massive poverty, a weak state, poor governance and regional insecurity would have severe destabilizing effects.[13]

EXPLORATION

Exploration activities like seismic surveys and exploratory drilling have localized environmental impacts. Both activities require the setting up of base camps that result in clearing land of vegetation, developing access routes, creating sewage and solid waste, along with noise and light pollution. Without careful planning and waste management, exploration teams may introduce alien and invasive plants. Teams would tap into ground or lake water resulting in changes to water systems, which would have implications for wildlife and their habitats.[14]

To undertake seismic surveys, exploration teams clear vegetation in straight lines with an average width of 5 metres.[15] These lines create access to previously inaccessible locations. For instance, in the early 1980s, before its commitment to "no-go" into World Heritage Sites, Shell's oil exploration programme's cutting lines provided access to three quarters of the Selous Game Reserve in Tanzania that have subsequently been used by poachers, mining prospectors and cultivators.[16] Similarly, in Belize's Sarstoon-Temash National Park, rangers have seen an increase in illegal logging and poaching along the seismic trails cut by the US Capital Energy company.[17] In the Virunga context, such cutting lines could be used by poachers, illegal loggers as well as rebel groups. Further, seismic operations themselves involve controlled blasts which lead to vibrations and noise pollution.[18]



OIL EXPLORATION COULD PROVIDE GREATER ACCESS FOR POACHERS AND ILLEGAL LOGGERS

These risks are further exacerbated during development of oil infrastructure, which is initiated in the exploration phase and further expanded during exploitation. Construction sets a precedent for other activities that threaten conservation of local habitats and species. New roads result in new settlements along access routes to service road traffic. These communities grow organically over time, developing the land around them for homes and agriculture. Satellite images of the Brazilian Amazon demonstrate the fragmentation of forests caused by this kind of development. Forest habitats become more susceptible to fire, trees bordering roads die more frequently, seed germination is impaired, and pioneer species like vines block out light

and prevent forest regeneration.[19] New settlers may also introduce agricultural animals or hunt wild animals in their surroundings as a cheap source of protein. By blocking animal trails with roads and human development, migration patterns are affected, which may threaten some species' survival. For instance, elephants living in the Congo Basin have learned to avoid roads, confining themselves to smaller and smaller patches of habitat as road networks grow. As a result, elephants' inter-breeding potential is limited and identifying the food and resources they need to survive becomes increasingly challenging.[20]

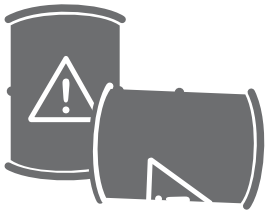
Pollutants from exploratory drilling include oxides of nitrogen, carbon monoxide, sulphur dioxide, and volatile organic compounds. Exploratory wells may provide a path for surface contaminants to come into contact with ground water.[21] Exposure to these pollutants can cause health problems, such as an increase in respiratory infections or poisoning from contaminated water.[22]

EXTRACTION

A minimum set of requirements are needed to prevent pollution from oil spills, gas flaring and waste dumping. Firstly, pipelines and drilling equipment require regular maintenance and protection from threats such as sabotage and oil siphoning for illegal trade. Secondly, legislation regarding maintenance, environmentally-friendly waste disposal, pipeline closure and rehabilitation need to be in place and based on globally-agreed best practices. Further, this legislation needs to be enforced systematically.

In an area prone to violent conflict and lacking systematic government legislation and enforcement, pollution-free extraction will be extremely difficult, if not impossible to guarantee. The longer the pipeline and the more remote the location, the more difficult ensuring pipeline maintenance and protection becomes.

North Kivu, the province where Virunga is located, is affected by protracted armed conflict, the causes of which are complex. Oil extraction is likely to fuel further conflict as minerals provide the main source of export revenue, and thus of foreign exchange, in North Kivu. The availability of large quantities of oil will probably shift the focus of rebel groups from less profitable resources like cassiterite, a mineral currently mined in North Kivu, to oil, providing an additional lucrative new form of conflict financing and resulting in renewed instability. The International Crisis Group has warned[23] that if oil reserves are confirmed, it could worsen deep-rooted conflict dynamics within DRC, including border conflicts with its neighbours. Rebel control of roads would limit access to oil spill sites, hindering clean-up efforts and potentially trapping communities into oil spill zones without aid.



IN THE NIGER DELTA, GROUNDWATER AND SOIL HAVE BEEN POLLUTED BY TOXIC BY-PRODUCTS

Regarding legislation, the Draft Hydrocarbon Bill from March 2013[24] is not very detailed on requirements for environmental and social impact assessments and makes no mention of specific regulations or use of best practices for maintenance, disposal, closure and rehabilitation of oil fields.[25] Similarly, the Environmental Code from 2011[26] simply states that necessary measures need to be undertaken to prevent and limit any event of pollution. The lack of specificity makes enforcing such regulation challenging.

Even if that clear legislation existed, the enforcement of law is difficult in such a political climate. A recent DRC study investigating Virunga concludes that "although wildlife acts exist as a global conservation tool for the protection of species, most remain unenforced, especially during wartime when human resources and funding are inadequate to monitor illegal activity and enforce existing wildlife law."[27] Further, the study argues that the root cause of biodiversity loss and threats to protected areas can be traced to government policies and their enforcement.

Separately, drilling close to Virunga's eight volcanoes may affect the size and frequency of volcanic eruptions. A similar situation was experienced in Indonesia where oil and gas drilling caused a volcanic eruption in 2006 that displaced 30,000 residents and destroyed around 10,000 homes, four villages and 25 factories. That volcano is expected to continue erupting for the next 25–30 years.[28] At a meeting of the American Association of Petroleum Geologists, in South Africa, 74 geologists concluded that the eruption was caused by drilling for oil and gas. One geologist argued that the data "clearly shows that the well failed and this failure was the driver for the breakdown of the rocks – it was the trigger for the mud volcano." The oil company denies any wrong-doing.[29]

POLLUTION

Nowhere have the consequences of pollution been better illustrated than in the Niger Delta. Between 1976 and 1996, the equivalent of approximately 1.8 million barrels of oil from 4,835 oil spills were formally reported to the Nigerian National Petroleum Corporation. Watchdog groups say the actual figures may have been ten times higher.[30] Prior to a poorly-enforced ban on gas flaring implemented in 2008, Nigeria was the world's top source of flared gas, which is proven to cause severe health problems. By some estimates, flaring consumed the equivalent of 40 per cent of Africa's total natural gas use.[31] Oil companies operating in the Niger Delta often do not have appropriate waste treatment facilities. The lack of insulated landfills results in the contamination of groundwater and soil by the toxic by-products of oil extraction.[32]

Niger Delta pollution causes long-term environmental damage. A recent United Nations Environment Programme (UNEP) report concluded that

field observations and scientific investigations found that oil contamination in the area where the Ogoni ethnic group lives "is widespread and severely impacting many components of the environment."[33] Oil spills and the delay in cleaning up have led to oil being washed through farmland and almost always ending up in creeks. This pollution has severely impacted the health of mangroves, which are nurseries for fish and natural pollution filters. Although there is no longer active oil extraction in this area, oil spills continue to occur.

Human rights monitoring bodies and courts are increasingly recognizing poor environmental quality as a causal factor in violations of human rights.[34] Violations include rights to an adequate standard of living, to earn a livelihood, to adequate food, to water, to adequate housing, to health and to life itself.

Niger Delta fisherman[35]

"If you want to go fishing, you have to paddle for about four hours through several rivers before you can get to where you can catch fish and the spill is lesser … some of the fishes we catch, when you open the stomach, it smells of crude oil."

UNEP reports that the fisheries sector in the Niger Delta is suffering from the destruction of fish habitats and persistent contamination of creeks. Where entrepreneurs have established fish farms their businesses have been ruined by the presence of a film of oil.[36] UNEP identified numerous instances of drinking water contaminated by hydrocarbons. Niger Delta's communities reported gastric disturbances and skin complaints to Amnesty International, which they attribute to exposure to oil through food and to direct contact with contaminated water, soil and food.[37] While few studies internationally have analysed health implications, where evidence does exist, people complain of similar symptoms.[38] The cost of pollution is often paid by local communities as shown by the suit filed by Ogoni people from the Niger Delta against Shell in 2012. Four Ogoni farmers said they could no longer work or feed their families because oil spills caused by Shell in the area damaged their crops and fish farms. A Dutch court dismissed four out of five allegations, but ordered Shell to pay damages to one farmer.[39]

A further example of the pollution risks associated with oil extraction is provided by the Bas Congo province of DRC. Oil exploration commenced in Muanda, Bas Congo, in 1967 and extraction began in 1981. At inception,

offshore drilling constituted around 26,000 barrels a day and onshore drilling constituted 11,000 barrels.

Oil extraction in Bas Congo has resulted in pollution caused by poor maintenance of pipelines, gas flaring and dumping of waste. For instance, in 2007 a leak in a dilapidated pipeline formerly operated by Gulf Congo led to an oil spill in the swamp and rivers of Nzenzi Siansitu, a city in the province. Observers reported coagulate oil 1.5 metres thick floating on the Nzenzi Siansitu rivers and causing pollution to drinking water and destruction of the local ecosystem. In 2010, toxic waste dumps were reported by locals in the vicinity of Kongo and Tshiende villages leading to local protest marches. In February 2011, locals expressed concern about the dumping of toxic waste in the Atlantic Ocean that reportedly resulted in the decimation of several fish species within a three kilometre radius. In 2008 a national deputy named Gilbert Kiakwama described the situation as "deplorable".

Network of Natural Resources, a non-governmental organization

"Two out of four people who die in Moanda [the location of Bas Congo's coastal oil terminal] die of lung problems. Fruit trees in Moanda and in the region no longer bear fruit…previously in Moanda, we collected small fish all along the beach. Now you have to go up to 50 kilometres to get a few fish."

Locals complain of respiratory infections and incessant coughing due to air pollution from gas flaring, which has led to lung disease. To date, no independent environmental assessment has been undertaken of the effects of oil pollution, although an assessment is currently on-going.

In the case of Virunga, pollution of water sources would affect the park, populations living around Lake Edward and Lake Albert, as well as surrounding countries that depend on the White Nile basin for water.[40]

Pollution from oil activities would damage Virunga's biodiversity and compromise its outstanding universal value. This would put at risk its World Heritage Site status and reduce its attractiveness for the purpose of tourism.

OIL CURSE

Historical evidence in oil producing countries shows that rather than reducing poverty and inequality, oil has adverse social and economic effects[41] and in many cases fuels conflict. Three processes are primarily responsible for this "natural resource curse". Firstly, exporting oil causes the local currency to appreciate

making other exporting sectors less competitive. As a result, workers lose jobs in other exporting sectors, but these jobs are not absorbed by the oil industry. Thus the economy becomes reliant on oil with little diversification in other sectors. Secondly, the price of oil fluctuates leading to unpredictable revenues and causing severe economic disruptions making long-term planning challenging.[42] Finally, oil revenues raise the value of being in power and provide politicians with more resources to influence the outcome of elections, thereby increasing resource misallocation in the rest of the economy.[43] Implications include higher levels of corruption and lower levels of transparency.

The above scenario played out in Nigeria, whose Niger Delta is the world's seventh largest oil exporter. The instability there following oil spills contributed significantly to the record high oil prices on global markets in 2006. An International Monetary Fund study found that between 1970 and 2000, Nigeria earned about US$350 billion in oil revenue. However, income per capita declined, poverty increased from 36 per cent of the population to 70 per cent, and inequality worsened sharply.[44]

ECONOMIC AND SOCIAL DEVELOPMENT

One may argue that the DRC government could use additional income from oil exploitation to address some of the drivers of conflict like poverty and inequality. However, based on evidence from the DRC and elsewhere, this is unlikely to occur in North Kivu.

An in-depth study of the dynamics of conflict and oil in the Niger Delta was undertaken by researchers in 2005.[45] The study found that although the oil economy did not cause conflict, it fuelled communal and ethnic tensions and underpinned the proliferation of arms. Illegal theft and trade in oil contraband has increased in Nigeria since the 1990s.[46] While data is hard to come by, Benin's finance minister acknowledged in 2011 that more than three-quarters of the fuel consumed in Benin had been illegally imported from Nigeria.[47] Given the close proximity of North Kivu to Uganda, Rwanda and Burundi, rebel groups may siphon oil from pipelines and sell it to neighbouring countries, which would lead to further instability in the region.

Woman from the Union of Women Fishermen for Integrated Rural Development, North Kivu

"Last year when Soco came to discuss drilling for oil, there were people who were in favour and others against this exploitation. This caused strife between the two groups. I was among the group of those who do not want this; I landed directly in the line of fire of threats from Soco supporters. We tried to explain to people that this operation will decrease the production of fish but others would not accept it because they had been promised jobs."

Bas Congo is a case in point. The DRC law states that "operators of concessions will continue to implement social projects that benefit local communities in locations where their installations are situated." However, a 2008 report analysing the impact of oil extraction in Bas Congo[48] concluded that oil exploitation has not positively contributed to the coastal city of Moanda where the oil terminal is located. The population remains in poverty and no social infrastructure constructed by operators is visible in Moanda.

The Pole Institute said during an interview with the community in Rutshuru, North Kivu, in May 2012 that Soco had promised riches to the local community including "massive hiring".[49] In reality, few additional jobs are likely to be created from oil exploration and exploitation over the long term as oil extraction is capital intensive, and those that will be created will require technical expertise that local residents likely do not have. A former minister from the region said that during a visit to the DRC's Matadi offshore installation, he was surprised to see only 30 skilled Congolese workers on the platform.[50]

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

VIRUNGA'S SOCIAL AND ECONOMIC VALUE

SEIZING HYDROPOWER POTENTIAL

A welder at work on a hydro-electric project in Mutwanga. Abundant freshwater resources make Democratic Republic of the Congo a prime location for hydropower development. The Mutwanga station, which uses water from Virunga, provides electricity to 10,000 nearby residents, but generation could double with the addition of two new projects. Energy access has been shown to spur economic growth, which can relieve poverty and lead to better lives.

The Total Economic Value (TEV) of the Virunga ecosystem is likely to be US$48.9 million annually. If current challenges are addressed, the park's value has the potential to be as much as US$1.1 billion per year. It could also be the source of more than 45,000 jobs, including existing positions.[51] TEV is a widely-used instrument to value ecosystems. It classifies all social and economic benefits from into three categories: direct-use, indirect-use and non-use values. In this exercise the direct-use value includes fisheries, tourism, hydropower, medicines and education and research. The indirect-use value includes carbon sequestration and pollution control, as well as water supply and erosion control. The non-use value represents the value of knowing that park's resources can be used in the future. The real value of the park is likely to be far higher than US$1.1 billion annually, as the current methodology does not include all possible factors. More details on the methodology, its limitations and examples of values not captured in the TEV are included in the annex.

Table 1
Overview of Virunga's current and potential social and economic value

	Factors	Current value (US$ million/year)	Potential value (US$ million/year)
Direct-use value	Fisheries	30	90
	Tourism	0	235
	Hydro-electric power	5	10
	Other values (incl. pharmacological use, education and research)	6	13
Indirect value	Carbon sequestration and forest conservation	0	55
	Water supply	1	1
	Erosion control	6.9	7.8
Non-use value	Future use of park's resources	0	700
Total value		**48.9**	**1,111.8**

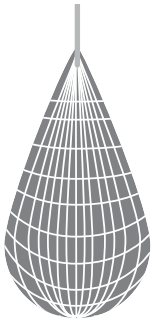
The current instability jeopardizes the value of the park. Over the past 20 years Virunga has experienced increasing intrusion from neighbouring settlements, as well as high levels of poaching of many of its native species, including the mountain gorillas. Visitors and animals alike suffer from insecurity as a result of recent conflicts in and around the park. During the Kivu War (2004–2009)

rebel forces expelled park rangers and occupied the park's headquarters. During this time much of the park's forests, wildlife and infrastructure were destroyed.[52] The instability continues to be an issue and has forced authorities to close the park to tourists.

In order to overcome current challenges, tangible improvements need to be made. These improvements include: ending conflict and rebel activity within the park and in its immediate surroundings, securing park access, decreasing the scale of corruption, making funds available to maintain and protect the park's plants and animals, and implementing an effective law enforcement system to guarantee the integrity of the ecosystem. If the park's boundaries are respected and sufficient resources are made available to guarantee protection[53], in the medium to long term it is possible to foresee a stable environment, where tourism and other sustainable solutions can flourish without affecting the integrity of the park.[54]

The following sections provide additional information on the factors that contribute to Virunga's current and potential value, namely fisheries, tourism, hydro-electric power, pharmacological use, education and research, carbon sequestration, forest conservation, water supply, erosion control and other values. The current valuation scenario is based on Virunga's situation in the past twelve months characterized by intense conflict and instability in the park and its proximity. The potential value scenario illustrates a situation where the park is sustainably managed, where stability and security are guaranteed, where an effective law system protects the integrity of the ecosystem, and where resources are made available to assure its sustainability over the medium to long term. More specifically the potential value scenario is based on assumptions that 44 per cent of the park is covered by forests and the deforestation rate is reduced from 0.25 per cent annually to zero. Both scenarios look at services provided not only within the boundaries of park but also in its surroundings.

DIRECT USE VALUE: FISHERIES

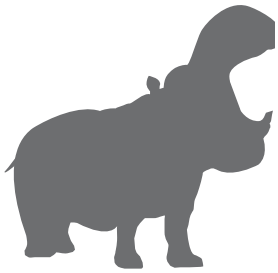


Current value

Assumptions: Average market value	*US$2/kg*
Lake Edward – production	*15,000 tonnes/year*

Current value from fisheries is likely to be US$30 million annually based on an average market value of US$2 per kilogram and an average annual production of 15,000 tonnes.

A recent study of Lake Edward and Lake Albert shows that the fishery industry employs approximately 27,000 fishermen. The annual production is around 22,000 tonnes, of this 15,000 tonnes comes from Lake Edward. At an average market value of US$2 per kilogram, this represents a US$30 million industry.[55]



LAKE EDWARD'S HIPPOS ARE IMPORTANT TO THE HEALTH OF THE LAKE AND ITS FISHERIES

The current park regulations are not well respected[56] and enforcement is weak, which has led to overfishing and a decline in hippopotamus numbers. Hippos are an important part of the ecosystem because their dung provides vital nutrients for fish. Declining hippo populations has coincided with decreases in fish production in Lake Edward.[57]

Potential value

Assumptions:	*Average market value*	*US$2/kg*
	Yield improvement	*x3*
	Lake Edward – potential production	*45,000 tonnes/year*
	Jobs created by tonne produced	*0.62 job/tonne*

Potential future value from fisheries could be US$90 million annually based on an average market value of US$2 per kilogram and an average annual production of 45,000 tonnes.

By introducing sustainable management systems, such as boosting fish populations through rebuilding the hippopotamus population and enforcing policies like those controlling net mesh size, the current yield could triple.[58] At a conservative stable market value per kilogram, this will bring the value of Lake Edward's industry to US$90 million annually. The industry could generate more than 28,000 jobs in fishing and related activities such as smoking, drying, transportation and resale.[59]

Although Lake Edward is shared by DRC and Uganda, the overall potential value of fisheries is directly linked to Virunga.[60] The water quality is related to the quality of forests and soils, and is affected by human activities on and off shore. If sustainable fishery management regimes are adopted in the park, these will have a direct impact on the quality of water, on fish stocks and consequently on the fishery industry's growth potential across the entire lake, regardless of national borders.[61]

DIRECT USE VALUE: TOURISM

Current value

Assumptions:	*Number of tourists in the past 10 months (since September 2012)*	*0*
	Average spending per tourist per visit	*US$0*

Current value from the tourism industry is set at zero as the park was closed in September 2012 due to insecurity in the region.

Until September 2012, tourism was a valuable source of income for the park and local communities. If stability is achieved, tourism could represent the

largest source of income for Virunga and those living nearby. In the three years prior to the latest unrest, the southern sector of Virunga, known for its critically endangered mountain gorillas and its chain of active volcanoes, was considered safe for visitors. More than 100 tourists visited these sites every month.

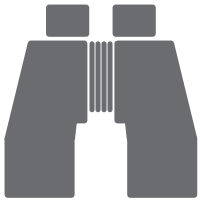
During the period of 2009–2011, the annual growth rate in the number of Virunga tourists was more than 200 per cent, growing from 400 to 4,000.[62] This growth trajectory is comparable to Rwanda's tourism flux in the early 2000s. Since Rwanda's parks re-opened, visits rebounded from 417 in 2000 to nearly 20,000 visits in 2008, of which 17,000 were to see mountain gorillas.[63] Considering Virunga's biodiversity and size, similar numbers could be achieved.

Potential value

Assumptions:	*Average number of tourists per year*	*16,200*
	Tourists visiting the gorillas per year	*12,960*
	Spending per tourist per visit (excluding gorilla permit)	*US$1,600*
	Gorilla permit	*US$700*
	Families of habituated gorilla within Virunga	*6*
	Number of members in each gorilla family	*10–12*
	Number of tourists per group	*6*
	Number of visits per day	*1*
	Number of days of visit per year	*360*
	Proportion job/revenues generated	*1 job/US$7,000*
	Consumer surplus (percentage of total spending)	*75%*
	Total contribution of tourism to GDP	*6%*
	Share of Virunga contribution to total tourism contribution	*25%*
	Indirect contribution (of total Virunga contribution)	*75%*

Potential future value from tourism is US$235 million annually. The following elements contribute to this: direct value from gorilla tourism of US$30 million, "consumer surplus" of US$22 million, value generated by tourists visiting other tourist attractions of US$5 million, and indirect value of US$178 million.

Virunga has approximately 200 gorillas divided into 17 groups, of which six are habituated groups.[64] Each family is composed of approximately 10–12 members. Rules control gorilla tourism. A maximum number of one tourist group per day per gorilla group is allowed. Thus the potential maximum number of gorilla tourists per year is approximately 13,000. If, based on Rwanda's case, we assume US$700 per gorilla permit per non-resident and an



MOUNTAIN GORILLA TOURISM ALONE COULD GENERATE US$30 MILLION PER YEAR AND CREATE THOUSANDS OF JOBS

average spending per tourist per visit of US$1,600, the potential direct annual value of gorilla tourism is US$30 million.[65]

A previous study estimated that the "consumer surplus" for the segment of travel to visit gorillas was equal to 75 per cent of total spending.[66] The consumer surplus represents the additional value visitors would have been willing to pay to see gorillas, over and above the fee they are charged. For instance, if a consumer would have been willing to spend US$5,000 on a holiday to see gorillas, but were only charged US$3,000, their consumer surplus is US$2,000. If the consumer surplus is added to the direct value generated by gorilla tourism, the total spending per tourist could be as high as US$4,025 and potentially represent more than US$22 million annually in additional direct value to US$52 million annually.[67] This value could be more than US$5 million higher annually if 20 per cent of tourists visiting the park also enjoy other tourism circuits, such as the volcanoes. The total direct value of US$57 million generated by tourism can be realized in a situation where stability and securing access to the park are guaranteed.

In addition to the direct economic impact, the travel industry has a large indirect impact through investment spending, government spending, and domestic purchase of goods and services. In neighbouring countries the total annual contribution of tourism is 8–9 per cent of gross domestic product (GDP).[68] Although DRC has the potential to achieve a similar result, the country is rich in other natural resources and the contribution of tourism to GDP would probably be lower. At the same time, national parks represent the main tourist attractions of DRC. Virunga could become the most valuable asset for the country and a lure to attract tourists to other parks in DRC. Virunga's indirect contribution to DRC's GDP from tourism is estimated at US$178 million. This number is based on an assumption that 6 per cent of DRC's GDP is from tourism,[69] 25 per cent of that value is Virunga's contribution and 75 per cent of Virunga's contribution is indirect.

Specific benefits are generated by the creation of employment opportunities for rangers, guides and eco-guards, among others. The opportunities for economic recovery through tourism are clear. The example of Rwanda and Uganda shows that the development of a tourism industry could generate 7,420 job opportunities for local communities or one job per US$7,000 generated by the tourism industry.[70] The Congolese Wildlife Authority (ICCN) currently employs 430 staff with the potential to increase by 230 in the next two years. Local development benefits from a strong tourism industry. The conservation of the park's integrity is directly linked to the development of local communities through the provision of sustainable employment opportunities and revenue sharing schemes that enable communities to benefit from education, access to

water, electricity and improved health care. The exact proportion of revenues shared differs across DRC, Uganda and Rwanda and goes up to 30 per cent.[71] If this proportion is applied to a US$57 million industry, tourism can generate more than US$17 million annually for the local community. Revenue sharing schemes help ensure that local communities take responsibility for the protection and conservation of the park, and recognize its value.

DIRECT USE VALUE: HYDRO-ELECTRIC POWER

Current value

Assumptions:		
Mutwanga – Electricity produced	*9.4 MW/year*
Average sale price	*US$1,000/MW*
Jobs created per MW produced	*500 jobs/MW*
Official minimum wage	*US$90/month*

Current value from hydro-electric power is estimated at US$5 million annually based on US$9,400 generated annually by electricity sales and US$5 million as job opportunities for local communities.

Access to electricity has been recognized to have substantial benefits for poverty reduction, promotion of production, health and education.[72] Large subterranean water resources make the DRC one of the most endowed nations in the continent with 100,000 megawatts (MW) of hydropower potential.[73] As shown by the EU-sponsored hydro-electric project recently completed in Mutwanga, hydropower stations not only offer tax revenues, but more importantly reduction in pressure on forests to obtain charcoal, employment opportunities and business investments not otherwise possible. The Mutwanga station, which uses water from inside Virunga, provides approximately 9.4 MW of electricity and serves 10,000 inhabitants.[74] At an average sale price of US$1,000/MW, the current production represents a total value of US$9,400 annually.

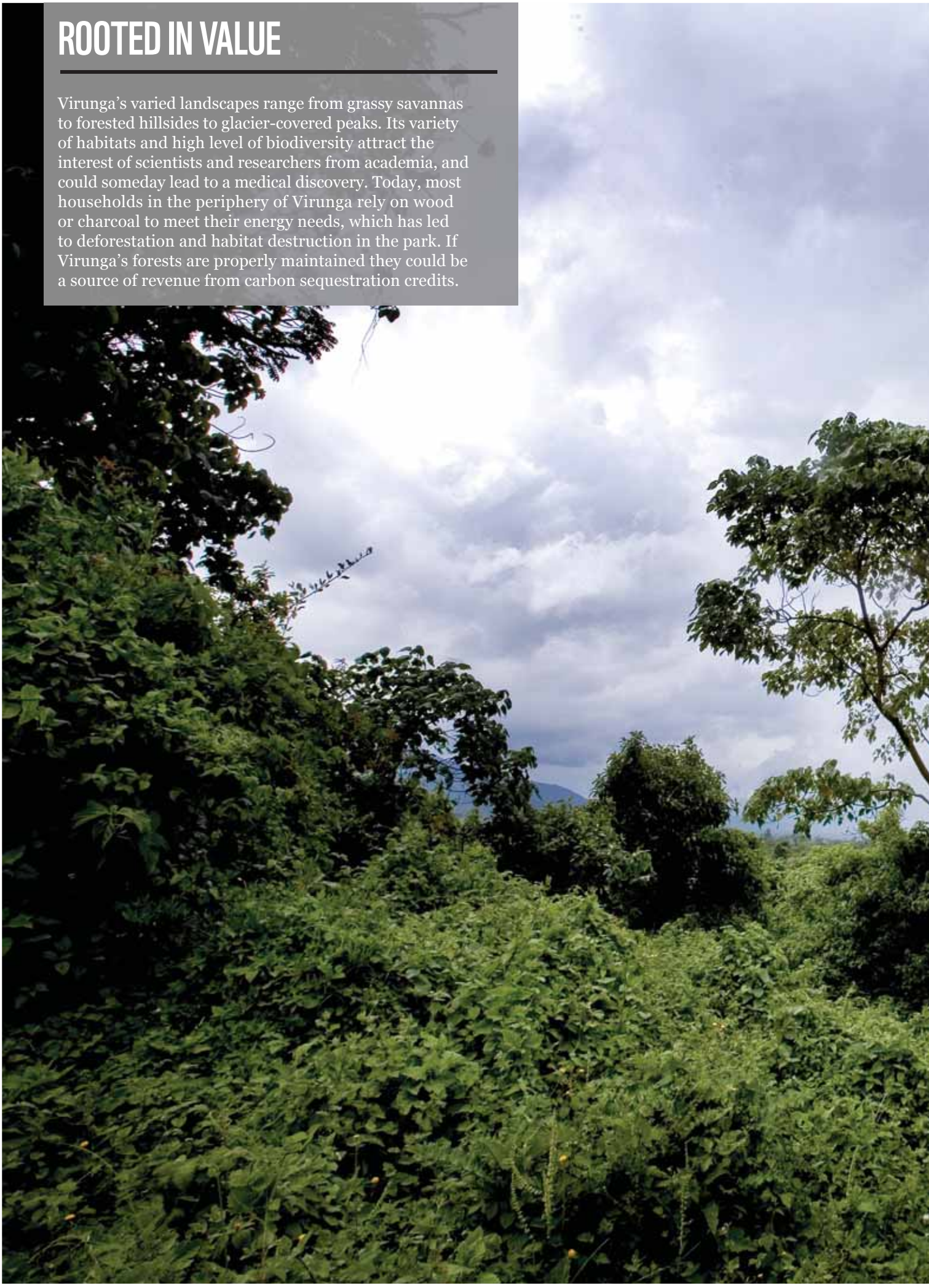
The electricity will give small entrepreneurs the chance to develop industries that were previously impossible, due to the cost of electricity. Two investors have already showed interest in establishing transformation factories in the proximity; these will offer job opportunities and additional income for local communities. The total jobs created could be approximately 4,700.[75] At an average monthly salary of US$90, the job opportunities generate US$5 million annually.[76,77]

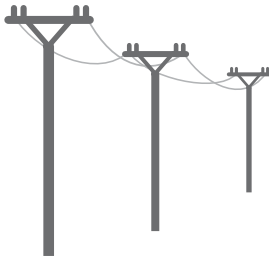
Potential value

Assumptions:	
Mutwanga, Lubero and Rutshuru – electricity produced	*20 MW/year*
Average sale price	*US$1,000/MW*
Jobs created per MW produced	*500 jobs/MW*
Official minimum wage	*US$90/month*

ROOTED IN VALUE

Virunga's varied landscapes range from grassy savannas to forested hillsides to glacier-covered peaks. Its variety of habitats and high level of biodiversity attract the interest of scientists and researchers from academia, and could someday lead to a medical discovery. Today, most households in the periphery of Virunga rely on wood or charcoal to meet their energy needs, which has led to deforestation and habitat destruction in the park. If Virunga's forests are properly maintained they could be a source of revenue from carbon sequestration credits.





INVESTMENT IN HYDROPOWER HAS THE POTENTIAL TO DOUBLE THE AMOUNT OF ELECTRICITY GENERATED

Potential future value from hydro-electric power is more than US$10 million annually based on US$20,000 generated by electricity sales and US$10 million as job opportunities for local communities.

If a more stable situation is achieved within the park and its proximity, two additional projects could be developed in Lubero and Rutshuru. These stations would more than double the production of electricity in the area up to 20 MW per year and generate more than 10,000 jobs for local communities. Maintaining stable sale price and monthly salary, the hydropower production could bring more than US$10 million annually. Sustainable management of energy production around Virunga will limit threats to the park over time due, for example, to population increases and their associated increased demand for energy.

The importance and relevance of these initiatives for the development of local communities and conservation of the park is further illustrated by the decision of Howard G. Buffett Foundation to donate US$5 million to support development of the two off-grid hydroelectricity plants. The grant is part of a two-year, US$50 million commitment by the foundation to support food security, economic development and mitigate conflict in eastern DRC.[78]

OTHER CONTRIBUTORS TO DIRECT USE VALUE: **PHARMACOLOGICAL USE**

Current value generated by pharmacological use of the plants in the park is likely to be US$1.5 million annually. The potential future value could be as high as US$6 million annually.

One of the incentives for preservation of biological diversity is the potential future use of these resources for extractive or other use, such as the potential value generated by the use of plants that can yield ingredients for medicines in the future. The potential value of pharmaceuticals derived from plants in Virunga is estimated using a model which takes into account: the number of species present in Virunga, the probability of plants yielding a useful product, the royalty rate on sales of such a product that would be payable to DRC, an appropriation rate, the likely value of an internationally traded pharmaceutical product, and the area of the forest.[79] Based on these factors the value for medical use is currently estimated at US$1.5 million per year.[80] Better conservation and protection of the park could potentially increase the probability of a medicinal discovery. The option value could be as high as US$6 million per year.

OTHER CONTRIBUTORS TO DIRECT USE VALUE: **EDUCATION AND RESEARCH**

Current value generated by education and research grants is likely to be US$4–5 million annually. The potential future value could be as high as US$7–8 million annually.

One of the important values of Virunga is the potential for education and research on the park as a field of study. The high biodiversity and coexistence of multiple habitats represent a unique "education and research" value. Current NGOs' research funds are approximately US$3–4 million annually. The grants and funds dedicated by research centres and academic institutions are approximately US$1–2 million, including from Dian Fossey Gorilla Fund International, which operates the Karisoke Research Centre. The total current value is likely to be US$4–5 million annually. In the future, with a stable governance, the value could be as high as US$7–8 million, with a substantial increase of funds from researchers and academics to reach US$3–5 million annually.

Other development opportunities could be possible in a more stable situation; the current methodology does not include all possible factors. Please see the annex for further details on the limitations and adjustment to the scope of the valuation for this study.

INDIRECT USE VALUE: CARBON SEQUESTRATION AND FOREST CONSERVATION

Current value

Assumptions:	*Carbon captured*	*250 tCO2/ha*
	Value of carbon	*US$10/tCO2*[81]
	Share of Virunga saved from deforestation	*0%*

Current value from carbon sequestration is set at zero due to the lack of improvement in the level of deforestation.

There are more than 3 million people living less than one day's walk from the park. The city of Goma has experienced a large increase in population, from 550,000 in 2007 to approximately 1 million today. Only 3 per cent of households have access to semi-reliable electricity. This is not the case for the other 97 per cent, which rely largely on energy wood and charcoal.[82] The 3 million inhabitants of North Kivu province represent a consumption of 1,780,000 tonnes or 3 million cubic metres of wood annually.[83] The consumption of wood is exacerbated by illegal charcoal production organized by rebel groups to fund their activities and by international demand coming from neighbouring countries, such as Rwanda and Uganda.

Local need for wood is threatening Virunga's forest resources and animal species through destruction of their habitat. The intense deforestation of Virunga also impacts climate change, as the loss of natural forests is responsible for 15–20 per cent of human-induced greenhouse gas emissions globally.[84] The most important instruments for payment of ecosystem services are the Reducing Emissions from Deforestation and Forest Degradation

(REDD) scheme and the Kyoto Protocol's Clean Development Mechanism. Under the REDD+ mechanism, Virunga can be compensated for the decrease in the rate of deforestation. However the level of deforestation has not been improving, therefore the current carbon sequestration value generated by Virunga is equal to zero.

Potential value

Assumptions:	*Carbon captured*	*250 tCO_2/ha*
	Value of carbon	*US$10/$tCO_2$*[85]
	Share of Virunga saved from deforestation	*0.25%*
	Potential hectares for reforestation programmes	*40,000*

Potential future value from carbon sequestration is US$55 million annually split between US$5 million from reduction in the level of deforestation as part of the REDD+ scheme and US$50 million from clean development mechanism projects.

An economic valuation of the DRC's natural capital and ecosystem services would make a strong case for integrating forest conservation into national decision-making. If properly maintained, the forest offers an opportunity to sell carbon credits and to supplement the funds needed to carry out reforestation activities within the park and its surroundings. The same is valid for the other parks and reserves of the country. A 0.25 per cent decline in the level of deforestation would allow storage of almost 500,000 additional tonnes of CO_2. At a price of US$10/t CO_2, the potential value of the forest from carbon credits is approximately US$5 million annually.[86]

In 2011, Africa boasted elevated status as the third-largest supply location for clean development mechanism projects. At stable carbon prices, Virunga and its proximity have the potential to generate up to US$50 million by promoting projects and initiatives, similar to the ECOmakala reforestation programme, which is replanting 20,000 hectares. Creating plantations to provide an alternative to the park's natural forests will, in effect, make it possible to reduce deforestation and degradation of Virunga's forests, a good complement to REDD+ initiatives.[87] Further details are provided in the annex.

Virunga has an important function in climate change mitigation. Similar to other Congo Basin forests, Virunga plays a role in generating rainfall. Deforestation in the park would lead to changes to rain patterns in the region. Given its role as rainmaker and mitigator of climate change, the case for forest conservation and for good forest management of Virunga is strong.[88]

INDIRECT USE VALUE: WATER SUPPLY

Current and potential value

Assumptions: Households depending on Lake Edward water resources — *50,000*
Average water consumption per household — *20 litres/day*
Number of days in a year — *365*
Average cost — *US$0.003/litre*

Current and potential future value from water supply is estimated at US$1 million annually.

An estimated 107 million people live in the Great Lakes region; it is one of the most densely populated areas of Africa.[89] More than 50,000 households depend on Lake Edward for their livelihood, including water supply. Based on a replacement cost approach, maintaining the quality of Virunga's water resources represents an annual saving for local population of almost US$1 million.[90] The value does not change in the current and potential future scenarios as the cost of sourcing water elsewhere for drinking will be the same. Additional information on the methodology is included in the annex.

The potential contamination of Virunga's water resources will affect not only the farmers and fishermen of Lake Edward, but also communities in other countries downstream that rely on the waters of the White Nile basin.[91] Disruption or degradation of this ecosystem will impact the breeding process, biodiversity and production of fish. Households will be affected negatively by a decrease in fish availability, as fish is the main source of dietary protein. A trans-boundary agreement with neighbouring countries, with the objective to protect water sources, may be an effective solution to reduce impact on food supply and to avoid restoration costs.

INDIRECT USE VALUE: EROSION CONTROL

Current value

Assumptions: Area of park covered with forest — *345,230 ha*
Percentage of forest currently affected by erosion — *2%*
Area of forest currently affected by erosion — *6,905 ha*
Cost to restore 1 hectare — *US$1,000/year*

Current value from erosion control activities estimated at US$6.9 million annually.

As illustrated above, deforestation is a significant issue in DRC. The country's forests are being destroyed for agricultural purposes, food, shelter and as a source of energy. Illegal and refugee settlements have exacerbated this situation. Restoration of damaged ecosystems is an important, but costly,

activity for maintaining the integrity of the park and avoiding issues such as loss in agricultural productivity. Erosion control and ecosystem conservation can help reduce the cost. The restoration of an ecosystem might cost more than a thousand dollars per hectare annually.[92] The restoration of rainforest corridors in Andasibe area, Madagascar, shows that US$770–1690 per hectare was needed annually to restore degraded ecosystems and to restore natural forests.[93] Based on an estimate of US$1,000 per hectare per year, the erosion control of 2 per cent of Virunga forest affected by erosion may result in US$6.9 million annually of avoided damage costs due to restoration activities.

Potential value

Assumptions:	*Area of park covered with forest*	*345,230 ha*
	Percentage of forest potentially affected by erosion	*2.25%*
	Area of forest potentially affected by erosion	*7,768 ha*
	Cost to restore 1 hectare	*US$1,000/year*

Potential future value from erosion control could be US$7.8 million annually.

Forests control erosion by slowing down water flows; intense deforestation is contributing to severe soil erosion. The current annual deforestation rate of 0.25 per cent can increase the area of forest affected by erosion in a year's time to 2.25 per cent or 7,768 hectares.[94] Excessive erosion causes problems such as desertification, decreases in agricultural productivity due to land degradation, sedimentation of waterways, and loss of the nutrient rich upper soil layers. A well-managed forest might result in US$7.8 million annually of avoided damage costs due to restoration activities of 2.25 per cent of forest. Additional information on the methodology is included in the annex.

NON-USE VALUE: FUTURE USE OF PARK RESOURCES

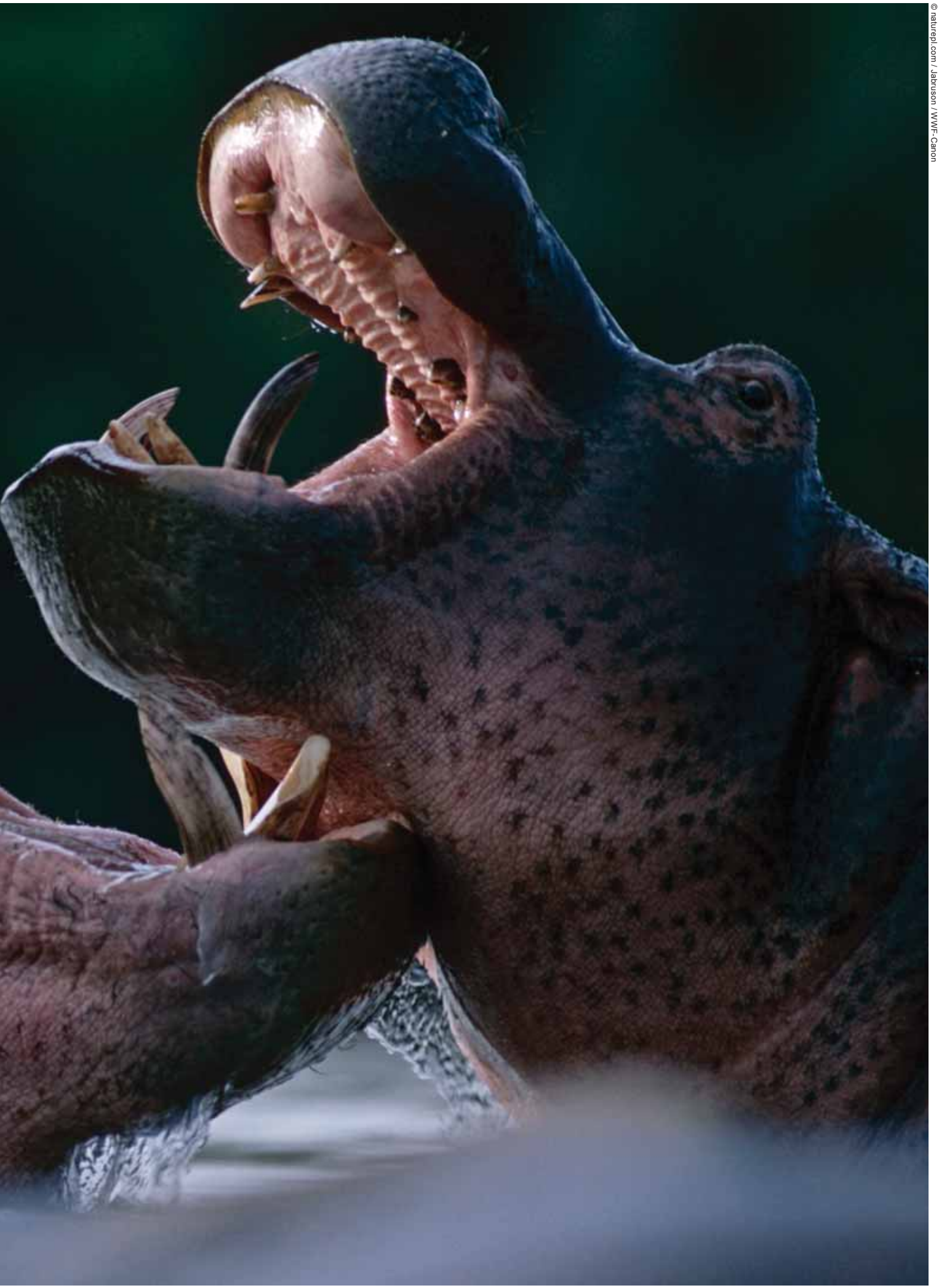
Potential future value generated by the fact that gorillas live in the park could be US$700 million annually.

This looks at the value generated by knowing that the park exists, with no consideration for any current or planned use; it reflects the willingness to preserve an option for potential future use. It illustrates also the value generated by knowing that future generations will be able to enjoy the same resource. It was not possible to collect primary data, such as through tourist surveys. However, a previous study estimated that the annual value attributed, by 150 million households in developed countries, to mountain gorillas for the fact they exist was approximately US$1.865 billion per year.[95] Based on a price index of US$375 for a gorilla permit before 2007 and US$700 today, the potential total annual value generated could be around US$3.5 billion. This amount is discounted to 20 per cent, or approximately US$700 million annually, to account for a limited sample size and lack of recent primary data.

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK
CONCLUSIONS

WORTH PROTECTING

Virunga's most famous residents may be its mountain gorillas, but the park is home to more than 3,000 other species, more than any other place in Africa. Many of the plants and animals found in the area survive nowhere else, and each has its part to play in the ecosystem. The hippos of Lake Edward are both an indicator of the lake's health and a critical element for its fishery. Sustainable management of Virunga's land, water and wildlife will have direct and indirect economic benefits for communities that rely heavily on the park's natural resources.



OIL EXPLORATION PLANS PUT AT RISK VIRUNGA'S VALUE, WHICH COULD EXCEED US$1.1 BILLION PER YEAR IF DEVELOPED SUSTAINABLY

Virunga represents a valuable asset to Democratic Republic of the Congo and contributes to Africa's global heritage as the oldest and most biodiverse park on the continent. Support for long-term development, economic initiatives, conservation, stability and security needs to be guaranteed. Enforcing the park's current boundaries and restabilizing rule of law within the park can help to restore the integrity of the park's ecosystem and, if maintained, can promote long-term development of the surrounding region.

Plans to explore for oil and to exploit oil reserves put Virunga's value at risk. Pollution from oil extraction is likely in the unstable province of North Kivu, where Virunga is located. Environmental degradation and human rights abuse can lead to direct impacts on economic and social development. Oil exploration could also threaten Virunga's status as a World Heritage Site, which if lost, could reduce the potential value of the park. The most critical risks associated with oil development include: large scale clearance of vegetation, introduction of invasive plants, fragmentation of habitats, increased likelihood of poaching, which could threaten the survival of local species, and pollution from oil spills, gas flaring and waste dumping. The likelihood and impact of these risks is illustrated by case studies such as Bas Congo and Niger Delta.

In addition, the expected social and economic benefits of oil development often do not materialize as demonstrated in the Bas Congo and Niger Delta examples. The risk of the "oil curse" could result in worsening poverty and inequality indicators as in the Niger Delta. Under the oil curse, the oil exporting country's currency appreciates causing a decline in the competitiveness of existing export sectors, oil price volatility destabilizes government revenues prohibiting long-term planning, and large cash flows increase the risk of misallocated resources.

Virunga does not stand on its own. DRC has five World Heritage Sites and a variety of national parks. Although many of these require rehabilitation and maintenance, their natural assets represent a potential long-term source of income for local communities through a range of associated economic activities.

The Total Economic Value of Virunga is currently US$48.9 million but could be more than US$1.1 billion if managed in a sustainable manner. DRC should invest in capturing the total economic value rather than putting the long term value of the park at risk.

NOTES

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ACRONYMS

DRC	Democratic Republic of the Congo
GDP	Gross Domestic Product
ICMM	International Council on Mining and Metals
ICCN	Congolese Wildlife Authority
MW	Megawatt
NGO	Non-governmental organization
OECD	Organisation for Economic Cooperation and Development
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
TEV	Total Economic Value
UK	United Kingdom
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
US$	United States dollar
WWF	World Wide Fund for Nature

THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

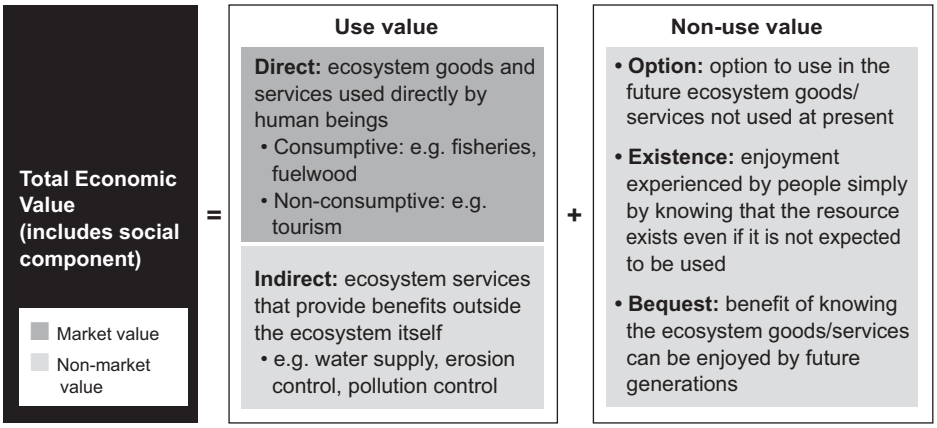
ANNEX

TEV METHODOLOGY

In order to be able to assign a monetary value to both social and economic dimensions, Dalberg used the Total Economic Value (TEV) framework. This is a standard framework used to value ecosystems and includes both economic and social value on an annual basis.

TEV classifies all social and economic benefits from an ecosystem into three categories, direct-use, indirect-use and non-use values. Direct-use values (economic dimension) are goods and services used directly by human beings, for example fisheries and tourism. Indirect-use values (social dimension) are benefits provided outside the ecosystem itself like water supply or erosion control. Non-use values (social dimension) include the benefits of knowing that the ecosystem can provide goods and services in the future. Once the value of each category has been estimated, the sum of the three gives a total estimated monetary value.

Figure 2 Total Economic Value framework



For each category, Dalberg:

- Identified all factors to be included in each value category of the TEV framework;
- Defined the appropriate valuation technique for each factor;
- Defined the inputs needed for each factor to calculate the social and economic value.

Figure 3 illustrates the factors and inputs used to define the Total Economic Value of Virunga. Total Economic Value is a powerful instrument to calculate the value of ecosystems, particularly for non-market benefits such as ecosystem services. However the economic valuation is inherently uncertain and can only give an approximate indication of value. The following section provides more details on the limitation and adjustment to the scope of the valuation.

Figure 3 Total Economic Value factors and inputs

Value category	Factors	Valuation technique	Inputs	Unit
Direct-use value	**Fishery**	Market values	Fishermen in the area Volume of fish Value of fish	Number Tonnes/year US$/kg
	Tourism	Travel Cost Method (TCM) Market values (Direct, Indirect and Induced contribution)	Tourists visiting the park Share of gorilla tourism on total tourism Gorilla permits/person Average expenditure per visit DRC GDP Total contribution of tourism to GDP Share of Virunga contribution to total tourism contribution	Number/year % US$ US$ US$ % %
	Hydro-electric power	Market values	Additional jobs Average salary Electricity production Average cost	Number US$/year MW/year US$/MW
	Pharmacological use	Value of biodiversity	Plant species in forest Probability of a "hit" Royalty rate on sales Appropriation rate, or rent capture Average value of drugs developed Area of forest	Number % % % US$/year ha
	Education and research	Grant values	Value of funds/grants provided by NGOs Value of funds/grants provided by research centres and academia	US$ US$
Indirect use value	**Carbon sequestration and forest conservation**	Loss in economic activities, climate change effects	Tonnes carbon Virunga forest saved from deforestation Value of carbon Potential for reforestation programmes	tCO2/ha ha US$/tCO2 ha
	Water supply	Replacement cost	Households served by park's water resources Average water consumption of households Average cost (Goma, Kinshasa)	Number litres/year US$/litre
	Erosion control	Offsite and onsite costs of soil erosion	Virunga forest Current share of affected by erosion Deforestation rate Cost of reforesting land affected by erosion	ha % %/year US$/ha/year
Non-use value	**Existence value and bequest**	Qualitative	Interviews and desk review	na

LIMITATIONS AND ADJUSTMENTS TO THE SCOPE OF THE VALUATION

TEV illustrates gross revenues
The valuation does not represent a cost-benefit analysis, therefore the TEV represents potential gross economic benefits, rather than net effects.

Selection of factors to be included
Given the nature of this valuation – defining the social and economic value of Virunga and the current unstable situation in Virunga and its proximity, the analysis focused on the most relevant factors participating in value generation. The lack of current and historical data limits the possibilities to include an economic value for all factors.

It was not possible to determine, for example, the value generated by non-timber forest products. These products are important for food security, either directly or as a means of generating income. Products such as nuts, leaves, roots, fruits, fungi and honey are a source of fibre, vitamins and essential minerals in the diet of local people, while also providing marketable products used to generate income. A sustainable commercial and domestic use might increase incentives for forest conservation and reduce or mitigate poverty. Unfortunately it was not possible to collect relevant information on value produced and effect on household income. Previous study reported an almost complete lack of results reflecting the fact that respondents appeared unwilling to disclose use levels.[1] As a result these products have not been taken into consideration when investigating the total economic value.

Indirect values such as transport of goods by lake and absorption of pollution by lake were not included in the evaluation.

Value of water supply and erosion control are based on the replacement cost and restoration cost
The damage cost avoided and replacement cost are methods that estimate the value of ecosystem services based on either the costs of avoiding damages due to lost services or the cost of replacing ecosystem services. Although these methods do not provide strict measures of economic values, they provide useful estimates of the value of these ecosystems or services. The assumption is that, if people incur costs to avoid damages caused by lost ecosystem services, or to replace the services of ecosystems, then those services must be worth at least what people paid to replace them. These methods are particularly appropriate when the risks to incur these costs are high, such as in the case of Virunga.

Limited time of the valuation process
In the interest of time and resource efficiency, the data collection time period was limited to approximately 12 weeks. During this time the valuation team

was able to review a large number of key documents and to interview more than 50 stakeholders. Of these, more than 20 interviews were conducted on the ground despite the local instability and lack of security. To ensure the most relevant data were collected, a prioritized interview list and document list was determined.

POTENTIAL JOBS GENERATED BY VIRUNGA

As mentioned in the fourth section, "Virunga's social and economic value," fisheries, tourism industry and hydropower generation can generate thousands of job opportunities for local communities. The table below provides more details on the assumptions.

Assumptions

Fisheries	
Lake Edward – Potential production	*45,000 tonnes/year*
Jobs created	*0.62 jobs/tonne*
Potential jobs generated by fisheries	*28,000*
Tourism	
Potential value of tourism industry	*US$52 million/year*
Jobs per US$ generated	*1 job/US$7,000*
Potential jobs generated by tourism industry	*7,420*
Hydropower	
Potential produced annually	*20 MW*
Jobs per MW produced	*500 jobs/MW*
Potential jobs generated by hydropower	*10,000*
Potential jobs created	*45,420*

LEGAL CONSIDERATIONS

The DRC law that established Virunga as a nature reserve in 1969 constitutes the heart of the legal protections enjoyed by the national park today.[2] Although the law prohibits activities incompatible with the protection of nature, Soco's authorization exploits an exemption in the law that allows "scientific activities" in protected areas.[3] DRC is a state party to the World Heritage Convention that the country ratified in 1979. The World Heritage Convention does not permit any activity that will negatively affect a site's outstanding universal value. In 2011, the director general of UNESCO and the prime minister of DRC signed the Kinshasa Declaration. By requesting the respect of the law and the implementation the World Heritage Committee decisions, the declaration states that the DRC government will "comply with the provision of the UNESCO World Heritage Convention, and its national legislation to

secure its natural sites" (paragraph 3).[4] This implies a commitment by the DRC government to secure Virunga from activities like oil development.

Similarly, during Ramsar's 2012 convention, a joint statement was issued that highlighted the risks of drilling in Lake Edward in terms of population growth and infrastructure development within the park's boundaries.[5] The United Kingdom (UK), France and South Africa (home countries of Soco, Total and SacOil respectively) and Democratic Republic of the Congo[6] have ratified the Ramsar convention prohibiting oil extraction from wetlands of international importance such as Virunga.

In 2012, the UK government released the following press statement: "The UK opposes oil exploration within Virunga, a World Heritage site listed by UNESCO as being 'in danger.' We have informed Soco and urge the government of the DRC to fully respect the international conventions to which it is a signatory."[7] In November 2012, the Belgian Federal Parliament adopted a resolution requesting the DRC government to act rapidly in order to stop irreparable damage to the park and requesting the Belgian government to plead with Paris and London "so that they effectively meet the UNESCO's request to do everything possible to ensure that oil and mining companies established on their territory (Soco and Total) do not damage the properties inscribed on the World Heritage List" and "considering sanctions against the oil companies Total and Soco if they do not respect the laws of the DRC and its international commitments, particularly vis-à-vis UNESCO."[8] To date, no action has been taken on the part of the DRC government to stop exploration activities within the borders of the park.

In the absence of a law to regulate the oil industry in the DRC, a Draft Hydrocarbon Bill[9] has been proposed. Upon reviewing the bill, the Vale Colombia Centre on Sustainable International Investment noted that "there is a lot of discretion given to the minister in some cases and to other bodies in other cases, to determine issues by decree or authorizations, or to get around restrictions… Article 24 appears unusual in that it states that the granting of rights will be subject to respect of protected areas, but at the same time allows for a decree to derogate from this restriction. This creates a risk that rights will be granted in protected areas – decrees can be passed much more easily than legislation, simply by the relevant minister. They do not need to pass parliament."[10] Further, Article 98 of the draft bill does not reflect best-practice standards for social and environmental impact assessments. No requirement is made to include plans for the management of: alien species, biological conservation, waste, air pollution, ground and surface water, closure, rehabilitation and stakeholder consultation, among others.[11]

ADDITIONAL INFORMATION ON CARBON SEQUESTRATION

The REDD+ scheme, in which the DRC is already engaged, could potentially generate the necessary funding to address a wide range of development and environment challenges. Specific initiatives can help to address the risk of deforestation through:

- Reduction of demand for charcoal by improving energy efficiency by introducing more efficient wood stoves for cooking, and by a better and improved transformation of wood into charcoal;[12]
- Conservation of existing stocks by increasing wood production outside Virunga, such as the ECOmakala reforestation programme;[13]
- Diversification of the existing energy sources through the installation of renewable energy sources such as hydropower, and the investment in the necessary infrastructure to provide electricity.

This value from REDD+ could be increased through the participation in carbon sequestration projects. The first project registered by the country under the Clean Development Mechanism was the Ibi Batéké carbon sink plantation. The project will replant 4,200 hectares of degraded land and trap an estimated 2.4 million tonnes of carbon dioxide (CO_2).[14] The Yasuní-ITT Trust Fund, launched by the Ecuadorian government and managed by the United Nations Development Programme, provides another opportunity to protect biodiversity, enhance conservation and reduce CO_2 emissions.[15]

NOTES

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WWF International
Avenue du Mont-Blanc
1196 Gland, Switzerland
www.panda.org

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THE ECONOMIC VALUE OF VIRUNGA NATIONAL PARK

1 BILLION

If developed sustainably, the park's total economic value could exceed US$1.1 billion per year

3,000+

The number of plant and animal species found in Virunga National Park

45,000

Virunga could be the source of 45,000 fishing, hydropower and tourism jobs

x3

Lake Edward could produce three times as much fish as it does today

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