The Ape in the Machinery: A Status Report on Great Ape Conservation in Natural Resource Extraction Zones in Central Africa

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1.0 Introduction: boom times for Africa's extractive industries leave little room for the last great apes

Africa is experiencing an unprecedented surge in mineral and hydrocarbon development. The landscape is being turned upside down in search of the materials and energy that drive the 21st century economy. A map showing new mining, oil and gas projects in Africa is often outdated in a matter of months as new finds are revealed, investment deals brokered, and exploration and development projects rolled into place on the ground. While the potential economic gains for governments and corporations from these booming extractive industries are immense, the threats to the social, cultural and ecological fabric of African nations are equally profound, and have raised many concerns as the region's economies grow.

One particular challenge is the threat being placed on an already stressed native biodiversity. Mineral and hydrocarbon development can result in broad scale changes to habitat structure and composition as a result of both direct and indirect impacts generated during the project exploration, development and operation, and close-out phases. The severity of these impacts represents particularly acute challenges for species with limited capacity to abandon sites and colonize new areas, and many IUCN Red List species unfortunately fall into this category. Given the severity of these threats to wildlife and habitats, companies have begun to recognize that these impacts create significant risk to their operations.

Africa's great apes stand squarely at the center of these challenges. All great ape populations are at risk, and the threats from mineral and hydrocarbon development to remaining populations are adding significant impacts to a cumulative mix that jeopardizes their long-term survival.

In an effort to mitigate this challenge, many businesses are now working with governments, NGOs, planners and field scientists to explore management practices that follow a mitigation hierarchy based on avoiding and minimizing adverse impacts first, and then compensating for the residual impacts and risks to great apes and other threatened species, with a goal, where feasible, of producing a net positive gain. While the development of these best practices has the potential to reveal how economic development can proceed without completely sacrificing the biodiversity and ecosystem services that represent essential "natural capital" for all nations, the answers are not yet conclusive enough to verify the practices most suitable to sustaining great apes. Moreover, it is doubtful that companies can truly achieve no net loss or a net gain of biodiversity when serious impacts on critical species, such as great apes, occur. However, more widespread testing and adoption of these measures will be essential if we are to sustain viable populations of apes over the long term.

The following report explores the significant threats and risks to apes resulting from the activities of extractive industries, and outlines some of the policies and practices being applied to mitigate these challenges. Section 2.0 examines some of the specific impacts that can be expected to affect great apes and their habitat during the exploration, development, production, and close-out phases of mineral extraction. Section 3.0 looks at methods and tools being applied to respond to these impact risks, including a review of the broad elements of a process known as the "mitigation hierarchy", in which meticulous planning and management practices are employed to avoid and minimize adverse impacts, and then mitigate and compensate for those that cannot be avoided. Section 4.0 reviews some of the ways these methods are being adopted through voluntary and regulatory mechanisms at national and international scales.

The report concludes with a case study of an emerging mining project in Central Africa, and explores in detail one attempt to implement the mitigation hierarchy in one of the earth's most important centers for chimpanzee and gorilla populations.

2.0 Crossing paths with extractive industries – how do extractive industries affect the conservation of great apes?

Extractive industries have been an important component of African economies for most of the 20th century, and look set to play an even bigger role in the 21st. Virtually all available landscapes and near-shore seascapes across the African continent have been evaluated for their metal, mineral, and hydrocarbon potential, and many are already assigned to industry in large-scale concessions, with production rates increasing at an exponential rate. Africa's proven oil reserves have more than doubled from estimates of about 53.3 billion barrels in 1980 to nearly 130 billion barrels in 2012. African countries now represent nearly 10 percent of total global oil production, and could soon be the source for more than 25 percent of U.S. imports. There are now more than 15,000 oil wells developed in western Africa and another 20,000 in north and central African countries (Dennys 2012). Natural gas is following a similar trajectory, with new reserves in Africa now estimated at more than double what was assumed 20 years ago (Kasakende and Elham 2009).

Africa also produces more than 60 metal and mineral raw materials and is a major producer of several of the world's most important minerals and metals including gold, diamonds, PGM (platinum groups), uranium, manganese, chromium, nickel, bauxite and cobalt. African reserves represent about 30 percent of the earth's total for many metals and minerals, including 40 percent of gold, 60 percent cobalt and 90 percent of the world's PGM reserves, making it the likely most significant producer of this particular resource for the 21st century. A significant volume of these metal, mineral and hydrocarbon resources is found in areas that overlap with great ape habitat, including the oil deposits found in the Albertine Graben on the border of DRC and Uganda and along the coasts of Congo, Gabon, Cameroon and Nigeria, and the diverse metals and mineral deposits in eastern DRC, Central African Republic, Cameroon, Gabon, Guinea, Liberia and the Republic of Congo.

Unfortunately, extractive resource development in Africa has traditionally operated on the assumption that there are always losers and winners, with the broad needs of biodiversity conservation consistently being on the losing end of the equation. Africa's high level of poverty, its severe infrastructural deficits, and its continuing weak voice in negotiating mineral development contracts have exacerbated this condition (ECA 2011). Current uncertainties about energy supply and the expected rise in future demand for hydrocarbons and other minerals, particularly due to global economic growth and technology development in Asia, make reform urgent. Strategies must be developed that ensure that development in this sector can be conducted in a way that does not require us to sacrifice natural capital, particularly species such as the great apes whose futures are already at such a precarious point.

However, prior to moving forward with conservation responses it is important to recognize where and how extractive industries affect great apes and their habitat during each phase of exploration, development, production, and close-out. Some of these impacts are a direct consequence of industry actions, while others are the indirect consequences of other subsistence or commercial activities that have been put in place as a result of the work or financial activity generated by extractive industries. Increasingly, these direct and closely linked indirect consequences are further intensified by the cumulative impacts resulting from multiple industries operating within the same landscapes. While it is often difficult to isolate specific impacts as being the sole responsibility of one actor, it is still crucially important to recognize where and how extractive industries may be contributing to threats through their project lifecycles. Identifying and acknowledging these contributions becomes the first critical step in formulating truly effective mitigation responses and, ideally, can form the basis for more effective ex-ante planning.

2.1 Observations on potential cumulative impacts from extractive industries throughout the project life cycle.

The study of the impacts of extractive industry on wildlife is still nascent and therefore too incomplete to have provided a definitive picture yet of the consequences of each phase of project development for great ape populations, or of the cumulative impacts that may occur. Such research is sorely needed and increasingly industry is engaging NGOs, research scientists, and civil society to help them obtain it. However, some observational and conjectural data derived from field studies carried out in recent years in the vicinity of extractive industry sites do provide some insight into probable risks and threats to great apes during the extractive industry lifecycle.

Most extractive industry projects proceed through a similar set of stages implemented over the course of what is often expected to be a very long life cycle of 20 to 50 years. Each stage of the development process can be expected to raise the threat of distinct impacts, whose intensity, scale and duration will vary, and on occasion accumulate over time. The stages can be summarized as follows:

Pre-feasibility (P): Before committing to the development of a concession, most companies will carry out a series of preliminary studies to evaluate potential financial, environmental, institutional and social risks to future company operations and reputation that the project may incur. These studies are generally conducted as desk exercises at this stage, but may occasionally include limited field activities. It is common for consortia of different companies (joint ventures) to collaborate in this process in order to share risks and costs. Very few impacts typically occur during this phase of the project life cycle unless actual field studies are carried out.

Exploration and appraisal (E): A commitment to acquire a concession requires companies to carry out the field studies necessary to acquire a more thorough understanding of the extent, quality, and marketability of subsurface resources, and of the social and environmental risks that may be associated with surface resources. Seismic surveying and exploratory drilling are likely to be carried out during this phase with the objective of proving or disproving the presence of commercially viable quantities of exploitable metals, minerals or hydrocarbons. Most survey sites and drill pads will typically be small in area, often requiring the clearing or disruption of only a few hectares of vegetation, or less, in each site. However, there could easily be hundreds of such sites scattered across the landscape with an elaborate network of secondary and tertiary roads and access trails constructed or rehabilitated to service each site. The transport infrastructure may begin to fragment available habitat, and species such as gorillas that are reluctant to stray far from home territories may become isolated. Many ape groups may also be severely disrupted by the significant increase in noise and disturbance of traditional feeding and nesting sites and of other habitat within their range.

A centralized field station will also likely be established to service exploration teams. Such stations frequently cover large areas, and inject significant amounts of capital into local economies. This new capital can result in a dramatic increase in bushmeat hunting to meet increased local demands and new demands from industry workers, as these workers can now afford to buy bushmeat with their salaries. The new influx of human residents also increases the risk of disease transmission to apes and the possible introduction of exotic species which can reduce or compete for available food supplies. In many cases the new human residents have come from far afield in the hope of employment, so that even if the local community has a taboo against eating apes (such as along the southern Congo and Gabon coastline), the new arrivals will not. This can further result in a weakening of local tradition. Finally, these new residents will necessarily clear forest in order to cultivate staple food crops, thus further reducing the area available to wildlife and native vegetation.

Most companies will also typically prepare a comprehensive environmental and social impact assessment (ESIA) during this phase of work. The ESIA will often follow national guidelines, if any exist, or those required by lenders or donors, if outside funding has been obtained to advance a project. However, established ESIA guidelines can be quite weak, and the specific EIAs often provide only a limited or incomplete picture of threats to biodiversity and, as described in section 3.0 below, it may be important to include supplemental processes that can support and greatly enhance the ESIA results.

Implementation (I): The results of the exploration and appraisal phase will reveal the volume, accessibility, and commercial viability of the resource, and identify any social, legal or institutional concerns that might affect project development. If the analysis of appraisal data meets the technical, financial, and corporate policy objectives then the company may decide to develop the resource field, a commitment that may result in the investment of hundreds of millions or billions of dollars over the subsequent 20-50 years or more.
The implementation phase of the project can result in the most dramatic ecological changes and greatest period of disturbance for biodiversity generally and for individual species. Implementation activities may include more complete development of the transportation network both to move around the extraction area and to connect with regional distribution and shipping centers; construction of drilling and extraction production sites; and construction of facilities, such as pipelines and terminals, processing centers, and lodging and service centers for workers. The ESIA can help anticipate and respond to some of these impacts, although it is unlikely that the prior environmental assessments will take full account of the cumulative impacts likely to occur, or reveal the actual magnitude of impacts. For many species, including great apes, the responses to increased noise, habitat degradation or destruction, road and vehicle encounters, and increased hunting pressures may not become fully apparent until project implementation begins. Some unverified observations suggest that, when disturbed, a community of chimps or gorillas will generally migrate to adjacent territories, resulting in stress to both immigrant and resident populations. Females might be able to migrate between groups but males may be killed, form male-only groups, or possibly be integrated into a new group (Vosper, 2012).

Operations (O): The implementation phase of an extractive resource development project transitions into the operations phase, and generally results in the continuous day-to-day production of metals, minerals, oil or gas; maintenance of facilities; and transportation of the exploited materials to market via pipelines and export terminals. In some cases, the most dramatic impacts on populations of species such as great apes will already be very apparent, with some individuals lost, groups disrupted or reduced in size, and overall population size and genetics altered.

One challenge for project managers during the operations phase is distinguishing between direct and indirect project impacts and enacting appropriate mitigation measures. Although the ultimate results of direct and indirect impacts from these activities on biodiversity are often similar, they may differ in source, area affected, scale, intensity and boundaries of responsibility.

Direct impacts resulting specifically from project development are normally limited to the exact boundaries of the project area, and will decline and cease at the end of the project's life. Some of these impacts can be minimized or mitigated through good management practices. However, indirect impacts may not even be closely associated with project activities. Instead, they can result from the actions and decisions made by people with little or no association with the project, and are simply triggered by the project's presence.

For example, a mine or oil resource development project may result in a dramatic influx of new settlers into a previously sparsely populated area, with only a small portion of the new residents actually working for the extractive company. Most will seek employment through existing or new service sectors, or simply try to benefit from the increased cash flow generated by the company. Deforestation resulting from the development of new settlements, and increased hunting pressures from subsistence or commercial hunting ventures are potential examples of indirect impacts that may be out of the immediate control of the extractive company, but are unquestionably a consequence of its presence. The cumulative results of such indirect impacts can be far more severe than the direct impacts of project development. Although it may be difficult to determine who is responsible for addressing and mitigating such indirect impacts, they are just as likely to disrupt a project as direct impacts (EBI 2009).

Decommissioning and close-out (D): When the commercial life of the extraction project comes to an end, a decommissioning process will typically be implemented in order to remove facilities and restore project sites to the degree feasible. Restoration work typically includes some efforts to re-vegetate the site, principally to ensure that adequate ground cover is in place to avoid significant erosion, and measures to reduce adverse impacts to hydrologic and watershed functions, along with other actions appropriate to the site's next intended use.

Some infrastructure may also be removed, such as buildings, conveyors, or railway lines. Open air pits or shafts may be filled in and land surfaces re-contoured. Industrial wastes (e.g., lubricating oils, hydraulic fluids, coolants, solvents, and cleaning agents) may need to be treated similarly to wastes generated during mining activities, for example by placing them in containers for temporary storage or transport by a licensed haulier to an off-site disposal area.

Direct impacts to great apes from the decommissioning and close-out work may be similar to those experienced throughout the life of the project since site disturbance levels from noise and physical disruptions are likely to be very high throughout the affected environment. However, an additional indirect impact can be the significant economic consequences of dramatically reduced investment in the local economy, loss of employment, and a decline in demand for services. These social and economic changes may result in an eventual relocation of many residents, thus taking pressure off apes and other hunted species and allow populations to recover. Alternatively, hunting pressures and habitat alterations may intensify as residents turn to the available natural capital as a means to make up for lost revenue from the closed project.

Summary: The above observations suggest that risks and threats to great apes are potentially very high over the life of a resource extraction project, and many severe impacts can occur and build in intensity unless appropriate impact avoidance, minimization, and compensation measures are put in place early in the project life.

Table 1 summarizes some of these potential impacts to great apes that may occur in relation to the different phases of project development. Sections 3.0 and 4.0 look at possible measures that may be able to respond to these risks and threats, and policy and institutional changes that can increase the adoption of these measures.

Table 1. Potential impacts from extractive industry on great apes

Key: LSM – Large scale mining ASM – Artisanal and small-scale mining O&G – Oil and gas development

Potential Impact	Industry: Project Phase	Expected Response – Chimpanzees and Bonobos	Expected Response - Gorillas
Loss of habitat (expected in cases of open caste mining)	LSM: I, O ASM: E, I, O O&G: I, O	• High death rates, especially infants and weaker individuals, due to starvation or reduced food intake • Limited, restricted and reduced feeding opportunities. • Elimination of nesting sites • Breakdown or total collapse of group structure • Destabilization of surrounding groups • Integration of females into other groups • Death of males (especially the alpha male) due to intergroup conflict (less likely with bonobos) • Increased conflict over reduced resources • Possible increase in disease as animals are weakened by hunger	• High death rates, especially infants and weaker individuals, due to starvation or reduced food intake • Limited, restricted and reduced feeding opportunities. • Reduction in number and quality of nesting sites (ground and trees) • Females possibly integrated in to other groups • Destabilization of groups with silverback males fighting for dominance as group is displaced • Possible increase in disease as animals are weakened by hunger
Partial loss and fragmentation of habitat	LSM: E, I, O, D ASM: E, I, O, D O&G: E, I, O, D	• Limited, restricted and reduced feeding opportunities. • Degradation/reduction of home range • Breakdown of group and possible fragmentation of group • Elimination of nesting sites • Breakdown or total collapse of group structure • Destabilization of surrounding groups • Integration of females into other groups • Death of males (especially the alpha male) due to intergroup conflict (less likely with bonobos) • Increased conflict over reduced resources • Possible increase in disease as animals are weakened by hunger	• Limited, restricted and reduced feeding opportunities” • Degradation/reduction of home range • Breakdown of group and possible fragmentation of group • Reduction in number and quality of nesting sites (ground and trees) • Females possibly integrated in to other groups • Destabilization of groups with silverback males fighting for dominance as group is displaced • Possible increase in disease as animals are weakened by hunger

Potential Impact	Industry: Project Phase	Expected Response – Chimpanzees and Bonobos	Expected Response - Gorillas
Degradation/ reduction of habitat (e.g. noise, reduced air or water quality, change in habitat composition or structure, invasive species)	LSM: E, I, O, D ASM: E, I, O, D O&G: E, I, O, D	• Risk of possible disease outbreaks • Disruption of home range delineation • Possible reduction in food sources due to invasive species and loss of total habitat area	• Risk of possible disease outbreaks • Disruption of home range delineation • Reduction in food sources due to invasive species and loss of total habitat area
Hunting pressures - increase in number of hunters, availability of munitions and snare wire, increase in hunting activity, increase in commercialization of hunting	LSM: E, I, O, D ASM: E, I, O, D O&G: E, I, O, D	• Rapid reduction of whole population in the hunted area • Possible collapse of group if alpha male killed (specifically chimpanzees) • Degradation of group composition and dynamics • Possible destabilisation of group where multiple individuals killed when protecting others - specifically relating to mothers • Loss of unique culture possible if multiple sites targeted. • Increased loss of young to pet trade if mothers killed.	• Rapid reduction of whole population in the hunted area • Silverbacks known to defend group and, if killed, can lead to collapse or death of entire group • Possible young ending up in pet trade • Destabilisation of group • Loss of unique culture possible if multiple sites targeted
Disease transmission from humans to apes	LSM: E, I, O, D ASM: E, I, O, D O&G: E, I, O, D	• Potential for death of whole groups or even populations, as occurred in the northern Gabon and Republic of Congo Ebola outbreak of 1995- early 2000s	• Potential for death of whole groups or even populations, as occurred in the northern Gabon and Republic of Congo Ebola outbreak in 1995-early 2000s

3.0 Measures to reduce conflict between apes and industry

Conservation practitioners are working with a wide range of tools and measures intended to minimize impacts to great apes and their habitat, and to improve biodiversity conservation in general. This section looks at three important approaches that are rapidly becoming central components in the requirements and practices adopted by governments, lenders/donors, and companies: the preparation of Strategic Environmental Assessments to provide a cumulative overview of potential impacts across landscapes; the use of spatial planning tools to guide the practical implementation of mitigation hierarchy principles; and the application of the “mitigation hierarchy” as articulated by the Business and Biodiversity Offset Program (BBOP) consortia and the International Finance Corporation (IFC). In general practice, these three approaches are best combined to generate the data, analysis, and stakeholder response that permits a clear delineation of conservation threats, action targets, and response scenarios.

3.1 Strategic Environmental Assessments

As mentioned in Section 2.0, most industries prepare a comprehensive ESIA during the exploration and appraisal phase of project development. Unfortunately, few ESIAs provide thorough coverage of threats to biodiversity, and very few do any significant original fieldwork to establish baseline conditions or determine the actual status of species and habitat. Most ESIAs are prepared for isolated development projects and do not take cumulative impacts into account, including the cumulative impacts from other economic sectors and climate change operating in the same landscape. Further, the actions included in the ESIA to mitigate identified adverse impacts are often minimal and rarely enforced, if they are required at all. All too often the ESIA becomes more of an epitaph to biodiversity than an applied management plan.

One option for strengthening the outputs and use of the ESIA is to provide a broader framework for viewing all industry developments proposed or taking place across a landscape, and include more specific guidelines and requirements for the ESIA process. Increasingly, governments, lenders/donors, and civil society groups are employing a Strategic Environmental Assessment (SEA) process to build this framework. SEAs are high-level decision-making procedures used to promote sustainable development. These assessments take place before decisions about individual extractive industry projects are made, and they generally include entire landscapes or regions as their frame of reference. The SEA can also serve as the mechanism to establish the key questions, criteria, and actions that should be included in a project-specific ESIA.

An SEA should be conducted at the very earliest stages of decision-making to help formulate broad scale policies, plans and programs and to assess their potential development effectiveness and sustainability. This distinguishes the SEA from more traditional environmental assessment tools. EAs and ESIAs certainly have a proven track record in addressing the environmental threats and opportunities of specific projects. However, they are less easily applied to policies, plans and any broader program. In this way the SEA serves to complement and provide the gateway and guidance for the EA or ESIA and other assessment approaches and tools (OECD 2006).

SEAs are typically stakeholder-driven, and require extensive scoping among all groups that may be affected by direct or indirect impacts from regional development scenarios. Scoping sessions generally aim to produce stakeholder consensus on when, how and where it is best to develop extractive industry projects within the landscape or region in question. SEAs usually place a great deal of emphasis on identifying information gaps in advance of individual project developments, and in this sense they can result in ESIAs that ultimately fill these gaps through needed research and field studies. SEAs also typically place a strong emphasis on identifying specific geographic areas likely to be highly sensitive to extractive industry projects, and the SEA will frequently include identification of opportunities to strengthen or establish protected areas and no-go zones, along with recommendations for protocols and standards to guide individual project developments (Kloff *et al*. 2010).

Much of the emphasis in the development of the SEA is on assessing risk and predicting social and environmental effects over broad geographic areas from multiple potential development actions. Thus scenario analysis and multi-criteria assessments, risk analysis, and identification of potential mitigation opportunities become important components of the final SEA product. In this way the SEA provides an important initial step to support the use of more advanced spatial planning tools and the mitigation hierarchy.

The success of SEAs requires stakeholder consensus that ideally should include buy-in by government. In the absence of a government-led planning process, a consortium of private sector companies may find it advantageous to engage in broad analysis of this type as a way to anticipate impacts and reduce overall risk.

3.2 Spatial data analysis and long-term conservation planning and monitoring
Spatial planning uses existing and original data to provide an integrated perspective on conditions, threats, and opportunities for improved resource management across a specific geographic area. The use of spatial planning tools typically includes measures to coordinate the spatial impacts of sectoral policies in order to achieve a more even distribution of economic development across or region or between regions than would otherwise be created by market forces, and to regulate the conversion of land and property uses (ECE 2008).

Some of the decisions and actions that spatial planning typically seeks to support include:

- More socially and economically balanced development within regions, and improved competitiveness;
- Enhanced transportation and communication networks;
- Greater access to information and knowledge by affected stakeholders;
- Reduced environmental damage from all infrastructure and extractive development;
- Enhanced protection for natural resources and natural heritage;
- Enhancement of cultural heritages as a factor for development;
- Development of energy resources while maintaining safety; and,
- Limits to the impact of natural disasters.

Since most of these issues are cross-sectoral in nature, effective spatial planning should help to avoid duplication of effort by all actors engaged in development across a region or landscape, including governments, industry, communities and individuals (ECE 2008).

Spatial planning thus becomes a potentially valuable tool for anticipating and responding to threats (in this case to great apes), and may incorporate a variety of methods and outputs. Its ultimate goal in this context would be to identify the optimal scenarios, decisions and actions to reduce risks and maximize benefits for apes and their habitat in the face of impending extractive development proposals. The tool currently under development by the Wildlife Conservation Society (WCS) offers one perspective of how spatial planning tools might contribute to reducing threats from extractive industry developments. Figure 1 provides a summary of the steps that are proposed to drive the process.

Spatial planning tools can provide an opportunity for government, industry, lenders/donors, NGOs, and civil society to anticipate and prepare for potential adverse impacts early in the project life cycle, and, like the SEA, can provide a broader and richer understanding of direct and indirect cumulative impacts across a larger area than the project development site. Similar to the SEA, the spatial planning process can provide valuable data and stakeholder verified scenarios and objectives that can greatly assist the advanced identification and selection of actions that can reduce threats to apes and other biodiversity.

WCS Spatial Planning Process

The process comprises three sequential steps that integrate a process of stakeholder consultations with analytical work, as follows:

Establish Dynamic Baselines*: The process works from the premise that landscapes change continuously, even in the absence of the proposed land use change ("the project"), and that understanding those changing conditions is essential to assessing the viability of any project. Ideally this step begins with a participatory process on dynamic baselines, which brings together key stakeholders to consider how the landscape is likely to change even in the absence of any individual project under consideration. The goal is to develop plausible scenarios for what the future of the area might look like. These scenarios are informed by stakeholder input on population growth estimates (or bounded range), economic projections (or a bounded range), a set of robust climate change prediction(s), and a map and list of human activities made more likely because of anticipated climate change.*

Although many historical and current factors account for the pattern of the human footprint, the spatial planning process focuses on three fundamental factors: population growth, economic development, and climate change. Predictions of future population, infrastructure development, and climate change are derived through the participatory process and review of the relevant scientific, economic, and development literature. Those predictions are then used to drive multiple forecasts of the possible future spatial distribution of human influence.

Set Stakeholder Objectives - *With human footprint forecasts underway, a second process is undertaken with stakeholders to identify objectives for the landscape or region in question. Clear objectives reveal specific management objectives and help articulate measures of success. These criteria and objectives are then used as inputs into an optimization analysis, responding to the accepted dynamic human footprint forecasts, to generate landscape scenarios. The stakeholder consultation also builds on any prior spatial planning and priority setting, using existing data and indications of preferences by communities.*

Optimize Solutions to Conservation and Development - *Future land-use scenarios are identified using stakeholder-defined objectives given the forecasts of the future human footprint. Scenarios are alternative visions for the future of the landscape. An optimization tool allows the identification of options that meet individual stakeholder objectives while minimizing the cost to other stakeholders. Incompatible objectives are also revealed through this analysis, leading to conflict*

Figure 1. WCS's proposed spatial planning process

3.3 The mitigation hierarchy and biodiversity offsets/compensation

The mitigation hierarchy is a best practice approach to managing biodiversity risk. The approach advocates applying efforts early in the development process to prevent or avoid any adverse impacts to biodiversity wherever possible; then minimize and reduce impacts that cannot be avoided; and then repair or restore impacts that cannot be avoided, minimized or reduced. Only after these initial actions to avoid, minimize or reduce, and repair or restore adverse impacts have been completed do project developers respond to remaining residual effects through compensation measures for those residual impacts, or ideally and where feasible, creating a 'biodiversity offset' through the process of the mitigation hierarchy. If an offset is not possible, some other form of compensation may be needed (Figure 2).

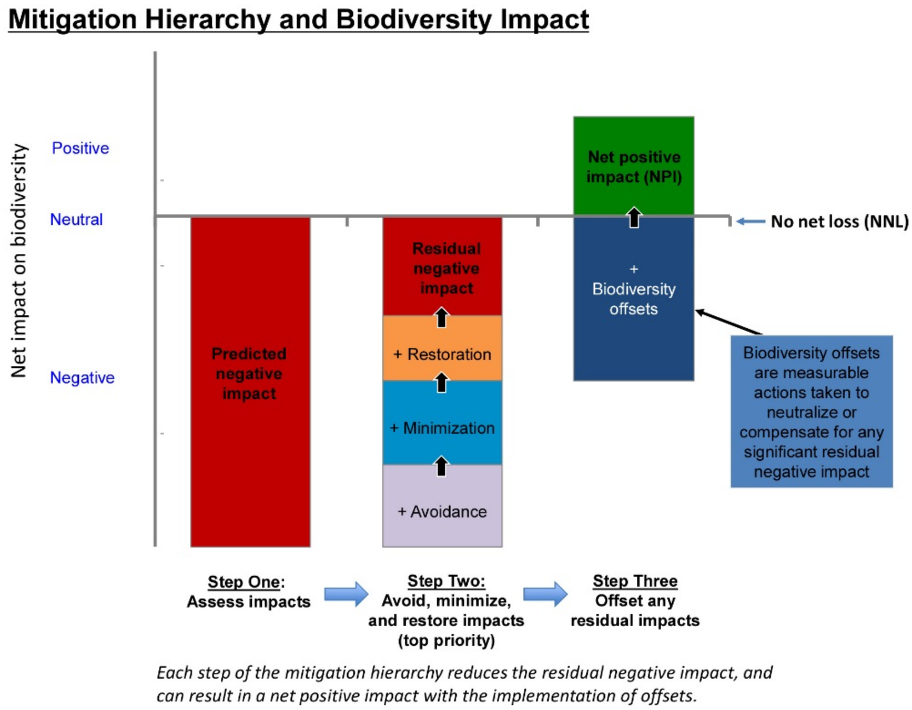

Figure 2. The mitigation hierarchy

> ***What are "biodiversity offsets"?***
>
> *Biodiversity offsets are measurable conservation actions designed to respond to significant residual adverse impacts to biodiversity from project development. Offset actions are proposed and implemented after appropriate prevention and mitigation measures have already been applied. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity.*
>
> *While biodiversity offsets are defined here in terms of specific development projects (such as a road, mine, or well field), they can also be used to compensate for the broader effects of programs and plans.*

The mitigation hierarchy process distinguishes between actions to "compensate" for residual impacts, and those to "offset" residual impacts. Compensation for residual impacts can take a variety of forms, including financial payments or funds established and managed over the life of a project to cover recurrent costs for conservation management; or specific actions designed to offset residual damages (Figure 4). Examples of possible offset activities that may be included as a form of compensation could include:

- Strengthening ineffective protected areas by investing in capacity building for management staff and additional needed management activities;
- Establishing new protected areas or no-go zones in collaboration with communities and government in order to conserve particular species and increase available habitat;
- Establish movement and dispersal corridors for wildlife;

- Establish or strengthen buffer zones adjacent to protected areas;
- Work with communities to develop alternative livelihoods that can reduce or eliminate unsustainable activities and hunting pressures.

Biodiversity offsets and other compensatory projects hold great potential to significantly reduce impacts from large-scale impacts such as those inherent in large-scale extractive industry projects. However, they are not a panacea and must be designed with recognition of cumulative threats across a landscape or region to be most effective. Offset projects that are designed for individual projects or in isolation from other planned or active developments in a region could result in an incomplete response to risks and threats that accumulate from multiple projects and industries across large geographic areas. In some cases, individual offset proposals will be too small to affect the landscape-scale impacts facing a species at risk. There is also a risk that poorly coordinated offset projects may fail to account for other regional or national conservations strategies (Kormos and Kormos 2011b).

Ideally, offsets should be designed and implemented as part of a national planning effort taking into account the cumulative impacts of development in the country, and contributing to and nested in existing national conservation strategies, including recovery plans for IUCN recognized threatened and endangered species and protected area strategies (Kormos and Kormos 2011a and b). Government-endorsed national offset and compensation strategies may also be most effective if supported and overseen by effective and transparent institutions, such as conservation trust funds, to ensure permanent funding to deliver conservation outcomes over the long term.

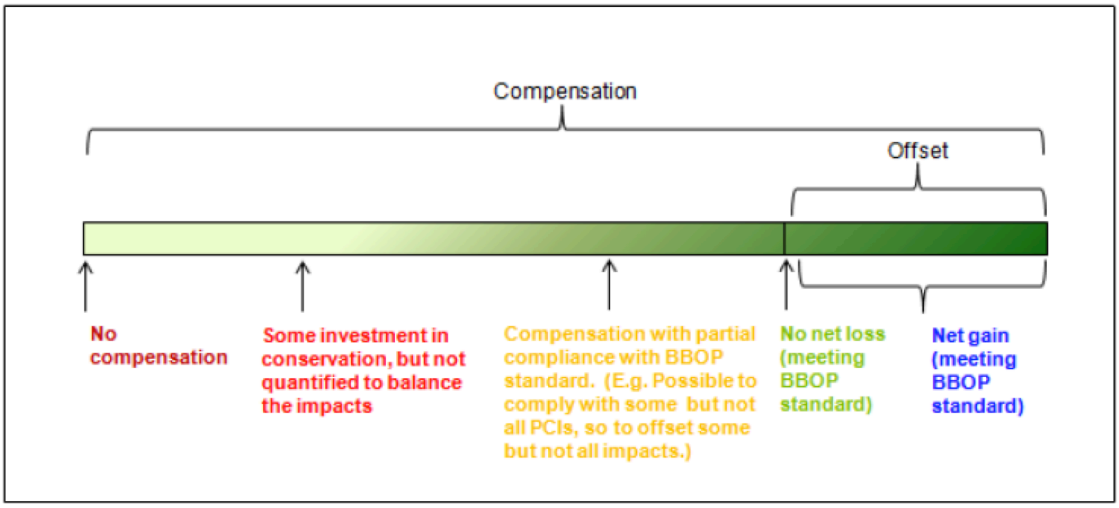

Figure 3. The role of offsets in a biodiversity compensation strategy

A key factor in the development of any compensation strategy is the assurance that investments in conservation or offset activities do not simply provide a mechanism to allow inappropriate developments to move forward. This is particularly true in areas of rare, unique, or highly threatened species and ecosystems, and it may be distinctly true in the last areas harboring the world's great apes. Thus all compensation and offset strategies proposed in great ape habitat must ensure that appropriate monitoring, planning, and management mechanisms are in place and secure over the long term to guarantee that the compensation objectives are achieved (Carroll *et al*. 2008).

Optimally, the collective process of avoiding, minimizing, repairing, and compensation or offsetting will produce '*no net loss'* (NNL) *of biodiversity*'. The concept of NNL or Net Positive Impact (NPI) for biodiversity is a central tenet in the mitigation hierarchy process, and often raises concerns as a risky or impractical goal for extractives. There is an implicit assumption that the implementation of an extractives project always results in some biodiversity loss. However, the concept of NNL tries to recognize this risk and possibility, and accepts that changes in populations, composition or structure of biodiversity could very well occur as a result of an extractive project applying the mitigation hierarchy. In some cases, such as in the immediate vicinity of a large open pit mine, these changes are unavoidable. However, the NNL principle requires industry to identify actions that can lead to a situation where targeted conservation actions can result in gains in population, composition and structure for species and ecosystems that will match, or in the case of NPI, exceed those losses incurred due to project impacts. When this point is achieved, field assessments are necessary to confirm that the "quantity" and "quality" of biodiversity present in the defined affected area remain relatively constant over space and time.

There will unquestionably be instances where NNL may be extraordinarily difficult, if not impossible to attain. In such cases a like-for-like offset of the residual impacts on biodiversity may be beyond reach and a project would be restricted to implementing compensation actions that strive to incur the least amount of biodiversity loss possible, while accepting that some loss will occur. It is essential for projects employing the mitigation hierarchy to acknowledge these risks and possibilities at the outset. This may be particularly important in situations where great apes occur, since, as Table 1 shows, the potential impacts from extractives on apes can be severe and long lasting.

The concept of achieving no net loss is also predicated on two important concepts: first is the concept that the entity causing the impacts is responsible for paying for that compensation, and secondly, that the compensation financing will be put in place for at least as long as the impacts last, or ideally in perpetuity, to ensure the permanence of conservation outcomes. Ideally this should lead to increased additional financing for conservation of key habitat and species. Further, it is essential to demonstrate that mitigation actions are additional to already planned conservation actions, and that proposed conservation measures are not duplicative or redundant.

3.4 Integrating SEA, spatial planning and mitigation hierarchy into broad-scaled conservation planning

As mentioned earlier, the application of the SEA, spatial planning and mitigation hierarchy tools at a program or project scale can typically become a closely integrated process that produces the data, analysis, and stakeholder response that permits a clear delineation of conservation threats, action targets, and response scenarios. These steps are proving to be essential to achieve realistic and long-term conservation outcomes. Even in those cases where it is not possible to achieve NNL, or NPI, these exists the ability to explore compensation actions that deliver the best possible conservation results on the ground. Table 2 provides a concise overview of how these approaches can be seamlessly integrated.

The mitigation hierarchy as outlined by BBOP and endorsed by an increasingly wide body of business, government, lenders, donors, NGOs, and civil society groups, can provide important principles and protocol to guide the application of these actions on the ground. However, the mitigation hierarchy differs from the SEA and spatial planning in one very important respect – it can be applied on a site-specific level. A company or producer can decide to apply the mitigation hierarchy as part of a voluntary determination to apply best practice and reduce its biodiversity risk. Thus the mitigation hierarchy could be relegated to project or site specific concerns, which could prevent the recognition and mitigation of critical indirect or cumulative impacts.

It therefore becomes essential to determine where in the natural resource planning and management process tools such as the SEA, spatial planning, and the principles of the mitigation hierarchy are best applied.

SEA and spatial planning have such strong political dimensions that, in most circumstances, government must play a key role in initiating, steering and validating the process, although there is also an important role for lenders/donors to play in supporting it. Both sectors have a great deal to gain from the results provided from the SEA and spatial planning tools. The data and stakeholder verified scenarios and objectives that can ensue from these processes provide a valuable framework from which to adapt policies and standards for industry development across a landscape.

At a landscape or project scale:
Government commissions a Strategic Environmental Assessment (SEA) ***to review policies and programs*** that will influence extractive industry development strategies across a landscape or region.
Spatial planning tools applied to ***reveal impact threats and identify mitigation solutions***.
Develop baseline data and on-going monitoring programs to ***quantify biodiversity values*** at the site and landscape level.
Use species distribution models and systematic conservation planning tools to ***produce best practice mitigation measures and biodiversity offset plans.***
Build the technical and management expertise to ***implement offsets.***
Ensure the permanence of implemented offsets by establishing resilient legal and financial mechanisms for offset management
At a global, regional and national scale:
Ensure the availability of technical support to lenders, companies, and governments to ***establish regulatory and voluntary standards and policies for the development and delivery of no net loss of biodiversity***
Generate lessons learned from ***a portfolio of site-based biodiversity offset and compensation projects.***

Table 2. Applying an integrated process of SEA, mitigation hierarchy and spatial planning

The business sector also gains immensely from this process, since the outputs can help define the rules under which they will operate. Thus industries would do well to be engaged throughout the spatial planning and SEA process since their readiness to respond to predicted impacts and preferred scenarios can provide them with a competitive advantage in eventual concession awards and project development. However, in places where the political will or understanding is absent, it may only be possible to increase the application of SEA and spatial planning tools by first supporting extensive capacity building for government. Wider adoption and use of SEAs, spatial planning tools, and more cumulative benefits from the guidance of the mitigation hierarchy will likely depend on provision of this capacity building and the subsequent dialogue necessary to mainstream and institutionalize it.

Despite these constraints and concerns, the number of extractive industry development projects benefiting from increased use of an integrated approach to SEA, spatial planning, and mitigation and compensation processes continues to grow worldwide. Section 4.0 looks at mechanisms being adopted by governments, lenders/donors, and companies themselves to mainstream these methods and produce a body of models and lessons learned that can give weight to the possibility of NNL of biodiversity in extractive industry projects. This learning process will be particularly important in great ape habitats, where these projects are unfortunately still few and far between. Section 5.0 provides a summary of one such project in Central Africa where an emerging mine project is working to apply spatial planning and the mitigation hierarchy in an area of abundant lowland gorilla and chimpanzee populations.

4.0 Changing rules of the game – regulating and incentivizing industry for conservation gain

As mentioned in Section 1.0, the dramatic growth in investments in the energy and minerals sector is resulting in ever-growing threats to biodiversity, ecosystem services, and communities that depend on natural resources for their livelihoods. It is very clear to society at large that these investments do not come without risks. Throughout the world, governments face growing civil unrest as communities voice their opposition to large-scale mining, oil and gas development projects that threaten their water supplies, rivers, forests, and food production. As one of the more horrifying examples, the profound social disruption that has plagued the eastern provinces in the Democratic Republic of Congo for decades originates at least in part in political maneuvering and social protests against uncontrolled mining.

However, the dramatic growth of extractive industry projects is encouraging a unique three-pronged response by governments, lenders, and the companies themselves. Cumulatively, these actors could produce a set of policies, standards, requirements and practices that could incentivize all extractive industries to do much more than just account for their adverse impacts. If enacted, applied and enforced, these measures could result in extractive processes that significantly reduce impacts on biodiversity. However, it is also increasingly obvious that the effectiveness of this response increases the more that governments engage to create and enforce standards that require best practices from industry (Figure 4). Enactment and enforcement of national standards for extract industries can thus establish the ground rules by which industry must operate, and add weight and clarification to the funding requirements now being included by lenders and donors in funding agreements.

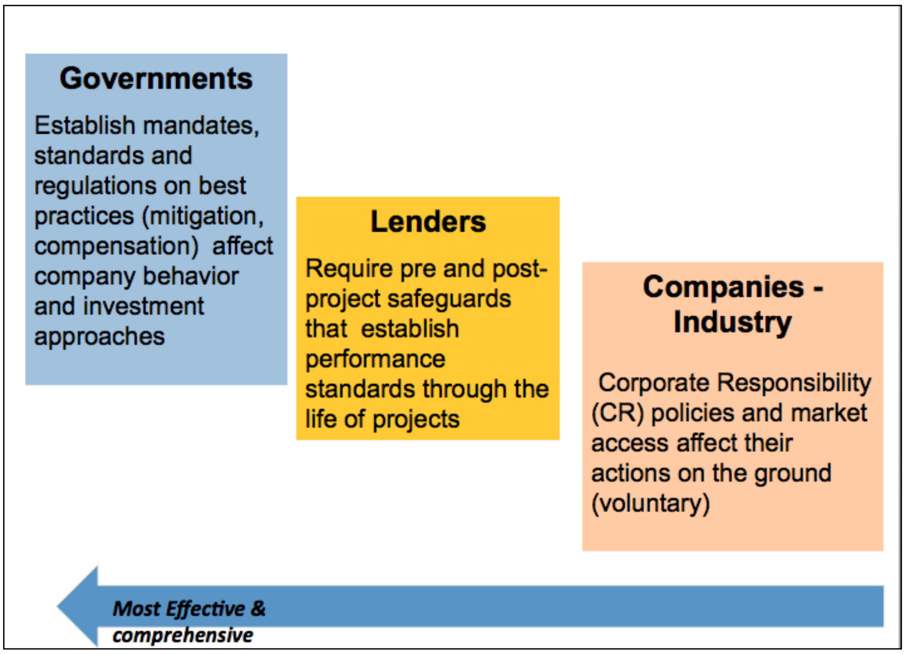

Figure 4. Institutional measures by governments, lenders, and companies to mitigate the impacts from extractive projects

4.1 National policies and standards

Governments are slowly beginning to respond and, together with civil society, are looking for solutions to these threats to ecosystem services and biodiversity. Requiring companies to follow strict mitigation requirements and then offset their impacts may provide one of the most immediate and effective options. Practical applications of these changes are still few and far between, although increasing at a noticeable pace. In May 2012 the Government of Colombia released a preliminary version of a manual aimed at achieving NNL for larger-scale infrastructure developments. They are now refining their approach and developing new regulations based on input from a stakeholder forum and financed by the World Bank. Similarly, the Government of Peru completed a draft regulation in July of 2012 requiring NNL for new infrastructure development, which it expects to finalize in 2013. The regulation builds on the results of a World Bank-funded workshop and attended by a representative of the Colombian Government in an effort to establish mechanisms to share information across the region. Both countries have now embarked on a process to operationalize these regulations and guidelines and build a robust scheme for reducing and compensating impacts over the next five years.

These experiences are gaining traction elsewhere, including in areas critical for the survival of great apes. The Government of Gabon is exploring measures to mitigate and offset the negative impacts of extractive industries, and initial conversations have also taken place in Uganda. The policy paths being pursued by these countries have the potential to create a momentum that can grow substantially as a result of cumulative exchanges and the growing pressures to respond to the pace of investment.

4.2 Funding sources and lender policies and standards

These government changes are further enhanced by increasing pressure from lenders and donors to mitigate and offset adverse impacts to biodiversity. The most dramatic evidence of these pressures is the International Finance Corporation's (IFC) Performance Standard 6 (PS6) that has now been adopted by 76 Equator Bank financial institutions responsible for more than 70% of project financing in developing countries. The IFC's PS6 requires funding recipients to demonstrate NNL for impacts in natural habitat and NPI for biodiversity as a result of project implementation activities in critical habitat. PS6 recognizes that protecting and conserving biodiversity, as defined in the Convention on Biological Diversity, is fundamental to sustainable development and to all of its investments. The applicability of this Performance Standard is established during the Social and Environmental Assessment process, while implementation of the actions necessary to meet the requirements of PS6 is managed through the client's Social and Environmental Management System.

Unfortunately, few lenders have biodiversity specialists working within their organization, and a recent study has identified that most bankers are not equipped to identify biodiversity risks. There is now a pressing need to help financial institutions to develop this technical capacity or ensure that they have easy access to it.

4.3 Internal corporate policies and standards

The emerging government and lender/donor trends are further complemented by a growing corporate interest in adopting environmental and social best practices to manage project risk. More and more natural resource extraction companies are creating voluntary internal responses to environmental and social risks through policies and protocols designed to avoid adverse impacts wherever possible, and otherwise minimize, mitigate, restore, or offset them in all other cases.

The incentives driving this behavior are largely market-based and institutional. Companies with a proactive vision of future markets realize that their readiness to comply with government, lender, or shareholder mandated requirements gives them a leading edge in obtaining and following through on the development of concessions. Companies without this readiness may be poorly positioned to participate in the growing natural resource development markets.

These growing changes in how extractive companies deliver their goods suggest that we are at an opportune time to enhance biodiversity conservation measures on the ground, and specifically improve conservation actions for great apes. However, governments and businesses have voiced a strong need for technical support and guidance to make them operational. Companies and EIA practitioners have also articulated a need for guidance and assistance to improve the EIA process, recognizing that project implementers require appropriate and proven planning and management tools to avoid and minimize their impacts and to design effective offsets. Government, industry, and civil society are also demanding access to working cases that will demonstrate how these policies can be put into practice and sustained over the long term.

4.4 Putting extractive industry conservation processes into practice

Clearly, there is much work to be done to help mainstream the application of the measures and methods outlined in Section 3.0 and now being considered by governments, lenders/donors, and companies as part of the broader solutions toolbox. A pressing task for conservation practitioners in the next decade will be to lead the work that can demonstrate where and how these new practices can be best applied, and to create the lessons learned that will lead to more and better conservation, with sustainable financing provided directly by the private sector.

It will also be essential for practitioners to ensure that the two key prerequisites for achieving NNL are included in the growing corporate, government and donor policies, namely that the fund for compensation actions comes from the entity causing the impacts, and that the compensation financing is ensured for at least as long as the impacts last, or ideally in perpetuity to ensure the permanence of conservation outcomes. Compensation funding must be sufficient to finance the management of offsets and dedicated to sustain conservation areas and actions that are not already financed.

As these demonstrations and lessons grow we will be in a position to provide a tangible response to one of the key constraints affecting great ape and broader biodiversity conservation: the lack of sufficient financing to ensure long-term support for protected areas and the sustainable management of working landscapes.

At the present time these methods are frequently applied in a piecemeal manner with little integration or coordination across regions or landscapes. More significantly, the institutional support for the use of these methods is also inconsistent and incomplete. Most applications of spatial planning and the protocol of the mitigation hierarchy occur through voluntary conditions established by companies in collaboration with NGOs or civil society. In those instances where government standards are in place or in process, significant questions remain about the long-term enforcement, and thus effectiveness, of these standards. The end result for great apes and other associated biodiversity is uncertain in all of these cases, but certainly not encouraging. In section 5.0 we look at an active extractive industry project now being developed in Central Africa in the midst of significant great ape populations in order to assess one example of the outcomes that may result from the application of these methods and processes in practice.

5.0 Case Study: The XYZ iron ore mine in Central Africa

A major international mining company is at the early stages of planning the development of a proposed iron ore mine (‘the XYZ project’) in Central Africa[1]. The mine site is located near a remote rural village located approximately 300 km northwest of the capital and more than 400 km from coastal ports. The target iron ore mineralization is located along a laterite ridge running for approximately 50 km north-south. A main road runs along the middle of this ridge (Figure 5).

The proposed XYZ mine will be located in a core area of the Guineo-Congolian Forest in an important forest-savannah transition zone known to contain biodiversity of global significance, including significant populations of lowland gorilla and chimpanzee. The source of a major river situated adjacent to the mine site has been identified by the IUCN as critical for the conservation of forest ecosystems in this basin. The national Government has recognized the conservation importance and ecological sensitivity of this region, and

[1] The XYZ project is an actual project in development. However, the name and location of this project has been changed to respect the privacy of the implementing company.

established an operating national park in the 1990s immediately adjacent to the proposed mine site. The government has now also proposed the establishment of a contiguous protected area to further ensure the long-term ecological viability of this area. The two parks will form an important contiguous transboundary protected area of over 5,000 km^2 once protected area establishment and development is complete.

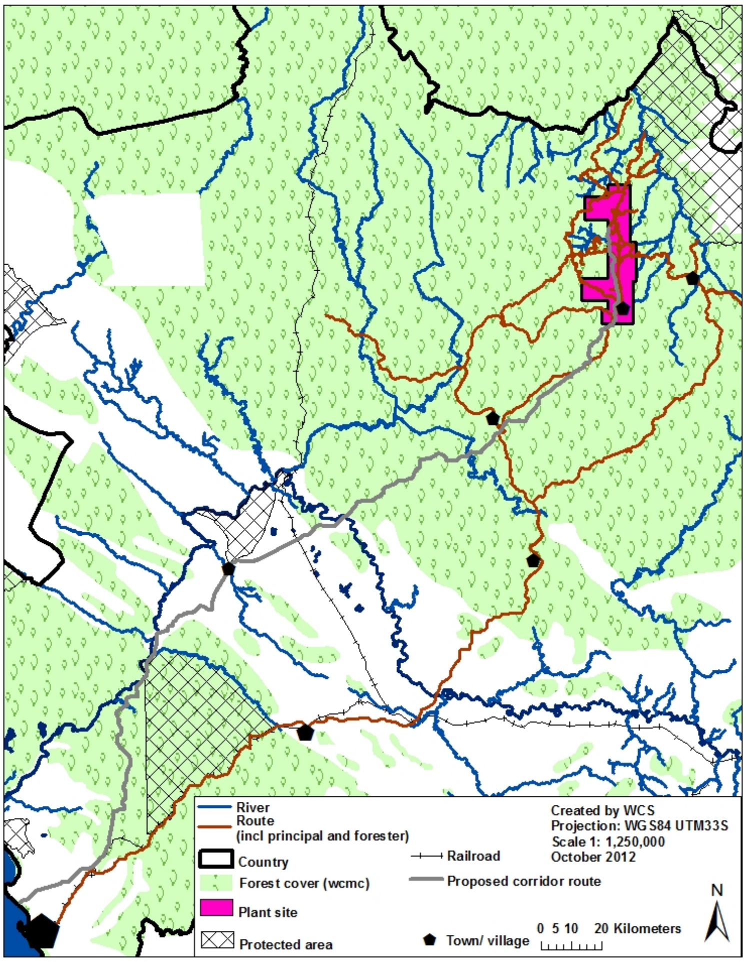

Figure 5. Location of the XYZ mine project and a proposed resource transport corridor route

The current mine concession overlaps with part of the western section of the proposed new protected area by an estimated 125 km^2 (though the ore body itself is located outside the boundary). The sub-surface rights granted to the mine concession further overlap with surface rights granted in three forest concessions, all of which are being actively logged (Figure 6).

Following earlier reconnaissance work, XYZ was awarded exploration rights for approximately 1000 km^2 after submitting a research permission application. The extracted ore will be transported via a buried slurry pipe network that travels southwest from the mine site more than 400 km to a coastal port facility.

An Order of Magnitude (OoM) work programme as part of prefeasibility studies indicated that the XYZ mine had the potential to become a world-class iron ore operation and, when fully operational, could be capable of exporting 45-50 million tons of iron ore per year for approximately 25-30 years.

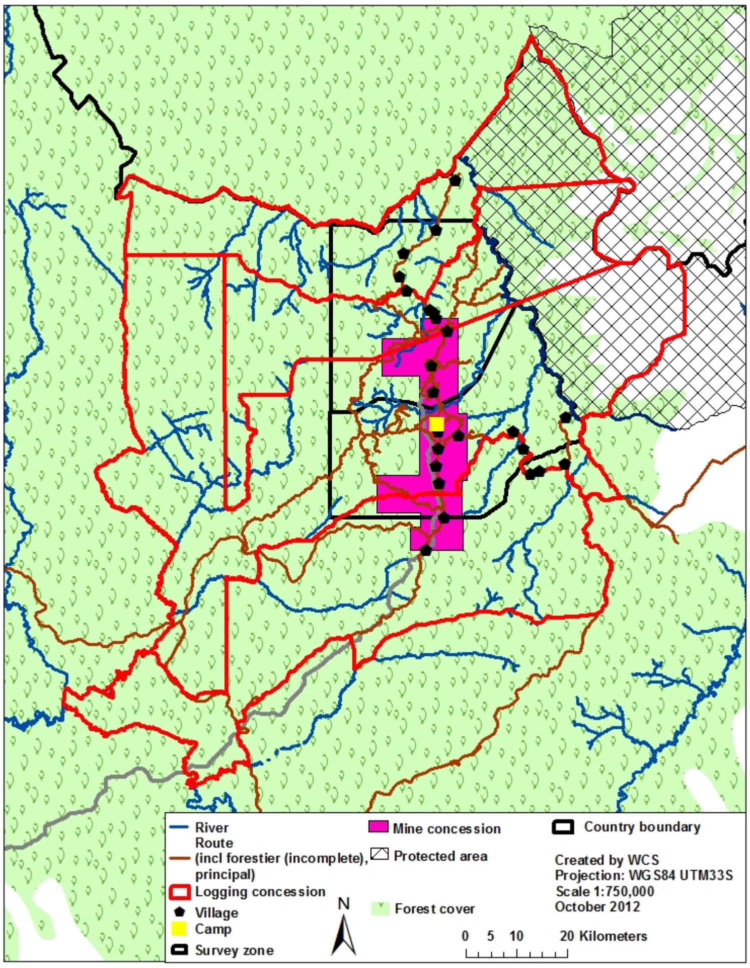

Figure 6. Location of XYZ mine concession and proposed protected area in relation to logging concessions

As part of its ongoing prefeasibility work, the mining company has undertaken detailed investigations to determine the engineering feasibility and economic viability of exploiting the iron ore resource. An environmental and social impact assessment (ESIA) and associated studies are still ongoing. More specific studies to establish biodiversity baselines and carry out ongoing monitoring of biodiversity in the mine site area and along key sections of the transport corridor have also been on-going since 2009.

5.1 Direct and indirect threats to great apes

Particular attention has been placed by the mining company on potential impacts to great apes and their habitat. Although exact population numbers are unknown for the mine site or the transport corridor, it is evident that western lowland gorilla (*Gorilla gorilla*) and western chimpanzee (*Pan troglodytes troglodytes*) do occur in the project area, although in lower numbers than are found elsewhere in the region (Figure 7). Field surveys to estimate great ape relative abundance indicated an estimate of 75.7 (45.35 – 126.33) nests per km^2, which suggests an approximate number of 900 individuals in the mine site area. While this reveals the presence of a reasonably healthy population, it is noticeably lower than similar areas surveyed elsewhere in the country with a density estimate of 234 (185 – 299), suggesting an estimate of 68,000 great apes across 27,000 km^2 of rainforest. A tract of forest of similar dimensions to the XYZ mine site is thus likely to include approximately 2,800 individuals, a nearly threefold density increase.

Ecologically, great apes and the habitat they depend on appear to be experiencing a twofold threat in both the mine site and transport corridor. On the one hand commercial and artisanal loggers are quickly degrading and eliminating habitat. Logging operations are resulting in a change in the composition and structure of habitat in forest areas. They are also greatly increasing access opportunities for hunters through new road and trail construction.

At the same time, the new employment opportunities available from the logging companies and at the mine site have significantly increased some local incomes and available revenue. This, in turn, is increasing hunting incentives as hunters seek to take advantage of the increased demand and purchasing power for bushmeat. Great apes do not appear to be specifically targeted by hunters. However, apes are killed opportunistically, and their population at a site will necessarily decline far faster than the populations of the usual targets of bushmeat hunters (large rodents and forest antelopes), as the reproductive rate of great apes is far slower than almost all other species apart from elephants. It is also likely that the general presence of the hunters probably alters feeding, movement, nesting, and dispersal behavior.

Surveys carried out in 2012 show a significant increase in hunting across a large part of the mine site and transport corridor areas compared to previous surveys carried out in 2009-2010 (Figures 7 and 8). Hunting signs were recorded over almost all of the surveyed area in 2012. There also appears to be a strong correlation between the increased hunting pressures and a dramatic increase in logging operations in the mine site area (Figures 9 and 10). This evidence was strongly correlated with results from a related bushmeat study carried out during this same time period. Field observations indicate that the loggers consume significant quantities of bushmeat, and put no restriction on who uses logging roads or trails to enter the forest. This suggests a strong correlation between expanded logging operations and increased hunting pressures, as has been evidenced throughout the forested tropics, and this can be expected to further intensify as previously inaccessible areas are opened to new logging operations.

Thus the increasing threats to great apes in this area appear to be only indirectly related to the proposed mine project. The rehabilitation or construction of new roads and access routes in the forest is certainly assisting increased hunting, both subsistence and commercial. However, the logging companies have contributed to this growing transport infrastructure, and hold perhaps the greater weight of this impact. Similarly, the influx of new and significant sources of income for local residents and immigrants is increasing the market for bushmeat and other forest products, and this new capital comes from both resident mining and logging crews. Separating out the sources and responsibilities for responding to these growing impacts thus becomes a highly complicated task.

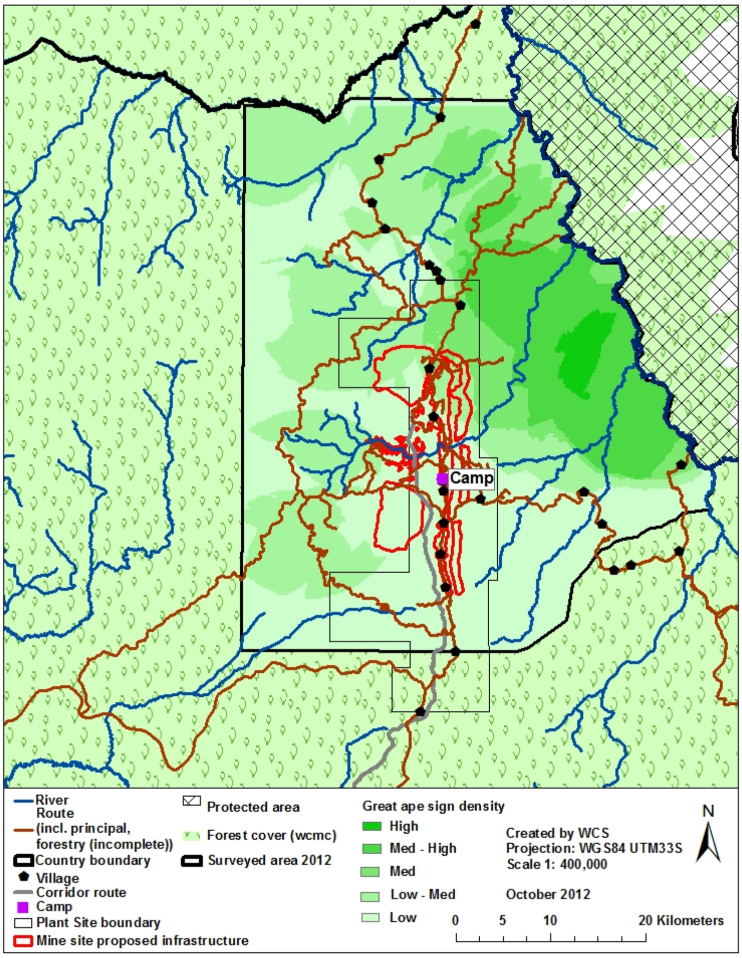

Figure 7. Great ape sign density in the area of the proposed XYZ mine project, 2012 surveys

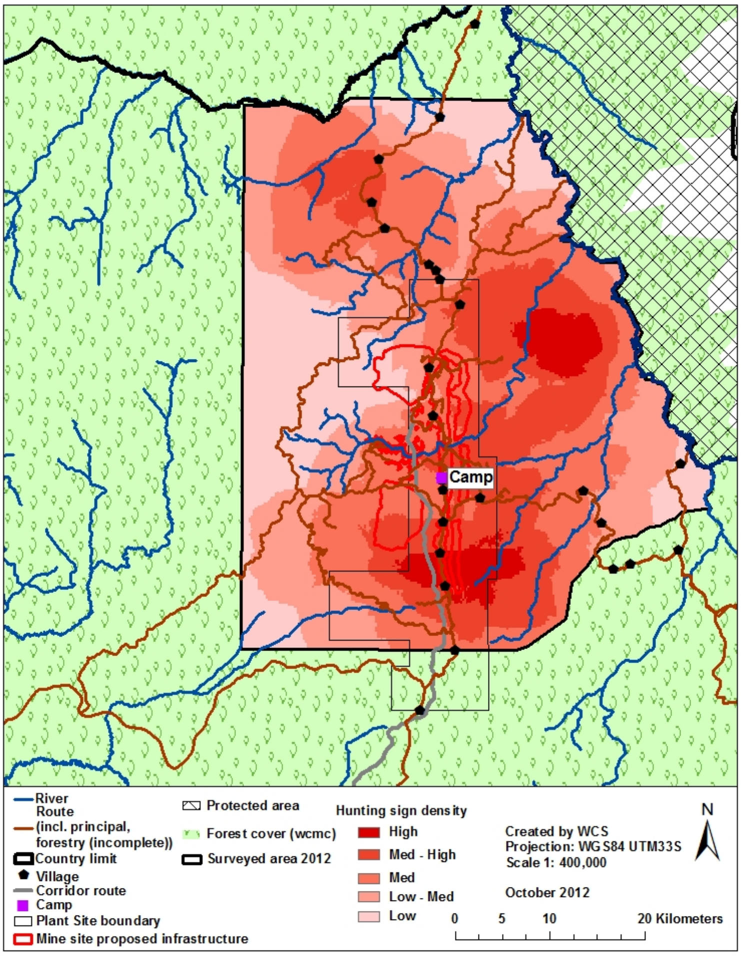

Figure 8. Hunting sign density in the vicinity of the proposed XYZ mine project. 2012 surveys.

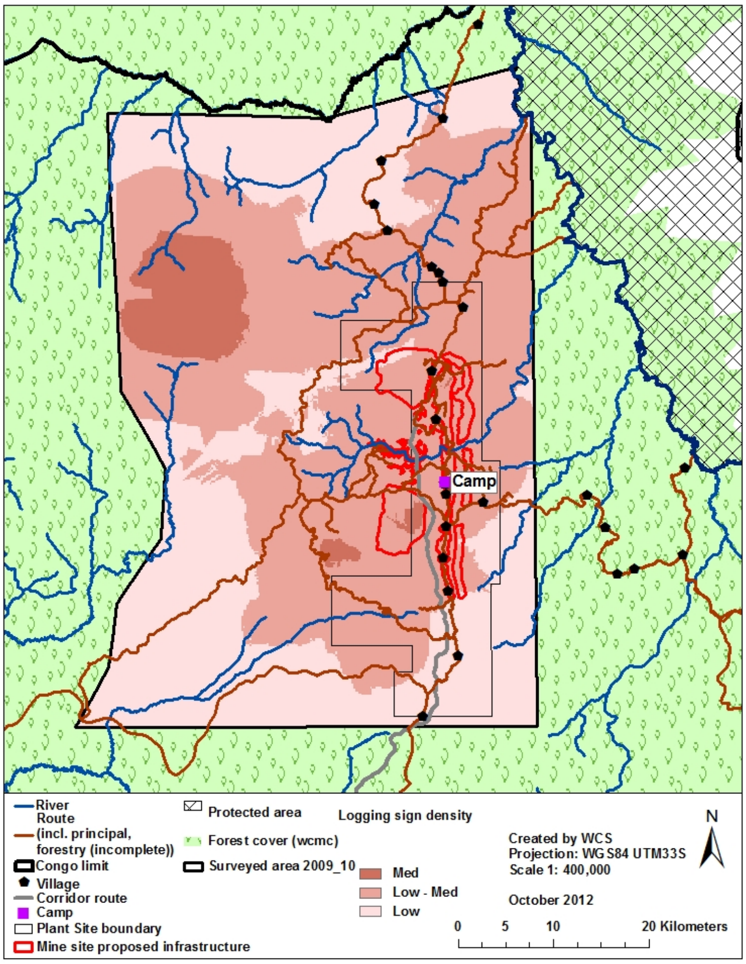

Figure 9. Logging sign density in the XYZ mine site area, 2009-2010 surveys.

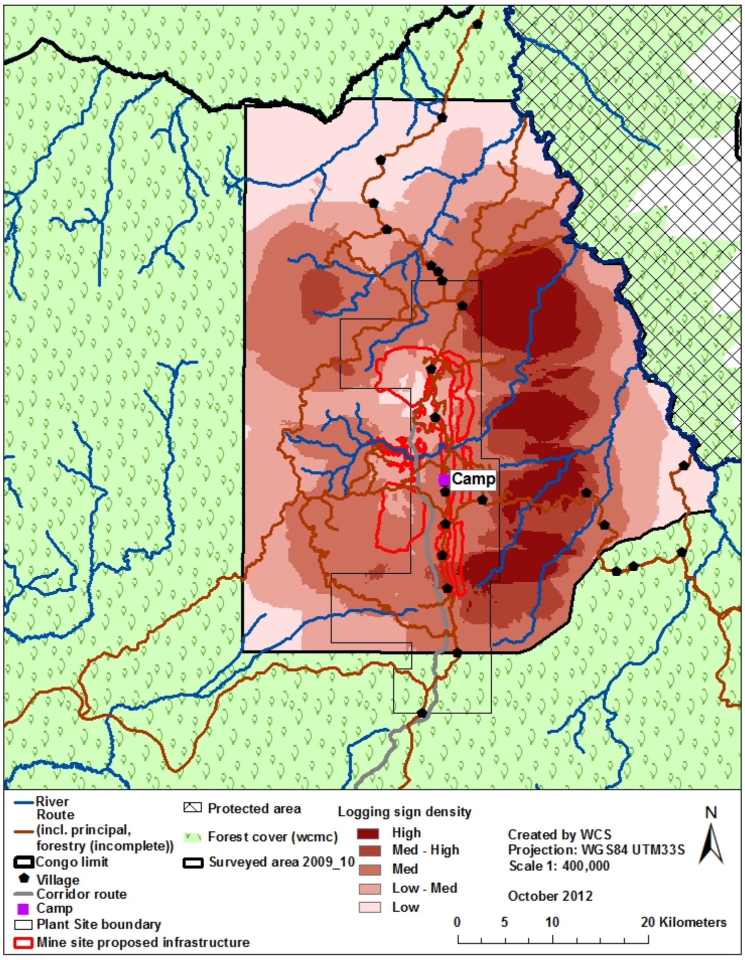

Figure 10. Logging sign density in the XYZ mine site area, 2012 surveys.

5.2 Commitment to the mitigation hierarchy: the future for great apes in the vicinity of the XYZ mine

The XYZ mine is sensitive to these overlapping responsibilities and recognizes that the threats to wildlife being experienced in the mine site area and transport corridor are severe, possibly some of the most intense in the country. However, the mine is also committed to contributing what it can to try to mitigate its share of the impacts through improved natural resource management practices, with a particular attention to monitoring of wildlife populations and enforcement of existing laws and codes.

The mining company has expressed a voluntary commitment to follow the guidelines of the IFC's PS6, and the XYZ project is now completing its comprehensive environmental and social impact assessment (ESIA) process. The ESIA process has included the use of spatial planning tools to apply remote imagery and GIS mapping of ecological characteristics in order to assess existing conditions and predict probable changes over time. However, the spatial planning has been limited to the distinct boundaries of the mine site in the concession area, and a narrow width of the proposed pipeline transport corridor extending to a coastal port. No assessment of possible indirect impacts outside of these mine site areas or of adjacent developments has been considered in these spatial analyses.

The ESIA and spatial planning work completed to date has suggested several possible measures that can be implemented to mitigate and offset direct and indirectly adverse impacts from further mine development, including support for the establishment of new protected areas, improved management of existing ones, and more effective land use practices outside of protected areas. Some of the initial actions being considered by the mine project that could benefit great apes include the following:

- *Carry out semi-annual monitoring of large mammals, including great apes, in the wet and dry seasons* to verify on-going changes in the relative abundance and distribution of mammal, avifauna, reptile and amphibian, and selected aquatic species now known to inhabit the mine site area, with particular attention given to IUCN-classified CE, EN, NT, or VU species. As part of this on-going monitoring work at least one updated survey would be carried out to verify changes in the relative abundance of large mammals in potential biodiversity offset sites, including the proposed OLNP.
- *Develop education and public awareness campaigns* to ensure that local residents have the information necessary to make responsible decisions on land and resource uses. It will be particularly important for residents to understand the benefits from the ecological services provided by mammals, birds, bats and invertebrates, including such roles as insect control, pollination and seed dispersal.
- *Continue assessments of the frequency, intensity, and duration of hunting expeditions,* and include more detailed analyses of the drivers of bushmeat hunting. Particular attention would be placed on evaluating costs and prices with an aim to identify incentives that can increase costs to hunters and sellers and increase market prices (or at least drive prices to be more competitive with domestic meat supplies).
- *Implement a hunter education program* to empower local communities to reduce their take of non-listed wildlife to scientifically determined sustainable levels, and to assist in the enforcement and prosecution of non-sustainable and illegal hunting practices. Hunter education programs can inform hunters of best management practices to reduce harvests during important reproductive and migratory periods, control the number of species taken, and result in more responsible game management. Broader environmental education programs can discourage the purchase and consumption of certain species, particularly known threatened, endangered, rare or unique species, and increase the consumption of alternative protein sources if these sources can be provided at more than competitive market prices. It will also be essential to continue these education programs over very long time periods to produce convincing behavior change. Experience with similar programs has shown that the more effective programs begin with youth and continue until these youth move into productive adulthood, at which point they can then become the role models for subsequent generations.
- *Provide support to government and NGO groups to enforce existing wildlife conservation laws* through trained and equipped teams that are empowered by local community councils and government agencies. More effective enforcement will require increased patrols by trained and equipped field technicians backstopped by empowered park management authorities, concession management teams, and local government. Enforcement would also include monitoring of hunters and harvests, and the sale of meat in markets.
- *Fund and implement existing draft natural resource management and economic development plans*. Preliminary community-endorsed plans have been prepared for several communities in the area of the proposed mine, and include a wide range of activities that could help reduce bushmeat demand. The plans would be amended to establish a system of collaborative management between village councils, the mine, national government, and NGOs to facilitate monitoring and enforcement of bushmeat laws.
- *Increasing the availability of domestic meat supplies* could reduce the severe price difference that now exists in local markets. Supplies of domestic meat are often done at logging concession markets, but the market price is often higher than bushmeat.

This is counterproductive. Instead, it is absolutely vital for concessionaires to subsidize domestic meat supplies so that they are ultimately cheaper than bushmeat.

- *Design a biodiversity offset and compensation plan.* The tentative options for a compensation plan include the possibility of providing the financial and technical support for the establishment and management of the proposed new protected area contiguous to the existing national park. Consideration is also being given to providing long-term financial and technical support to another existing protected area located adjacent to parts of the proposed transport corridor. The work of designing an appropriate offset or compensation mechanism for the XYZ mine is proceeding, but the establishment of the new protected area has a strong political dimension to it that requires parallel action by the government to manage the multiple other land uses that are factors in the associated landscape, particularly commercial logging operations. While the results from the proposed offset mechanism at the mine will not necessarily resolve all impending risks and threats to biodiversity, the implementation of the mitigation hierarchy for a project of this type would constitute significant progress in the efforts to reconcile extractive exploitation projects in Africa with significantly improved safeguards for biodiversity and the ecosystem services upon which local human populations depend.

If applied, these actions could collectively result in greatly reduced impacts to great apes in particular, and local biodiversity in general. Some gorilla and chimpanzee groups should benefit from the establishment of new protected areas and connecting corridors, and improved management in existing ones. Targeted and frequent monitoring should produce the scientific information that can support more effective decision making and adaptive management in these reserves and surrounding buffer zones.

However, the proposed mitigation and compensation actions are unfortunately limited in geographic and institutional scope. They will principally respond to the voluntary commitments of the mining company, and are designed to reduce or compensate for direct impacts expected from the mining activities. Other indirect and cumulative impacts are unlikely to be fully resolved by this mitigation and compensation process, including the dramatic impacts incurred by intensified illegal logging and hunting throughout the affected environment. The limited capacity and weak political will of national and local government agencies to enforce existing policies, or forge and implement much needed new ones adds to the obstacles. Without immediate action to control logging and commercial hunting outside the mine site, the end result is likely to be a continued decline in the size, integrity, and health of great ape populations in the immediate mine site and surrounding areas. This likelihood reinforces the need for extractive industry conservation strategies that include and, indeed are driven by national standards and policies that ensure that cumulative impacts are recognized early in the development process, and indirect impacts are included in mitigation responses.

6.0 Conclusions and recommendations

The XYZ mine project provides an important model showing some of the real benefits that can be gained when extractive industries commit to biodiversity conservation goals and apply some of the more promising mitigation tools. However, the project also reveals some of the limitations of the tools available to respond to risks to great apes from extractive industries, and the pressing need for more rigorous policies to ensure that these tools are applied in a way that fully captures the cumulative impacts occurring across a landscape. It is incredibly important for industries to recognize the immediate and enduring impacts individual projects can have on local populations of apes and associated biodiversity. The actions being taken by companies to apply technologies to anticipate potential impacts and carry out mitigation measures that will avoid, minimize, or compensate for them must be applauded and held up to serve as essential lessons to guide our conservation strategies.

However, the long-term resolution of the threats to great apes from expanding extractive industry developments will require an approach that encompasses the multi-faceted sources of impacts. It cannot be isolated to one project or even industry. It will require responses that include more widespread adoption of landscape and regional scale planning and decision making tools, such as SEAs and spatial planning frameworks, and the mainstreaming of standards and protocol such as the mitigation hierarchy into the procedures of government bodies. These methods and measures must occur at scales that permit full recognition of cumulative impacts if we are to even approach the possibility of no net loss of biodiversity, and specifically the long-term security of viable great ape populations and habitat. Moreover, counting only on the good will of companies or lender requirements will fall short. Policy options must also fit into the mix so that compliance requirements to address cumulative impacts on great ape habitat are put in place and monitored. Anything less will leave us far short of a scenario in which industry and great apes can co-exist in a working landscape.

References

African Union, 2006. *Fuelling Africa's Sustainable Development: The Oil And Gas Perspectives* - First African Union Conference Of Ministers Responsible For Hydrocarbons (Oil And Gas) 11-15 December 2006, Cairo, Egypt African Development Bank/African Union, 29p.

Business and Biodiversity Offset Program (BBOP), 2012. *Standard on Biodiversity Offsets*. Washington, D.C.: Forest Trends. 29p. http://bbop.forest- trends.org/guidelines/Standard.pdf

Campbell, Bonnie, 2003. Factoring in Governance is Not Enough – Mining Codes in Africa, Policy Reform and Corporate Responsibility. *Journal of Minerals and Energy*, Vol. 18, No.1, pp 2-13.

Carroll, Nathaniel, Jessica Fox and Ricardo Bayon, 2009. *Conservation and Biodiversity Banking: A Guide to Setting Up and Running Biodiversity Credit Trading Systems*. Earthscan Publishers. 320p.

Carter, Assheton Stewart, Keith Alger , Larry Gorenflo, and Patricia Zurita, 2006. *Mainstreaming Biodiversity into Oil and Gas Development*. Washington, D.C.: Conservation International. 17p.

Casteel, Kyran, 2008. Central African Exploration Boom. *Energy and Mining Journal*, March 2008, pp. 46-48.

Colin A. Chapman, Michael J. Lawes, and Harriet A. C. Eeley, 2006. What hope for African primate diversity? *African Journal of Ecology* 44, 116–133

Cook, Nicolas, 2012. *Conflict Minerals in Central Africa: U.S. and International Responses*. Washington, D.C., U.S. Congressional Research Service, 38 p.

Dennys, Katharine, 2012. *Is East Africa the New Frontier for Oil and Gas Exploration Opportunities?* Consultancy Africa Intelligence, http://www.consultancyafrica.com/index.php?option=com_content&view=article&id=949: is-east-africa-the-new-frontier-for-oil-and-gas-exploration-opportunities&catid=57:africa- watch-discussion-papers&Itemid=263

Downey, Morgan, 2009. *Oil 101*. Wooden Table Press LLC. www.morgandowney.com 438p.

Economic Commission for Africa (ECA), 2011. *Minerals and Africa's Development: The International Study Group Report on Africa's Mineral Regimes*. Addis Ababa, Ethiopia, 230p. http://new.uneca.org/Portals/15/CrossArticle/1/Documents/ISG_Report_eng.pdf

Economic Commission for Europe (ECE), 2008. *Spatial Planning: Key Instrument for Development and Effective Governance with Special Reference to Countries in Transition*. Geneva: United Nations Publication. 56p.

Energy and Biodiversity Initiative, 2010. *Integrating Biodiversity Conservation into Oil and Gas Development*. Accessed at http://www.theebi.org/pdfs/ebi_report.pdf.

Gajigo, Ousman, Emelly Mutambatsere and Guirane Ndiaye, 2012. *Gold Mining in Africa: Maximizing Economic Returns for Countries*. Working Paper Series #147. African Development Bank, Tunis, Tunisia. 52 p.

Hickey, J.R., Nackoney, J., Nibbelink, N.P., Blake, S., Bonyenge, A., Coxe, S., Dupain, J., Emetshu, M., Furuichi, T., Grossman, F., Guislain, P., Hart, J., Hashimoto, C., Ikembelo, B., Ilambu, O., Inogwabini, B.-I., Kavunga, R., Liengola, I., Lokasola, A.L., Lushimba, A., Maisels, F., Masselink, J., Mbenzo, V., Mulavwa, N.M., Ndunda, N.M., Omasombo, V., Reinartz, G.E., Sakamaki, T., Strindberg, S., Takemoto, H., Vosper, A., Kühl, H., 2012. A Spatially explicit rangewide model of suitable conditions for the bonono (*Pan paniscus*) for conservation planning. Diversity and Distributions. In preparation.

Ingram, Vern, Julius Chupezi Tieguhong, Jolien Schure, Eric Nkamgnia and Maurice Henri Tadjuidje, 2011. *Where artisanal mines and forest meet: Socio- economic and environmental impacts in the Congo Basin*. Natural Resources Forum 35 (2011) 304–320

International Council on Mining and Metals, 2005. *Biodiversity Offsets: A Briefing Paper for the Mining Industry*. ICMM, London, United Kingdom. 25p.

Isaac, Nick J.B. and Guy Cowlishaw, 2004. How Species Respond to Multiple Extinction Threats. Proceedings: *Biological Sciences*, Vol. 271, No. 1544 (Jun. 7, 2004), pp. 1135-1141

IUCN, 2011. *Rapport de l'atelier pour l'élaboration d'un plan d'actions pour la conservation des bonobos*. Kinshasa, January 2011.

Kasekende, Louis and Elham M.A. Ibrahim, 2009. *Oil and Gas in Africa*. African Development Bank/Oxford University Press. 252 p.

Kloff, Sandra, Clive Wicks, and Paul Siegal, 2010. *Extractive Industries and Sustainable Development: A Best Practice Guide*. World Wildlife Fund, 124p.

Kormos, R., C. Boesch, M. I. Bakarr and T. M. Butynski (eds.). 2003. *West African Chimpanzees: Status, Survey and Conservation Action Plan*. IUCN – The World Conservation Union, Gland, Switzerland.

Kormos, Rebecca and Cyril Kormos, 2011a. *International Finance Corporation Performance Standards 1 and 6: Their potential impact on Endangered and Critically Endangered Species with a particular focus on Great Apes*. Arcus Foundation, Cambridge, UK, 15 p.

Kormos, Rebecca and Cyril Kormos, 2011b. *Towards a Strategic National Plan for Biodiversity Offsets for Mining in the Republic of Guinea, West Africa With a Focus on Chimpanzees.* Arcus Foundation, Cambridge, UK, 92p.

Morgan, David B. and Crikette M. Sanz, 2012. *African Great Ape Conservation in the Age of Industrialized Timber*. 42 pp.

Nicholas, Aaron, Andrew Dunn, and Dirck Byler, 2010. Conserving the Most Endangered Gorilla. *Endangered Species Bulletin*. Spring 2010, pp. 20-22

Plumptre A.J., Rose R., Nangendo G., Williamson L., Didier K., Hart J., Mulindahabi F., Hicks C., Griffin B., Ogawa H., Nixon S., Pintea L., Vosper A., McLennan M., Amsini F., McNeilage A., Makana J.R., Kanamori M., Hernandez A., Piel A., Stewart F., Moore J., Zamma K., Nakamura M., Kamenya S., Idani G., Saka T., Yoshikawa M., Greer D., Tranquilli S., Beyers R., Bennett E., 2010. *Eastern Chimpanzee (*Pan troglodytes schweinfurthii*): Status Survey and Conservation Action Plan 2010-2020*. Gland, Switzerland: IUCN

PriceWaterhouseCoopers. 2010. *Biodiversity Offsets and the Mitigation Hierarchy: A review of current application in the banking sector*. Business and Biodiversity Offsets Programme and UNEP Finance Initiative, 43 p.

Priddle, Robert, ed. 2012. *Golden Rules for a Golden Age of Gas*. International Energy Agency, Paris, France. 150p.

ten Kate, K., Bishop, J., and Bayon, R. 2004. *Biodiversity offsets: Views, experience, and the business case*. IUCN, Gland, Switzerland and Cambridge, UK and Insight Investment, London, UK. ISBN: 2-8317-0854-0. http://cmsdata.iucn.org/downloads/bdoffsets.pdf

Tranquilli, S., Abedi-Lartey, M., Amsini, F., Arranz, L., Asamoah, A., Babafemi, O., Barakabuye, N., Campbell, G., Chancellor, R., Davenport, T.R.B., Dunn, A., Dupain, J., Ellis, C., Etoga, G., Furuichi, T., Gatti, S., Ghiurghi, A., Greengrass, E., Hashimoto, C., Hart, J., Herbinger, I., Hicks, T.C., Holbech, L.H., Huijbregts, B., Imong, I., Kumpel, N., Maisels, F., Marshall, P., Nixon, S., Normand, E., Nziguyimpa, L., Nzooh-Dogmo, Z., Tiku Okon, D., Plumptre, A., Rundus, A. Sunderland-Groves, J., Todd, A., Warren, Y., Mundry, R., Boesch, C., Kuehl, H., 2011. Lack of Conservation effort rapidly increases African great ape extinction risk. *Conservation Letters*. 10.1111/j.1755

Turner, S.D., 2012. *World Heritage Sites and the Extractive Industries*, IUCN/World Heritage Center consulting report, 75p.

U.S. Environmental Protection Agency (EPA), 2012. *The Oil and Gas Development Process*. http://www.oilandgasbmps.org/resources/development.php

Villegas, Cristina, Ruby Weinberg, Estelle Levin, and Kirsten Hund, 2012. *Artisanal and Small-scale Mining in Protected areas and critical Ecosystems Programme (ASM – PACE): A Global Solutions Study*. Estelle Levin Ltd and World Wildlife Fund. 82p.

Vosper, Ashley, 2012. Pers.comm.

Walsh, Peter D., Kate A. Abernethy, Magdalena Bermejo, Rene Beyersk, Pauwel De Wachter, Marc Ella Akou, Bas Huijbregts, Daniel Idiata Mambounga, Andre Kamdem Toham, Annelisa M. Kilbournk, Sally A. Lahm, Stefanie Latour, Fiona Maisels, Christian Mbinak, Yves Mihindouk, Sosthe`ne Ndong Obiang, Ernestine Ntsame Effa, Malcolm P. Starkey, Paul Telfer, Marc Thibault, Caroline E. G. Tutin, Lee J. T. White, and David S. Wilkie, 2003. Catastrophic ape decline in western equatorial Africa, *Nature*, Volume 422:10, April 2003, pp 611-614