Photo: Industrial development projects are present in all ape range countries and are among the greatest threats to their survival. © Morgan and Sanz, Goualougo Triangle Ape Project, Nouabalé-Ndoki National Park

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CHAPTER 7

Status of Apes: Impacts of Industrial Development Projects on Apes

Introduction

Industrial development projects—defined here as agribusiness, hydropower, infrastructure, logging and mining activities—are present in all ape range countries and are among the greatest threats to their survival (Arcus Foundation, 2014). The direct footprint of a single project may be limited and easily quantifiable; cumulatively, however, these projects have significant impacts on apes and their habitats, especially if their indirect impacts and associated infrastructure are taken into consideration (Arcus Foundation, 2018). Indeed, projects that are intertwined, such as dams that are built to provide electricity for mining companies, contribute to cumulative impacts on ape populations over large areas and extended periods of time.

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The global human population growth rate and associated demand for land and natural resources indicate a trend that is likely to worsen and become more unsustainable (Arcus Foundation, 2018; Bologna and Aquino, 2020). While populations need places to grow and thrive, the affluent citizens of the world tend to engage in unsustainable consumption patterns and lifestyles that are contributing to most of the deleterious environmental and social impacts noticeable today (Marques *et al.*, 2019; Wiedmann *et al.*, 2020).

Part of the solution is societal change, including a transition to an economy that meets people's needs without exceeding planetary boundaries (Hickel, 2019). The potential benefits of such a change are promising, but they are not likely to materialize unless the conceptual models and frameworks that underpin this transition consider all possible ramifications. In shifting their reliance from fossil fuels to renewable energy, for example, governments may depend on dams and other "green" projects whose effects on biodiversity can also be devastating. In some cases, such projects drive the sourcing of additional minerals from ape habitats to satisfy new demand, such as the nickel required for the construction of wind turbines (World Bank, 2017).

Overall, many projects of concern are being developed and planned in ape ranges, some of them large-scale. The Belt and Road Initiative, for instance, will impact many protected areas that are home to apes, leading to significant fragmentation of their habitat (Arcus Foundation, 2018; Ng *et al.*, 2020). It is difficult to estimate what proportion of apes may be affected, although it is likely to be high, given the significant overlap between industrial development projects and ape ranges (Sloan *et al.*, 2018; Wich *et al.*, 2014a).

Without measures to mitigate the impact of these projects, the future for apes appears bleak (Sloan *et al.*, 2018; Wich *et al.*, 2014a). National laws and regulations are improving within ape range states, however. Many countries are requiring biodiversity offsets, yet their use for great apes remains controversial (Arcus Foundation, 2018; see Box 7.1). Meanwhile, some banks have improved their lending standards and are taking certain biodiversity risks more seriously, which sometimes prevents the funding of projects that could have significant impacts on biodiversity (WWF, 2018). The public is also increasingly putting pressure on companies to provide products that are sourced ethically and sustainably (Viciunaite and Alfnes, 2020; Zhang and Zhu, 2019). Over the past few years, many certification schemes and auditing systems have been created or expanded to include a biodiversity component (IRMA, 2018; ResponsibleSteel, 2022; Tayleur *et al.*, 2017). In addition, an increasing number of large-scale industrial projects, such as mining projects, are developing ape-specific mitigation measures and action plans (IUCN, 2014; IUCN SSC PSG, 2020b).

Nevertheless, much more needs to be accomplished to ensure the long-term survival of all ape species. Stakeholders still lack a basic understanding of the long-term impacts of different types of industry on apes, and of the effectiveness of mitigation measures (Junker *et al.*, 2020). Furthermore, many industrial development projects occur in remote locations, far from external scrutiny, rendering independent monitoring difficult (Arcus Foundation, 2015).

Another factor to consider in developing mitigation strategies is that industrial development projects have different effects across ape taxa, in line with each taxon's distinctive ecological requirements, social systems, demographics and ranging patterns (see the Apes Overview). The cultural behaviors of each species—and the personality of each individual ape—can also influence responses to impacts, making it difficult

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to develop uniform mitigation strategies (Morgan *et al.*, 2018; Pederson, King and Landau, 2005).

Ape mitigation measures are more likely to be effective if they are tailored to the specific species, subpopulations and unique context of a project site, and if they take into consideration the interconnectedness of people, wildlife and their shared environments—including how disturbances in one of these can lead to disturbances in the others (see Chapter 2). Examples of such transmissions include the recent spread of zoonotic diseases linked to human encroachment into wild habitat, and the wildlife trade (Jones *et al.*, 2008; Wilkinson *et al.*, 2018).

Since the first volume of *State of the Apes* was published, two main factors have led to enhanced mitigation efforts: national and lending standards around biodiversity management have improved, while more research has shed light on how industrial development projects affect apes (Arcus Foundation, 2014; Lindshield *et al.*, 2019). This chapter provides summaries of the potential impacts of these projects on apes, species-specific responses to identified impacts, and the best mitigation strategies currently available to ensure positive conservation outcomes for apes. It also presents an update on development projects examined in the different volumes of the *State of the Apes* series. As discussed in Case Study 7.1, 7.2 and 7.3, some of these proceeded as planned, while others have been halted or changed ownership.

Photo: Wherever several industrial development projects occur in a single ape habitat, their cumulative impacts hinder ape population connectivity and represent a serious threat to their long-term viability. © HUTAN-Kinabatangan Orang-utan Conservation Project

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The key findings from this chapter are:

- The number of industrial development projects in ape habitat is significant and likely to grow in tandem with the global demand for infrastructure, technology and energy.
- Wherever several industrial development projects occur in a single ape habitat, their cumulative impacts hinder ape population connectivity and represent a serious threat to their long-term viability.
- The impacts of industrial development differ across ape subgroups and species, pointing to a need for mitigation measures that are tailored to individual populations or species.
- Various mitigation strategies aim to minimize the impacts of industrial development projects on biodiversity, but few specifically address impacts on apes.
- By facilitating the exchange of advice, the Avoid, Reduce, Restore and Conserve (ARRC) Task Force of the International Union for the Conservation of Nature (IUCN) Species Survival Commission may help to bridge the gap between stakeholders of industrial development projects, on the one hand, and primatologists and conservationists, on the other.
- More long-term research studies are needed to assess the impacts of industrial development projects on apes; in turn, the findings can be used to improve mitigation efforts.

Ape Behavioral and Ecological Characteristics

The five ape taxa differ in their type of social systems, their diet and other behavioral and ecological characteristics. These traits and features can influence how they might respond to impacts from industrial development projects, and which mitigation approaches are most effective. Table 7.1 summarizes these characteristics for each ape taxon; for more details, see the Apes Overview.

Variations also exist across different species and subspecies, especially when they occur in different habitat types (Furuichi, 2009; Moore *et al.*, 2017). By taking into account both site-specific ecological conditions and apes' behavioral characteristics, survey planning and mitigation measures can better protect and respond to species- and habitat-specific needs. Chimpanzees, for example, are found at greater density in forested areas than in forest–savannah mosaic habitats, where they make use of larger territory to access sufficient resources (Lindshield *et al.*, 2021). A survey area may thus need to be larger in a forest–savannah environment than in forest regions. Regardless of the habitat type, however, a survey that extends beyond a development project's physical boundaries is more likely to identify all the areas of ape territory that overlap with the project area.

Some of the ape taxa occur sympatrically, or in the same geographic area; such is the case for gorillas and chimpanzees, as well as orangutans and gibbons (see the Apes Overview). Wherever these species overlap, they have developed mechanisms to avoid each other and cohabit within the same landscape (Basabose and Yamagiwa, 2002; Marshall, Cannon and Leighton, 2009). With further reduction of their habitat, however, that coexistence might be put under pressure, as feeding competition can increase given that the different taxa depend on some of the same resources. Furthermore, the killing of gorillas by chimpanzees was recently documented for the first time and could increase with further disturbances to their habitat (Southern, Deschner and Pika, 2021).

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TABLE 7.1

Behavioral and Ecological Characteristics of Apes, by Taxon

Characteristics	Bonobo	Chimpanzee	Gibbon	Gorilla	Orangutan
					
Number of species	1	1	20	2	3
Countries within their range	1	21	10	9	2
Habitat types	Forest; forest–savannah mosaic	Forest; forest–savannah mosaic	Forest	Forest; forest–savannah mosaic	Forest
Locomotion	Terrestrial	Terrestrial	Arboreal	Terrestrial	Arboreal
Diet	Generalist; frugivore	Generalist; frugivore	Generalist; frugivore	Generalist; frugivore/ herbivore	Generalist; frugivore
Territoriality	No	Yes	Yes	No	No
Social organization	Community; multi-male–multi-female fission–fusion	Community; multi-male–multi-female fission–fusion	Groups; adult pair and offspring	Groups; variable	Most frequently mother–offspring social unit

Source: Apes Overview

Overall, apes are effective flagship species: they are charismatic, live mainly in pristine habitat, range over large areas and are good seed dispersers. Owing to their sensitivity to habitat disturbance, most ape species also serve as a protective umbrella for equally or less sensitive species (see the Apes Overview). The conservation of ape habitat may thus benefit a wider range of biodiversity and restricted-range species.

Industries Prevalent in Ape Ranges

Industrial development projects are present in all ape ranges, where their numbers have grown since the publication of the first volume of *State of the Apes* (Arcus Foundation, 2014; UNGA, 2019). The representation of different industrial sectors varies across ranges, reflecting factors such as the historical and political context, the local geological formations and the presence of major rivers (Arcus Foundation, 2014, 2015, 2018). A detailed understanding of these projects can help conservationists and other practitioners anticipate where major threats lie for each taxon and genus; it can also assist them in determining where urgent action is required. Hydroelectric power dams, for instance, are absent in the bonobo range, but they are a significant threat to gibbons, as 165 dams are planned or under construction in their range (Arcus Foundation, 2018). This knowledge could help prioritize the development of appropriate mitigation strategies to tackle impacts of dams on gibbons, whereas no such action would be required for bonobos.

To provide an indication of the risks to each of the five ape taxa, Annex VII ranks the anticipated prevalence of agribusiness, dams, infrastructure, logging and mining

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Photo: An indirect impact of industrial projects is easier access to remote areas, typically following project-related road construction or rehabilitation. Consequences include the creation or expansion of hunting grounds and greater interaction between humans and apes, which increases the risk of disease transmission. © Ronan Donovan

projects in their ranges over the 2020–25 period. These various industrial projects impinge on apes at different spatial and temporal scales. For example, logging normally occurs temporarily in one area over several months, which can give habitats a chance to recover. In contrast, mining activities tend to be sustained in the same areas for decades, and dam projects flood areas permanently (Arcus Foundation, 2014, 2015, 2018).

Impacts on Apes

Types of Impact

The negative effects of industrial projects on apes can be grouped into three categories: 1) direct; 2) indirect; and 3) cumulative (Arcus Foundation, 2014). Direct impacts are associated with the project's activities, or its ecological "footprint," which may involve removing all the local vegetation to build access roads and camps, for example. These impacts are usually the easiest to anticipate as they are related to project-specific components.

More difficult to predict—but usually more significant—are indirect impacts, which are "by-products" triggered by the presence of a project. These impacts usually extend beyond a project's physical boundary (Arcus Foundation, 2014). Project managers typically attempt to defer responsibility for managing indirect effects to regional government authorities who act at a larger scale. One type of indirect impact is an increase in the population of villages in or close to a project area, the result of in-migration of people seeking work. Such influxes usually lead to higher pressure on natural resources and exacerbate existing threats to apes (Arcus Foundation, 2014). Another indirect impact is easier access to remote areas, typically following project-related road construction or rehabilitation. Consequences include the creation or expansion of hunting

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grounds and greater interaction between humans and apes, which increases the risk of disease transmission (see Chapter 1).

Cumulative impacts are the successive, incremental and combined direct and indirect effects of several development projects on the same landscape. These impacts can extend over a large area, potentially straddling borders if the projects are based in more than one country (Arcus Foundation, 2014). The need to operate within different countries' legal and regulatory frameworks can complicate the management of cumulative impacts.

Ape Responses to Impacts

As mentioned above, apes respond to impacts according to their socioecological characteristics (see the Apes Overview). Since chimpanzees are more terrestrial than arboreal gibbons, for example, they can more easily travel on the ground between different forest fragments. When development projects cause disturbances or destruction of habitat that force groups of territorial apes to flee into neighboring territories, intergroup conflicts can arise, sometimes with fatal outcomes (Boesch *et al.*, 2008; Mitani, Watts and Amsler, 2010; Morgan and Sanz, 2007). While several studies have investigated how apes respond to varying impacts from different industries, many knowledge gaps remain, as discussed in the section on long-term research and monitoring (see below).

Mitigation Approaches

This section outlines mitigation strategies that are designed to minimize impacts of industrial development projects on biodiversity, including apes. While international lenders, governments, non-governmental organizations (NGOs) and companies tend to refer to these strategies as "best practice," they do attract criticism, especially with respect to their implementation and monitoring (Evans, Wingard and Humle, 2021).

Lender standards, for example, have come under fire owing to a lack of empirical evidence that they are achieving conservation objectives over long time scales. This absence of data is linked to a lack of standardized evaluation criteria, limited project monitoring, under-reporting of failing projects and a general dearth of project information (Kormos *et al.*, 2014). Certification schemes have also attracted criticism (Morgans *et al.*, 2018). Opportunities for strengthening mitigation strategies thus abound, especially with respect to tackling impacts on apes.

The Mitigation Hierarchy

Many industrial project developers are using a framework known as the mitigation hierarchy to guide them in reducing negative impacts on biodiversity (BBOP, 2013; CSBI and TBC, 2015). Implementation of the mitigation hierarchy is increasingly required by lenders and voluntarily adopted by companies (de Silva *et al.*, 2019). It is also being incorporated into national legislation in many ape range states (Evans, Wingard and Humle, 2021; GIBOP, 2019).

The mitigation hierarchy can be applied throughout the lifecycle of a project. It promotes an iterative application of the following four sequential steps (see Figure 7.1 and Annex VIII):

- **Avoidance**. This first step is the most crucial and most effective for minimizing negative impacts on ape populations and their habitats (Phalan *et al.*, 2018). It is applied most rigorously to the highest-priority biodiversity features, such as apes. Effective avoidance measures are based on robust baseline data and implemented from the design stage

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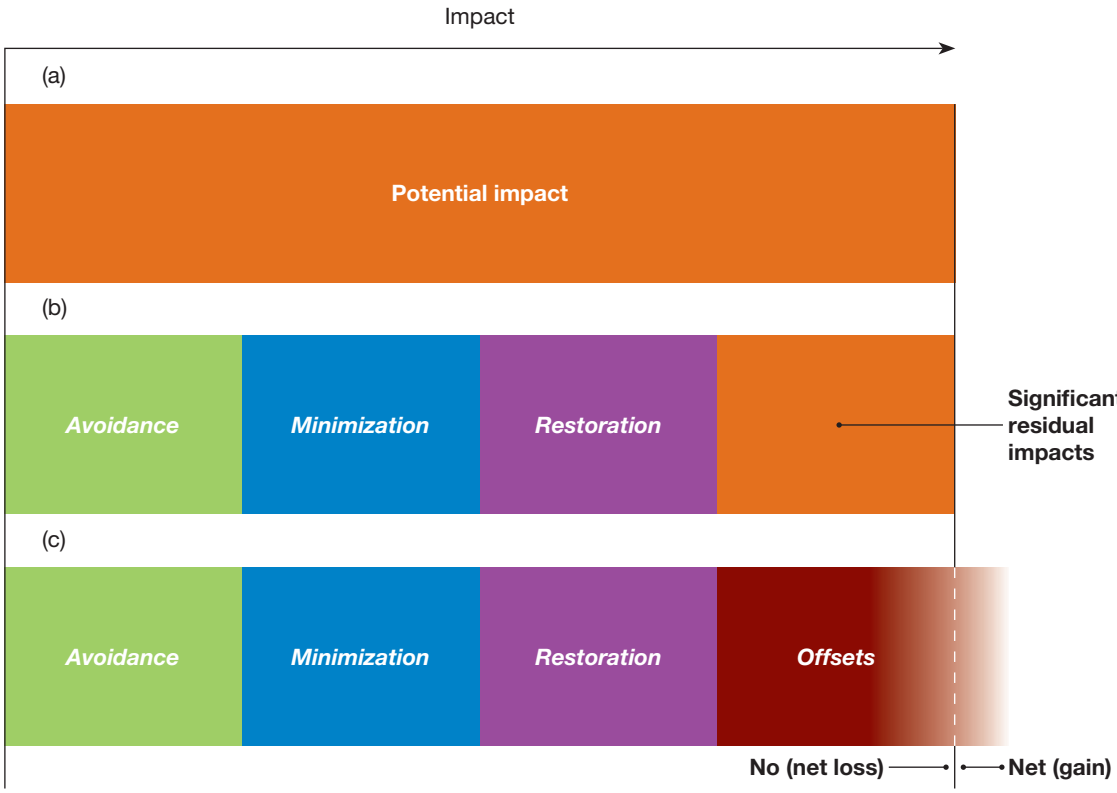
FIGURE 7.1

The Mitigation Hierarchy



Notes: This diagram shows the application of the four steps of the mitigation hierarchy—avoidance, minimization, restoration and offsets—to reduce a project's impacts. In bar (a), all potential project impacts are identified and estimated. In bar (b), avoidance, minimization and restoration measures have been applied and the project's residual impacts can be quantified. In bar (c), offsets are used to compensate for residual impacts to reach no net loss for natural habitat and to secure a net gain for critical habitat.

Source: CSBI and TBC (2015)

of a project, such as through careful spatial or temporal siting of infrastructure or disturbance away from ape habitat (Arcus Foundation, 2018; CSBI and TBC, 2015). One example of avoidance is the re-rerouting of the Nigerian Cross River superhighway to avoid the Cross River National Park, which harbors important populations of the critically endangered Cross River gorilla (*Gorilla gorilla diehli*) and the endangered Nigeria–Cameroon chimpanzee (*Pan troglodytes ellioti*). The buffer area around the highway was reduced from 19 km to 140 m (Cannon, 2017).

- **Minimization**. Taken on site, minimization measures aim to reduce the duration, intensity or extent of impacts that cannot be completely avoided (CSBI and TBC, 2015). Effective minimization can eliminate some negative impacts. To reduce the fragmentation effect of roads, for example, canopy bridges can be installed to help maintain a minimum of habitat connectivity for arboreal species (Birot *et al.*, 2020; Linden *et al.*, 2020). Minimization measures require regular updating and adaptation to specific contexts. During the COVID-19 pandemic, for instance, additional

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guidance was developed to minimize the risk of disease transmission to apes (IUCN SSC PSG, 2020a). Questions remain as to the effectiveness of many minimization measures, including noise reduction efforts, given the poor understanding of what noise levels are tolerable for apes (Arcus Foundation, 2014).

- **Rehabilitation/restoration**. The third step in the hierarchy involves taking on-site measures to improve degraded ecosystems or to reestablish the structure and function of lost ecosystems following exposure to impacts that could not be completely avoided or minimized (CSBI and TBC, 2015). Restoration has the specific goal of returning an area to its prior state or one that is similar; in contrast, rehabilitation aims to restore basic ecological functions or ecosystem services, for example through the planting of exotic trees to stabilize bare soil or the establishment of a lake to provide a recreational facility. The best way to increase the chances of restoration success and decrease costs is to begin restoration trials as early as possible in the first stages of a project. It is often impossible to restore ape habitats to their original state given their ecological complexity and the long time frame over which they were created. As a consequence, the success of rehabilitation and restoration efforts is not ensured, highlighting the need to place more effort on avoiding impacts from the outset (Maron *et al.*, 2012).
- **Offsetting**. This mechanism is designed to compensate for any remaining negative (or residual) impacts following the application of the first three steps of the mitigation hierarchy. The aim is to attain no net loss or to support additional conservation actions to reach a net gain (CSBI and TBC, 2015). Following best practice guidelines, offsetting is required for all projects impacting great apes, but it is meant to be applied as a last resort, as it triggers moral and ethical considerations (Kormos *et al.*, 2014; see Box 7.1). Offsets are usually off-site measures that fall into two main categories: restoration offsets aim to rehabilitate or restore degraded habitat, and averted loss offsets are intended to reduce or prevent expected biodiversity loss, such as habitat degradation. As offsets are often complex and expensive, the earlier steps in the mitigation hierarchy are preferable. In some cases, companies work together to compensate for impacts and develop aggregated offsets. Two mining companies in Guinea, the Compagnie des Bauxites de Guinée and Guinea Alumina Corporation, have caused residual impacts that affect the western chimpanzee (*Pan troglodytes verus*) and are collaborating on an aggregated offset. They supported the creation of a new national park in Guinea, the Moyen-Bafing National Park, where approximately 5,000 chimpanzees can be safeguarded (A.P.E.S. Wiki Team, 2019a). To be successful, aggregated offsets of this scale and complexity require the formation of multiple partnerships between government entities and NGOs (Maddox *et al.*, 2019).

National Legislation

Levels of national protection for apes vary across range states. A review of the legislation relating to apes in 17 of the 31 range states showed that three countries—Cambodia, the Lao People's Democratic Republic and Viet Nam—do not provide any domestic legal protection to their ape species. This legal gap affects the southern yellow-cheeked crested gibbon (*Nomascus gabriellae*), northern yellow-cheeked crested gibbon (*Nomascus annamensis*) and the southern white-cheeked crested gibbon (*Nomascus siki*) (Rodriguez *et al.*, 2019).

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BOX 7.1

Ethical Considerations in the Mitigation of Impacts on Apes

The Ethical Importance of Apes

Apes matter ethically both as individuals and as members of collectives. As individuals, they have capacities such as sentience, self-awareness and sociality that are widely thought to underpin high moral importance (Arcus Foundation, 2020). Their complex cognitive abilities allow them to create unique and valuable local and population-wide cultures (Boesch *et al.*, 2020; Kühl *et al.*, 2019). Ape collectives, such as populations and species, may be seen as having intrinsic value, understood as value that is independent of their usefulness to humans. They also have high ecological value, for instance as seed dispersers; in this sense, they play an important role in maintaining healthy and productive ecosystems that support ecosystem services on which humans and other species depend (Chancellor, Rundus and Nyandwi, 2017; Haurez *et al.*, 2015; McConkey *et al.*, 2018).

Such values may be in tension with each other, however, and they can also be weighed differently, depending on which ethical approaches are taken. First, ethical decisions relating to apes vary based on whether the focus is on individuals or a collective body, such as a population or species; in the latter case, individual interests are given less importance. Second, if assessments prioritize the human-use (extrinsic) value of apes—such as their role in safeguarding ecosystem services—then the development of agricultural or mining projects in ape habitat can be presented as serving human interests better than the conservation of that land. Third, approaches that utilize net value or net harms as tools for making ethical decisions may allow certain harms to be inflicted on individuals, as long as those harms are mitigated or accounted for. In contrast, approaches that grant rights to individuals rule out certain harms, even if such harms could, according to a net-benefit view, be remedied elsewhere (Karlsson and Edvardsson Björnberg, 2021). As discussed below, the distinction between approaches that utilize net benefits versus rights is key in the context of mitigating impacts of industrial development projects on ape habitats.

The net-value approach. The mitigation hierarchy described in this chapter is an influential form of the net-value (or net-benefit) approach. It provides practical guidance designed ▸

Photo: Apes matter ethically both as individuals and as members of collectives. As individuals, they have capacities such as sentience, self-awareness and sociality that are widely thought to underpin high moral importance. © Martha Robbins/MPI-EVAN

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to produce the best possible outcomes wherever development projects affect biodiversity (CSBI and TBC, 2015). While the mitigation hierarchy considers the general value of biodiversity, it fails to incorporate other ethical considerations that are relevant to mitigating impacts on apes, including:

- any suffering (physical or psychological), other changes in welfare and the death of individual apes;
- the loss or preservation of ape cultures and their benefit to humans instrumentally (e.g., for research) and/or intrinsically; and
- the loss or preservation of ape populations or species, in terms of their intrinsic and extrinsic values (that is, their contribution to ecosystem health and services, as well as to biodiversity).

The rights approach. As indicated above, this approach maintains that apes—both as individuals and as collectives—have values that should not be sacrificed, even if doing so could yield a net gain or be carried out without net negative impacts (Karlsson and Edvardsson Björnberg, 2021). Prominent examples of this view defend the rights of individual apes based on their sentience and complex natures. This position is most clearly expressed in the World Declaration on Great Apes, which stipulates that great apes have a right to life, a right to live freely in their habitat and a right not to be subjected to intense physical or psychological pain (Great Ape Project, n.d.). An ape rights approach would parallel a human rights approach, requiring that all development projects respect rights and that industry decision-makers avoid infringing on them.

Since the rights approach requires any proposed development project to respect basic individual ape rights, it is more restrictive than the net-value approach. Nevertheless, industry groups may favor the rights approach, as it creates clear and distinct limits that plainly dictate moral decisions. In contrast, more time, money and resources may be required to make the predictive calculations necessary for the net-value approach.

Ethical Considerations in the Mitigation of Impacts

Regardless of whether a net-value or a rights approach is adopted, avoidance—the first of the four stages in the mitigation hierarchy—is most effective in terms of preventing negative impacts, value loss and rights violations. But what about the other three stages of the mitigation hierarchy? This discussion examines two of these: minimization (stage 2) and offsetting (stage 4). An assessment of rehabilitation/restoration (stage 3) is beyond the scope of this box, as research findings remain inconclusive. Some studies emphasize its ineffectiveness and high costs, while others highlight its successes, suggesting that results may be dependent on local factors (Guy, Curnoe and Banks, 2014; Wilson *et al.*, 2014a).

Minimization (stage 2 of the mitigation strategy). The net-value approach classifies the minimization of impacts as ethically acceptable so long as a development project does not lead to an overall net loss in biodiversity. If a logging project were to be established in ape habitat, for example, it would need to meet two requirements to avoid a net loss. First, apes would need to be protected from any imminent danger, such as impacts from new roads, pollution and noise disturbance, through appropriate mitigation. Second, apes would need sufficient habitat to maintain their social cohesion and cultural behaviors. Project developers would need to undertake dedicated actions to fulfill these requirements, since even if the apes had enough remaining habitat to survive, habitat fragmentation and isolation could threaten their ability to disperse and to find resources, which would reduce genetic flow among populations (Inoue *et al.*, 2013). As apes are key seed dispersers, loss of their habitat may also impact overall ecosystem health. To avoid net biodiversity loss, the available habitat would thus need to be expanded outside the project area or connected to neighboring ape habitat. Either method would be demanding, both technically and financially.

Evaluating the ethical acceptability of this proposed logging development from a rights approach is more difficult. Even if the hypothetical logging project team puts in place mitigation measures to protect apes from serious harm and death, the development nevertheless compromises the apes' right to "live freely in their habitat." Similarly, if the logged forest is within a group's home range and the developers respond by expanding other habitat areas to maintain the amount of available habitat, the group's territory would still be lost. That loss could lead to increased intergroup competition, among other risks (Boesch *et al.*, 2008). From this perspective, removing even a small portion of forest can disproportionally jeopardize and harm the freedom of particular individuals or groups. It is thus very unlikely that such a development would be ethically permissible based on the rights approach.

Another minimization strategy is the translocation of a population from a destroyed habitat to another area. From a net-value approach, translocation is acceptable so long as the number of individuals in a healthy habitat remains unchanged from the start to the completion of a project. In practice, however, the strategy involves a series of risks. The capture, transport and release of primates can have negative impacts on the physical and mental health of individuals; social disruptions within groups and among new neighboring groups can have long-term negative social effects; and new predators and unexpected ecological disruption can come into play (Kavanagh and Caldecott, 2013). A translocation project thus requires extensive planning and stable financial sources to cover high costs (Fischer and Lindenmayer, 2000). Net-value assessments of completed translocations do not consider the social and emotional impacts on individuals, however. From a rights approach, translocation is highly problematic, as individuals lose their right to live freely in their original habitat, lose autonomy in the translocation process, become physically stressed and face significant risks in adapting to a new location.

Offsetting (stage 4 of the mitigation strategy). In view of apes' critical role in maintaining ecological integrity, mitiga-

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Photo: The capture, transport and release of primates can have negative impacts on the physical and mental health of individuals, and social disruptions within groups and among new neighboring groups can have long-term negative social effects. © IAR Indonesia (YIARI) / MoEF in Indonesia

tion strategies call for like-for-like replacements as opposed to general biodiversity offsets. In other words, offsets must involve species and habitat types that are identical or equivalent to the ones that are lost (Bull *et al.*, 2013; Ives and Bekessy, 2015). If, for example, a logging project is expected to have residual impacts on an ape population, including significant habitat degradation, an offset strategy might entail improving habitat quality for other ape populations, either locally or farther afield. Legal arrangements could be made to provide their habitat with a higher conservation status or to reduce existing threats, for instance (Bull *et al.*, 2013; Maseyk *et al.*, 2021).

In principle, such offsetting could be acceptable from a net-value approach, but it would be difficult and potentially unachievable. First, it may not be possible to compensate for the suffering inflicted on individual apes in the degraded habitat. If the degradation is so severe that the original population dies out, that population's genetic diversity and cultural uniqueness would be permanently lost and could not be offset. Second, an offset for any individuals lost must result in population growth of the protected offset population that equals or exceeds not just its own projected population levels, but also those of the lost individuals. Additional protections for apes in the offset population would also be needed in relation to any expected anthropogenic threats to that population. Moreover, it would not be ethically acceptable to interpret the prevention of harms in the offset community as a green light for additional harms to apes elsewhere.

From the rights-based perspective, none of these offset options would be acceptable under any circumstances. Negative residual impacts that result in significant habitat degradation risk violating apes' freedom from the infliction of intense physical and psychological pain, their right to continue to live freely in their original habitat and, potentially, their right to life. The benefits to other habitats and individual apes would be irrelevant.

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In addition to providing legal protections for individual species, countries are now beginning to enact legislation designed to compensate for adverse impacts of development projects on biodiversity, once the mitigation hierarchy has been fully applied to avoid and minimize potential impacts, and to rehabilitate or restore disturbed ecosystems (Evans, Wingard and Humle, 2021; GIBOP, 2019). The number of countries with government policies on biodiversity offsets has nearly doubled in the past 15 years. More than 100 countries now have, are developing or are starting to discuss national policies that require, encourage, guide or enable the use of offsets. The Global Inventory of Biodiversity Offset Policies compiles information on the status, scope and implementation of biodiversity compensation policies, including offset policies globally. Its database reviews and scores the national environmental legislation and policy developments of 197 countries. Average scores for ape ranges show that the majority of range states have some form of legislation related to offsetting (GIBOP, 2019; see Table 7.2).

In Guinea and Uganda, the Conservation, Mitigation and Biodiversity Offsets in Africa (COMBO) program is working to mainstream biodiversity conservation into national development policy and practice. Launched in 2016, the initiative aims to reconcile African economic development with conservation efforts by collaborating with governments, developers and industry actors to expand and improve the application of the mitigation hierarchy (WCS, n.d.-b).

International Lender Requirements

Many multilateral lenders now require the recipients of their investments to adhere to environmental and social frameworks to ensure the sustainability of projects in their portfolio (Mendez and Houghton, 2020). Nevertheless, the weakening of some lender standards has raised concerns regarding increasing risks to biodiversity in general and to apes in particular, notably with respect to the financing of high-risk infrastructure projects (Arcus Foundation, 2018). This section

TABLE 7.2

Overall Status of National Legislation Surrounding Offset Policies in Ape Range Countries

Family	Genus	Overall status of provisions for biodiversity compensation and/or offsets
Great apes	Bonobos and chimpanzees (*Pan*)	Voluntary
	Gorillas (*Gorilla*)	Voluntary
	Orangutans (*Pongo*)	Required
Gibbons	*Hoolock*	Required
	Hylobates	Voluntary
	Nomascus	Voluntary
	Siamang (*Symphalangus*)	Required

Note: The table indicates the overall status of legislation for the 32 countries that contain ape ranges: Angola, Bangladesh, Brunei, Burundi, Cambodia, Cameroon, Central African Republic, China, Democratic Republic of Congo, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, India, Indonesia, Ivory Coast, Lao People's Democratic Republic, Liberia, Malaysia, Mali, Myanmar, Nigeria, Republic of Congo, Rwanda, Senegal, Sierra Leone, South Sudan, Tanzania, Thailand, Uganda and Viet Nam (see the Apes Overview).

Source: GIBOP (2019)

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considers some examples of rigorous frameworks to mitigate risks to biodiversity and offers related resources.

The International Finance Corporation

The International Finance Corporation (IFC) is part of the World Bank Group and a large source of multilateral, private-sector funding. As part of its lender requirements, IFC has eight performance standards that define a client's responsibility for managing social and environmental risks. Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources represents international best practice for biodiversity management (IFC, 2012, 2019). Its objectives are to protect and conserve biodiversity and habitats, maintain benefits from ecosystem services and promote sustainable management of living natural resources (IFC, 2012). The basic targets are a net gain for critical habitats, which are of highest importance for biodiversity conservation, and no net loss for natural habitats, which contain natural ecosystems. IFC's updated guidance note of June 2019 includes a specific reference to great apes:

> Special consideration should be given to great apes (gorillas, orangutans, chimpanzees and bonobos) due to their anthropological significance. Where great apes may potentially occur, the IUCN/Species Survival Commission (SSC) Primate Specialist Group (PSG) Section on Great Apes (SGA) must be consulted as early as possible to assist in the determination of the occurrence of great apes in the project's area of influence. Any area where there are great apes is likely to be treated as critical habitat. Projects in such areas will be acceptable only in exceptional circumstances, and individuals from the IUCN/SSC PSG SGA must be involved in the development of any mitigation strategy (IFC, 2019, p. 21).

The Equator Principles

The Equator Principles are part of a risk management framework adopted by financial institutions to determine, assess and manage environmental and social risks in projects. The set of ten principles is primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making. As of October 2022, 137 financial institutions and 38 countries had adopted the Equator Principles. Under these principles, projects are grouped in different risk categories, with higher-risk projects (including those in ape habitats) required to adhere to strict environmental principles. Principles 2, 3 and 4 relate to the environment and, more specifically, biodiversity (Equator Principles, 2020). Based on a project's risk category, the Equator Principles also require projects to demonstrate their compliance with other applicable standards, such as:

- IFC Performance Standards on Environmental and Social Sustainability;
- World Bank Group Environmental, Health and Safety Guidelines; and
- relevant host country laws, regulations and permits that pertain to environmental and social issues (Equator Principles, 2020).

Certification Schemes

In response to consumer pressure, many industries are developing voluntary certification standards to show compliance with environmental best practice (de Silva *et al.*, 2019). On the whole, these schemes provide their own environmental frameworks with which companies must comply to ensure certification continues. Regular, independent third-party auditing checks compliance and conformity with a standard. As none of the existing standards addresses impacts to apes specifically, there is an

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Photo: FSC certifies forests and forest products that are managed in line with its principles and criteria. Principle six states that conservation zones, protection areas and connectivity should be established to protect rare and threatened species and their habitats. Principle nine commits the FSC to maintaining and enhancing high conservation value. Seedlings in a tree nursery in an FSC certified concession. © Alison White

opportunity to contribute to the development of existing or new certification schemes. Standards and their frameworks are normally linked to a particular sector, such as mining or forestry. The following certification schemes are relevant to industries operating in ape habitats.

The Roundtable on Sustainable Palm Oil and Other Agribusiness Certification

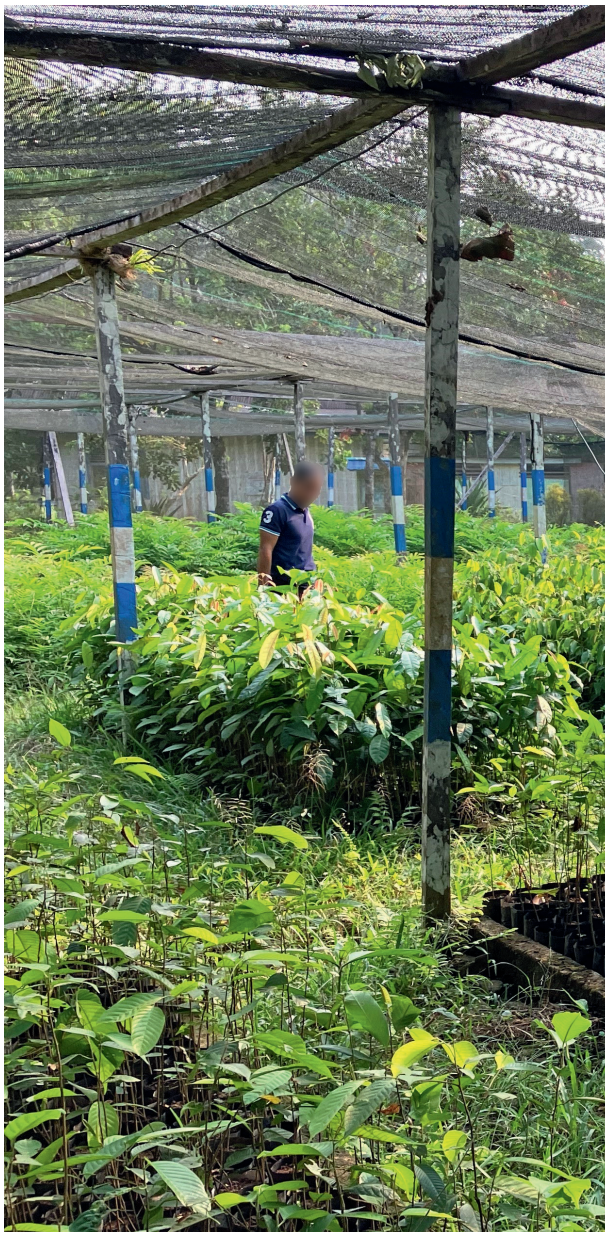
The Roundtable on Sustainable Palm Oil (RSPO) was established in 2001, after a group of European retailers, processors and consumer goods manufacturers became concerned about their public image in connection with news about deforestation in Southeast Asia (Arcus Foundation, 2014). As of December 2022, the RSPO comprised 5,466 members across seven different sectors: banks and investors, consumer goods manufacturers, environmental and nature conservation NGOs, oil palm growers, palm oil processors, retailers, and social and development NGOs (RSPO, n.d.).

In 2018 the RSPO revised its principles and criteria to ensure greater measurability and relevance. The next review is scheduled to take place in 2023. The seventh principle aims to protect, conserve and enhance ecosystems and the environment. It includes a land-clearing criterion whose guiding philosophy is that high conservation value, high carbon stock and peatlands must be protected and are not to be cleared for planting oil palm. Although there is no specific mention of apes in the guidance document, these protected areas normally coincide with ape habitat as they harbor threatened species (RSPO, 2020).

In addition to the RSPO, several other agribusiness certification schemes that operate in ape habitat—such as Fair Trade and the Rainforest Alliance—feature principles relating to biodiversity (Grunert, Hieke and Wills, 2014). None of these schemes explicitly mentions apes.

Forestry Stewardship Council

The Forestry Stewardship Council (FSC) provides standard setting, trademark assurance and accreditation to companies, organizations and communities interested in responsible



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forestry. Since its founding in 1994, FSC has certified more than 2.2 million km² (220 million ha) of forest in 89 countries. It has certified nearly 57,000 km² (5.7 million ha) of forest in seven African ape range states and more than 54,000 km² (5.4 million ha) in eight Asian ones (FSC, n.d.).

FSC certifies forests and forest products that are managed in line with its principles and criteria. Two of its ten principles relate to biodiversity; although they make no direct mention of apes, some of the references to endemic, threatened and endangered species apply. Principle six states that conservation zones, protection areas and connectivity should be established to protect rare and threatened species and their habitats. It also calls for effective measures to manage and

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control hunting, fishing, trapping and collecting. Principle nine commits the FSC to maintaining and enhancing high conservation value at the management unit level. This process requires assessment of the presence of endemic, rare and threatened species whose status is significant at the global, regional or national levels. The next steps involve developing strategies to maintain and enhance these values, and then monitoring their effectiveness (FSC, 2019, 2023).

Mining Certification Schemes

Mineral deposits are known to overlap with areas of high biodiversity (Murguía, Bringezu and Schaldach, 2016). In the past 15 years, mining companies have made increasing use of certification schemes to demonstrate they are operating responsibly. Most mining certification schemes develop their standards around three distinct criteria:

- **environmental**, as related to air and water quality, waste management, rehabilitation and biodiversity conservation;
- **social**, with a focus on human and labor rights, health and safety, and community development; and
- **governance**, concerning legal compliance, policy, transparency and ethics.

An analysis of 15 different mining certification schemes showed that of the three, environmental criteria were most frequently excluded from certification scheme principles. Even among schemes that considered the environment, only 60% included guidelines on managing biodiversity risk (Mori Junior, Franks and Ali, 2015).

The IUCN ARRC Task Force

The ARRC (Avoid, Reduce, Restore and Conserve) Task Force was launched in 2016 to tackle the impacts of industrial development projects on apes (ARRC Task Force, n.d.; Campbell, 2021). It is part of the IUCN Species Survival Commission, Primate Specialist Group—which comprises the Section on Great Apes and the Section on Small Apes. The ARRC task force draws on the expertise of more than 150 ape experts who are members of the Section on Great Apes and is also affiliated with other IUCN programs (Campbell, 2021). The ARRC acronym represents the task force goal, which is to ensure that development projects follow international best practice standards, including the application of the mitigation hierarchy, to secure positive outcomes for apes (ARRC Task Force, n.d.).

Until recently, the ARRC Task Force provided companies with ad hoc advice on standard compliance. In January 2019, however, the IFC took the unprecedented step of requiring clients to consult with IUCN's Section on Great Apes[1] regarding any projects that could affect great ape habitat (IFC, 2019). A project that seeks funding from the IFC, or from one of the banks aligned with its standards, is thus effectively required to consult with the ARRC Task Force to seek advice on collecting accurate baseline data, developing appropriate mitigation measures and ensuring impacts on great apes are kept to a minimum.

The IFC requirement presents a tremendous opportunity for the great ape conservation community to engage with governments, industry actors and banks to avoid and reduce adverse impacts on great apes and their habitats. It also offers banks and companies operating in those habitats a chance to decrease their reputational risks, including by protecting great apes from harm and obtaining the best available advice on how to mitigate adverse impacts wherever they do occur. In early 2020, the Task Force responded to these favorable circumstances by establishing a Steering Committee comprised of 20 primatologists specialized in the different ape taxa, as well as internal

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policies and principles to guide its activities (ARRC Task Force, n.d.).

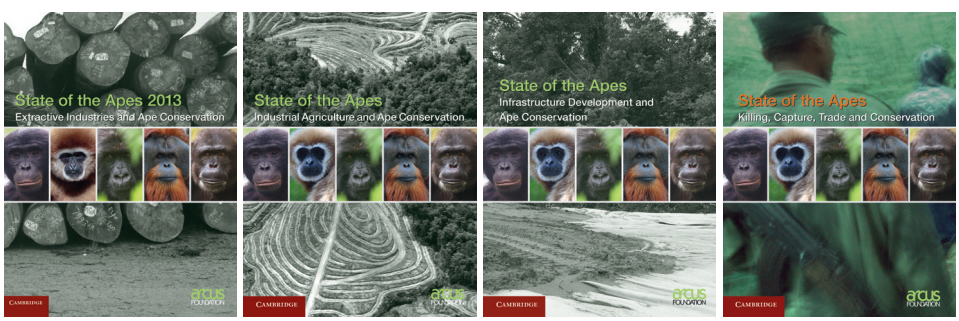
To date, the ARRC Task Force has engaged with over 20 projects at different stages of development. Its activities so far have ranged from providing advice about survey methodologies to advocacy concerning projects that should be avoiding critical ape habitat. This work has led to more in-depth consideration of apes in project areas, increased survey efforts, improved survey methodologies for gathering accurate baseline data, better long-term monitoring frameworks, more effective mitigation measures and improved offset requirements. The Task Force also aims to conduct independent audits of projects of concern for ape conservation, as well as a long-term assessment of impacts of a few key projects on which data are lacking. To maintain transparency, the ARRC Task Force makes all its advice and results of independent assessments publicly available on its website (ARRC Task Force, n.d.). By monitoring and keeping track of the projects with which it engages over the long term, the Task Force will be able to assess how successful it is at influencing decision-making and improving conservation outcomes for apes.

The ARRC Task Force works with governments and partners in ape range states to build national capacity, including improved knowledge of best practice standards for apes and better technical capacity to respond rapidly to projects impacting apes. By encouraging early and continued involvement of conservationists and ape experts, the Task Force aims to improve mitigation and reduce both indirect and direct negative impacts on apes.

Other Resources

Many resources on how to avoid harming ape habitat from the onset, strengthen baseline surveys and devise effective mitigation strategies are freely available to ape experts, conservationists, NGOs, the private sector and lenders. Here are some examples:

- **The IUCN Ape Populations, Environments and Surveys (A.P.E.S.) Database** (iucngreatapes.org/apes-database). Launched in 2007, this database aims to centralize all great ape survey data (Kühl *et al.*, 2007). It is a useful tool for verifying what surveys have been conducted in an area, obtaining an idea of ape density and assessing trends. Data on gibbons are being added to the database.
- **IUCN Best Practice Guidelines** (iucngreatapes.org/best-practice-guidelines). Seven best practice guidelines are relevant to great apes, including two that are directly related to industrial development projects—on logging and the FSC. The other guidelines focus on human–wildlife conflict, population surveys and monitoring, disease, reintroduction and tourism. A new best practice guideline on



The *State of the Apes* series (stateoftheapes.com). All volumes, policy and investor briefings, background papers and videos related to this series can be accessed freely.

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mitigating the impacts of industrial development projects on apes is forthcoming.

- **The *State of the Apes* series** (stateoftheapes.com). All volumes, policy and investor briefings, background papers and videos related to this series can be accessed freely on the Arcus Foundation's website. Intended for a broad audience of policy-makers, academics, researchers, NGOs and experts in the conservation field, the series explores the interrelated factors that affect apes' wellbeing, including industrial development in ape range states, as well as measures for averting and mitigating harm to ape populations.
- **The Conservation Evidence Project** (conservationevidence.com). This searchable website provides evidence for conservation interventions, with specific actions collated for primates (Conservation Evidence, n.d.; Junker *et al.*, 2017; Petrovan *et al.*, 2018). Evidence-based assessment of different actions is particularly useful for selecting effective mitigation measures and identifying research gaps (Junker *et al.*, 2020).

Managing Cumulative Impacts

Cumulative impacts are growing as landscapes increasingly host multiple development projects. At the regional and national scales, tools such as cumulative impact assessments and strategic environmental assessments (SEAs) can help to identify and manage these impacts on apes and other priority biodiversity features (IFC, 2013; Sadler *et al.*, 2010). Such assessments are seldom conducted at these levels, however, as few developers want to take on the considerable cost and responsibility of carrying them out (Arcus Foundation, 2014). Complicating matters is a widespread lack of inclusivity in land use planning, when it is undertaken at all.

In the absence of a global vision, development projects can have avoidable impacts on local biodiversity, for instance when mining companies build adjacent roads through a landscape although they could have shared a single one. Such disconnected planning can threaten the long-term survival of apes by compromising connectivity across a landscape, and by missing the opportunity to identify important areas for conservation or avoidance measures before potential impacts can occur. This problem typically reflects poor communication between government departments and conservation organizations. If, for example, a national mining department is not aware of or has not received relevant data, it may not be able to take ape priority sites or protected areas into consideration when evaluating mining or other permit applications. Long legal battles can ensue, as can the degazettement of protected areas or the retraction of permits. By the time permits are rescinded, however, projects tend to have had some level of impact on biodiversity.

The situation is changing as some countries, including Uganda, are making SEAs mandatory (Government of Uganda, 2019). Legally embedded SEAs remain rare in ape range countries, however, and even if they are mandatory, the relevant laws tend to be weak and their enforcement poorly executed (Tshibangu, 2018). These shortcomings highlight the need for stronger legislation and SEA practice that can help ensure assessments are conducted before impacts can take shape. SEAs can be useful tools for anticipating and averting potential impacts, as well as for assigning responsibility for addressing specific impacts, for example to a government department or a company (Arcus Foundation, 2014). Their utility, however, rests in large part on the strength of a country's SEA-related legislation, its efforts to reinforce their implementation and its com-

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mitment to preserving conservation areas into the distant future.

Long-Term Research and Monitoring

The main benefits of conducting research are threefold: 1) it facilitates an understanding and the quantification of impacts of industrial development projects on apes; 2) it documents the effectiveness of different mitigation measures; and 3) its long-term monitoring results can inform adaptive management. The more research is carried out on effective mitigation measures, the more insight is acquired. There is growing evidence, for instance, that gibbons are using artificial canopy bridges and that these measures help decrease fragmentation impacts (Chan *et al.*, 2020; Das *et al.*, 2009). Such research allows conservationists to support proposals for the use of canopy bridges or other measures, for example in advice provided to companies. Knowledge gaps remain, however, including with respect to impacts on some ape taxa, such as bonobos.

In practice, the involvement of researchers and ape experts in a project's development tends to be limited to discrete stages or tasks, such as participating in stakeholder consultations or conducting baseline surveys. In contrast, best practice suggests that experts should be involved as early as possible in a project to ensure avoidance measures are appropriately considered (IFC, 2019). Since apes are long-lived species with slow rates of reproduction and impacts may only become apparent over many years, there is also a need for more independent studies to assess the long-term effects of industrial development projects, support mitigation and inform regional management plans. In the Congo Basin, for example, long-term monitoring and research have helped to guide decision-making processes concerning sustainable logging (see Case Study 7.1).

CASE STUDY 7.1

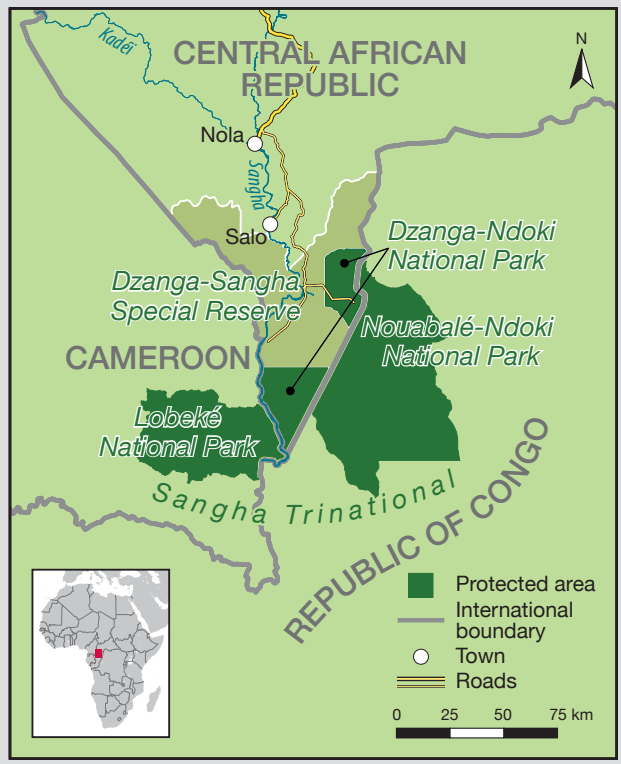
Using Great Ape Research in Assessing Risks to High-Conservation-Value Forest in the Congo Basin

A key benefit of long-term great ape research sites in high-conservation-value forests is the potential impact their outputs can have on decision-making around industrial development projects. In addition to steering companies towards more environmentally sound land use and management practices, research findings can support calls for the avoidance of impacts from the onset of a project.

Since the early 1990s, applied research has been a cornerstone of the conservation mandate of the Republic of Congo's Nouabalé-Ndoki National Park (NNNP), part of the Congo Basin's Sangha Trinational (TNS) region, a UNESCO World Heritage Site (see Figures 7.2 and 7.3). Research activities at three research sites within and bordering the NNNP—the Mbeli Bai Project, the Goualougo Triangle Ape Project and the Mondika field station—have been ongoing for more than 20 years (See Figure 7.3; Estienne, 2022). While much of what has been

FIGURE 7.2

The Congo Basin's Sangha Trinational Region



Sources: Protected areas—UNEP-WCMC (2021a, 2021b, 2021e); country boundaries—GADM (n.d.); other base map detail—OpenStreetMap (n.d., © OpenStreetMap contributors, published under Creative Commons Attribution License CC BY; for more information see http://creativecommons.org)

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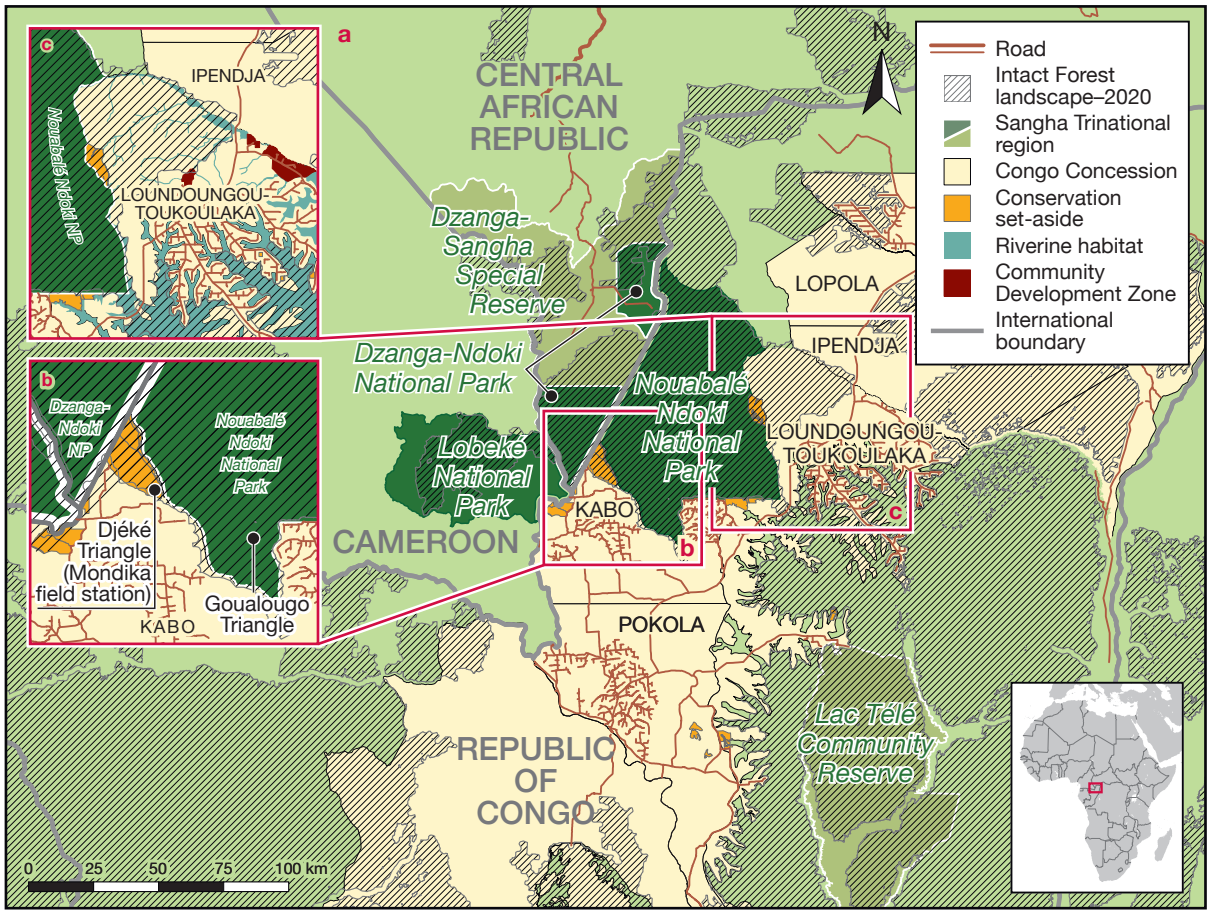
FIGURE 7.3

TNS Protected Areas Where Road Expansion and Timber Concessions Overlap with Intact Forest Landscapes, 2020



Notes: Located in the Kabo concession, the Djéké Triangle contains intact forest landscapes that are contiguous with the Nouabalé-Ndoki National Park in the Republic of Congo as well as the Ndoki National Park in the Central African Republic. Significant intact forest landscape also remains in the Loundoungou-Toukoulaka concession, including a designated "conservation set-aside" area.

Data sources: Potapov *et al*. (2017); protected areas—UNEP-WCMC (2021a, 2021b, 2021e); country boundaries—GADM (n.d.); other base map detail—OpenStreetMap (n.d., © OpenStreetMap contributors, published under Creative Commons Attribution License CC BY; for more information see http://creativecommons.org)

learned about the behavioral ecology of central chimpanzees (*Pan troglodytes troglodytes*) and western lowland gorillas (*Gorilla gorilla gorilla*) can be attributed to studies at these sites, the research efforts also provide enduring platforms for addressing the most pressing issues facing great apes in the Ndoki landscape and beyond, including threats from logging.

Much of the TNS region still consists of intact forest landscapes (IFLs), defined as large, connected tracts of undisturbed forest. Over time, however, multiple-entry logging has come to typify the landscape. Two main measures can help to counter the ongoing loss of IFLs and irreplaceable natural attributes, such as large, old-growth trees characteristic of the Congo Basin forests; these measures require urgent application (Bastin *et al.*, 2015; Potapov *et al.*, 2017). One is the creation of permanent conservation set-asides; the other is the adoption of adaptive forest management strategies to reduce forest degradation. With the aim of informing the management strategies in logging concessions neighboring the NNNP, the Goualougo Triangle Ape Project worked with forestry field teams to identify, record and analyze important ape food resources in these areas. In addition to informing

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assessments of future logging impacts on ape populations, the documentation of high concentrations of food resources in relation to carbon hotspots can feed into climate change scenarios.

Protecting Intact Forest Landscapes

The designation of the NNNP in 1993 was the first step towards ensuring preservation of intact ape habitat in the Ndoki landscape (Estienne, 2022). Shortly thereafter, Wildlife Conservation Society scientists and independent researchers initiated field studies in the Goualougo Triangle and Mondika IFLs, outside of the park's boundaries. The results of their research led to a recognition of the Goualougo Triangle's exceptional conservation value and, in 2003, its annexation to the NNNP. This landmark conservation initiative set a precedent for the use of evidence-based research on apes and forests to inform decision-making on land use and protection (Arcus Foundation, 2014).

Two years later, the Djéké Triangle of the Kabo Forest Management Unit also acquired increased protection, based on the results of long-term gorilla monitoring at the Mondika field station. The Triangle was classified as a "conservation-set-aside" to meet Forest Stewardship Council (FSC) certification criteria, which require forestry companies to spare a percentage of intact forest in leased concessions from timber exploitation for conservation purposes (Morgan *et al.*, 2019; see Figure 7.3).

As beneficial as the set-aside status has been for the Djéké Triangle, it has not entirely eliminated the potential threat of future logging as it lacks the official and long-term protection that a National Park status carries. The recent downgrading of protected areas for resource extraction in other parts of tropical Africa indicates there is no room for complacency with regard to protecting remaining intact forests (Edwards *et al.*, 2014; Qin *et al.*, 2019; Watson *et al.*, 2018).

In addition to presenting opportunities for gorilla research and future tourism, the Djéké Triangle is rich in terms of other wildlife and biodiversity (Harris *et al.*, 2021). In lobbying for the highest level of protected status for the Djéké Triangle, local stakeholders, funding bodies and government agencies are relying on empirical assessments of that biodiversity. One study conducted a standardized comparison of species composition on either side of the NNNP border, in the Triangle (outside the NNNP) and in the more remote forests of the Goualougo Triangle Ape Project (in the NNNP), using video footage from 35 camera traps that served as a "reference of intactness" in the Park. The preliminary results indicate that the two areas harbor a similar number of small to large mammalian species (Morgan and Sanz, 2020).

These findings support arguments for elevating the protected status of the Djéké Triangle. They have been presented to the Nouabalé-Ndoki Foundation, which is responsible for governing the NNNP, as well as the Ministry of Forest Economy of the Republic of Congo.

Transition to Managing Forests and High Conservation Value

Long-term conservation monitoring efforts are urgently needed in the Republic of Congo, not only because roughly 80% of its forests are designated for multi-use resource exploitation, but also because important populations of great apes live outside of the country's protected areas (Strindberg *et al.*, 2018). While outright elevation of unprotected forests to national park status may not be feasible in every context, applied research that assesses IFL loss and identifies high-conservation-value forests can help to underpin ape protection initiatives (Morgan *et al.*, 2020). More specifically, robust scientific data can facilitate the identification of land use options that reduce pressure on IFLs throughout the TNS. This process involves conducting annual updates of the remaining IFLs in the seven logging concessions adjacent to the NNNP and merging these updated data into a large-scale, satellite-based forest integrity index, such as the Forest Intactness Index (Grantham *et al.*, 2020b).

A 2020 concession-scale analysis indicated the loss of 2,014 km^2, which is equivalent to 19% of remaining IFL, since 2017. This loss of intact forest can largely be attributed to the opening of 2,853 km of logging roads in previously unlogged forests over the past two decades (Morgan *et al.*, 2020). Regular on-the-ground monitoring of the opening and closure of these logging roads can address uncertainties associated with satellite-based accessibility maps, while also verifying that illegal transportation infrastructure is not being built in the concessions. These results support a previous estimate that the remaining IFL in the Republic of Congo will be lost by 2080—unless efforts to halt the decline are implemented immediately and effectively (Potapov *et al.*, 2017).

In this context, the Goualougo Triangle Ape Project is helping to inform the current debate surrounding a FSC Motion, which provides guidance on assessing and protecting IFLs. In particular, the project is linking ape abundance estimates to floral assessments, including those from commercial timber inventories (Morgan *et al.*, 2018). One such assessment concerns the Loundoungou-Toukoulaka concession, which comprises the largest remaining IFL bordering the NNNP (see Figure 7.3). An estimated 1,647 km^2 (164,700 ha) of intact forest in the concession is contiguous with the national park; however, only 2.2% (128 km^2; 12,800 ha) of the IFL is classified as a "conservation set-aside." Meanwhile, 27% of the IFL—core areas of which are floristically unique and merit further study—has been lost since 2017 (Gond *et al.*, 2013; Morgan *et al.*, 2020).

Such research on key features in great ape habitat can inform the high-conservation-value forest approach. Over time, identifying cumulative changes in the quality and quantity of resources can provide a means of establishing thresholds for when a forest can no longer support viable umbrella species such as great apes. This work also provides quantifiable results based on which stakeholders can develop approaches that take ecosystem integrity into account in identifying core IFL (Grantham *et al.*, 2020a; Haurez *et al.*, 2017). It allows for

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the development of conservation initiatives that explicitly consider the needs of gorillas and chimpanzees in protecting and managing IFLs.

Overall, long-term research projects in the TNS region have collected sufficient data to help stakeholders demonstrate the high conservation value of large areas within the landscape. As a result, protection has been extended to an increasing proportion of ape habitat in the area. In addition, empirical evidence has played a key role in persuading more companies to apply certified sustainable forestry practices to ensure favorable outcomes for apes. Such long-term partnerships among the government, the private sector and researchers can be replicated wherever apes or other umbrella species face a similar demise.

Moving Forward

For conservationists who continue to tackle impacts of industrial development projects on apes, the abovementioned engagements with the private sector point to the following priorities.

- **Bridging the gap between ape conservationists and the private sector**. Poor communication and information sharing between ape conservationists and relevant private sector actors—such as companies and banks—impedes the development and consideration of ape-specific mitigation strategies. The ARRC Task Force can help to bridge the gaps by facilitating and promoting the exchange of information between the sectors.
- **Engaging at the government level**. Ape experts and conservationists usually provide advice on how individual development projects can enhance safeguards for apes. Since such projects are numerous and sited across large areas, however, providing advice at a higher level may be more beneficial. In some cases, site-level mitigation initiatives can be scaled up to inform wider government policies. One example is the Wildlife Wood Project in Cameroon, which the Zoological Society of London launched as a public–private partnership in 2007 (see Case Study 7.2). The project's initial goal was to improve the logging practices of two companies. Today it works with several companies, lobbies the government to standardize logging practices and promotes enhanced sustainability of such projects.
- **Defining ape priority areas**. Identifying and securing priority ape populations is imperative for their long-term protection. Taking this step is among the most effective ways of preventing adverse impacts from the start of a project, so long as priority areas are off limits to development. As indicated above, the avoidance stage of the mitigation hierarchy is key to minimizing adverse impacts on ape populations and their habitats.
- **Improving policy to address impacts during the early stages of a project's operational life**. It is not unusual for companies to change their plans or corporate guidelines, loosen their approach to mitigation once lenders have provided loans, or be sold off to new owners with weaker biodiversity standards (see Case Study 7.3). Following a change of ownership, it can be difficult to require a company to recognize responsibility for impacts attributable to previous management. This problem is common among mining companies which specialize in exploration activities that are poorly regulated. Exploration can last for more than ten years, leading to the destruction and degradation of vast areas and creating roads or access to previously remote areas. After a mine changes ownership, degraded areas tend to serve as a new "baseline," which leads to lower compensation requirements. By linking the avoidance step of the mitigation hierarchy to such a new baseline, new owners can also undermine the potential effectiveness of mitigation measures. These distortions could be prevented if governments and lenders held compa-

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nies accountable for previous impacts and if policies around exploration were strengthened.

- **Standardizing mitigation metrics**. The most effective mitigation strategies are project- and species-specific; however, consensus among ape conservationists is required to standardize the advice provided, for example with respect to the following questions:
  - What constitutes an adequate baseline?
  - What is the most appropriate way of quantifying residual impacts and determining an appropriate offset to compensate for the loss of apes given a wide range of uncertainties?
  - What is the best way to monitor impacts on apes?

Discussing these questions can help practitioners to arrive at a consensus, which can then be captured in best practice guidelines to inform advice on mitigation strategies.

CASE STUDY 7.2

The Cameroon Wildlife Wood Project: An Update

This case study updates a discussion of the Cameroon-based Wildlife Wood Project (WWP) that was presented in the first volume of *State of the Apes* (Arcus Foundation, 2014, pp. 120–4). Launched in 2007 by the Zoological Society of London (ZSL), the project aims to ensure the persistence of viable wildlife populations through sustainable forest management (ZSL, n.d.).

In the early 2000s, sustainable forestry practices began to spread across Central African countries, and the promotion of environmentally friendly approaches became linked to the prospect of gaining access to the premium market for certified products. Most of the logging concessions in the region—and particularly Cameroon—were European-owned, with progressive, conservation-conscious management.

ZSL began to collaborate with these private-sector entities in Cameroon through its WWP by engaging with key logging partners, undertaking research on best practices and wildlife management methods in logging concessions, agreeing with companies on policies and procedures to put in place, and developing and implementing wildlife management plans alongside staff training. The next stage involved compiling and disseminating lessons learned to all relevant private-sector actors in the country, including those running agroforestry,

FIGURE 7.4

Wildlife Wood Project

Sources: Protected area—UNEP-WCMC (2021a); country boundaries—GADM (n.d.); other base map detail—OpenStreetMap (n.d., © OpenStreetMap contributors, published under Creative Commons Attribution License CC BY; for more information see http://creativecommons.org)

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mining and hydroelectric projects. Together with partner logging companies, ZSL also tested a series of technological solutions, such as the surveillance of logging roads with camera traps, as well as real-time acoustic monitoring of gunshots, chainsaw use, and vehicle and motorbike engine noise. In 2016, ZSL released a toolkit featuring guidance and tools to enable the forestry sector to adapt to evolving environmental standards, legal and regulatory frameworks, certification requirements and wildlife protection goals (ZSL, 2016).

Having benefited from more than ten years of direct support from the WWP in implementing wildlife best practices, partner logging companies in Cameroon are taking positive management actions to conserve wildlife in their concessions. Through the implementation of agreed wildlife management plans, they are closing old logging roads; providing workers with competitively priced protein alternatives to wild meat to prevent them from hunting; and adapting their logging activities to minimize impacts on great apes and other local wildlife as much as possible. For Pallisco and Rougier—the two companies with which ZSL was fully involved in wildlife and illegal activity monitoring and management—field-based teams were set up to collect data on a near-permanent basis. Their work was instrumental in the identification of key great ape areas, whose demarcation is used for adaptive management and as a deterrent to illegal activities (Tchakoudeu Kehou, Daïnou and Lagoute, 2021).

After companies in Cameroon, Central African Republic and other neighboring countries expressed interest in the WWP's model of operation, ZSL intended to scale up the project over a wider landscape. Since the 2008 financial crisis, however, the region has favored Asian investors who operate in markets that accept lower-quality wood. These investors have acquired many concessions that were previously owned by European concessionaires, leading to a drop in the number of concessions engaged in certification.

Nevertheless, the WWP has been able to raise awareness, persuade some government representatives to call for the incorporation of wildlife management in the sustainable forest management framework, and ensure that wildlife is recognized as an integral component of forest management standards in Cameroon. Indeed, laws that take wildlife protection in logging concessions into account are being implemented based on the WWP's experience. National forestry and wildlife schools in Mbalmayo and Garoua have included sustainable forest and wildlife management themes as modules for teaching the next generation of conservation leaders.

Based on monitoring data collected in logging concessions in Cameroon, the WWP has shown that illegal exploitation has decreased while the status of great apes and other large and medium-sized mammals seems to have improved. In Pallisco forest concessions, for instance, monitoring teams have documented an increase in the gorilla encounter rate between 2016 and 2019, which indicates that their population is resilient to sustainable logging practices where management plans are implemented and effective. To date, the WWP's joint work with the Cameroonian government and the logging company Pallisco has been its most successful conservation-focused collaboration, one that has supported economically viable activities.

The WWP model is expanding to two additional logging companies—Alpicam and Cameroon United Forests—both of which own concessions in IUCN great ape priority conservation areas (IUCN, 2014). Alternative schemes, such as ZSL's Sustainability Policy Transparency Toolkit (SPOTT), are also investigating the integration of trackers for sustainable forestry and wildlife management practices (Oppenheimer *et al.*, 2021). Pallisco currently ranks first among all Cameroon-based forest companies on the SPOTT index, which evaluates public disclosure using environmental, social and governance criteria. It is also among the top ten of the 100 timber and pulp producers, processors and traders assessed in the index, demonstrating the positive effects of the WWP model and their commitment to sustainable forestry practices (SPOTT, n.d.).

Forest-dependent communities are sometimes viewed as a hunting threat to local wildlife, including great apes. The WWP sees people as an essential component of the forest ecosystem and recognizes that they need to be part of the solution. The project engages directly with local communities—including those bordering on logging concessions of partner companies—with an eye to empowering them to play a role in managing their natural resources. Through a full process of free, prior and informed consent, the WWP assesses people's willingness to participate in community surveillance networks designed to facilitate information sharing in support of great ape conservation efforts. The project then tracks the networks' progress through regular field visits and community platforms meetings, with the aim of ensuring that the communities develop the capacity required to continue operating over the long term, without (or with minimal) assistance from ZSL. The WWP has also placed emphasis on community behavior change, in particular through educational radio programs on great ape protection and conservation issues.

On the regulatory front, the WWP has provided input into the development of Cameroon's forestry laws and FSC national and regional standards. Next steps include encouraging the Cameroonian government to adopt compulsory best practices in wildlife management and to require their implementation as a prerequisite for the allocation of forest management units, in line with the ZSL toolkit. The WWP also plans to encourage banks and financial institutions that support logging industries to insist that their beneficiaries implement sustainable management practices. ZSL intends to continue working with auditing firms, certification bodies and other platforms to promote best practices in wildlife management.

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CASE STUDY 7.3

Change in Mine Ownership: Who Is Responsible for the Long-term Impacts?[2]

Background: The Simandou Mine and Biodiversity

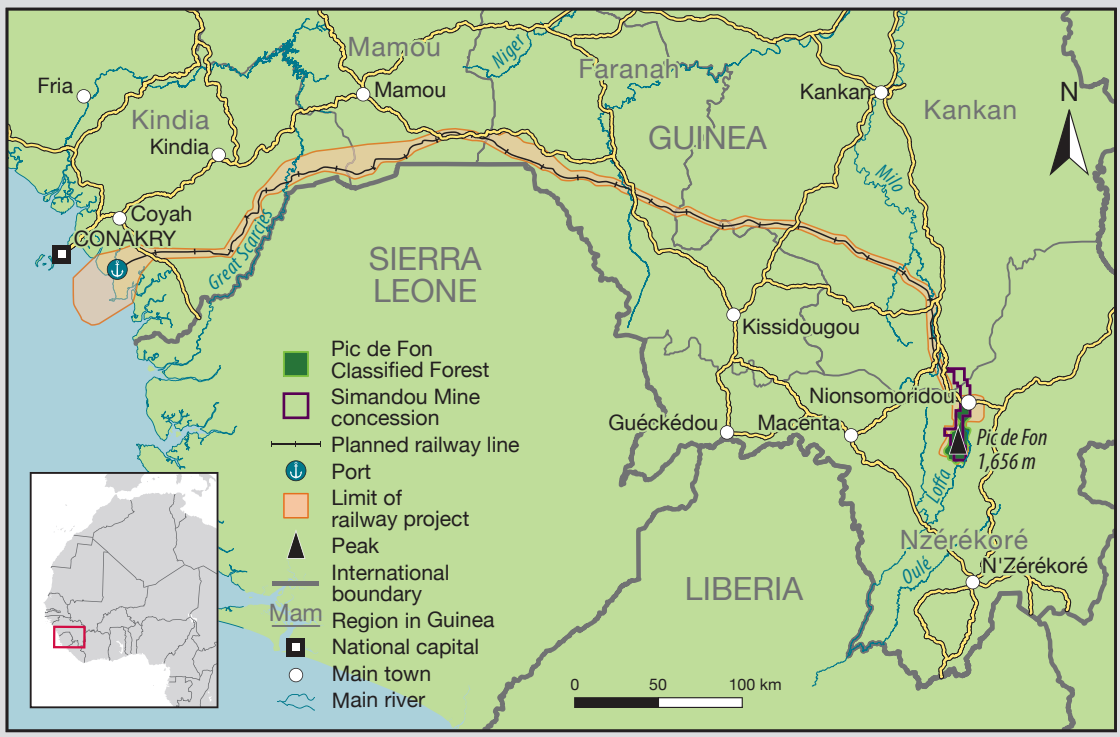
The Simandou massif in the Kankan and Nzérékoré regions of south-eastern Guinea has one of the largest unexploited iron ore deposits in the world. It extends over 110 km from north to south and includes one of the highest peaks in West Africa, the Pic de Fon (1,656 m; see Figure 7.5). This area is critical for biodiversity, harboring highly threatened wildlife species such as the critically endangered western chimpanzee (*Pan troglodytes verus*) and the endangered Diana monkey (*Cercopithecus diana*) (A.P.E.S. Wiki Team, 2019b).

In the late 1990s, Rio Tinto's affiliate Simfer was granted exploration rights at Simandou, initially through four mining exploration licenses covering as many "blocks" (Lewis and Nogueira, 2021). Early on, Simfer developed mitigation plans for Simandou blocks 3 and 4 that included biodiversity targets based on its internal corporate policy and Performance Standard 6 of the IFC, one of the lenders to the project. To guide the development of mitigation plans, including offsets, Simfer initiated long-term data collection on chimpanzees in the Pic de Fon Classified Forest in the southern blocks starting in 2007. The company also collected chimpanzee survey data along the planned railway between the mine and a port on the Guinean coast, which was to be built in areas of high chimpanzee density. The number of chimpanzees along the planned railway remains unknown, but 2,750 chimpanzee nests were recorded in the rail study area (Kormos *et al.*, 2014; Rio Tinto Simfer S.A., 2012b). Simfer published mitigation plans in its 2012 environmental and social impact assessment (Rio Tinto Simfer S.A., 2012b).

Simfer proposed and committed to mitigation measures for chimpanzees in the southern mining blocks, including controlling hunting, protecting habitat within their range and creating additional habitat for them. Since the mine was expected to impact chimpanzee habitat, Simfer investigated potential options for offset sites to compensate for residual damage (Rio Tinto Simfer S.A., 2012b). The company formed a technical group called the Simandou Biodiversity Offsets Working Group, which brought together representatives from Simfer, Guinea's Ministry of Environment, Water and Forestry, and the non-governmental organization Guinée-Écologie (Kormos *et al.*, 2014).

FIGURE 7.5

Simandou Mine and Transport Routes



Sources: Rio Tinto (2012a, Figure 1.1); WCS (n.d.-d., Figure 1); country boundaries—GADM (n.d.); other base map detail—OpenStreetMap (n.d., © OpenStreetMap contributors, published under Creative Commons Attribution License CC BY; for more information see http://creativecommons.org)

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Divergence of Mitigation Approaches following Change in Mine Ownership

By July 2008, the mining plans were in flux. The government ordered Simfer to retrocede the exploration licenses for Simandou blocks 1 and 2, which lie in the north of the massif. The government awarded the licenses to Beny Steinmetz Group Resources (BSGR) in December 2008. The decision effectively split the Simandou massif into two separate mining projects, both of which would require rail links to the coast to evacuate iron ore. In 2010, BSGR sold 51% of its stake in blocks 1 and 2 to the world's largest iron ore miner, Brazil's Vale (Lewis and Nogueira, 2021). In April 2014, the government of Guinea canceled BSGR and Vale's mining licenses in Simandou. Five years later, the government awarded the northern blocks to the Société Minière de Boké–Winning (SMB–Winning) consortium, which comprised Winning Shipping, a Singaporean maritime firm, United Mining Supply, a Guinean–French logistics company, Shandong Weiqiao, a Chinese aluminum producer, and the government of Guinea.

While iron ore production has not yet started in the Simfer-managed southern blocks (blocks 3 and 4), road building for access and exploration activities has led to some loss of grassland since the early 2000s. Satellite imagery indicates that direct impacts from the footprint of roads and drill pads have been stable in recent years; however, artisanal mining has increased, probably an indirect—or induced—impact that may be linked to an influx of people in search of economic opportunities at the site. This small-scale mining caused some loss of forest cover in the south of the Pic de Fon Classified Forest between 2011 and 2017, as is visible in satellite imagery (see Figure 7.6). No corresponding studies or analyses were conducted for blocks 1 and 2; only recently, in 2020, did the SMB–Winning consortium develop plans to assess the potential impacts of mining in these northern blocks (WCS, n.d.-c).

Management and mitigation of adverse impacts on biodiversity are difficult when a mining project is active. As exemplified here, a hiatus due to a change in ownership can exacerbate these challenges, especially with limited or no presence of personnel to manage the site. If mitigation financing is not provided up front, resources to address impacts may not be available.

Mitigation Issues Linked to Change in Ownership and Development Timeline

This case study highlights a number of mitigation issues for chimpanzees and other wildlife in the context of ownership change.

First, between 2008 and 2019, there was a high risk that impact mitigation would not occur in blocks 1 and 2, as neither national law nor lender or corporate standards required mitigation best practice. The government had not yet updated national policy to align with international standards, such as IFC Performance Standard 6, and companies were not compelled legally to manage their impacts. BSGR and Vale did not produce biodiversity action plans, nor did they establish mitigation financing for blocks 1 and 2 or the rail line. Neither company published corporate biodiversity no net loss standards between 2008 and 2014.[3] From 2014 to 2019, neither BSGR nor the SMB–Winning consortium had a license for Simandou blocks 1 and 2. During this 11-year period of ownership uncertainty, the risk that biodiversity impacts would not be mitigated was thus high. As it takes time to prepare an environmental and social impact assessment and associated mitigation plans, and because no biodiversity action plan was available for implementation in 2014, biodiversity impacts were likely already occurring and would continue for some time.

Second, even if mitigation plans based on best practices had been in place for the northern blocks and the rail line in 2014, there was an ownership gap of five years between when the government removed the license from BSGR and Vale and when it granted it to the SMB–Winning consortium. Any planned implementation of mitigation measures would have suffered significant delays during that period. In addition to the delays, a change in ownership potentially creates a situation where one company is following one set of standards, while another is operating under a different set. If biodiversity management is not harmonized to reflect best practice across the various blocks and the rail line, the potential exists for indirect and cumulative impacts on critical habitat and chimpanzee populations, despite the company's efforts to adhere to the highest environmental, social and governance (ESG) standards.

Third, current practice—including corporate and lender standards, as well as national policy—does not require financing for mitigation activities during early project phases, such as exploration. In fact, companies often do not even consider the impacts of exploration and only adopt a mitigation hierarchy approach for the design and development of the final project. This gap persists although the critical contribution of early mitigation measures to overall reductions of impacts on biodiversity is well documented and predictable. Examples include the proper siting and mitigation of impacts of new access roads and other linear infrastructures that can facilitate access to previously remote areas. If financing for the mitigation of impacts from exploration had been in place in blocks 1 and 2, then biodiversity risks linked to the ownership gap and delays in the development of mitigation plans could have been addressed. Companies are not likely to secure such funds unless governments include dedicated requirements for financing mechanisms that consider early impacts—especially those that affect highly threatened species such as great apes—in early-stage project licensing agreements. Taking this step is relevant for both mine exploration and for associated infrastructure, such as the proposed rail connecting Simandou to a port.

Solutions: Improved Policy and Green Financing

Typically, the two strongest drivers of enhanced ESG standards are laws and regulations, and, increasingly, lender standards. Guinea and other African countries have integrated relevant improvements in their legislative frameworks

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FIGURE 7.6

Satellite imagery showing forest cover change in the Pic de Fon Classified Forest between (a) 2011 and (b) 2017

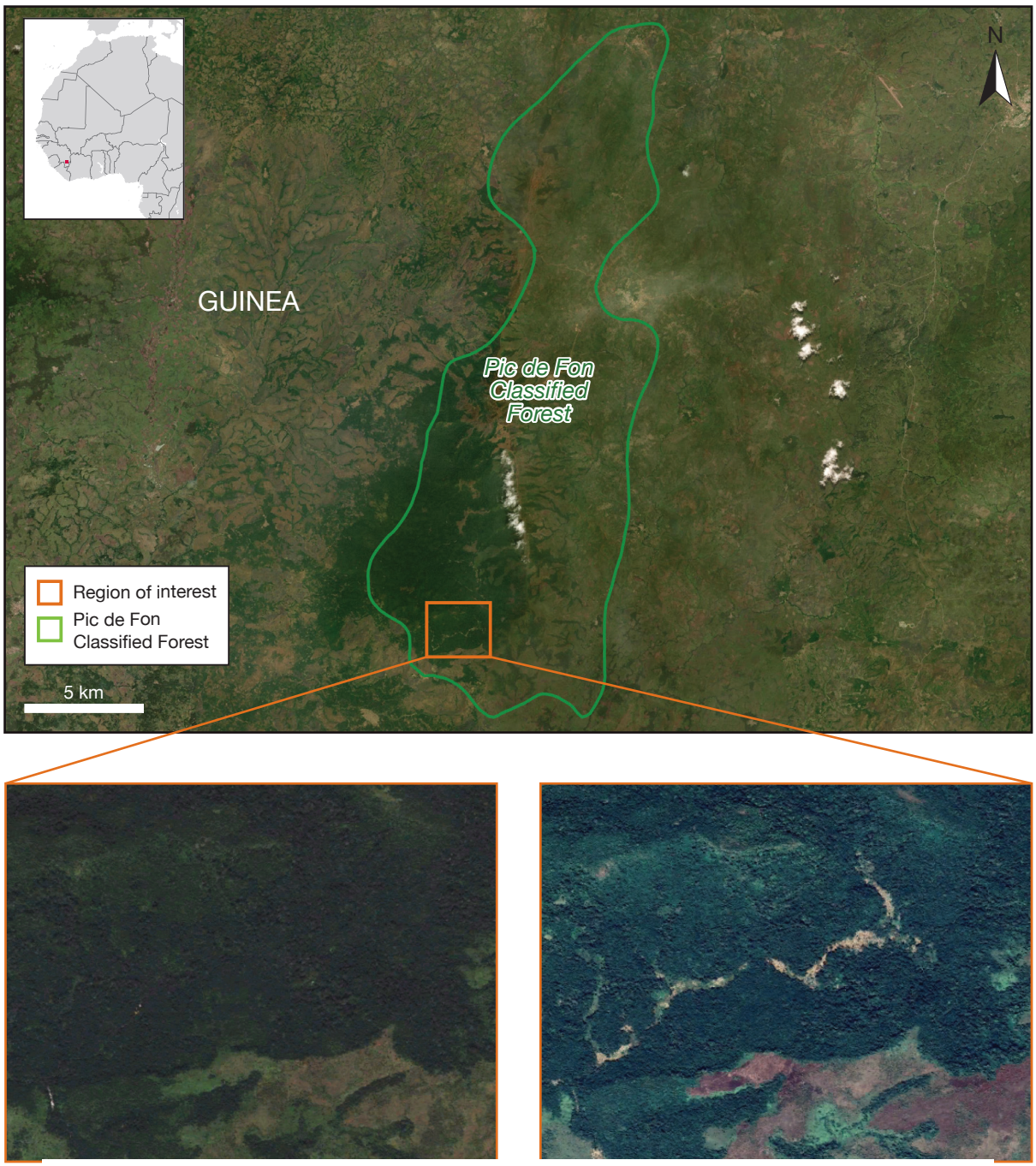

Image sources: Top: © 2022 Esri, Maxar, Earthstar Geographics and the GIS User Community. a) © 2022 Maxar Technologies. b) © 2022 CNES / Airbus.
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in response to initiatives such as the Conservation, Mitigation and Biodiversity Offsets in Africa (COMBO) project, which is led by the Wildlife Conservation Society, implemented in partnership with Biotope and Guinée Écologie, and funded by the French Development Agency and the French Facility for Global Environment (WCS, n.d.-b). In Guinea, policy on the mitigation hierarchy, including avoidance and offsets, is under development and, once approved, is expected to legally require compliance in places such as Simandou. Such laws, if implemented properly, can ensure that the liabilities for financing mitigation would be transferred to new owners so that long-term benefits to nature and wildlife are not compromised. A third driver of better ESG performance is a government's commitment to granting licenses exclusively to companies with good internal policies and a proven track record of implementing these policies.

New lender standards that focus on reducing biodiversity risk may also form part of a solution. Financial institutions are starting to associate companies that are high carbon emitters or that have weak ESG standards on biodiversity with higher risk. These new standards also consider the extent to which pension funds and re-insurers are divesting from higher-risk companies. As debt financing of mining projects becomes more competitive, companies that do not apply adequate ESG standards may find financing more difficult to secure and more expensive. Chinese institutions are some of the largest lenders for infrastructure in Africa; with evolving national climate policies, they may take on a greater leadership role in addressing climate and biodiversity loss and demanding greater compliance with ESG standards. Greater uptake of these lender and policy requirements can support compliance with conservation commitments, even when project ownership is transferred.

Conclusion

Industrial development projects are likely to increase in number, in line with the demand for resources, infrastructure and energy (Christmann *et al.*, 2022). Fortunately, their impacts on apes are generally taken seriously, as was the case regarding the hydropower dam in the Tapanuli orangutan (*Pongo tapanuliensis*) range in Sumatra (Laurance *et al.*, 2020). Ape-specific mitigation measures continue to be developed, and long-term research provides a better understanding of their effectiveness in terms of minimizing further adverse impacts on apes.

In view of apes' intrinsic and ecological value—as individuals, populations and species—any significant disturbance of their habitat for human development is difficult to justify. The adverse impacts humans have already had on ape populations arguably give rise to an obligation to protect their habitat, both by improving impacted areas and preventing further degradation. Moreover, the 2009 H1N1 (swine flu) and recent COVID-19 pandemics, as well as the risk of zoonotic spillover related to encroachment into ape habitat, call into question whether industry should be allowed to encroach on these ecosystems under any circumstances.

Industrial development is continuing to expand, however, creating a growing need for efforts to reduce its individual and cumulative impacts on apes. The most effective actions are those taken at higher levels, such as through improvements of policy and government regulations. At the local level, the best way to protect the long-term viability of ape populations is through strategic environmental impact assessments and land use planning, which can help identify threats and opportunities for ape conservation before a new development project is launched. In all these approaches, the consideration of apes as an umbrella species can secure better outcomes not only for apes, but also for the ecosystems they help to sustain.

Acknowledgments

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Box 7.1: Victoria Green and Clare Palmer

Case Study 7.1: David Morgan, William Winston and Crickette Sanz

Case Study 7.2: Oliver Fankem and Andrew Fowler

Case Study 7.3: Hugo Rainey and Ray Victurine

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Endnotes

1 IFC Performance Standard 6, which is quoted above, refers to the IUCN Section on Great Apes and cannot be changed to refer to the ARRC Task Force directly until the next revision of the guidance note. Until then, any request is transferred to the ARRC Task Force.

2 This case study was written by Hugo Rainey and Ray Victurine, based on their experience in Guinea engaging with the mining sector and the government on biodiversity since 2003, including through the COMBO (COnservation, Mitigation and Biodiversity Offsets) program.

3 Vale adopted a corporate policy of no net biodiversity loss in 2019 (Vale, n.d.).

4 Re:wild (www.rewild.org).

5 Re:wild (www.rewild.org).

6 Resolute Mining (www.rml.com.au).

7 Zoological Society of London (www.zsl.org/conservation).

8 Re:wild (www.rewild.org).

9 Zoological Society of London (www.zsl.org/conservation).

10 The Biodiversity Consultancy (www.thebiodiversityconsultancy.com).

11 Texas A&M University (liberalarts.tamu.edu/philosophy).

12 Re:wild (www.rewild.org).

13 Lester E. Fisher Center for the Study and Conservation of Apes, Lincoln Park Zoo (www.lpzoo.org/conservation-science/science-centers/lester-e-fisher-center-for-the-study-and-conservation-of-apes).

14 Texas A&M University (liberalarts.tamu.edu/philosophy).

15 Wildlife Conservation Society (www.wcs.org).

16 Washington University in St Louis (anthropology.wustl.edu).

17 The Biodiversity Consultancy (www.thebiodiversityconsultancy.com).

18 Wildlife Conservation Society (www.wcs.org).

19 Washington University in St. Louis (virtualplanet.wustl.edu).

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