



RESEARCH BRIEF

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Conserving critically endangered central African Mountain Gorillas from poaching threats

Maximising conservation outcomes through careful designing of incentive schemes

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Presently, the mountain gorilla in Rwanda, Uganda, and the Democratic Republic of Congo is endangered, mainly by poaching and habitat loss. Revenue from gorilla tourism is shared with local communities, but the current scheme yields less-than-optimal conservation outcomes and therefore cannot be entrusted with long-term conservation. However, a performance-linked benefit sharing scheme, in which the park agency makes payments to the local community based on the increase in the gorilla population, can achieve socially optimal conservation. This scheme would make it unnecessary for the local community to poach. Therefore, it becomes unnecessary to impose poaching fines and anti-poaching enforcement on the local community. However, the ideal benefit sharing scheme would require a huge financial outlay. An appropriate pricing strategy for gorilla tourism could raise more money for this conservation scheme.

There are two species of gorillas, namely the Western and the Eastern, each with two subspecies. The two subspecies of the Eastern gorilla are the Mountain and the Eastern Lowland Gorilla. The gorilla has remained threatened, despite decades of research and many efforts to save it. The Mountain Gorilla (*Gorilla beringei beringei*) is the most endangered, with a total population of 786 individuals and is therefore the focus of the research on which this brief is based. The relevant gorilla range in Rwanda, Uganda and the DRC occurs in an area called the Virunga Massif. The annual revenue earned directly from gorilla tourism in these countries is currently estimated to be US\$3 million, before the employment opportunities created are even considered. Accounting for multiplier effects, such as employment, gorilla tourism contributes over US\$20 million annually,

Key Points

- The threat of extinction has not receded despite a population increase.
- Merely compensating local communities for damage caused by wildlife will not secure the future of gorillas.
- Benefits need to trickle down to the communities to maintain buy-in.
- Linking benefits to specific measurable outcomes of the gorilla population together with granting property rights is likely to result in the best outcome.

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apportioned between Rwanda, Uganda and the DRC.

However, even though these countries earn a lot of revenue from gorilla tourism, this revenue does not trickle down to the communities that shoulder the cost. Sharing the benefits of gorilla tourism helps reduce the sense of grievance that local communities feel toward their displacement for the creation of national parks, which takes away the opportunity to use the land in agriculture. Farmers in these communities also suffer crop damage from gorillas. Human activities, such as poaching gorillas and encroaching on gorilla habitat through agriculture or settlement, contribute to possible extinction. For these reasons, sharing the benefits of gorilla preservation with local communities is crucial to encourage people to change their behaviour.

The current incentive scheme in the Virunga Massif entails sharing revenue from gorilla tourism with the local community. This is used to finance community projects for enhancing community welfare. The exact proportions shared differ for each of the three countries but range between 5% and 30%. Certainly the flow of revenue has helped win some compliance with conservation rules from local communities, even though local attitudes toward wildlife are still fairly negative. The current conservation outcomes could therefore be improved by changing the design of the incentive scheme. We argue against merely compensating local communities for damages caused by wildlife and call for benefit sharing schemes which encourage local communities to undertake actions that allow the wildlife populations to grow. Poaching by local communities can be addressed more effectively by granting locals property rights to wildlife.

Using a bioeconomic model, we investigate the conservation and human welfare outcomes under the revenue sharing scheme currently in place and propose a performance-linked benefit sharing scheme in which the park agency would make payments to the local community based on the growth of the gorilla population.

Background to the Problem

The mountain gorilla exists naturally in two small, isolated populations, found in two locations which form their last remaining natural habitat. The Virunga Massif – situated on the slopes of extinct volcanoes along the borders of the DRC (the Mikenos sector of the Virunga National Park (Parc National des Virungas), 7900km²), Rwanda (Volcanoes National Park (Parc National des Volcans), 160km²) and Uganda (Mgahinga Gorilla National Park, 33.7km²) – is home to about two-thirds of the total gorilla population. The other population is found in Bwindi Impenetrable National Park in south-west Uganda, on the border with the DRC (331km²). The mountain gorillas of the Virunga occupy an area of approximately 450km², while the Bwindi gorillas occupy about 215km². The Virunga population was estimated to be 480 in 2010; the Bwindi population totaled 302 according to the 2006 census. The mountain gorillas' home range in the Virunga is small, between 5 and 30km²; therefore, daily foraging movements may involve crossing national borders. The Bwindi population is relatively stable and even increasing, according to the 2006 census. Moreover, the Bwindi gorilla population has not been disturbed by humans as much as the Virunga population has.



Figure 1: Distribution of the mountain gorillas. Source: International Gorilla Conservation Programme

Despite the recent recovery of the population, current threats of extinction are as real as they were in the 1950s. The current mountain gorilla population is less than the theoretical minimum for survival, meaning they are more vulnerable to unpredictable catastrophic events such as outbreaks

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of disease and sudden loss of habitat. However, due to several pressures, the United Nations Environment Programme in 2002 projected that the mountain gorillas' natural habitat will have shrunk to only 10% of its original range by 2032.

Conservation Challenges The threat of poaching is a challenge to gorilla conservation. In addition, the Virunga region remains largely politically unstable, further increasing threats to gorillas. Furthermore, isolation and low population numbers raise concerns about inbreeding. The Virunga region is also under considerable pressure from competing land uses, most notably agriculture. In addition, the national parks do not have buffer zones between the local communities and the parks' resource base. The current gorilla habitat and range is considered to be only a fraction of what it used to be; losing more habitat, therefore, will greatly endanger the survival of the remaining gorilla population.

Increasing pressure on the land has been the driving force behind gorilla tourism, in the hope that if gorillas can "pay their way," then this could increase the value of their natural habitat. Where gorilla tourism has developed, mountain gorillas have become an economic asset of national importance. The strong demand for gorilla tracking (tourism) therefore offers the possibility to generate sustained wealth from wildlife.

The Bioeconomic Model There are several actors operating in the Virunga region: park agencies for each of the three countries, local communities in the vicinity of the national parks, and military rebels. We build a simple bioeconomic model to capture the interaction between broad groups of the different actors. In this simplified model, we consider two economic agents (the park agency and a local community living adjacent to the park) and three possible land uses (gorilla conservation/tourism, gorilla poaching and agricultural production). The park agency has the mandate to care for the gorillas, manage tourism and collect tourism revenues from gorilla tracking, mountain climbing and other related activities. The local community engages in agricultural production, as well as poaching, especially of infant gorillas for sale on the international market. Enforcement against poaching is done by the park agency, which also collects the fines levied on poachers. Thus, gorilla poaching involves the risk or probability of being caught. Due to enforcement by park agencies, convicted poachers are liable to a fixed fine. The park agency receives income from gorilla tourism and poaching fines and also benefits from the public good value of the gorillas. Wildlife and habitat are considered "public goods" – a type of good or service that anyone can use or enjoy, but that no individual has an incentive to conserve.

Both the local community and the park agency legally benefit from gorilla tourism, as the local community gets a predetermined proportion of the revenues generated. However, the local community and the park agency pursue individual interests and consequently act uncooperatively. The local community is involved in poaching and ignores the public good value of the gorilla population, while the park agency takes the public good value of the gorilla population into account. The local community makes decisions about allocating its labour between its two livelihood activities (gorilla poaching and agriculture) while the park agency makes a decision about the level of anti-poaching enforcement. On the other hand, the park agency will enforce rules against poaching up to the point where the additional cost of the anti-poaching effort would begin to be greater than its additional benefit.

To develop policy recommendations, we consider the point of view of a social planner, who acts in the interest of society as a whole (in this case, society consists of the local community and the park agency). The planner chooses poaching effort and anti-poaching enforcement to maximise the net benefits (benefits minus costs) from agricultural and gorilla activities, including the public good value of the gorilla population. The benefits from the gorillas are based on the size of the gorilla population, effect of the population on gorilla tourism, cost of anti-poaching enforcement, and revenue from sale of infant gorillas by the local community.

Under the current system, poaching pays higher returns to labour than farming. But when a social planner looks at the benefits to society as a whole, taking into account both public goods and earnings in the community, the planner wants to recommend incentives that make it more profitable to conserve gorillas. Consequently, the optimal gorilla population would be larger when the social planner sets up the incentive system than it is under the current benefit-sharing system. This indicates that individual decisions are not good for society in this case. At first

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glance, one way to conserve wildlife might be to increase agricultural productivity in areas neighbouring protected areas. However, this solution might be inappropriate because increasing agricultural product prices in an area that has massive population pressure will lead to a lower wildlife population in the long run. We therefore focus on policies such as benefit sharing schemes which do not necessarily increase the scale of agriculture.

Analysis of Benefit Sharing Schemes From our model solution, the gorilla population will not reach its socially optimal level in the market equilibrium, with or without a revenue sharing scheme. Thus, the current revenue sharing scheme has no effect on conservation outcomes because there is no connection between the size of the gorilla population and the amount of money that the community receives. However, revenue sharing obviously has an effect on community welfare insofar as it provides additional income. In central Africa, the local community's share of proceeds from gorilla tourism is invested in social infrastructure such as schools and water tanks.

One suggestion is to impose a deterrent fine on convicted poachers. Instead of setting the fine arbitrarily, the poaching fine has to be high enough to discourage poaching. However, it is a challenge to obtain the necessary information to guide the decision of how high the fine should be. Furthermore, a deterrent fine does not create incentives for the local community to take a long-term view of its interaction with the gorillas. As a result, a deterrent fine alone will not bring the desired conservation outcomes for society.

The devolution of property rights over wildlife has been suggested as a solution. The idea is to devolve control to local communities. However, for devolution of property rights to positively affect conservation practices, it needs to simultaneously bring tangible benefits to the local communities.

Performance-linked Benefit Sharing Scheme We propose a performance-linked benefit sharing scheme in which the park agency pays the local community a payment directly linked to the growth in the gorilla population. This scheme would simultaneously set the fine for poaching the gorilla to zero while setting the payment to the local community equal to the shadow price of gorillas. The shadow price is an estimate of what something would be worth if it was sold in a market. The scheme would guarantee the growth in the gorilla population to a level consistent with social optimality with no hunting. Because the incentives going to the local community are linked to the gorilla population, an increase in the gorilla population directly translates into an increase in income going to the local community and therefore enhanced community welfare.

While the performance-linked benefit sharing scheme guarantees social optimality, the implementation of such a scheme requires significant financial resources. As a starting point, additional financial resources could be generated by reforming the pricing of gorilla tracking permits. External financial support for benefit sharing schemes around gorilla conservation is also crucial. One practical way to raise external financial support might be to impose a gorilla conservation levy on all international visitors at the ports of entry into the gorilla states. The resultant revenues would then be earmarked for the gorilla benefit sharing scheme. This could therefore help address the potential financial shortfall associated with a performance-linked benefit sharing scheme.

Local communities will engage in poaching as long as the benefit from such activities exceeds the benefits from alternative activities. This is partly fuelled by the high incidence of poverty in these areas. Therefore, in order to persuade communities living in the vicinity of the gorilla habitat to be partners in gorilla conservation, a stable flow of financial resources linked to their cooperation in gorilla conservation is required. It is important that disbursements are linked to the attainment of specific conservation goals, e.g., the growth in the population of the gorilla. Also, the three countries can integrate activities, thereby reducing costs and ultimately increasing the amount available for gorilla conservation through the exploitation of country-specific attractions which could all enrich the tourism experience and boost revenue.

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Conclusion

The proposed alternative benefit sharing scheme has two advantages over the current revenue sharing scheme: the local community's welfare is enhanced as it earns more from the gorilla and the local community is given incentives to take a long-term view of its interaction with the gorilla population, as payments are based on the population dynamics. The proposed scheme only requires the park agency to do a regular census and thereafter make payments accordingly. This reduces the burden on the regulator and encourages self-monitoring by the local community. Should locals decide to poach, their hidden actions are revealed in the next gorilla census and thus penalised accordingly. With a performance-linked benefit sharing scheme, the local community assumes full responsibility for the gorillas. In addition, the international community must have an interest in supporting conservation financially beyond tourism visits.

ABOUT THIS BRIEF

This brief is based on "Evaluating the Prospects of Benefit Sharing Schemes in Protecting Mountain Gorillas in Central Africa," Efd Discussion Paper 12-16, November 2012. (The DRB series of research briefs is associated with the Efd Discussion Paper Series.)

FURTHER READING

UNEP – WCMC [2003], *Report on the Status and Conservation of the Mountain Gorilla: Gorilla gorilla beringei*, United Nations Environment Programme – World Conservation Monitoring Centre.

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