Making the economic case to promote avoidance in infrastructure development

Irene Burgués[1], Aaron Brunner[1], Rhona Barr[1], Alfonso Malky, Anna Behm Mazosera[2], John Reid[1]

[1] Conservation Strategy Fund (CSF)

[2] International Gorilla Conservation Programme (IGCP)

Abstract

Proposals to avoid environmental damage by re-routing or changing the scope of road or railroad projects are often rejected by developers on the grounds that changes are too expensive. However, through running and sharing in-depth economic analyses that properly calculate financial costs and quantify tangible environmental, economic and social externalities, it is often possible to persuade decision-makers to choose more environmentally-friendly project alternatives. We describe two cases in which the most economically viable option also avoids biodiversity impacts. First, valuation of potential revenue loss from Gorilla tourism in Uganda's Bwindi Impenetrable National Park showed that road alternatives outside the park's boundaries have better overall economic performance than upgrading a route through the Park. Moreover, road alternatives outside the Park would avoid further fragmentation of one of the last remaining habitats of the critically endangered mountain gorilla (*Gorilla beringei beringei*). Second, we present an economic analysis of proposed road and rail projects connecting Pucallpa (Peru) to Cruzeiro do Sul (Brasil). This analysis shows that neither transport alternative is economically viable. This finding holds even without incorporating the value of negative environmental effects; project investment and maintenance costs simply outweigh reduced transport costs and increased profitability of economic activities in the area. As with the case in Bwindi, the best economic choice (in this case not building the road or railway) also avoids significant risk of deforestation and fragmentation in high biodiversity areas. We conclude that there is significant scope for avoidance of biodiversity impacts through targeted, up-front environmental economic analyses.

The case of road alternatives in and around Uganda's Bwindi Impenetrable National Park[1]

Introduction

In July 2012, the Uganda National Road Authority (UNRA) advertised a request for expressions of interest to design and construct 1,900 kilometres (km) of strategic roads in the country. One of the proposed projects is an upgrade of the road from the Ikumba junction on the Kabale – Kisoro road, through Ndego gate, Ruhija, Kitahuriira, Hamayanja and then to Buhoma. Approximately 13 km of the Ikumba – Ruhija section of the proposed road passes through Bwindi Impenetrable National Park (BINP), one of the last remaining habitats of about half the world's population of the critically endangered mountain gorilla (*Gorilla beringei beringei*), one of Uganda's main tourist attractions, and a globally recognized UNESCO World Heritage Site. Another 12 km of the road runs along the park boundary. Specific objectives for the project that includes the Ikumba – Ruhija section are: 1) To improve the performance of the tourism sector by easing access to the tourist attractions in the region; 2) To improve access to

[1] To view the complete analysis, please refer to: http://www.conservation-strategy.org/sites/default/files/field-file/CSF_bwindi__series_technical_apr2015_web.pdf

goods/passenger transport services, and reduce transport costs along the route; 3) To improve access to social and economic development opportunities along the route; and 5) To ensure no roadside communities become worse off as a result of the road upgrading works.

If the upgrade comes to fruition under the proposed plan, evidence suggests that the gorilla population will be affected in two ways: 1) gorillas will actively avoid areas of high human activity; and 2) gorilla mortality from disease, poaching, and vehicle collisions will increase. Given BINP's importance to Uganda's development and conservation objectives, the International Gorilla Conservation Programme (IGCP) and the Uganda Chapter of Poverty and Conservation Learning Group (Ug-PCLG) have proposed, in consultation with local communities and engineers, two road alternatives that would reroute the Ikumba – Ruhija road section outside of BINP. The two proposed alternatives follow the same route outside of the park except that Alternative 3 follows a mountain ridge in order to avoid steeper terrain. All proposed routes can be seen in Figure 1 below.

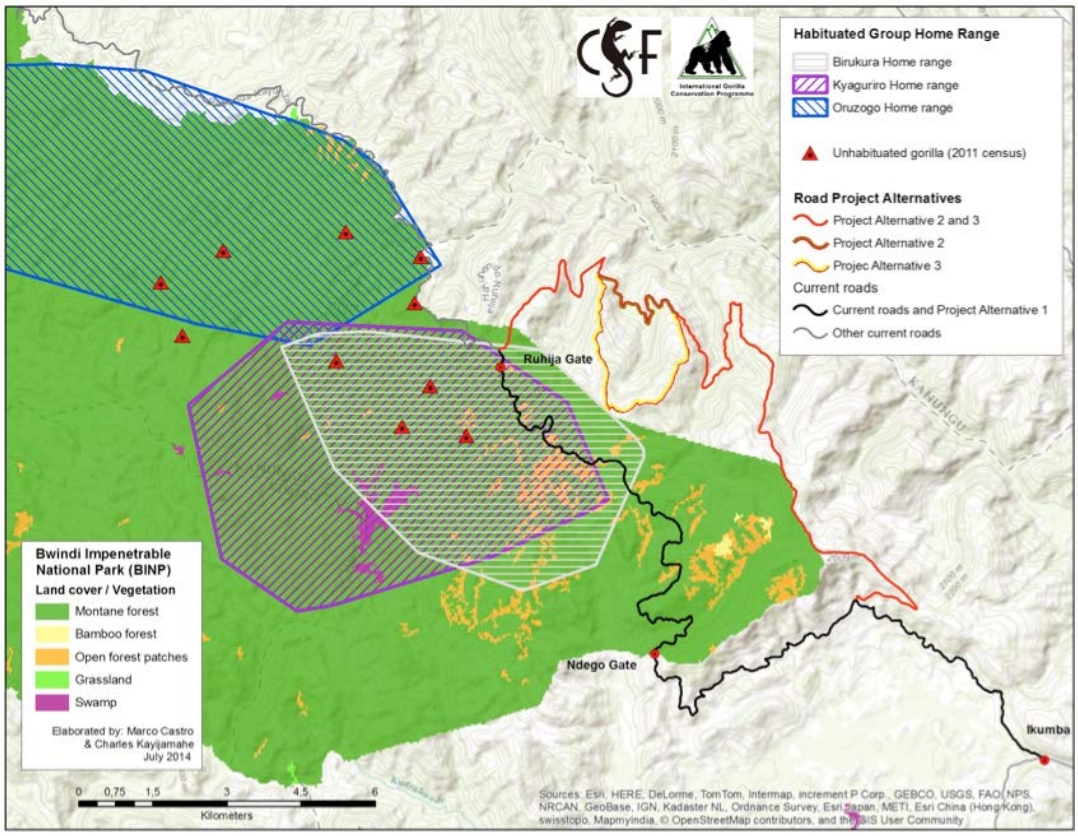

Figure 1 - Road project alternatives through and around BINP, habituated gorilla home ranges (2007-2012), and location of individual unhabituated gorillas discovered during census (2011)

Results

The results of our analysis show that the road alternatives outside BINP would have better overall economic performance than upgrading the route through the park. This conclusion rests on: lowered overall risks to the gorilla population, lowered risks to specific groups upon which lucrative tourism activity depends, as well as on the greater number of people and communities who would benefit from routes outside the park. These benefits outweigh the higher construction costs of the alternative routes. When the risk to gorilla populations and associated loss of permit revenues is included, upgrading the current road option through the park is estimated to cost the Ugandan economy approximately twice as much as the alternatives under BINP's current tourism

growth trends. At the national level this translates to a possible loss of some US $214 million over the next 20 years (in present value terms). Furthermore, both the national and specific objectives under which the Ikumba – Ruhija road improvement were proposed are best met by those alternatives that divert vehicles outside of the park.

The case of a Pucallpa-Cruzeiro do Sul transport link[2]

Introduction

In 2010, the Peruvian Ministry of Transport and Communications (MTC) launched a request for proposals to conduct studies on the final section of the Central Interoceanic Highway (IOC) in Peru, Pucallpa-Cruzeiro do Sul. The call was cancelled due to a lack of response. In June 2011, a second attempt let to a contract awarded to the Pucallpa Highway Consortium. The proposed roadway has a length of 141 km, starting from the Federico Basadre highway and continuing toward the south side of the city of Pucallpa, where it crosses the Ucayali river at the village of Mazaray, continuing along the right bank of the Abujao river, and ending at the Brazilian border at border marker 62 (see Figure 2).

The project for a Pucallpa-Cruzeiro do Sul highway interconnection would represent the last section of what is known as the IOC, one of the primary roads in the package known as the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA). This project risks generating significant environmental and social impacts. The project would pass through biologically rich areas of forest and river ecosystems near the Sierra del Divisor Reserved Zone and the Isconahua Territorial Reserve at the border with Brazil, as well as the native communities located within the project's zone of influence.

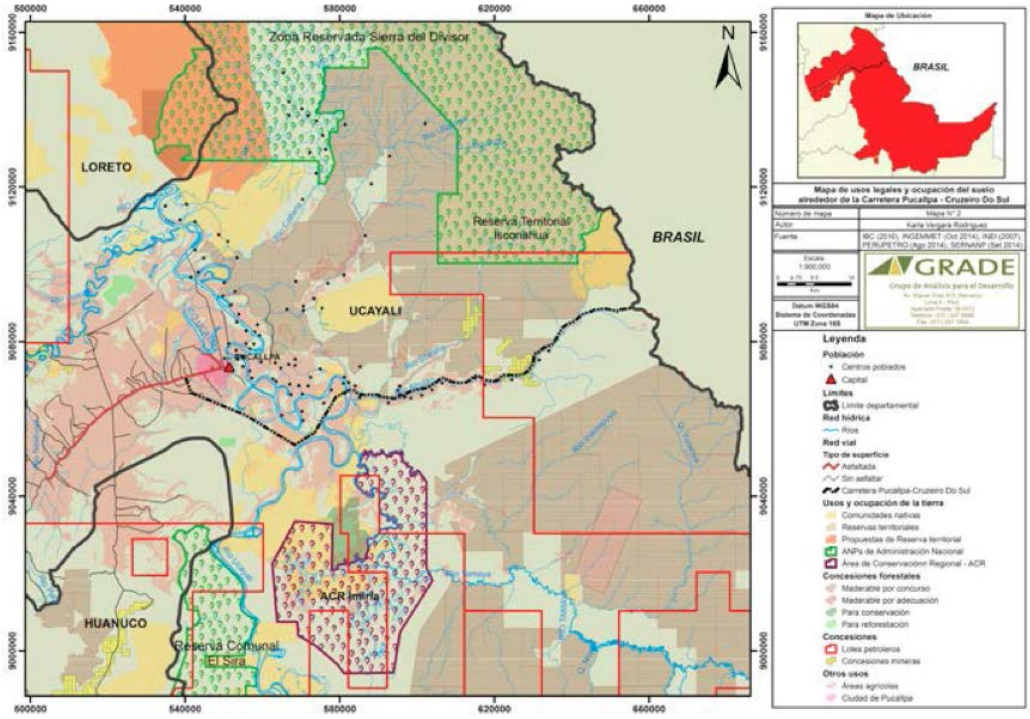

Figure 2 – Pucallpa-Cruzeiro do Sul proposed roadway

[2] To view the complete analysis, please refer to: http://www.conservation-strategy.org/sites/default/files/field-file/CSF_Pucallpa__series_technical_mar2015_web.pdf

Methods

To support the decision-making process Conservation Strategy Fund (CSF), The Nature Conservancy (TNC), and the consulting firm GRADE performed a comprehensive economic analysis of the interconnection project, examining both the road and railway alternatives. This research used updated data from the Pucallpa Highway Consortium on the construction and maintenance costs for the highway project. The analysis of the rail link used as a reference the investment, maintenance and operation costs obtained from the feasibility study for the Yurimaguas-Iquitos project.

Road benefits were calculated with the Roads Economic Decision Model (RED) developed by the World Bank[3]. This model estimates the net benefits based on the consumer surplus approach; that is, it assesses the benefits generated for users due to the reduction in vehicle operating costs and travel time new road or road improvement is in place. In regard to rail, a cost-benefit analysis was conducted, assuming the same logic for assessing the benefits based on the consumer surplus approach. In this case, the reduction in vehicle operating costs were calculated using market rates for rail passenger and cargo transportation currently in effect in Peru, while the reduction in travel time was calculated considering the same cost-per-hour parameters used in the RED model.

Since no roadway currently exists, transport demand projections for initial traffic used as their benchmark the arrival and departure tonnages at the port of Pucallpa, traveling down the Ucayali and Abujao rivers parallel to the proposed route. From that initial traffic annual increases were projected, considering the effects of reduced transportation costs and the local development that would be generated in the project's area of influence. It should be pointed out that not only was the same transportation demand (expected traffic) applied for both projects, the same path was assumed as well. In other words, it was assumed that the railway project is an alternative to the highway.

In addition to estimating the direct benefits and costs, the study quantifies a series of additional benefits and costs caused by the project but not paid or received by the project developer. These effects are known as "externalities." Positive externalities included increased access to education and health due to the time-savings and reduced transportation costs that would be generated. Also estimated was the value of the timber and non-timber forest products that would be able to be marketed as a result of improved access. Also, as a result of improved access and therefore land available increased productivity of agriculture was included. The negative externalities estimated included the costs of increased road and rail accidents, the increase in air pollution generated by the vehicles traveling as a result of either of the projects, and a value applied for deforestation and the reduction of environmental goods and services. Among those goods and services were the reduction of agricultural production due to soil erosion, reduced water supply from natural sources, and the reduction in carbon capture and storage capacity.

In order to assign values to the environmental and social externalities, various measurement methods applied and three different scenarios were considered: (i) with a railway project, (ii) with a highway project, and (iii) with no project. These projections were based on forest-cover change maps made between 1985 and 2011, and a set of variables associated with changes in land use during that period.

[3]For more information on the model, please refer to:
http://www.ssatp.org/sites/ssatp/files/publications/HTML/Models/RED_3.2/red32_en.htm

Results

The scale of the positive and negative externalities was driven principally by the degree of improvement in access (positive externalities) and projections of deforestation. In both road and rail scenarios the negative externalities would significantly outweigh the positive, but the figures for the road option are much worse than those for rail. The net value of the externalities for the railway option (US $ -19.2 million) is only 3.9% of the net value of the externalities for the highway (US $ -456.6 million).

Without considering the externalities, the net economic losses (net present value - NPV) would be US$ -662.9 million for the railroad, and US$ -308.9 million for the highway. In other words, neither project is economically feasible, with greater losses from rail due to its high up-front costs. As shown in Table 1, when environmental and social externalities are included, the highway project would generate higher overall costs to Peruvian society (US $ 83.3 million more than the railway project).

		With externalities	Without externalities
Railway project	NPV	-682.12	-662.93
Highway project	NPV	-765.46	-308.90

Table 1 – Economic analysis of road and railway alternatives, including environmental and social externalities (Net Present Value in millions of US$)

In conclusion, we find that both options would generate high costs for Peruvians and the country's economy. Of the two, the least damaging alternative in environmental and social terms would be the railway.

Acknowledgements: This document was made possible by the support of the American People through the United States Agency for International Development and its program on Biodiversity Understanding in Infrastructure and Landscape Development (BUILD). The views expressed herein are of the author (s) and do not necessarily reflect views of USAID or of the United States Government.