

# **BIODIVERSITY SATURATION IN COLOMBIA: COST-BENEFIT VS. MULTICRITERIAL IMPLICATIONS FOR NATURAL RESOURCE MANAGEMENT IN COMPLEX ECOSYSTEMS**

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## **INTRODUCTION**

Biodiversity keeps its route to extinction in many neotropical countries due poor valuation of the resource by the majority of their societies and/or institutions, guided by misleading environmental policy. Despite governments exhibit a great deal of interest and compromise on preserving the national biological endowment, conservation rhetoric plagues institutions. As a result, natural resource management reproduces all the biases and “enhances” the mistakes of industrialized countries used as models, which have totally different biotas, not to mention their social context. As an example, African models, mostly savanna ecosystem-based have been also wrongfully transposed for animal species valuation (wildlife and game fauna), while tropical rainforest management experiences from Asia are poorly known.

Neotropical environments are characterized by its extreme complexity, which creates a difficult valuation problem, at least at the gene and species level: The marginal social value of each new species considered in any resource management problem decreases because social choice becomes “saturated”. “Species saturation” would be the result of ignoring complexity and treating species as individual commodities that might be aggregated until the whole ecosystem appears, a false premise under systems theory. The purpose of this essay is to discuss this eventual “biodiversity saturation” as a direct result of a cost/benefit valuing approach, instead of a more suitable tool as multicriterial analysis.

## **TOO MUCH BIODIVERSITY?**

Resource use practices by traditional people in Colombia (indigenous tribes, afro-american descendants or mestizo communities) are typically multi-specific (IE: Ruiz 1996). Biological resource availability varies in time and space, according to fine-tuned environmental variations which may create favorable conditions for collecting, hunting or fishing a species only for a few days. Flowering, fruiting and animal behavior seasonal patterns are extremely sensitive to small variations of the environment, because tropical ecological regulation lacks extreme temperature shifts throughout the year.

Tropical rivers give us a good example: Seasonal fish movements are related to water levels, sediment dilution and organic matter concentration. Small changes in any of those variables drive not just annual migrations of hundreds of species, but local fish movements within a complex network of swamps, water channels and the flooded forest (Lowe-McConnell 1982). Some of those movements are truly continental travels that

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may take up to six months, but not in the same way as the salmon on temperate regions, but as a continuous flow of fish species which keeps substituting each other. Shore populations and fishing people perceive “subiendas” or “piracemas” (each name meaning the arrival of the fish from the lowest part of the river, in Spanish and Portuguese) as the progressive replacement of one species, according the rhythm and organization of their movements. By this way there are “fish for the whole year<sup>2</sup>”, but rarely the same on the dish for more than a week...<sup>3</sup>

Commercial fisheries have adapted unto some degree to such resource behavior by creating markets that respond to the relative abundance of each species (By example, the Iquitos or Manaus wild product markets). Large cities on the periphery (such as Bogotá, Cali or Medellín) enjoy a much lesser offer, not just because plane transportation is expensive, but because the extreme variability on the type of the resource, making extremely difficult to keep consumption patterns. In good years, people are not able to choose between so many species: they do not even know them.

Limited knowledge on the variability of the natural offer makes consumers to lock into few species, probably those more abundant, which end over-harvested. This is the case for big catfishes (Fam. Pimelodidae), a poor quality meat according traditional peoples (they acknowledge those fish as scavengers), but ecologically dominant and the largest in size (some reaching 150 kg).

Similar behavior can be observed with other animal resources such as wetland wildlife. Seasonality creates large habitat variations which are used by always moving populations of turtles, crocodiles, birds, aquatic mammals, not to speak about invertebrates, from which we know almost nothing. Local people enjoy a highly diversified offer of protein, and they know by tradition how to make use of it. However, markets are rarely linked to such offer, and when possible, they are concentrated in a few resources which become soon depleted and economically extinct (Randall 1986 Pearce and Turner 1987) In fact, economic behavior in the tropics seems to follow this pattern of “booming” economies (Galvis 1984, Patiño 1990-93), which usually turn on vast informal economies: Coca production and export may be explained in such a way.

Modern institutional development has failed to adapt to the continuous variation of biodiversity and society has changed consumption preferences towards non native products and technologies, where domesticated livestock dominates. A simplified offer has been the result of an economic model based on plain market strategies, with very negative impacts on resource management as well as on ecological dynamics, native cultures and traditional knowledge.

## **BIODIVERSITY IN PROJECT EVALUATION**

Infrastructure development, land use changes and direct ecosystem or wildlife use have impacts on biodiversity which are difficult to assess. Even the whole issue of extinction is poorly discussed on the grounds of social poverty: if there are so many species, people argue, why to worry to “spent a few” if society will be better off? The marginal

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<sup>2</sup> This is the title of an ethnographic report by C. Rodriguez (1997)

<sup>3</sup> Also, fish populations, when not moving (not all of the species do migrate) enter the flooded forest, making themselves unavailable to commercial captures, but not for local people (Goulding 1987)

value of the biotic variability is very low. Worse, people appear to be reluctant to reveal any value for wildlife (plants or animals) after the much campaigning by NGO's and environmental authorities: Contingent valuation probably has been able to show a high willingness to pay (and for certain specific and charismatic species), but certainly none to assume it (Stevens et al 1991). The same concept of "shadow species" used to protect an ecosystem through campaigning for the conservation of a single species is based and also becomes weakened for such idea.

People have learnt to be "politically correct", and, at least in poor societies, would not risk foreign investment if conservation requirements appear. Endangered species may survive not because people care, but because they are linked to employment, consumption and other kinds of economic welfare provided at local levels by the same conservation projects. NGOs have also learnt from that, and participatory strategies often shadow small but continuous subsidies to key actors in a region, shifting the whole dynamics of local powers. It is difficult to provide numbers, but surely cash flow from international cooperation is currently perceived as another kind of "seasonal species" that reaches the community from now to then.

Knowledge about neotropical biodiversity is also much less developed, at least for scientific standards<sup>4</sup>. A first general species listing is being prepared for some groups<sup>5</sup>, but information about plant or animal status is only available for a few. "Red Books" (following IUCN standards) of endangered species were only published by 2002 (IAvH), and they acknowledge that restrictions on field work may be frequently defining naturally rare species as endangered.

Environmental impact assessments (EIA) (Enforced by law during the last decade, based on US-EPA standards) end just with a general listing of "potential species" being affected by a specific project development, in a very vague context. Environmental damage by oil spilling, unforeseen effects of infrastructure building, deforestation and other activities usually remain unknown because there are not "information baselines" to contrast with. Large energy companies or other corporations have the best and more reliable information on the countries' biota, because their EIAs and further investments are controlled by tighter global surveillance and legal frames. However, Colombian government recently simplified its EIAs in order to oppose fewer restrictions to foreign investments, on the argument that the amount of ecological information previously required was too high and frequently, remained unused.

## **THE SIMPLER THE BETTER: A CULTURAL CONSTRUCT?**

Despite the idea that the more diversified the markets the better, there is no room, at least at the moment, to accommodate the whole biotic offer of tropical countries. "Biodiversity saturation" has been the result of urbanization and the transmission of foreign values by media and education. A recent study on social preferences for tree diversity in a large urban green area, show that even the poorest people have a very high "willingness to pay" for the recreational values of artificial forests, but the perceived welfare associated with each new added species approached zero around the tenth (Hernandez 1998). People preferred a simpler forest rather than a complex one, the

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<sup>4</sup> For further revision, see: [www.vcongresofauna.org](http://www.vcongresofauna.org).

<sup>5</sup> They are being published since 1999 in "BIOTA" the official species checklist for Colombia. See: [www.humboldt.org.co](http://www.humboldt.org.co)

latter just speaking on landscaping grounds. Five species are better than a hundred (the opposite ecological situation to that on tropical forests). Similar cases might be made for other resources, although no data is available (See Keller 1999). At the landscape level, there might appear a similar phenomenon: Ecotourism has tried to approach people to wildlife, but people frequently complain of “too much wilderness” referring to rainforest or similar wild environments. After a few days traveling through the forest or by a river, they become “saturated”, and would prefer some monkeys in an open zoo than hundreds of trees, arthropods, fish and birds. Thus, agricultural tourism is flourishing: it combines some wildlife experience (goats may suffice) together with the nice and “peaceful” life of the countryside.

It is a paradox for the western culture, always asking for the new, always inventing reality, that biodiversity is, at the end, boring. Even unnecessary, this is the risky point. Is this situation just the result of a historical perception shift? Is it the mind of the savanna ancestor still wanting to free its sight? To answer such questions it would be necessary to go deeper on the cultural evolution of the western mind and its links to the institutional development, something far beyond this essay, but we can try to analyze some of its economic basis through some commonly used tools to decision making.

## **COST/BENEFIT ANALYSIS**

Cost/benefit analysis would say that increased diversity mean higher costs and reduced benefits for project implementation: too much things to care about. Conservation of endangered species faces this problem which is already affecting even affluent societies<sup>6</sup>. Colombia recently declared its first “officially” endangered species (the Orinoco crocodile, which is doubtfully endangered at the global scale). Conservation costs for the species recover are already high and the government is reluctant to declare new species in such a category because the lack of resources to invest in expensive protection plans<sup>7</sup>. Moreover, in a recent inquire among local people, nobody wanted the species back (Oviedo 2004) and just few indigenous groups have accepted to reintroduce the species in their territories (pers obs).

However, NGOs and environmentalist are pushing hard for a kitty cat copying of the US problem, but risking larger complications than its source: the species by species approach may have terrible consequences for natural resource management in biodiversity rich countries, and may prove a worse approach than in the temperate zone, where it is already questioned.

Frustration and ideological conflict have already arisen among local communities, affected by resource use restrictions, frequently based on a wrongful “precautionary approach” inherited from external traditions that ignore local knowledge, technology or institutions. Regional extinction of wildlife has taught us that society might accept compensation for its over-exploitation. Indigenous groups in the Amazon were part of the extractive commercial chains for the export of jaguar, crocodile and other skins by the 50s and 60s According their philosophy, the environmental cost of such an action, forbidden by local traditions, would be transferred to the final consumers: for them,

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<sup>6</sup> It is the case of the Endangered Species Act, which raises major concern on the calculation of annual federal budgets and with very uncertain results. See Brown & Shogren (1998)

<sup>7</sup> This has been the case of the Condor re-introduction in Colombia, with enormous costs but still unclear results on biological grounds.

“white people” would get sick because of their greed and should pay the “price” to the “owner” of the animals. According to this vision, current social conflict among western (Colombian) society is the result of the “animal’s owner billing”. Despite the insight of such economic scaling of environmental impact, these traditional cost assessments are the exception among a western and modern scientific society, and certainly difficult to introduce in Colombian institutions.

Native people think about nature in a truly complex way, western society needs simplification: This is the Cartesian curse. Ecological complexity of neotropical environments is very difficult to approach and uncertainty still rules behind human induced perturbation. Large scale projects, such as dams, electric power lines, mining or road building have shown great unforeseen impacts but are unclear how far they have affected biodiversity and environmental services. Sometimes the biotic response to human-perturbation has shown to be much more resilient than foreseen, but to generalize such response would be dangerous<sup>8</sup>. Also, hurricanes, landslides, and other large “natural” perturbations are common on tropical ecosystems, and are probably some of the most important evolutionary forces that shape biodiversity. Any form the ecological dynamics take, the truth is that complex dynamic systems keep evolving far away from the simple addition or subtraction of species.

Cost-benefit analysis is not a good methodology for assessing project impact on wildlife, because those restrictions on basic information about neotropical ecology and ecosystem complexity. Another argument for restricting its utility would come from social insights: since economy is still poorly monetized, environmental costs are usually difficult to translate to money. Compensation becomes very similar as charity, and negative impacts (costs) are absorbed by a decreasing quality of life of local people, a fact that usually is not perceived or dismissed by governments and formal institutions. Moreover, a too recent trend towards urbanization makes rural changes less interesting for political action.

## **MULTICRITERIA ANALYSIS**

Wildlife conservation might be highly favored for a few species system, according to cost-benefit analysis. Some of those may act as shadow conservation species, such as tapirs or jaguars. Unfortunately, the extreme variability of the biota in regional or altitudinal ranges<sup>9</sup> make unlikely the selection of the proper ones, and ecological uncertainty on their roles also may affect that.

Equity is probably the most striking issue in project development in Colombia, since biodiversity is the “economic safeguard” for market shifts. Market development has two sides on biodiversity management: on one hand, rural population, linked to very unstable and incomplete markets, must rely on non monetary goods to deal with

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<sup>8</sup> By example, an undisclosed report of the impact of terrorist attacks on pipelines, which result on oil spills over rivers, have shown a large impact on the short term (animal mortality) but increased fertility and higher population levels for many species: the aquatic systems were able to clean themselves rapidly and re-colonizing from other rivers were rapidly prompted,

<sup>9</sup> Some amphibian species, by example, are endemic on each of the hundreds of short rivers that drain the western slope of the Andean mountains to the Pacific Ocean, sometimes closer than a few kilometers. Other species become ecologically replaced each 300 m throughout altitudinal gradients (Gast el al. 2000)

uncertainty. Most ethnic groups, peasants and afro-american peoples keep under their control as much biological resources as they can, to cope with sudden changes on economic policy as well as on the environment. On the other hand, market economies have shown to threaten the same social flexibility and increase community dependency and vulnerability (Cárdenas et al 2000), with higher costs for the nation on the long run: population displacement, violence, crime, and a general loss of local levels of welfare.

Biodiversity losses are specially felt by indigenous communities, but peasants too show a high dependence on wild plants and animals for food security (Aguilera 1999, Martinez et al. 1999). Economic compensation is very difficult to calculate when deep spiritual values are linked to animals, or when traditional systems acknowledge the complexity of the biotic system and keep a careful balance between social and ecological aspects. Substitution of wildlife by cattle has resulted in heavy environmental and cultural damage<sup>10</sup> (Baptiste 2001), a conflict still at the core of Colombian development.

Multicriterial evaluation favors stakeholder diversity and realizes that some of the complexity of the system may be incorporated to the analysis by allowing many voices to express their concern. At least, in the absence of scientific “hard data”, other sources for evaluating possible environmental impacts should be welcome, and social cost of wrong decisions may be shared by more people. In a regular CBA, just the gathering of relevant information may be higher than the total project cost...<sup>11</sup>

## CONCLUSION

Local communities in neotropical environments have more experience dealing with complexity and ecosystem management than with a species by species approach: their whole production or extraction systems are synchronized to such environmental variability in time and space. Thus, CBA for wildlife would be underscoring such advanced view of nature on the grounds of our scientific restrictions to handle tropical environments. Probably the recent academic approaches to model such complexity will make easier to create a dialogue with traditional knowledge, and it would be desirable to further cooperation on that direction.

Project impacts on forest and wildlife availability for economic development have been a largely neglected issue in neotropical contexts, and even the idea of comparing alternatives are constrained by the technological lock-in that drives innovation for wild populations management. At least, MCA has the potential to reveal other preferences that local or regional communities have for their future, or the need to consider different pathways to solve future demographic or economic constraints. Many indigenous groups, peasant guilds, or black communities are creating agendas for technological innovation of their own, and to build new institutions on the basis of their tradition as well as on the new national and global contexts they have to live on. Further research on the ways those groups express preferences and values will be necessary to enhance project evaluation methods. This means to go beyond ethnographic research as understood in the past, and to recover cultural diversity as the basis for dealing with the uncertain evolutionary path of the global environment.

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<sup>10</sup> Developers complain the resistance to care for domestic animals by indigenous and their “stubbornness” to adjust to modern production systems.

<sup>11</sup> By example, the ministry of environment requires that many information for allowing any wildlife commercial use, that inhibits all (legal) initiatives (See Bakker and Valderrama 1999).

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