Poverty, governance and conservation in the Gran Chaco of South America
Janis B. Alcorn*, Alejo Zarzycki 2 and Luis Maria de la Cruz 3

Abstract. The Gran Chaco is the second largest ecosystem in the Plata basin of South America, after the Amazon rainforest. The high biological and cultural diversity offer diverse opportunities for conservation, despite the threat of encroaching development. The greatest concentration of biodiversity remain in areas of northern Argentina and southern Bolivia where levels of poverty are very high, and indigenous peoples and poor criollo cattle raisers coexist. By improving informed governance, it has been possible to stabilize biodiversity levels and provide a basis for poor local people to collaborate, and to improve their situation in the face of threats from development. In this study we analyze the ongoing processes being applied in two Gran Chaco cases - from the Upper Parapeti Basin (upriver from Kaa Iya National Park) in Bolivia, and the Lower Pilcomayo in northern Argentina (a dynamic internal delta ecosystem where a tri-national biosphere reserve is being considered). Watershed management, when adapted to local ecological, cultural, social and political contexts, is shown to be an effective tactical strategy to activate moribund governmental institutions in response to local constituencies. In the two cases presented, NGO-facilitated processes enriched local people’s ability to take their own actions and to assess and frame their problems and goals for dialogue with their governments. The NGOs also offered technical assistance with land-use zoning, reforestation and alternative income-generation activities in collaborations that shifted government engagement. The methods used differ from the standard conservation and development projects, and their success offers lessons in building social network systems and civic science that improve conservation and reduce poverty. We close with a reflection on the framing of poverty alleviation and sustainability in conservation discourse.

Keywords. Environmental governance, Gran Chaco, Argentina, Bolivia, watershed management, riverine wetlands.

INTRODUCTION

After the Amazon rainforest, the tri-national Gran Chaco is the second largest South American ecosystem with high biological and cultural diversity that together offer diverse opportunities for conservation, despite the threat of encroaching development. The greatest concentration of Gran Chaco dry forest biodiversity remains in northern Argentina and south-eastern Bolivia. Levels of poverty are very high; indigenous peoples coexist with poor criollo cattle raisers. By improving informed governance, it has been possible to stabilize biodiversity and provide a basis for poor local people to collaborate to improve their situation in the face of threats from development. In this context governance refers to the formal and informal sharing of power and responsibilities, how decisions are made, who participates, and how accountability is achieved.

Because so many “conservation and development projects” fail to produce long-term sustainable impacts and yet continue to be replicated, we offer for consideration an approach different from the classic project of NGOs and donors. We analyze ongoing processes being applied in two Gran Chaco cases - from the Upper Parapeti Basin in Bolivia (upriver from Kaa Iya National Park, the largest protected area in South America) and the Lower Pilcomayo in northern Argentina. These two cases offer lessons in improving governance to enhance conservation and reduce poverty. Ecosystem services and biological resources in both cases include water and land for agriculture, forest resources (wood, honey, wild carob, artisan materials, carbon sequestration etc.), free-range cattle ranching, fishing, hunting, underground aquifer renewal and habitat for diverse wildlife and birds. In both cases, watershed management is used as an approach for facilitating landscape-level conservation in impoverished, biodiverse areas, and local engagement is nurtured to activate moribund governmental institutions to be responsive to local constituencies.

The cases described here support the conservation value of building locally-sustainable “social network systems”, linking the energy of diverse people and agencies across landscapes (Laven et al. 2010). In addition, we illustrate the advantage of using a watershed management focus as a viable tactical strategy for encouraging biodiversity conservation, building on rivers as natural connections across the landscape and water as a resource of common concern to all, regardless of ethnic and cultural differences. In this context, we reflect on the framing of poverty alleviation and sustainability in conservation discourse.

CASE ONE - UPPER PARAPETI, BOLIVIA

BACKGROUND

The Parapeti River descends from the semi-humid forests of the Andean foothills to nourish the dry Chaco forests in the flatlands of Isoso, where it spreads into the seasonal wetlands of Kaa Iya National Park - the largest tract of dry forest remaining in the world. In the Lower Parapeti, vast dunes and blowing sand fill the river channel six months of the year (May to October). In the other six months (November to April), the waters flow both above and below ground - through the deep sands of Isoso down to the deep rock of the Guiana Shield, where the Parapeti re-forms aboveground as a small seasonal stream that runs northward from the wetlands to Conception Lake (Ortiz et al. 2009). Sedimentation from upriver deforestation threatens Kaa Iya National Park, yet upriver communities appear to be unaware of the impacts their actions have on people and biodiversity downstream.

The Parapeti Basin (61,000 square kms) is home to some 100,000 people (density 0.15 persons per square km in the case sites). Over half of this population are indigenous people and the majority live in extreme poverty as measured by basic needs indicators. Local and indigenous communities, ranchers, and the wildlife of Kaa Iya National Park, depend on the river and the seasonal wetlands it creates. The watershed contains a mosaic of different types of land tenure associated with the different sectors of civil society - ranchers, titled indigenous territories, peasant farm communities with uncertain tenure but traditional rights, communities with titles, indigenous communities who are indented on ranchers’ lands, mining and oil-gas concessions, and protected areas.

The ecosystem services and resources are slowly being reduced by deforestation upriver, overgrazing, expanding urban development in small towns along the river and by intensive agriculture in Mennonite settlements that divert the river for irrigation before it enters Kaa Iya National Park. The

INTRODUCTIon

2 Alejo Zarzycki, Fundación Yangareko, Santa Cruz de la Sierra, Bolivia. yangareko@yahoo.com
3 Luis Maria de la Cruz, Fundación para la Gestión e Investigación Regional (FUNGIR), Formosa, Argentina. fundacionfungir@gmail.com
* Corresponding author: janisalcorn@yahoo.com
drivers of change include overuse of the land and the multiple impacts of the oil and gas companies who have operated in the area since the early 1900s. They have opened up *breaches* (road-like openings in the forest) which in turn opened the forest to extractive commercial enterprises such as hunting and logging. Nonetheless, the relative remoteness and low population density has served to protect the area until recently, when the soy bean boom started (CAPOMA 2009; Aranda 2010) and new infrastructure of The Initiative for the Integration of Regional Infrastructure in South America (IIRSA) hit the Chaco frontier hard. IIRSA is a coordinated capital investment plan for all of South America, financing the realization of a grand dream of highways and deep canals criss-crossing Latin America, linking the most remote areas to transportation hubs for shipping soy and other products from Pacific and Atlantic ports. IIRSA includes new dams for generating electricity and telecommunication networks - all designed to integrate the economies of the most remote areas into the global economy. Ecologists decry that IIRSA is financing the destruction of the Amazonian and other ecosystems; social activists decry it for displacing and impoverishing rural people.

Local peasants (*criollo campesinos*) and indigenous populations have been marginalized from participation in government management decisions. A small local NGO, Yangareko, began its work in the Parapeti with a strategy to use participatory land-use zoning to promote local peoples’ analysis of their environmental, social, and economic situation. Their mandate was to assist the people in determining what actions to take collectively to address the problems that they faced - and how they might raise their concerns with the government.

**METHODS APPLIED AND RESULTS TO DATE**

From 2002-2010, Yangareko completed their process across an area of 1.4 million acres, with 98 communities, in the Upper Parapeti watershed. The key mandate was to focus on participation in decision-making, a particular methodology aimed at generating self-confidence in local decision-making, through processes that generate technical instruments. Without grassroots participation, political decisions can be inappropriate, as in the case of short-term development decisions that may increase income to the state but which can result in deterioration of the productive ecosystems on which local communities depend. At the same time the intent was to encourage participation and awareness at all levels of decision-making (household, community, local government, development projects, national government agencies, etc.).

The limited technical knowledge of local communities, when compared to that of outside professionals, weakens their ability to argue their perspectives with government officials, industries, and academics. This observation is not meant as a “put down” of their knowledge but to encourage reflection on the different perspectives and discourses that exist in relation to co-existence with nature. For this reason, the creation of a technical team of young professionals, without preconceptions or elitist attitudes, proved to be very useful in keeping minds open to understand local perspectives, and allowing positive communication between the team and local people. Having the small teams arrive at the door of every household at the beginning of the work, in an attempt to involve everyone - no matter how remote their homes - was very much appreciated by the local people, generating comments such as “no one else has ever visited us to understand how we live.”

The collection of basic information focused on interviewing local people about their ways of life, their economy, their cultural, spiritual conceptions of their environment and their concerns about the natural resources on which they depend. This also brought to light the different conceptions harboured by the indigenous people and the more recent arrivals, the *criollo campesinos*. The team also gathered information on the vegetation, soil types and other physical parameters affecting current land use. This information was then presented in community meetings for shared discussion and enrichment. Community members analyzed the information from their own diverse perspectives, and identified their needs for technical assistance.

The next step was to assist communities to develop and establish their own community rules related to the use and management of natural resources in their landscapes. This was received with much enthusiasm, as the rules assisted the community assembly to manage internal conflicts as a group, without undue privilege as often happens when authorities unilaterally make decisions.

The communities then requested assistance from Yangareko to create a legally-recognized association that could represent all the communities in the immediate watershed. The process moved from all community members signing the necessary documents to the official recognition of a Watershed Committee Association by the relevant authorities (Figure 1). The watershed organizations voted to receive dues from each family in each community, and an assembly of representatives from all communities to meet quarterly to attend to watershed affairs. Membership has remained constant, and 95% of communities have participated in each quarterly assembly meeting for the past six years.

Yangareko used the data that was gathered by the field team to generate technical instruments, maps and documents related to land-use zoning and recommendations for improved resource management for each community and for the overall watershed. These recommendations were based on local knowledge and perspectives. Documents were developed, printed and then distributed by the representative association to the communities and to the county government who are now using them for local land-use decisions at individual, community and county levels.

Through local discussions generated by the technical documents, viable projects were developed for recovering degraded areas and protecting the forested watershed slopes and springs. The project proposals were based on the specific local knowledge and particularities of different families in each community and not by trying to create general projects into which everyone would have to fit. These project proposal discussions were also important to continue the reflections on the long-term impacts of land use that can be forgotten in daily activities such as protection of the water itself and the forested river banks (to prevent silting and subsequent flooding).

These local discussions have built the political will for the watershed association and community representatives to maintain discussions with county and regional authorities regarding county government planning and budget allocations to address environmental degradation and prevent further damage. Local discussions were also facilitated to understand, consider options, and reach consensus on the designation of local protected areas with characteristics that allow appropriate land uses for sustaining the resident communities. The communities saw the value that such protected areas could have for their resources in the future and the discussions raised appreciation for the immediate need to respect and conserve nature.

Yangareko also assisted communities and local leaders to understand the watershed concept in relation to the wider geographic and cultural space implied by upriver-downriver connections, and the interdependency of communities using the same resources. This raised the discussion of respectful co-existence with others. Exchange visits and discussions brought knowledge of the cultural and economic diversity of everyone living in the watershed, as well as different perspectives on how to use and protect the environment. Yangareko facilitated the signing of local agreements between different populations in the watershed to demonstrate commitment to the overall wellbeing of all the populations, and good intentions to work together.
Public awareness of the information arising from technical and local analyses was promoted by means of videos, photos, and participatory theatre which served to build and transmit the historical memories of the people themselves. These activities also contributed to the strength of local representative watershed associations that bind the communities together.

This process model was followed successfully in three neighbouring counties (Monteagudo, Huacareta and Muyupampa) that fall along the Upper Parapeti watershed, proving its value as a replicable process. This reaffirms that a key element for conservation and environmental management is attention to grassroots awareness-raising that nurtures the emergence of representative organizations which in turn can take their own informed actions into the future.

Yangareko assisted the new grassroots Watershed Committees with: administrative training; linkages to government agencies that could program resources for communities’ proposed activities; initial assistance to manage and implement pilot projects in beekeeping, orchards, and reforestation run by the representative association and; experience in responding to the constituent communities’ requests for assistance. As well, Yangareko provided basic equipment to sustain the organizations, all the while being clear that this external assistance was temporary.

Many NGOs in this part of the world function by ‘accompanying’ local communities and governments as they make decisions, not acting as executors of the projects per se. The NGO then continues to accompany the communities as a distant advisor that encourages reflection on what communities are learning themselves, as well as providing ‘on-demand’ technical backup for community decisions. The NGO then assists in the representation of those decisions to the government authorities - lending weight to the voices of peasants and indigenous communities that have a long history of disenfranchisement in remote rural areas.

Three cross-cutting themes are emphasized throughout the process that contribute to the construction of a long-term social movement for watershed conservation from the grassroots. The active role of women is encouraged, and women representatives were incorporated into the watershed associations. Youth involvement is encouraged through local street theatre adapted to rural conditions and agricultural high schools. All activities take into account the need to build the political self-confidence of rural, disenfranchised people to raise their own ideas and collective concerns to the politically-powerful people in industry and government agencies.

Tangible outcomes are multiple. Technical planning documents such as zoning plans and maps, at local and county levels provide recommendations for best development and land-use based on analysis of the socioeconomic condition, vegetation, biodiversity, hydrology, soils, topography, climate data and the current land use. These documents include maps with recommendations for ecologically sustainable development that benefits local communities and landowners. Documentation of socio-economic data at household and community levels in use by communities, as well as by county, regional, and national authorities for taking decisions based on real situations are another outcome. This kind of detailed information – gathered directly from families and then discussed by the community and then shared with government - is not otherwise available. Detailed maps of land use have been integrated into GIS over satellite images to enable monitoring into the future. Yangareko also maintains an archive of photographs and videos of the different perspectives, ideologies and positions of the communities, authorities, and general population.

The botanical richness of the Upper Parapeti watershed has been recorded through specimens collected, and then identified and stored in the herbarium of the University San Xavier de Chiquisaca in Sucre. Three grassroots-based watershed management organizations were formed, legally registered, and activated to enable community and cross-community participation in development planning decisions at county, regional, and national levels. New county protected areas (700,000 acres) are conserving important watershed areas that can be managed with county resources and external assistance. Reforestation activities have contributed to the stabilization of the river’s channel. Ongoing consultation is maintained with criollo and indigenous communities regarding their expectations in relation to their interests and concerns regarding Bolivian policy changes.

Yangareko has completed this work in the Upper Parapeti watersheds and Middle Pilcomayo watersheds, successfully building stronger relations between rural civil society in local communities and their government authorities in Huacareta, Villa Vaca Guzman and Monteagudo counties. Yangareko is receiving requests to do similar work with communities in other parts of these watersheds, including Guarani indigenous communities in Charagua county in the Lower Parapeti, and a mixture of indigenous and criollo campesino communities in four counties upriver on the Pilcomayo.

**CASE TWO - PILCOMAYO, ARGENTINA**

**BACKGROUND**

The Pilcomayo River Basin of Bolivia, Paraguay and Argentina, includes one of the world’s largest inland deltas – a vast, globally important site for migratory birds and home to many rare and endangered terrestrial and aquatic species that adjust to seasonal cycles of flood and drought. The tri-national basin covers approximately 200,000 square k.ms, of which some 70,000 square kms are located in Argentina. The Pilcomayo forms part of the great Plata River Basin.

Approximately 148,000 people live in the Argentinean section of the Pilcomayo watershed, at a density below 1 person per square km; about one third are indigenous and most of the others are criollo ranchers whose cattle run free-range in the forest. Water is critical to everyone in this dry region with rainfall of only 300 to 1200 mm per year. The area is crossed by the Pilcomayo River with its oxbow lakes and seasonal wetlands created when the annual floods “bathe” the dry forestland. Until recently this northern area of Argentina’s “interior” had long remained a frontier, with little modern development. The majority of the people live in poverty, even extreme poverty, as measured by poverty indicators. The entire ecosystem is under threat from drivers of change that include new foreign investment-driven infrastructure development, in part initiated by the IIRSA, in the form of
roads and channels. The development intends to produce short-term benefits by creating new soy and cattle production areas but the infrastructure is affecting fish migration and is changing annual flood patterns. Pollution from oil and upriver mining are also serious issues. Other drivers include poor project design due to the imposition of external criteria by financial institutions and a lack of serious attention to environmental issues in development plans. The local participation is subverted by approved workshop participant lists, and other tactics used to narrow the perspectives of the participants.

Over the past century, extreme changes have occurred in the Argentine section of the Pilcomayo Basin, violent colonization, migrations of people and cattle during the Chaco war in the 1930s, and rapid modernization and intrusion of the national and provincial administrative apparatus over the past 20 years. Traditional local governance and cultural patterns correlated positively with conservation. These systems and patterns (now marginalized) adapted to and responded to feedback from the ecosystem, and in turn protected biodiversity. They have been disrupted, with negative impacts on biodiversity. In the past decade, efforts have been made to reconnect older governance structures and knowledge with the modern state apparatus. The national and provincial regulations and laws appear good in principal, but they are poorly implemented. The challenge is to develop a robust, cross-scale, institutional governance. It needs to acknowledge the value of the diverse living ecosystem and effectively uses decision-making processes that integrate indigenous and local ideas about the river’s behaviour, the native forest and their resources for long-term sustainable development of the region.

The behaviour of the river is a major aspect of the living Pilcomayo. Some development projects wish to control the annual changes in the river through canalization and small dams - to make it a tame, predictable river. (In Upper Parapeti, the rivers behaviour is subject to change due to deforestation which leads to siltation, causing the river to flood wider in an uncharacteristic manner).

Unless there is a change in governance that incorporates more local participation, the expected future impact is negative. The living ecosystem of the Pilcomayo and its vast internal delta wetlands will be destroyed within the next ten years. The likely scenario will be intensive cattle production and monoculture industrial agriculture in the eastern part of the basin and degraded lands in the west along a channelized and engineered river without the wealth of species, habitats, and ecosystem services which currently characterize the area. In this scenario, rural inhabitants/constituents will largely disappear and there will be profound changes in the indigenous communities that remain. Those who migrate away from the area will live as deeply impoverished “squatters” on the edges of overgrazed cattle pastures and in poor shanty neighbourhoods on the edges of towns.

METHODS AND LESSONS LEARNED

From 1988-2002, the small Argentine NGO, La Fundación para la Gestión e Investigación Regional (FUNGIR), used a methodology of accompanying local indigenous (Toba, Wichi and Pilaga) and criollo communities. FUNGIR’s intent was to help the people assess their problems, learn about the ecological and social situation including the behaviour of the river and human adjustments to the river’s behaviour, gain the trust of the people, and ultimately support ecologically-sustainable and socially-just development of the Pilcomayo as a natural free-flowing river.

A major challenge was that the Pilcomayo watershed ecosystem and human population had long been invisible to government -- a generalized problem across northern Argentina. FUNGIR has used a long-term strategy to assist local people to make themselves more visible and take on responsibilities in relation to maintaining the ecosystem -- a strategy FUNGIR calls “constructing ownership.” This includes raising the profile of their ecologically sustainable land uses so that the provincial government does not see these lands as “unused/unproductive” and is therefore likely to promote other destructive land uses. At the same time it is necessary to encourage the people themselves to change their own view of what they do, to take responsibility for maintaining production from nature in a sustainable manner.

In 2003, FUNGIR began training local environmental monitors who were networked to each other and able to engage the government while at the same time assisting local communities improve their livelihoods and enabling them to access assistance for ecologically-appropriate development activities. By raising the profile of algarrobo production for example, the costs of destroying productive algarrobo groves by river engineering would have to be taken into account in cost-benefit analyses of massive infrastructure developments. These projects have the potential to destroy an ecologically-sustainable production system that benefits rural indigenous and criollo people in order to establish an agro-industrial system that will benefit investors. To date, these costs have not been taken into account in decision-making analyses, in part because of the incentives from agro-industry project funding and loans pushed upon the provincial government.

From 2002-2007, FUNGIR’s work focused on building grassroots relations with the Pilcomayo Master Plan Project funded by the European Union. FUNGIR assisted in the establishment of a Commission of Indigenous Peoples of the Pilcomayo to interact with the tri-national governmental Commission. In response to the indigenous interest, the EU funded the indigenous monitors to identify critical sites that needed to be taken into account for planning future interventions. The indigenous studies demonstrated that the indigenous people have better knowledge of the specific dynamics of the river than many of the technical specialists from the hydrology offices. However, the indigenous input ultimately had little influence on the Master Plan recommendations set out in 2007. FUNGIR facilitated a workshop of indigenous representatives to analyze the Master Plan report, and they concluded that:

- the “problem tree” in the project report was incomprehensible to them;
- the “problem tree” was created without any participation from them. It was formulated by those with little knowledge of the people of the Pilcomayo or their daily lives;
- the “problem tree” maintains baseline data that is incorrect, but the experts did not take their feedback into account;
- the “problem tree” did not take into account the dynamic nature of the river. It was just based on a photograph of one moment in time;
- the project never incorporated an understanding of their territory nor the land tenure situation in the area;
- the project failed to consider the conflicts that will arise between communities and between landowners when some areas are flooded;
- the project failed to take into account the sacred areas;
- the problem tree transforms things the people saw as opportunities into problems to be resolved by the project;
- their frustration that when they were in meetings with the project technicians, the experts listened to them, but then the external experts did not include anything the indigenous experts had said in their reports from the meetings.

In short, the five year effort at building civic science that incorporated local knowledge into environmental decision-making (Reed and Mellvleen 2006) failed to facilitate communication between indigenous communities and EU project staff. It did however contribute to learning
by community representatives and strengthened the local organizations of "impoverished" people. Local people and FUNGIR continue to relate their concerns to the national and tri-national Pilcomayo Committees. In 2007, the Pilcomayo Watershed Committee of Western Formosa was formed, and two indigenous monitors were elected to serve as delegates to the National Committee of the Pilcomayo Basin. FUNGIR serves as the NGO representative on the Argentine National Committee of the Pilcomayo Basin.

The indicators for monitoring identified by local people in Formosa province include: change in locations of area "bathed" during the annual floods; new areas where silt is being deposited; changes in vegetation that affect natural succession processes; advances in international and national negotiations that favour local participation in development plans; news of new infrastructure plans that will affect the local population and the ecosystem; and new private infrastructure plans and construction that will affect the basin.

From 2006-2009, FUNGIR expanded the local monitoring network westward into Salta province, in collaboration with Fundapaz and Asociiana - NGOs working for many years on poverty alleviation and land rights for indigenous and criollo ranchers along the Pilcomayo in Salta province. With the local monitors in the Salta province, many indicators were added to reports such as annual flooding and dropping of river levels, water resources for communities, drought impacts on people and wildlife, infrastructural issues, new fences, land use patterns, fish reproduction, and information about illegal logging. The information on illegal logging was integrated into GIS maps and presented to Salta province government agencies who took action to stop the illegal logging. Discussions among monitors scaled-up shared public awareness and concern about existing and pending development.

The inputs from local monitors have been constantly entered into FUNGIR’s GIS system and overlaid onto satellite imagery of the Pilcomayo during the different flood stages over the past seven years. FUNGIR has created a network of actors that produce information with FUNGIR serving as the articulator, assisting in interpretation and projection of future scenarios using the data and system. The actors include people working for the national weather services of Argentina, Bolivia and Paraguay, the Tri-national Commission of Pilcomayo, the Argentine and Brazilian Space Agencies, USGS (NASA), Formosa provincial water authority, and the local monitor network. More than 60 actors participate in the GIS network that enables permanent updating of the GIS ecosystem model, used to project flooding patterns from the Pilcomayo River’s behaviour. As a result of the information produced by the model, three large conservation and alternative production corridors have been recognized in Formosa Province under the Conservation of Native Forests law. The information is also being used by studies for possibly creating a Biosphere Reserve in the main wetlands area- known as the Bañado de la Estrella, a key area for criollo free-range cattle raisers who depend on the river movements to provide water and food plants for their animals.

FUNGIR also responded to local demands for alternative development projects by working with another local NGO, called Gran Chaco, to reach out to governmental agencies for assistance with production based on local forests -- honey production, algarrobo (Prosopis alba, “native carob”) flour commercialization, and improved livestock husbandry for cattle and goats grazing under forest cover. Across the Gran Chaco, indigenous people and criillos, as well as their cattle, have always depended on the nutritious and delicious dry fruits of the algarrobo which form stands along the Pilcomayo. Commercializing algarrobo in the Gran Chaco region is controversial for local culturo-religious reasons (Ortiz et al. 2008), but at the same time people realize that this route offers a new income source instead of deforesting the lands for agro-industrial use and displacing local people. Since 2008, federal and Formosa provincial programs are assisting with honey production and sale, algarrobo enrichment planting and management, community-based algarrobo flour production, and livestock husbandry activities, by providing training and materials, as well as purchasing algarrobo flour for school feeding programs. Algarrobo flour is also purchased by bakeries across the country and sold for export.

In addition to the environmental indicator monitoring work, local monitors were trained to gather data which was used to create the first socio-economic database for the area, previously nonexistent at the provincial and national levels. There was a 90% participation level as people who initially did not wish to participate changed their minds and provided information. This data has helped to make the population’s livelihood patterns and their dependence on the natural river and forest, more visible to the government. The database includes the georeferenced location of homes, corrals, grazing areas, number of persons per household, types of production, and the local people’s understanding of the map of their own territory/lands in the absence of any formal title or survey.

FUNGIR and NGO Gran Chaco have used this socio-economic data to promote the PAIIPPA (Program to Assist the Small Rural Producer). FUNGIR was invited to train the Formosa provincial forestry agency to adapt similar data collection processes, to use GIS, as well as to assist the Agriculture Department train youth to gather similar socio-economic data and monitor changes in other areas. In addition, FUNGIR signed an agreement with the National Labour Ministry to train 800 people to plant and maintain algarrobo areas, train 80 people to monitor algarrobo plantations, and train 20 people in the use of GIS.

Socioeconomic information gathered by monitors in Salta province proved useful for the Lhaka Honat indigenous organization and the criollo organization in their territorial negotiations with the Salta provincial government. These negotiations involve the subdivision of a 650,000 hectare area through ongoing negotiations mediated by Inter-American Commission on Human Rights intervention with Lhaka Honat and the Argentine government. In addition, Fundapaz has used the information in discussions with the national government on forest policy and land-use definitions in the Supreme Court. The Indigenous Peoples and the criollo organizations assert the need to protect the Chaco forest of Salta. Through studying the collected data, the improved understanding of overall river dynamics also contributed to improving an “erosion” bill in Congress and helped to estimate costs of environmental impacts by infrastructure projects.

Finally, the monitoring work discovered the reclusive and endangered “giant armadillo” that had not been seen in region for 50 years. Subsequently, national wildlife service agents installed a chip in its body to monitor the animal’s movements.

National and provincial government agencies are now beginning to pay attention to these long ignored constituents along the Pilcomayo and more sustainable, ecologically-responsible land use alternatives are beginning to receive government recognition. Finally, local people have become more confident and outspoken in their resistance to unsustainable development and infrastructure that will harm their livelihoods and the ecological integrity of the river basin.

**DISCUSSION AND CONCLUSIONS**

The two cases highlighted in this study are similar in intent, in their general approach and in their progress/outcomes. However, they differ in their engagement with local communities in accord with the political differences in the two countries. In Bolivia, local “municipio” (county) governments have significant power and substantial budgets due to the
in the two cases presented in this paper, NGO-facilitated processes enriched people’s ability to take their own actions, to assess and frame their problems and goals for dialogue with their governments, as well as offered technical assistance with reforestation and alternative income generation activities. Sustainability is addressed by encouraging good governance through the communities’ self-engagement with local and government agencies whose staff, energies and resources represent untapped resources (Tendler 1997). At the end of the day it is these institutions that need to be sustainable as they will continue long after NGOs have left and projects have concluded. In a future where global climate change threatens biodiversity, people will depend on functioning ecosystems. Networked systems of rural people with confidence to assess and communicate local conditions to governmental decision-makers will be key in the prevention of further impoverishment and resultant threats to biodiversity. The processes used in these two cases offer possible models for adaptation in other high biodiversity areas of the world.

We assert however that the bottom line is that there is no standard formula, global or regional, for achieving natural resource management and conservation that contributes to improved rural wellbeing. It is always necessary to bring local knowledge, local interests, local geographies, local ecologies, local cultures and local histories, fully into account in ways that put the local people in the decision-making driver’s seat with good technical assistance available.

ACKNOWLEDGMENTS
We gratefully acknowledge the research support from the GemConBio Governance and Ecosystems Management for the Conservation of Biodiversity, University of Thessalonika, Greece funded by the European Union, and project support from the Garfield Foundation. Donor’s intentions were to support locally-sustainable initiatives for conserving biodiversity and sustainable development. The conclusions however, remain the responsibility of the authors.

REFERENCES


