

**Lessons from the Equator Initiative:
Community-based Arapaima
conservation in the North Rupununi,
Guyana**

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Summary

This technical report examines the lessons learnt from a community-based effort to manage the Arapaima (*Arapaima gigas*), an endangered fish of the North Rupununi region in Central Guyana. The Arapaima management effort is a subproject of the North Rupununi District Development Board (NRDDB), which was short-listed by the UNDP Equator Initiative as a successful example of integrated conservation and poverty reduction. The results presented here are based on a series of interviews and focus group sessions conducted between July and November, 2003.

The report begins by introducing the research objectives, methodology and the theoretical background. This is followed by a short description of the study site, local culture and communities, and the Arapaima management project. The third component of the report then presents the study's major findings and discussion.

The report's findings and discussion are divided into five sections. The first examines community organisation and associated factors leading to the initiative's creation. Specific focus is given to knowledge sources, learning, and the key persons and supportive organisations involved. The discussion then turns to cross-scale institutional linkages and identifies the organisational levels of major stakeholders, the types of institutional linkages involved, and their effect on the project. The report continues with a description of biodiversity conservation and environmental improvements related to the initiative. This is followed by an examination of project related changes in income or livelihood opportunities within the communities. The discussion then concludes with a general examination of the initiative, culminating with a list of lessons learned.

The list of lessons learned at the end of the report attempts to address the study's primary purpose. This list first provides transferable lessons, including tailored capacity building, the creation of collaborative institutions and mechanisms, appropriate distribution of jurisdiction and rights to the resource, horizontal learning, the use of Traditional Ecological Knowledge as an entry point, and the provision of livelihood alternatives. The list then closes with an examination of non-transferable lessons, including supportive cultural and social conditions, committed local leaders and NGO personnel, and consistent support from partner organisations.

List of frequently used acronyms and abbreviations

AMP	Arapaima Management Plan
CEW	Community Environmental Worker
CFC	Community Fishery Committee
CIDA	Canadian International Development Agency
DFID	Department for International Development
EFC	Executive Fishery Committee
EI	Equator Initiative
FAO	Food And Agriculture Organization
IUCN	The World Conservation Union
Iwokrama	Iwokrama International Centre For Rainforest Conservation and Development
Mamirauá	Mamirauá Sustainable Development Reserve
NRDDB	North Rupununi District Development Board
UNDP	United Nations Development Programme

1. Introduction

1.1 *Brief description of research*

Community-based management has emerged as the dominant approach to integrated conservation and development. This approach often strives to reduce poverty through the conservation and sustainable use of biodiversity. Community-based management has had mixed results, and has failed to live up to expectations in many cases. Some argue that this failure is due to the impracticality of integrating the goals of conservation and development (Redford and Sanderson 2002).

How can community-based conservation reduce poverty through the sustainable use of biodiversity? We propose to address this question by identifying and understanding the conditions under which community-based conservation is successful. For this research we focused on a number of conservation and development projects short listed by the UNDP's Equator Initiative (EI). Two cases were subsequently chosen for research and comparison, including the North Rupununi District development Board (NRDDB) in Guyana, and the Toledo Institute for Development and Environment (TIDE), in Belize. While facing similar challenges, these initiatives seem to have developed unique and innovative approaches to conservation and poverty reduction.

This research is one of several EI case studies in a coordinated team project at the Natural Resources Institute, University of Manitoba, through a partnership with the International Development and Research Centre (IDRC) and the Biodiversity Conservation Office of Environment Canada. By documenting how biodiversity conservation and economic development can be simultaneously achieved, the research findings will be used to further the theory and practice of community-based conservation.

1.2 *Purpose*

The purpose of this study is to research the lessons learned from the NRDDB and TIDE initiatives in how biodiversity conservation and economic development can be simultaneously achieved. This technical report details the research findings related to the NRDDB. Rather than examining all of the projects under the NRDDB umbrella, this study focused specifically on the NRDDB's Arapaima management project. The research findings presented here therefore relate primarily to this project. However, the report does include a brief analysis of the larger NRDDB initiative (Appendix 1), with some discussion of its origins and key institutional relationships (Figure 3).

1.3 *Research Objectives*

The objectives of this study are:

1. To document the role of self-organization in the development of the initiatives.
2. To identify the cross-scale institutional linkages that facilitated project development and functioning.

1.4 Methods

Fieldwork was conducted from July to November 2003. Research methods involved a combination of Rapid Rural Appraisal techniques, including an archival review, informal and semi-structured interviews, participant observation, and a focus group session. These techniques were used to examine traditional and contemporary Arapaima management, local Arapaima folklore, significant changes in Arapaima use and fishers' livelihoods, community organisation and cross-scale institutional linkages affecting the project.

A total of thirty-two (32) semi-structured interviews were carried out with community members from ten (10) communities. Additional interviews were conducted with four (4) Government officials and two (2) NGOs personnel involved in the conservation project. The focus group session was used to conduct a timeline analysis and an institutional mapping exercise. The session was attended by twenty-one (21) participants from eleven (11) communities, including fishers, leaders and community project personnel. Participant observation was also used to gather data during community meetings, daily activities, and project monitoring. Archival research was also conducted to examine changes in fisheries legislation, historical Arapaima use, and changes in traditional resource use practices.

1.5 Theoretical Background

Self-organisation, learning and adaptation are central to the concept of resilience, and hence efforts to achieve sustainability. Holling et al. (1998) suggest that self-organisation is a primary evolutionary characteristic of both the social and environmental components of resource management problems. They go on to argue that the diversity, widespread occurrence and long track records of local management institutions suggest that many traditional social systems evolve and respond to ecological change. This leads to feedback learning and the generation of locally devised and adaptive management practices (Folke et al. 2002; Holling et al. 1998). Self-organisation in these traditional social systems thus allows them to cope with environmental changes before they accumulate and pose a threat to the community's social well being. This adaptive characteristic demonstrates that social and ecological systems "...can change qualitatively to generate and implement innovations that are truly creative..." (Holling et al. 1998:361). Self-organisation can therefore provide social systems with opportunities for innovative co-operation, built on feedback, learning and adaptation.

Complex social and ecological systems cannot be understood by examining any one scale in isolation. Effective management must take place at multiple scales, and involve institutions linked across space (horizontally) and across different levels of organisations (vertically) (Barrett et al. 2001; Berkes 2002). Horizontal linkages may include community networks involved in resource management initiatives, and the learning that results from this interchange. Vertical linkages refer to the relationships between different organizations at multiple levels, as in co-management. These horizontal and vertical institutional interactions are known as cross-scale linkages (Berkes 2002).

This multiplicity of scales is often ignored by state level, "one size fits all" conservation (Barrett et al. 2001). Such a centralised approach is incapable of incorporating feedback from management outcomes and ecosystem change into future management. This

mismatch of scales results in the loss of ecosystem resilience and the movement of natural system towards thresholds of collapses (Berkes 1996). Centralised management is thus often identified as a primary obstacle in attempts to achieve sustainable resource management and conservation (Holling et al. 1998).

Cross-scale conservation must therefore start at the lowest level of the organizational hierarchy, with planning being “bottom-up” (Berkes in prep.). Effective conservation in countries with legacies of centralised resource management will require the strengthening of local-level institutions in order to facilitate increased cross-scale interaction (Berkes 2002). Since governments often retain the majority of power in developing countries, state support and interventions are vital in achieving effective community-based management. These interventions may include state recognition of local institutions; development of enabling legislation; cultural revitalisation; capacity building; and local institution building (Berkes 2002; Ostrom 1990). However, empowerment of local communities is often difficult, since there is little incentive for governments to relinquish their power (Lele 2000). That said, some Governments also recognise that power-sharing with communities can also lead to cost savings, better enforcement and more effective compliance (Berkes, in prep.). The challenge for many communities is therefore finding ways to increase government support for the strengthening of local-level institutions, and the transfer of rights to local community resource.

2. Situational Background

2.1 The North Rupununi Savannas and its people

The Rupununi Savannas are on the eastern margin of a larger savannah system that extends into Brazil. The Guyana savannas are divided into the North and South Rupununi Savannas by the Kanuku Mountains.

The North Rupununi Savannas, which are approximately 8,000 km², form a seasonally flooded plain, known as the North Rupununi Wetlands (Figure 1). These Wetlands are dominated by the Rupununi, Rewa, and Essequibo Rivers, and include over 750 lakes, ponds and inlets covering approximately 220 km². During the rainy season, the Rupununi River floods into the surrounding savannas and forested areas. This flooding creates a large, unique wetland, which is an important feeding and spawning area for the area’s fish species. These flooded savannas also represent a historic pathway between the Amazon and Guyana’s river systems. As a result, the area contains remnant populations of Amazonian endangered species, which migrated into the area via the link between the systems. The area is thus globally unique, with extremely high fish species richness for an area of its size.

The North savannas are also the traditional home of the Makushi Amerindians. Compared to other indigenous Amazonian societies, traditional Makushi social organisation is known for individualistic tendencies, loose social structures, and lack of formal social groupings (Rivière 1984). Prior to missionary contact in the 1800s, the Makushi were primarily semi-nomadic, with both individuals and households being relatively mobile. Settlements were characterised primarily by a loose grouping of houses, although some nucleated settlements did exist (Rivière 1984, Myers 1993). These ‘villages’ tended to be political decentralized.

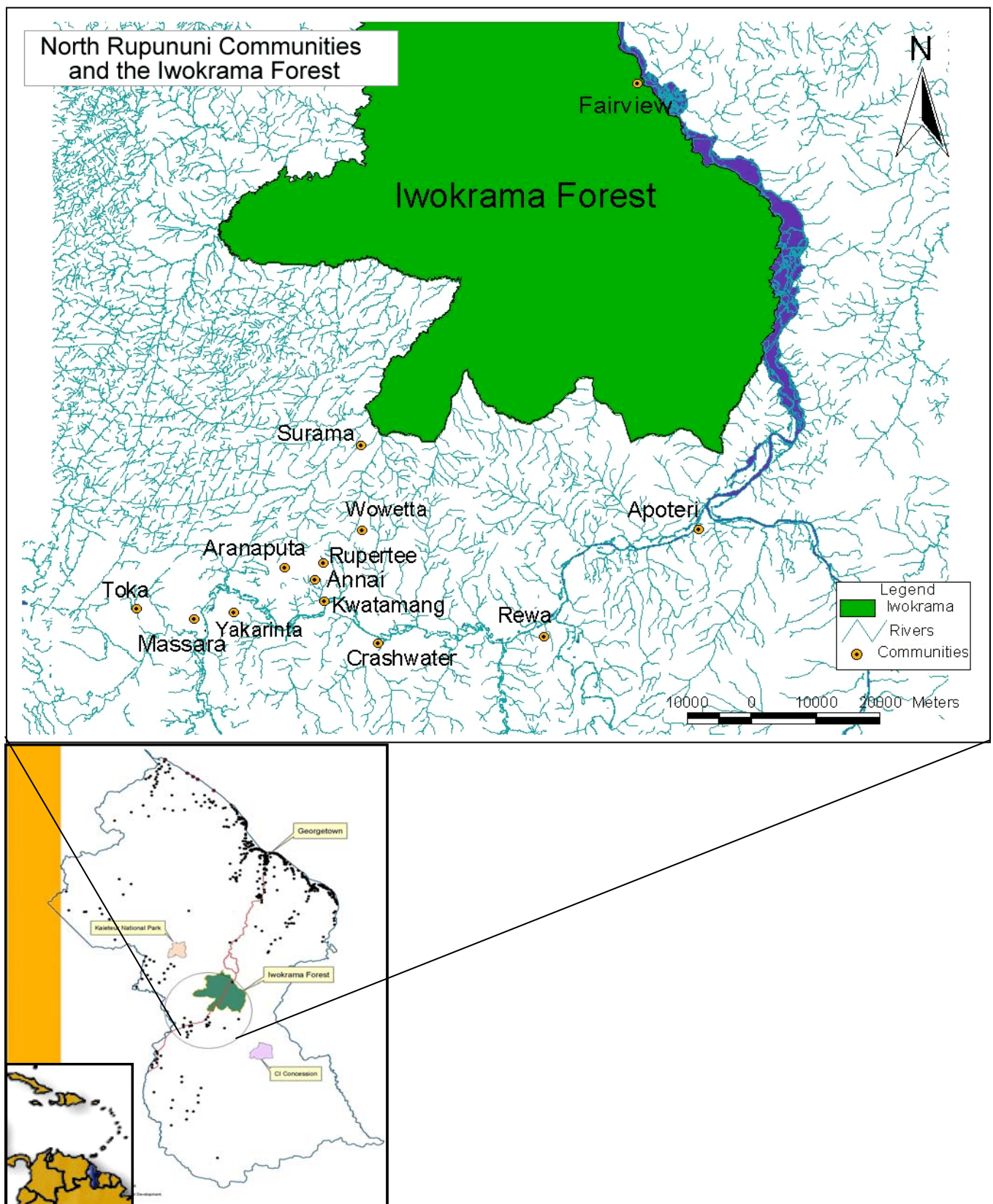


Figure 1 – Map of study area

However, local leaders or *Toushaus* were, and still are, a common feature of many settlements. Traditional Makushi culture included seasonal rituals and festivals, *parishara* dances and songs, and a rich folklore involving complex human-animal myths and food taboos. Although many of their beliefs and practices have faded, a significant amount of Makushi culture is retained today in remnants of the local folklore.

The primary livelihood activities in the area are subsistence farming and fishing. The main local crop is *cassava* (*Manihot esculenta*), which is used to produce farine (roasted cassava grains), cassava bread, tapioca, and various beverages. Fish are the major source of protein in the region. As such, fishing is an extremely important subsistence activity. There is some local commercial exploitation of wildlife, for the bush meat and pet trades. In these areas, Arapaima (*Arapaima gigas*) was harvested for both subsistence and income generation. Arapaima, or *warapai* in Makushi, is also a large part of local folklore, with a number of myths and taboos related to the species.

2.2 Community Structures

The Makushi of the North Rupununi are distributed among fourteen primary communities, consisting of approximately 3500 people. Annai Central, Crash Water, Rewa, Toka, Massara, Wowetta, Rupertee, Kwatamang, Kwaimata and Yakarinta villages are homogeneous Makushi communities. Apoteri village is a mixed Wapishana-Makushi community; Aranaputa village is mixed coastlander-Makushi community; Surama village is a mixed Arawak-Makushi community and Fairview village is a mixed Arawak-Wapishana community.

Eight of the fourteen communities (the exceptions being Rewa, Apoteri, Fairview, Kwaimata, Crash Water and Aranaputa) have legal title to some of their traditional lands. However, many of these communities have historically enjoyed customary rights to surrounding land and resources, to which they have no title. The villages are presently represented by democratically elected Toushaus or Captains.

These leaders make up the North Rupununi District Development Board (NRDDB), a local community-based NGO that facilitates the management and development of their member communities. The NRDDB was initially established as a formal link between the communities, government agencies, and Iwokrama, but has since taken responsibility for the planning and coordination of most educational, developmental, cultural and research programmes in the North Rupununi. The NRDDB currently oversees a number of ongoing projects. This research specifically examined the origins and development of the Arapaima conservation project and its linked initiatives.

2.3 The Initiative: Arapaima conservation

The Arapaima is one of the largest freshwater fishes in the world, reaching up to 3 m in length and 275 kg in weight. It is an obligatory air breather and has to surface regularly in order to obtain supplemental oxygen. As a result it is an easy target for fishers. When hunted, nearly all of the individuals in a lake can be removed. As a result, this species is threatened in many areas of its range, including Guyana.

Overharvesting in the last 30 years led to the rapid decline of Arapaima populations in Guyana's North Rupununi Savannas. In the late 1990s, joint action was taken by the NRDDDB and Iwokrama to develop a conservation project focused on the recovery of the species. The centrepiece of this initiative is the Arapaima Management Plan (AMP) (Box 1), which was crafted through discussions with communities, Iwokrama, and the Mamirauá Sustainable Development Reserve in Brazil. Current efforts involve the NRDDDB endorsing the harvesting ban; the formation of fisher groups at village and regional levels; a local monitoring program with check points; and a community education and awareness campaign (See Appendix 3 for a brief evaluation of these subprojects).

3. Major Findings and Discussion

3.1 Community organization

3.1.a. Origins of the project

- i. *Date of community initiation:* There was no specific date of project initiation. Arapaima management was first officially identified as a major community concern during resource management workshops sponsored by Iwokrama in 1998. Additional milestones include the community endorsement of a harvesting ban in 2000 and the establishment of a NRDDDB Fisheries Task Force in 2001 (see Appendix 2 for Timeline).
- ii. *Date of formally established:* The NRDDDB was established in January 1996.
- iii. *What inspired or precipitated the project?*
Arapaima harvest was taboo in traditional Makushi culture. However, the taboo broke down due to outsider harvesting, and by the 1970s and 80s communities in the area had begun to notice a dramatic reduction in the number of Arapaima. Although some people attributed the reduction to the disappearance of traditional rituals, most villagers seem to recognize overharvest as the major cause of the Arapaima's disappearance. Community members raised concerns over the state of the Arapaima fishery at village meetings and during regional meetings with Government officials in the 80s and 90s.

In 1998, workshops were held between the newly created Iwokrama International Centre and the North Rupununi communities. It was at these meetings that Arapaima management was identified as a local priority. This was to mark the beginning of a process that led to the establishment of links with the Mamirauá Sustainable Development Reserve in Brazil, which was involved in an existing community-based Arapaima management project. The Brazilian project was subsequently used as a model in the development of the North Rupununi's Arapaima Management Plan (Box 1).

Box 1. The Arapaima Management Plan

The Arapaima management plan refers to an effort by North Rupununi fishers to experimentally manage Arapaima (*Arapaima gigas*) for a period of three years. The management plan was developed jointly by the communities, Iwokrama and the Mamirauá Sustainable Development Reserve in Brazil. The guiding philosophy of the plan is that local social organization will be improved as local people work to conserve an economically important natural resource. The Plan's objectives are to increase the local Arapaima population, improve local organization institutions and increase local fishers' income. Structures created to implement the Plan include a community-imposed harvesting ban; the formation of fisher groups at village and regional levels; a local monitoring program with check points; and a community education and awareness campaign.

iv. *Whose idea was it?*

The “idea” for the project came from a series of meetings between community members, and Iwokrama scientists.

Trigger event.

Iwokrama sponsored community workshops, particularly the workshop held in 2000 with Government officials, Brazilian and UK fish specialists, and Iwokrama scientists.

Catalytic element.

Iwokrama's link with Mamirauá and the subsequent training of Guyanese fishers in the Arapaima survey method.

Other.

The project personnel that seem most committed to the project (Fisheries Committee Chairman, Secretary, and Survey coordinator) have all visited Mamirauá and seen the Brazilian project first hand.

3.1.b. *Knowledge*

i. *Sources of knowledge:*

This project is modelled on another initiative, and thus involved significant information sharing and knowledge transfer during its development.

- There was a major exchange of knowledge and expertise between the Brazilian and Guyanese projects. In 2001, Mamirauá fishers training their North Rupununi counterparts in a survey method for monitoring Arapaima populations (Box 2). This survey method is based on the ability of experienced fishers to distinguish between individual Arapaima at the moment of breathing. Once the method was proven to be scientifically rigorous, a workshop was

conducted to train Brazilian, Peruvian, and three Guyanese from the North Rupununi in the survey method. A follow-up training workshop was then held in

Box 2. The Arapaima Survey Method

Arapaima must gulp air in order to survive. Castello (2004) demonstrated that experienced artisanal fishers have the ability to count the number of Arapaima in a defined area by distinguishing individual fish at the moment of breathing. He showed that counts were strongly correlated ($r = 0.98$) with mark-recapture estimates calculated for the same populations. The study also assessed and confirmed that experienced fishers have the ability to train other fishers to count Arapaima.

Guyana, and included fishers representing all of the then 13 member communities of the NRDDDB. The workshop was conducted by four Brazilian Arapaima fishers, who instructed and then tested the Guyanese fishers. The accuracy of counts made by the trained Guyanese fishers was found to be similar to their Brazilian instructors.

- Institutional structures, such as the Executive Fisheries Committee (EFC) and the Community Fisheries Committees (CFCs) (Box 3), are based on the Brazilian model. These structures were set up based on technical advice provided by a Mamirauá scientist, with the NRDDDB, village councils and local fishers contributing in the form of human resources, organisational support and technical expertise. These institutions were developed in Brazil based on a one community project. Local input was therefore critical in modifying these structures to better cope with the multi-community conditions in the Rupununi. Many of the CFCs no longer function (Figure 6). This may be related to the absence of harvest, since the management of harvesting is the primary function of the CFCs.

- Although harvest has yet to occur, the AMP specifies that quotas will be determined collaboratively, and incorporate scientific advice from Iwokrama personnel.

ii. *If there is local knowledge and if relevant, who holds this knowledge?*

Many fishers have knowledge pertaining to the biology and ecology of the Arapaima. However, only Arapaima fishers and some experienced fishers (middle-aged and older) have the ability to distinguish between individuals. This knowledge seemed to exist prior to training, but fishers lacked the methodology to conduct standardized surveys. Local biologists trained along with the fishers were unable to match the accuracy of the fishers.

iii. *If there is outside knowledge used in the project, was there capacity building? Who was involved in providing capacity?*

Iwokrama has conducted a series of training sessions and workshops since 1998, focusing on community development and natural resource management. Many of these projects were facilitated by individuals from Iwokrama, the University of Guyana, Brazilian scientists and fishers, other international scientists, and Government representatives to a lesser extent. Although a number of persons have not been able to access training, most community members interviewed are

Box 3. Fisheries Committees

Community Fishery Committees: Thirteen Community Fishery Committees have been established to represent the interests of all fishers in each community (fourteenth community is a recent member of NRDDDB). Each committee consists of at least two persons who must be elected and mandated by the community and the village leaders, and who are responsible for enforcing the plan and organizing the fishery.

Executive Fishery Committee: This body is part of the NRDDDB and is supposed to bind all Community Fishery Committees together. The Executive Fishery Committee comprises of two positions appointed by the NRDDDB and five positions elected by the Community Fishery Committee members. The EFC is responsible for enforcing the rule of the Plan, monitoring exercises, harvesting, marketing and reporting activities.

The EFC has two additional positions for an officer of the Ministry of Fisheries and another from the Ministry of Local Government and Regional Development. However, plan states that the EFC “will carry out the management plan even if the authorised officers are absent”.

satisfied with the selection process. There also seems to be some amount of knowledge and information sharing between trained and untrained individuals. The Government did participate in many initial workshops and conducted an assessment of the area's aquaculture potential. Its subsequent involvement has been minimal.

3.1.c. *Leadership and key people*

i. *Individuals: What role did they play? How did their role change during the course of the project?*

A number of individuals at different levels are/were integral to the project.

- The president of Executive Fisheries Committee has been a Community Environmental Worker, a village leader, vice chairman of the NRDDDB, and a member of the original Fisheries Task Force. He was involved in the development of the management plan from the beginning, and is responsible for outreach, patrolling, consultations with communities outside of the NRDDDB, and meetings with government officials. For most persons on the ground, he is the face of Arapaima management.

- A Mamirauá scientist led the development of the Arapaima Management Plan. He was closely involved in the Brazilian project, and was present at the Iwokrama-communities fisheries workshop in 2000. He prepared the first draft of the Plan through consultations with key community members and Iwokrama scientists. He then conducted meetings in all 13 communities to present the plan and receive community feedback. He was also involved in the formation of local CFCs. Subsequent drafts of the Plan were prepared and presented to the Guyana Environmental Protection Agency, Department of Fisheries, Ministry of Amerindian Affairs and the Ministry of Local Government and Regional Development. He also met with the then Minister of Agriculture to submit the final draft of the AMP. He has since had very little contact with the project (initially due to funding restrictions) and is no longer with Mamirauá.

- The acting Director General of Iwokrama (formerly Senior Wildlife Biologist) was directly responsible for sourcing project funding, and establishing links between the communities, the Ministry of Amerindian Affairs, the Fisheries Department, and Mamirauá. He facilitated many of the fishery related workshops, and led early outreach activities in communities. He still provides advice to project and is involved in obtaining project funding.

ii. *Key organizations: What role did they play? How did their role change during the course of the project?*

- Scientists and fishers from Mamirauá facilitated knowledge transfer, allowing for scientifically rigorous community-based monitoring. Since training was completed, contact with Mamirauá has been minimal due to funding constraints.

- The NRDDDB acts as the regional representative body, acting as the link/filter between communities, Government, NGOs and other outside groups. The NRDDDB was created in response to the establishment of the Iwokrama Reserve and was thus exclusively associated with Iwokrama projects. It has since become more independent, and has direct relationships with government agencies

and a number of local and international NGOs. The NRDDDB seems to enjoy a high level of community support. Institutions within the NRDDDB, such as the Executive Fisheries Committee and the Community Fisheries Committees act as the official instruments of fisheries management in the area. The EFC still enjoys some amount of authority and respect in the communities, but has not been very active. The village-based CFCs apparently enjoyed broad community support and participation following their formation. However, many committees have since become inactive, non-functional or non-existent. This is partly due to the lack of economic incentive, since the fisher groups are voluntary. In addition, these structures were created primarily to manage quota harvesting. Therefore, a useful assessment of these institutions will only be possible after harvesting re-opens.

- Iwokrama has been the primary facilitator in primary stages of the project. It has sourced funding, created links with Government and other organizations, facilitated training and capacity building and continues to provide support and assistance to the project. It's involvement in the project has reduced as the NRDDDB became more independent. It still offers technical assistance to the project, such as applying for funding and providing scientific advice.
- Government officials were brought into the process through Iwokrama, and gave support in principle to the project. Iwokrama funding also supported a Department of Fisheries study of local aquaculture potential. However, efforts to make the management plan legally binding have stalled due to lack of political commitment at senior Government levels, combined with protracted procedural requirements.

3.1.d. *Learning*

i. *What learning processes did the project go through?*

- A Government study of community fish preferences and local geophysical conditions led to the ruling out of Aquaculture, which was being pursued in the project's initial stages.
- Iwokrama and local fishers attempted to develop a survey methodology, which yielded inconclusive results. As a result, linkages were pursued with Mamirauá, leading to the subsequent transfer of the Brazilian survey methodology. The first survey was carried out in March, while subsequent counts done in November. This was done to take advantage of the optimal survey conditions at this time of year.
- The initial Conservation Contract proposals from river communities focused on habitat/site management. These were later refined to involve the establishment of checkpoints (Box 4). Other

Box 4. Conservation Contracts and Check Points

Three checkpoints were established to monitor fishing activity along the Rupununi, Rewa and Essequibo rivers. Two of the checkpoints are community projects under Iwokrama's community Conservation Contract program. Conservation Contracts are agreements signed between individual communities and Iwokrama, where Iwokrama makes a payment of G\$360,000 (US \$2,000) over the period of one year, in exchange for a commitment by a community to the management of a specified resource or geographical area during the contract period. The Conservation Contract payment was used to operate checkpoints in the river communities of Rewa and Apoteri communities. The third checkpoint was established under separate funding and is located in a major farming area. Most of these checkpoints are not functioning as planned.

communities have since expressed interest in establishing checkpoints in their locations. There have also been discussions to change checkpoint location to more strategic locations.

- Following the establishment of the ban and other sub-projects, outreach efforts were directed to communities outside NRDDDB that are also known to occasionally use local fisheries. Consultations were run by NRDDDB and project personnel, with no input from Iwokrama. These consultations involved discussions about benefit-sharing and trade, with non-NRDDDB communities requesting membership in the NRDDDB.

- The development of the AMP has led to discussions about a potential “food fish” management plan and its inclusion under the institutions created for Arapaima management.

ii. *Was there adaptive management (learning-by-doing)?*

The project has yet to involve harvesting. However, monitoring mechanisms are active (surveys) or have been modified (checkpoints). Annual Arapaima surveys have been conducted since the beginning of the project. The AMP also identifies adaptive management as a guiding principle of the project, particularly in determining quotas sizes .

iii. *Were there learning networks (self-organized groups consisting of people from different organizations, who are engaged in problem-solving, subsequently recycling their experience to tackle new problems)?*

The Executive Fisheries Committee and the NRDDDB act as networks in a sense. Most NRDDDB workshops, seminars, and bi-monthly board meetings involve Iwokrama personnel and other scientists. These meetings are designed to bring together local and scientific knowledge and experience in a collaborative, problem solving environment.

3.1.e. *Funding*

i. *If there was funding for initial community organization, who provided the funding?*

Resources from Iwokrama’s Sustainable Human Development programme, funded by the UK Department for International Development (DFID), were used to finance initial community meetings. It was from these meetings that the idea from the NRDDDB emerged. This funding was also used for early workshops on resource issues and local fisheries management. Subsequent NRDDDB bi-monthly meetings were financed by the Board’s Trust fund. This Trust is a pool of funding from a number of sources, including DFID, IUCN - Netherlands Committee and Iwokrama’s project funds. Although NRDDDB meetings are usually a day, Iwokrama’s community development budget was used to fund a second day of meetings dedicated specifically to Iwokrama-community issues and project updates.

The outcome of the wildlife management workshops in 1998 was summarized in a book, “Community-based Wildlife Management in the North Rupununi” and distributed to communities, other NGOs, and Government departments. The book was also financed by DFID funding.

ii. *If there was capacity building, including training workshops, who funded it?*

The training of local fishers by their Brazilian counterparts, and Mamirauá scientists was funded by Mamirauá through a World Conservation Society grant. This funding also paid for the first survey in the North Rupununi. Iwokrama's DFID funding was used for the second survey and counter training; a World Conservation and Food Organization grant was used for the third count; and a combination of private and Iwokrama project funding was used for the fourth survey.

Iwokrama's DFID funding for Sustainable Human Development was also used in the training of Community Environmental Workers (Box 5) and villagers involved in the Conservation Contract programme. Several of the key community members involved in the project also participated in additional Iwokrama training programs (communication and report writing workshops; Forest Ranger Certification program) and other community-based projects (Bee keeping, Aquarium Fish Surveys and GIS mapping of local resource area).

Box 5. Community Environmental Workers

The Community Environmental Workers (CEW) programme was launched by Iwokrama in November/December 1999 after a year of consultations with communities, the North Rupununi District Development Board (NRDDB) and the International Board of Trustees. The concept of the CEW originated during the first North Rupununi wildlife management workshop facilitated by Iwokrama and the NRDDB in April 1998. During this meeting community representatives raised the idea of developing community rangers. The idea was further developed during the second North Rupununi wildlife management workshop in July 1998 that also involved Governmental representatives. A CEW was a part-time village worker, working 12 days per month under the joint supervision of Iwokrama and the respective Village/Community Council. The CEWs were paid a stipend by Iwokrama and were tasked with raising awareness, carrying out local research, and were the faces of Iwokrama and NRDDB's environmental education programs, particularly for the Arapaima ban and management. During the course of this study it became apparent that the outreach and awareness activities of the CEWs, and their presence within all of the communities, played a significant role in the social enforcement of the Arapaima ban. However, in early 2003, funding for this project came to an end, and the project is no longer active.

iii. *If there was funding for office, office personnel, vehicles, etc., who funded them?*

The physical centre of NRDDB activities is the Bina Hill Institute building (Box 6). The building houses the NRDDB's shortwave radio, Radio Paiwomak (Box 7) and a computer centre with internet access. Internet access was initially set up using Iwokrama and CIDA funding, but is now Bina Hill's responsibility. The institute employs a staff of seven community members and was initially funded by IUCN Netherlands. The institute is currently funded by the British Lottery.

The NRDDDB's boat and engine were purchased with Iwokrama/DFID Arapaima project funding.

3.1.f. *Human resources for initial organization (in-kind work as opposed to money)*

i. *NGO and Government personnel providing their time or services for free*

When possible, Iwokrama allows project personnel and community leaders to use the facilities at its Head Office and Field Station. It also assists with local transportation, particularly for meetings and workshops, providing the use of its vehicles and boats. The Bina Hill building, which acts as the NRDDDB headquarters and a centre for meetings and training activities, was built by a self-organized community group and Canadian Youth Challenge International volunteers, using materials purchased with IUCN funding.

Box 6. Bina Hill Institute

The Bina Hill Institute is the base of operations for the NRDDDB, and provides a facility for training and other research activities in the North Rupununi communities. The institute also houses Radio Paiwomak (Box 5) The Institute's building was constructed in 2001, with follow-up development initially supported by IUCN Netherlands. Bina Hill Institute acts as the location for the meetings of the NRDDDB and most regional workshops and training sessions. The Institute falls under the umbrella of the NRDDDB, with close links to Pronatura and Iwokrama. Most of the fisheries surveys for Arapaima and Aquarium Fish used the Institute as a base. Since the conclusion of the field research for this study, the institute has been equipped with a solar powered computer lab, and has conducted a introductory GIS mapping training course with community members.

ii. *Enlisting free help from outside groups.*

Personnel from Iwokrama, Red Thread (Guyanese NGO) and University of Guyana acted as primary contacts between NRDDDB and outside groups. Proposals associated with the Arapaima management plan were prepared by Iwokrama personnel and a Mamirauá scientist, in conjunction with community leaders.

iii. *Were there pre-existing relationships between these groups and the community?*

The relationship between Iwokrama and the communities existed prior to the formation of the NRDDDB and the development of the Arapaima management plan. This relationship facilitated the creation of linkages with Mamirauá and the Fisheries Department of the Agricultural Ministry. However, the creation of the Iwokrama reserve and organization was the result of a Governmental degree, and communities were not consulted prior to this decision. One of the NGO's first projects in the area was an outreach campaign focused on explaining the purpose of the reserve and its focus on community development. Research and outreach in this initial stage was led by Red Thread (a local NGO) and the University of Guyana. Interviewed villagers felt that this initial stage, along with Iwokrama's continued involvement in community development projects, has laid the foundation for a genuinely collaborative relationship.

3.1.g. *Use of free facilities.*

NRDDDB meetings and related fisheries workshops and meetings take place at the Bina Hill building. The NRDDDB also provides free use of their short wave radio to community members as well as for Fisheries related activities. Workshop and

meeting dates are also announced on Radio Paiwomak (Box 7), the community radio station. Fisheries related public outreach and educational programs are broadcast for a fee. However, recordings from meetings and other associated project information are also broadcast for free at the discretion of the radio operator. NRDDDB computers are also used by project personnel.

Box 7. Radio Paiwomak

Radio Paiwomak is Guyana's first and only community radio station. It began as a joint project between the NRDDDB, Iwokrama, UNESCO, the Guyana Broadcasting Cooperation, and the IDRC. Radio Paiwomak is operated by a group of community-based volunteers, and has been broadcasting since 2000. It currently services 9 of the 14 North Rupununi communities, or approximately 75% of the area's population. Broadcasts include health, agricultural, youth, educational and Makushi language programming. Programs also include environmental education and awareness campaigns associated linked to several NRDDDB projects, including Arapaima management. I was fortunate enough to participate in a number of these broadcasts, including a Makushi language interview about my project, which greatly increased local interest in the study.

3.2. Cross-scale linkages

There are a number key institutions involved in the Arapaima conservation project (see Table 1). These institutions operate at different levels of organisation and interact across different scales. Examining this cross-scale institutional interaction is therefore essential in understanding the development and functioning of the project.

3.2.a. *Institutional linkages key to related to project facilitation*

The NRDDDB is made up of village leaders as well as a number of additional community representatives (Figure 2). The NRDDDB is the primary link between communities and outside groups including Government and Funding agencies. However, it is most closely associated with Iwokrama and its constituent communities. Aside from being a key source of financial and human resources, technical support, and organisational capacity, Iwokrama also acts as a key linkage organisation for NRDDDB and its communities. Most of the NRDDDB/community links to funding sources, Government agencies and the private sector were initially forged through association with Iwokrama (Figure 3). This is changing as the NRDDDB begins to use Iwokrama-created linkages to establish independent links with Government and funding groups. The NRDDDB however, is still dependent on Iwokrama for some technical, financial and organisational support.

In the development of the Arapaima project, NRDDDB acted as a link between communities and outside groups, particularly Iwokrama. Iwokrama in turn created links with most of the other groups involved, particularly Mamirauá, DFID, and the Ministry of Fisheries Crops and Livestock. Each of these linkages contributed different degrees of financial and human resources; knowledge and technical expertise; and organisational support to the development of the project (Figure 4).

Barriers to the project

The NRDDDB lacks strong political links, which has proven to be a major barrier to attempts at getting government support for NRDDDB initiatives. Approval of the Plan stalled at Governmental level, due to bureaucratic processes, lack of political commitment at senior levels, and the low national economic importance of the fishery.

Whose initiative established these linkages?

Prior to the formation of the NRDDDB, and particularly after the construction of a road to the capital in the area, some village leaders had called for the creation of a regional representative body. However, it was not until Red Thread (Guyanese NGO), the Amerindian Research Unit of the University of Guyana, and Iwokrama began to conduct community meetings that the NRDDDB was formed. Iwokrama played a prominent role in creating linkages with outside organizations in the development of the Arapaima project (Appendix 2). However, the NRDDDB has since begun to create linkages with other groups independently of Iwokrama.

Table 1 – Primary stakeholders involved in the Arapaima project

Primary Stakeholders	Community	Regional	National	International
Fishers	X			
Village Councils/ Toushaus	X			
CFCs	X			
EFC		X		
NRDDB		X		
Iwokrama			X	X
Ministry of Amerindian Affairs			X	
Ministry of Fisheries			X	
Mamirauá Sustainable Development Reserve				X
DFID				X
Conservation, Food and Health Organisation				X
WCS				X

X	Level at which institute is based
	Level at which the institution is currently active in relation to Arapaima conservation

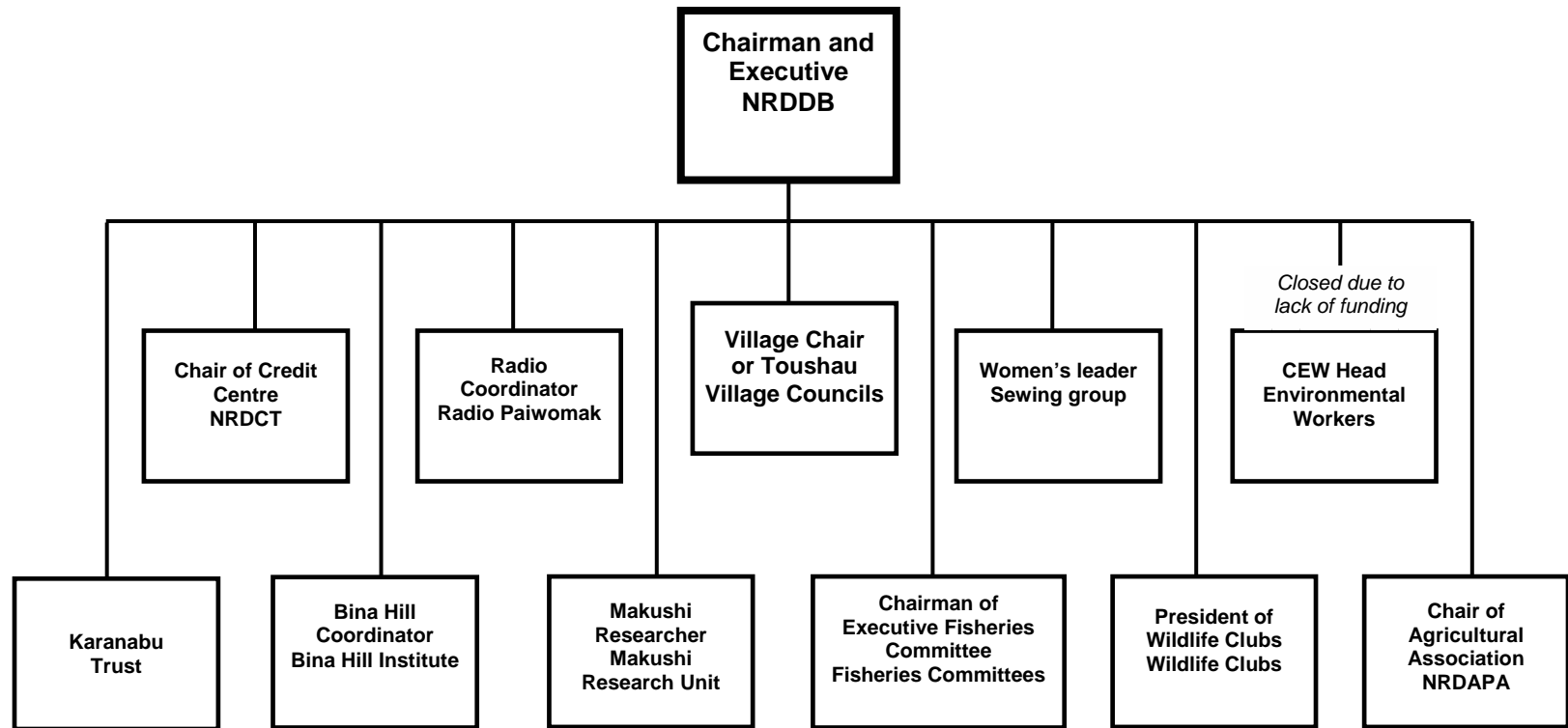


Figure 2 - Organizational Structure of the North Rupununi District Development Board

Figure 2 (continued) – Description of NRDDDB structures

Representative	Description
Chairman	Elected to position every two years. Open vote at NRDDDB meeting. Cannot be occupied by same person for more than two consecutive terms.
Executive Committee	Made up of Chairman, Vice Chairman, Secretary, Treasurer, and Assistant Secretary Treasurer. Elected through aforementioned process. Positions cannot be occupied by same persons for more than two consecutive years.
Toushou/ Village chair	Elected leaders of the 14 communities. Voted in by general elections in each community.
Karanambu Trust	Became member of the NRDDDB in 2003. Privately owned ranch on the southern boundary of the North Rupununi District (south of Yakarinta village on Map). Historically involved in Giant Otter conservation. Not yet clear what role it will play as member of NRDDDB.
Credit Centre - North Rupununi District Credit Trust (NRDCT)	The North Rupununi Credit and Development Trust (NRCDT) developed from the UNDP Poverty Alleviation Programme supported credit centre. The credit centre was originally managed by IPED, but has been handed over to the NRDDDB and is now managed by the Trust. The Ministry of Amerindian Affairs works closely with the NRDDDB and the NRCDT to manage the credit centre. The Centre provides short terms loans to community members for enterprise development. However, no data was gathered regarding the accessibility of loans, or the average rate of repayment.
Bina Hill	Appointed community member. (See Box 6 for description of project)
Radio Paiwomak	Appointment of trained community member. (See Box 7 for description of project)
Makushi Research Unit	The Makushi Research Unit emerged in 1995 as a joint research initiative by local communities, NRDDDB, Iwokrama, and the University of Guyana's Amerindian Research Unit. Its primary objective was to include community researchers in an ethnobiology study of the North Rupununi. The unit consists of researchers, primarily women, from local communities who are employed to carry out research on social, economic, and ecological aspects of life in the North Rupununi. The Unit has been involved in the production of books on Makushi life, which have generated income for the NRDDDB. They have also played a key role in developing a Mukushi curriculum for North Rupununi schools. The MRU has received support by the Gender Equality Fund of the Canadian International Development Agency (CIDA). This support included stipends for the researchers and field computers. MRU members were integral in assisting me in my attempts to understand local knowledge systems, particularly cultural taboos and beliefs.
Women's Groups	Iwokrama facilitated the creation of community sewing groups in 1996. These groups were composed predominantly of women, and were linked with the construction of activity centres in most of the communities. Groups in some communities are more active than in other. These sewing groups produce clothes, artistic embroideries, clothing, and mosquito nets. The sale of these items has become an occasional income source for some of the women involved.
Executive Fisheries Committee	Elected Representative. Vote carried out at open regional fishers meeting. Composition has remained the same since creation of the committee. (See Box 3 for description of committee)
Wildlife Clubs	Elected Representative. Vote carried out at meeting of Wildlife club members. Programme funded by Iwokrama and the US Audubon society, and jointly implemented by Iwokrama and the NRDDDB. Involved the creation of youth Wildlife Clubs in each of the 14 communities. The goal of the project was "to expose local youth to natural resource management, organisational and governance issues, and provide fora for discussion of environmental and other issues". Some clubs were more active than others, although there has been a yearly Wildlife club festival. This involves all 14 clubs, along with youth groups from other communities outside of the NRDDDB, in local craft making and skill competitions.
Community Environmental Workers	Elected representative. Vote involving CEWs from all communities. (See Box 5 for description of project)
North Rupununi District Agricultural Producers Association NRDPAA	The NRDPAA is the local representative body for farmers and agricultural producers. NRDPAA is working with the University of Florida, IICA, Ministry of Agriculture and NARI to develop peanut production systems in the North Rupununi and also working with the Rotary clubs of Kanataka and Demerara to put in place drip irrigation for savannah farming and micro-credit loan systems in the Rupununi. NRDPAA is also working on artificial insemination systems for cattle. During the research period, meetings were held between NRDPAA members and the representatives from the Institute of Private Enterprise development (IPED), a Guyanese NGO, to discuss credit opportunities for peanut cultivation in the area. These discussions are still ongoing.

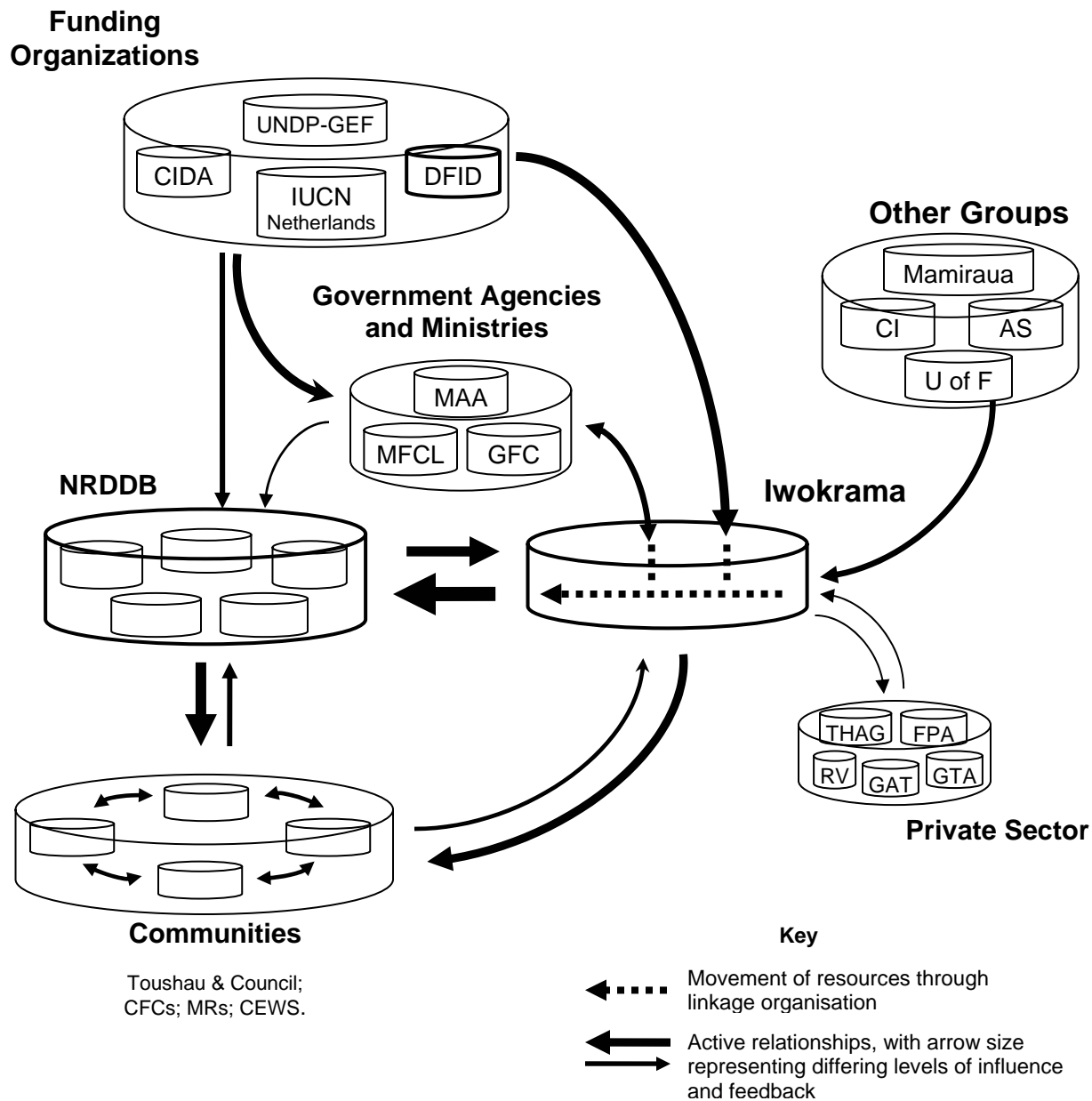


Figure 3 - Key institutional linkages facilitating the activities of the North Rupununi District Development Board

Figure 3 (continued) – Description of Institutions and their role in NRDDDB projects

Group	Full Name	Contribution to NRDDDB projects
Funding Agencies*		
UNDP – GEF	Global Environment Facility – United Nations Development Program	Institutional development, institutional set up, and resource surveys for Iwokrama Forest
DFID	Department for International Development	Senior Iwokrama staff support, sustainable human development, training, and community development
CIDA	Canadian International Development Agency	Institutional development, administration, community based tourism, and ecotourism internships
IUCN – Netherlands	World Conservation union - Netherlands committee	Aquarium fish trade; Bina Hill Institute
Government		
MAA	Ministry of Amerindian Affairs,	Community institutional development, Iwokrama Board of Trustees
MFCL	Ministry of Fisheries Crops and Livestock	Primary link through MOU with Iwokrama.
GFC	Guyana Forestry Commission	Primary link through MOU with Iwokrama.
Other Groups*		
Mamirauá	Mamirauá Institute For Sustainable Development	Arapaima fisheries management
CI	Conservation International	Iwokrama ranger training
AS	Audubon Society: Latin America:	Youth training in School Yard Ecology and “Cycle of Inquiry” (simple approach to scientific research)
U of F	University of Florida	Agricultural research and development
Private Sector		
THAG	Tourism and Hospitality Association of Guyana	Partners in tourism development
GTA	Guyana Tourism Authority	Partners in tourism development
GAT	Guyana Aquarium Traders	Partners in Aquarium trade development
RV	Rock View	Partners in tourism, agricultural development
FPA	Forestry Producers Association	Partners in timber development
Communities		
Toushou, Village council		Village level governance
CFC	Community Fisheries Committee members	Enforcement of Arapaima Management Plan and monitoring fishing activity
MR	Makushi Researchers – Makushi Researcher Unit	Conduct ethnobiological research
CEW	Community Environmental Workers	Environmental education and awareness in communities

* includes only a selection of the total number of partners involved

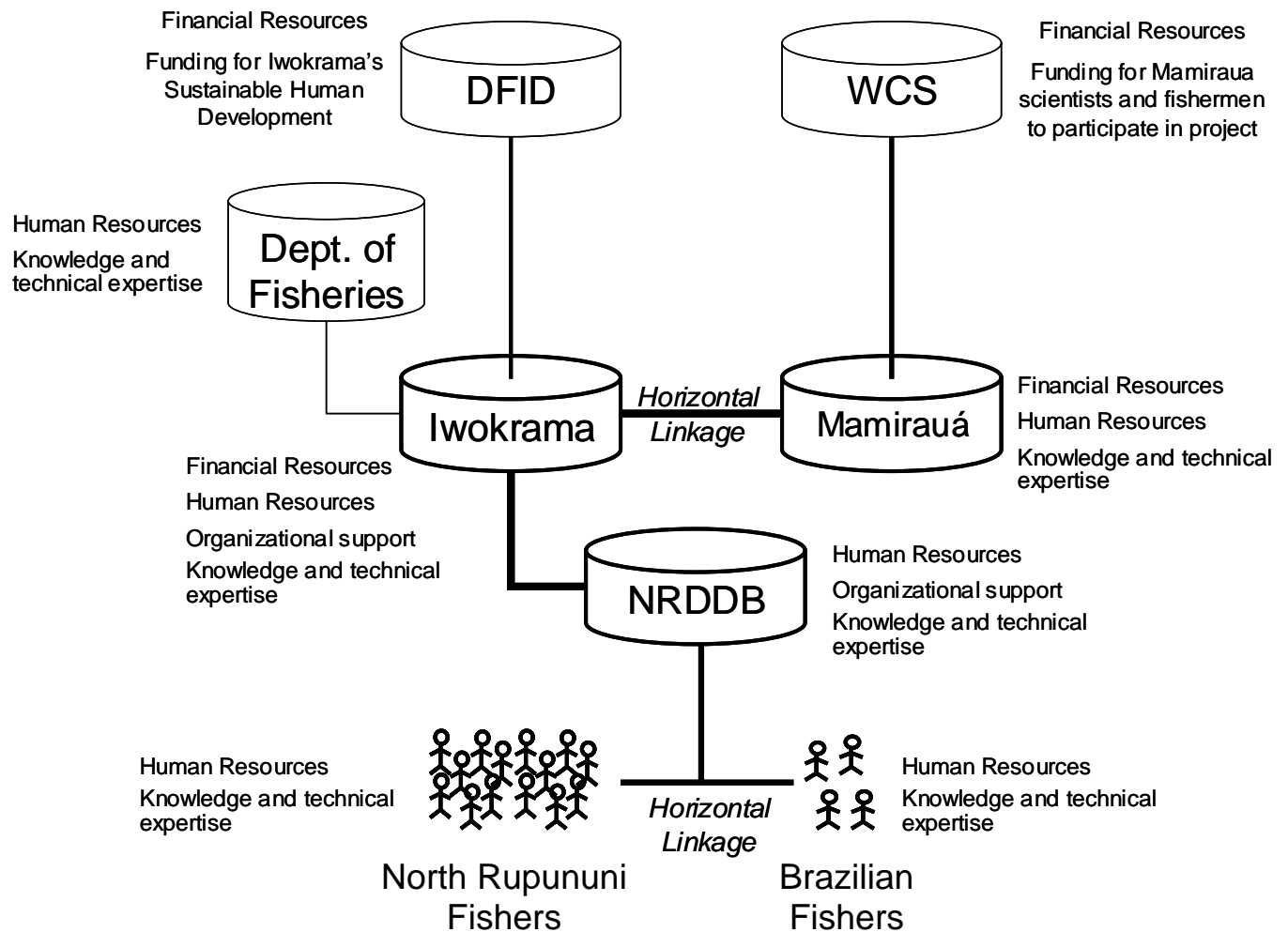


Figure 4 – Key institutional linkages that facilitated the development of the Arapaima project.

3.2.b. *Key horizontal institutional linkages (i.e., linkages across space and sectors, such as networking with other community groups, NGOs, and development agencies)*

- NRDDDB: information exchange and problem solving among the communities.
- Iwokrama – Mamirauá: integral in the transfer of TEK, development of the Management Plan, creation of appropriate local level institutions.
- Brazilian – Guyanese fishers: training and knowledge transfer. In addition, the Brazilians were seen as ambassadors a successful, income generating management system. For many Guyanese fishers they represented the benefits of supporting conservation initiatives, thus fostering increased local participation and buy-in.

3.2.c. *Key vertical institutional linkages (i.e., linkages across levels of organization, such as linking with key Government agencies)*

The Arapaima Management Plan outlines an organizational scheme for the implementation of the project, involving interaction between institutions at different scales. It stipulates that the Executive Fishery Committee will represent the interests of the Community Fishery Committees, which in turn, will represent the interests of the fishers from all the communities. The EFC and CFCs fall under the supervision of the Ministry of Fisheries, Ministry of Local Government and Regional Development, EPA and Iwokrama. However, Iwokrama is also supposed to play a facilitatory role with respect to organizational support of the fisher groups. Additional input should be provided by the Ministry of Amerindian Affairs, through the Ministry of Fisheries (Figure 5).

Unfortunately, there is currently almost no interaction between these government agencies and the fisheries committees. Most of the CFCs are also dormant, although some individual members still report to the NRDDDB and EFC (Figure 6). These individuals tend to be involved in other projects and occupy positions in other regional level committees, thereby interacting with EFC and NRDDDB members regularly. Some fishers are also currently involved in the project as counters, but most community fishers interviewed do not recognize a functioning CFC in their community. Iwokrama is playing a key role in sourcing funding for the counts and smaller costs associated with the project (patrols; outreach; community visits) (Figure 6). Iwokrama along with some EFC representatives continue to promote the Plan to officials in the Ministry of Fisheries.

Also see “*facilitating/enabling the project*” above.

3.2.d. *How does the policy environment impact the project?*

The former Guyana Fisheries Act was a major hindrance to the project, since it prohibits the harvest of Arapaima. A new Fisheries Act is in the process of being finalized and it allows for the harvest of the species using a legally approved management plan. The structure of the new Act is largely the result of recommendations outlined by an FAO policy review. This allowance in the new Act was identified by personnel from the Department of Fisheries, who assisted in

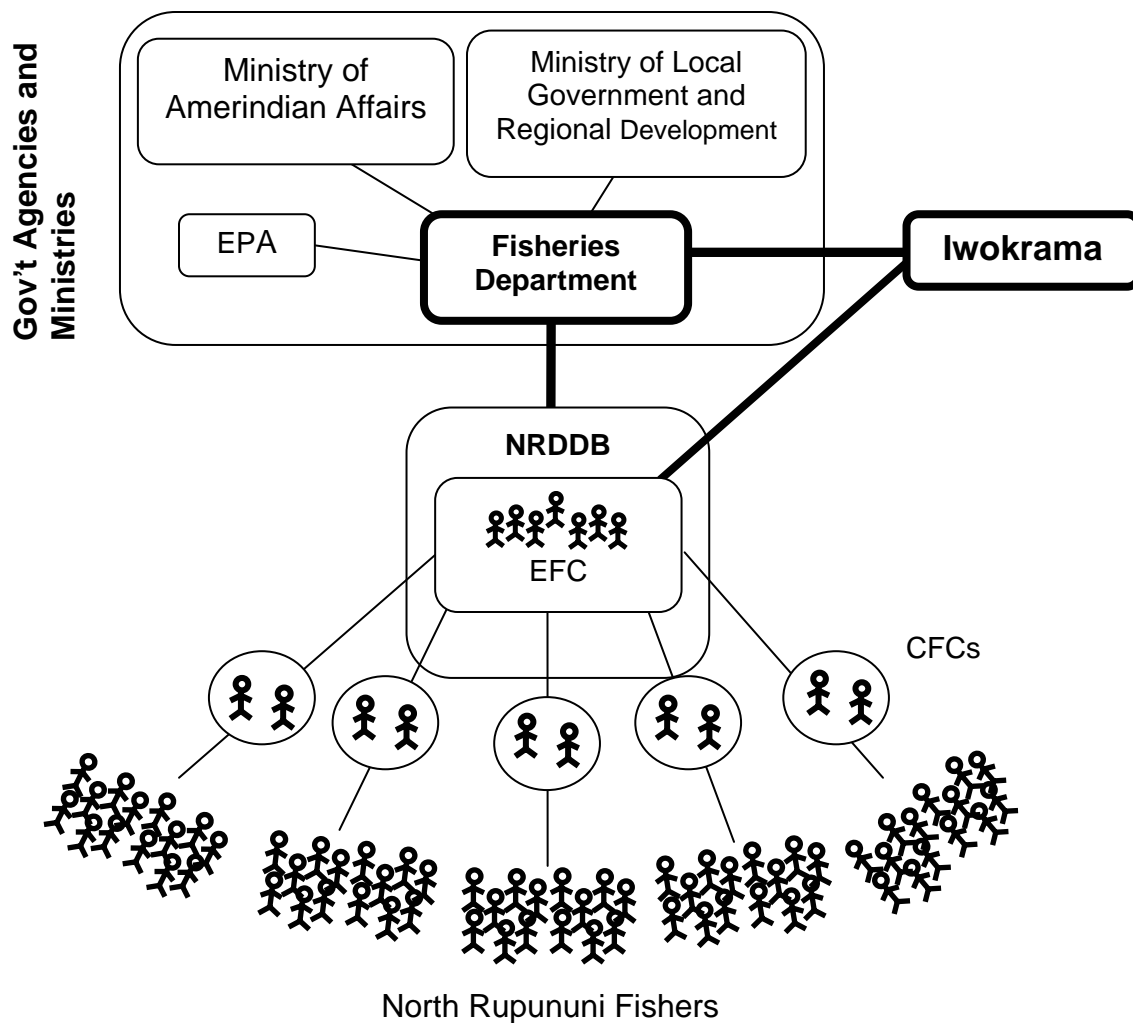


Figure 5 – Proposed organisational structure in the implementation the of the NRDDB Arapaima Management Plan (2001)

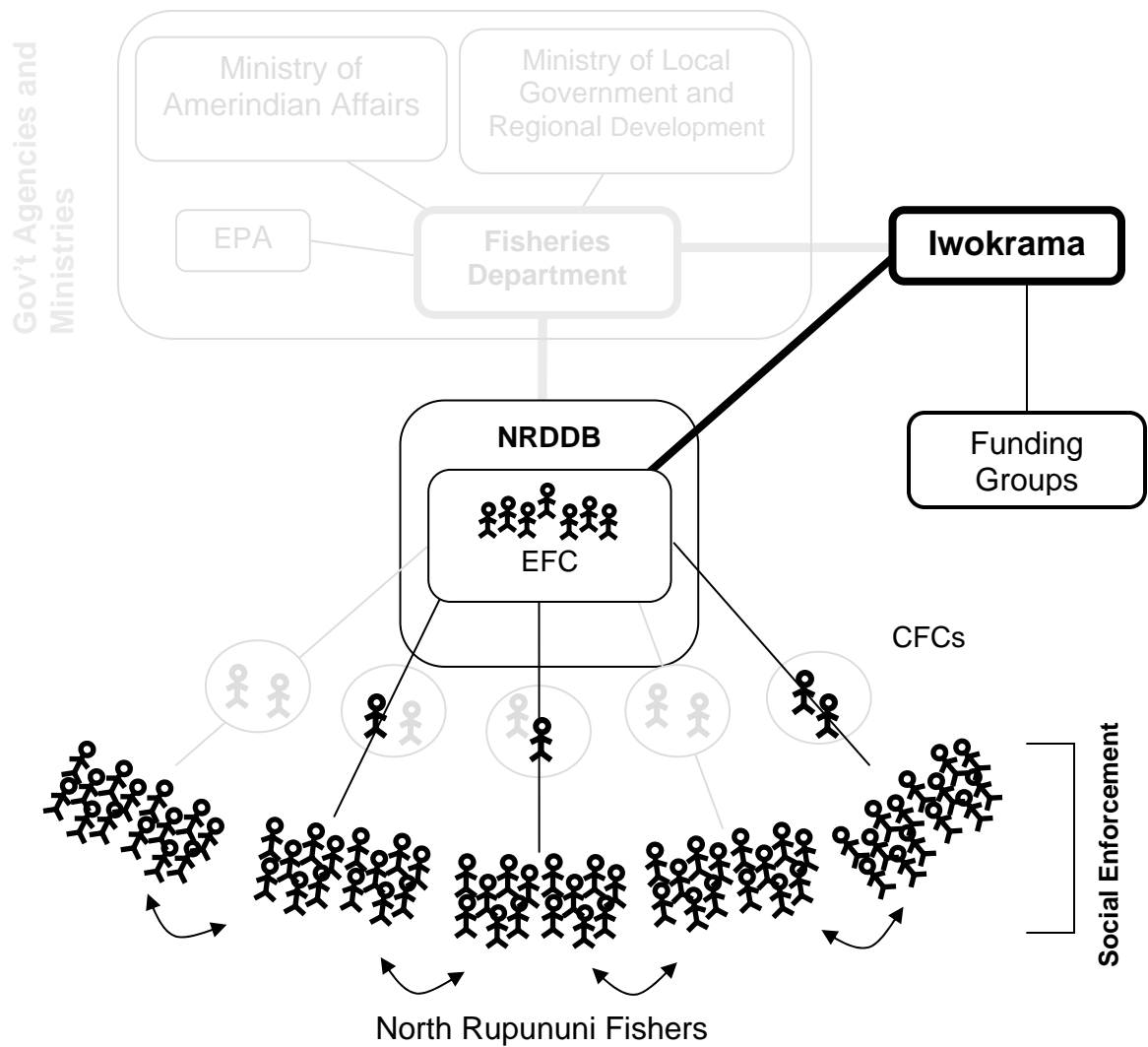


Figure 6 - Functioning institutional linkages in the current implementation of the NRDDB Arapaima Management project (2003)

modifying the AMP to satisfy the requirements of the new Act. Iwokrama facilitated the participation of these individuals in early community workshops and subsequent meetings to develop the AMP. These government representatives have since taken up other positions within the Ministry of Agriculture or in the private sector, and are no longer involved in the project. A new government fisheries officer was recently designated to work with NRDDDB projects. However Government funding is not available to allow much participation in the project, and the fisheries officer has a number of additional responsibilities. This lack of institutional memory and political commitment at senior levels is partly to blame for the AMP not being approved.

Government policy that legally recognizes local resource rights are a major prerequisite to effective community-based management. The current lack of such policies in Guyana needs to be addressed, since harvest by outsiders is a constant threat to local support of the ban. Outside harvesting was one of the major factors leading to the breakdown of the earlier taboo.

3.2.e. What change did the project trigger in government legislation or policy?

No directly related change in policy, although Government supported community-based management projects are unprecedented in Guyana. NRDDDB – Iwokrama interaction has involved high levels of consultation and collaboration. As a result, communities now expect full involvement from other groups (including the government) that carry out any local activities. Participation in the project has also increased awareness of resource rights, with the issue being pursued by community leaders during recent government consultations on a new Amerindian Act. The government has also taken a more collaborative approach to projects, which seems to be voluntarily in some cases, or as a requirement by international funders. Community project personnel also noted that their participation in the project changed their antagonistic approach to government. They say that they now realize that working collaboratively with the Ministry officials is critical to project success.

3.2.f. Are there any unusual interactions among Government agencies, NGOs, development agencies, etc, that impact the project positively or negatively?

Pressure from the private sector interest to pass certain aspects of the new Fisheries Act resulted in a sectioning of the Act. For instance, sections of the Act which allowed for export of shrimp to European markets were excised from the Act, rushed through the political process, and approved as a separate policy. However, other aspects of the Act, including the management plan stipulation, are not a high priority for the Ministry, and have thus seen little movement.

3.3 Biodiversity conservation and environmental improvements

3.3.a. *Conservation/improvement of what target resources (species and environmental resources)*

Conservation activity has been primarily focused on the Arapaima (*Arapaima gigas*). However, project outreach has also focused on the need for conserving Giant River Turtles (*Podocnemis expansa*), and to a lesser extent Black Caiman (*Melanosuchus niger*) and Giant otters (*Pteronura braziliensis*).

3.3.b. *Changes in resource state*

The number of juvenile and adult arapaima counted in the North Rupununi river systems increased from 425 in 2001 to 1200 in 2004. There has been some variation in survey methodology, with more lakes surveyed after the first count in 2001. This no doubt influenced the increase from 425 observed Arapaima in the first count, to 822 in the second count. However, most of the Arapaima counted in the second count were found in the lakes surveyed in the first count, suggesting that the increase was at least partially independent of the increased in sample area.

3.4 Poverty alleviation

3.4.a. *Indicators of poverty alleviation*

Harvesting has not occurred since the project began, resulting in no-direct income generation. However, high value markets were identified for future sale of harvested Arapaima. Marketing at these levels would result in a projected doubling of fishers' income. The annual Arapaima surveys are also an indirect source of income generation; generating over GUY\$3,225,000.00 (CDN\$27300.00) in salaries and rental of community equipment in the past three years (2001-2003). Surveys are approximately 28 days long, and income is provided to an average of 17 individuals. These individuals vary, but many of the originally trained counters still participate. Although only about 10-11 of the NRDDDB communities are represented consistently on the surveys, villagers from all of the original 13 communities have participated at some stage.

Initial fisheries workshops also highlighted the need for alternative income options after the community decided to impose a harvest ban. These discussions led to the development of an IUCN Netherlands funded small-scale Aquarium project in the area (Box 7). This has generated approximately GUY \$1,964,000.00, or CDN \$16,500.00 (Table 2)

Table 2 - Estimated income generated from the NRDDB Aquarium project

Description	Income earned (GUY\$)	Income earned (CDN\$)
Total Wages	\$1,044,000.00	\$8,773.11
Rental of local equipment*	\$730,000.00	\$6,134.45
Profit Paid to NRDDB	\$190,000.00	\$1,596.64
Total income for Communities & NRDDB	\$1,964,000.00	\$16,504.20

*Most of the spending on the equipment hire went to the community council of a community not represented by the harvesters.

3.4.b. *Improvements in community well-being*

Villagers interviewed are of the general opinion that living conditions have improved since the NRDDDB became active, although it is clear that some communities have benefited more than others. This seems to be due, in part, to differing degrees of capacity, leadership ability and commitment among various communities.

Box 6. Aquarium Trade

This project focuses on the sustainable use of aquarium fisheries as a non-timber forest product (NTFP), and as an alternative income source for local communities. Approximately 18 community members, representing 8 communities are employed in the harvesting process. The fish is then transported to Georgetown where it is delivered to an export agent. The profit goes into the NRDDDB trust, and is either reinvested into the project or used to support other NRDDDB projects. Funding by the Netherlands Committee for IUCN Tropical Rainforest Program is currently used to pay salaries and other expenses. The project has its origins at a meeting in 2000, between the NRDDDB, Iwokrama, Department of Fisheries officials and a fisheries scientist from the Natural Resources Institute in the United Kingdom. At the meeting, the potential for a local trade in Aquarium fish emerged as an alternative to Arapaima harvesting. Iwokrama and the NRDDDB have since gone into a partnership with the Guyana Aquarium Producers, a local Aquarium fish export agent in the capital. Harvesting began in 2002, but mortality rates were very high due to transportation delays. Subsequent shipments have seen a drastic decrease in mortality as a result of learning and increased expertise among the community members involved. Two shipments occurred during the research period, with 99% survival at delivery. Monitoring efforts include data collected by local harvesters, and used to calculate CPUE (Catch per Unit Effort). Changes in CPUE will then be used to determine the impacts of harvest on wild populations. Data collection only recently began, with no current information on the ecological impact of the project.

3.5 Analysis of community-based conservation

3.5.a. *Mechanisms, dynamics, drivers*

i. *Analysis of catalytic element that made the initiative work*

Need for Arapaima conservation was recognized by important community leaders prior to the project, but they lacked the resources to act. The local leadership has therefore supported the initiative from the beginning, resulting in local support and buy-in from many community members. The monitoring regime, and its use of both local and transferred knowledge, also increased community participation and support. Consistent funding, capacity building and organizational support by Iwokrama were, and still are, critical to the continuation of the project.

ii. *Decision-making processes*

Most decisions are supposed to be made through committee structures at various levels – CFC's in community, EFC at regional level and NRDDDB as the umbrella regional organization. Official EFC and CFC meetings are rare, however many members of the former are involved in the bi-monthly NRDDDB meetings. Although mostly inactive, CFC representatives are involved at higher level meetings of EFC or NRDDDB. In the absence of community meetings, some CFC reps. discuss upcoming EFC/NRDDDB meetings with individual fishers and then represent those views at the meetings. There are complaints that other CFC reps. represent personal opinions at the meetings. When the EFC does meet, decisions are arrived through open discussion and, usually consensus. Otherwise voting will be used. Senior members seem to have more talking time and greater influence on the final decision. NRDDDB meetings are larger, and may last for up to two days. All NRDDDB projects, including Arapaima management, are discussed, with project managers (community or Iwokrama personnel) presenting progress reports on each project. Although voting is written into the organisation's constitution, decisions are usually made either by consensus or unanimous majority.

iii. *Conflict-management mechanisms*

This is addressed in most groups by a voting mechanism. In addition, members of the communities, CFCs or the EFC can raise their concerns at the NRDDDB meeting either in written form, in person or through a representative. In some cases concerns are raised directly to Iwokrama personnel, who may then present these concerns to the individual(s) in question, or at the NRDDDB meeting. A few villagers felt that NRDDDB meetings do not foster input from 'ordinary people'. However, most recognize that it is designed to be an organization of leaders. Input in meetings is also difficult for some community members due to illiteracy, language, fear of large crowds and formal meetings, or fear of ostracism. That said, difficult subjects were raised and discussed in my presence, and no instances of resulting ostracism were reported.

iv. *What were the roles of horizontal and vertical institutional linkages in the development and success of the project?*

Both vertical and horizontal linkages outlined above are integral to the project. However, stronger Government – community linkages are needed to facilitate the approval of the plan, thus providing direct income to local fishers.

v. *Conflict resolution and enforcement*

Although Arapaima harvest is illegal, there is no formal government enforcement. Adherence to the ban has therefore been mostly voluntary (Table 3). This seems to be linked to the involvement of supportive leaders in combination with an effective education and awareness campaign using Community Environmental Workers (CEW). Having local players involved in and supportive of the conservation efforts has influenced social norms in most North Rupununi communities. The resulting social pressure to avoid Arapaima harvest seems to play a larger role in enforcing the ban than the formal structures set up by the management plan (Table 3). Three instances of harvest were identified during the research. In these cases, the harvester was reported to the EFC by both the local CEW, and other villagers. Visits to the individuals were then carried out by EFC members. In all cases, the catch was said to be accidental, and no penalty was enforced. However, most incidents resulted in a fair degree of gossip or “talk name” in the community, which in itself can be seen as a deterrent. Most conflicts are resolved either by the community Tousehaus and village council, or at NRDDDB meetings.

3.5.b. *Learning and Adaptive Management*

i. *How did previous observations lead to project formation and development?*

The structure of the management plan is based on earlier, similar experiences in Mamirauá, Brazil. Surveys, although previously attempted, were standardized through Mamirauá support. A joint Iwokrama-Department of Fisheries aquaculture study also led to the exclusion of Arapaima farming as an option. The need for alternative income options after the community imposed harvest ban led to the development of an Iwokrama supported small-scale Aquarium trade in the area.

ii. *How was experience incorporated into subsequent steps of the project? What was the role of experimentation?*

The survey size and time were adjusted after the first survey to maximize accuracy. Additional Arapaima counters were trained tested by “certified” counter after the initial Brazilian training occurred. Location of and number of check points continue to be adjusted in response to changes in fishers’ movements.

iii. *Role of memory, novelty, innovation*

Most of the Arapaima Management Plan’s features were transferred from Brazil. However, modifications of these structures to local conditions have taken place. Experiences in the Aquarium trade is also leading to increased exposure to marketing and transportation challenges. These experiences will almost certainly be utilized when the harvesting phase of the Arapaima project begins.

iv. *How monitoring informs the project*

Since the success of the project thus far has been focused on recovery in Arapaima populations, the surveys have been critical to the continuation of the project, both in terms of local interest as well as Governmental support.

Table 3. Responses to the question “Why is the ban having an effect?”

(All interviewees stated that the ban had reduced catch)

Response	Frequency
Change in attitudes	
People get to understand the need for the ban/conservation/project	11
Iwokrama/ Iwokrama workshops open our eyes/ wake us up	5
Want to leave them for next generations	4
People are more educated	2
Fear of penalty	
People afraid	5
People think that they will be reported	5
Everybody will know, and report you	2
More eyes watching	2
Economic benefit	
We will benefit from future harvest	7
It is good for tourism	2
Alternatives*	
We can catch other fish	10
We can do other things now (ecotourism, crab oil, honey, agriculture, bird trapping)	5
Other	
Amerindian people look to their leaders	1
Because of the ban, my mind just turn off of it now	1
I was not getting a good market	1
Unsure	1

*mostly in combination with the “fear of penalty” or “change in attitudes” responses.

v. *Barriers to CBC, and how the barriers were overcome*

Some of the major barriers to the project have been the absence of governmental support and political will, along with the lack of management capacity at the governmental and local levels.

vi. *Combining knowledge systems to solve problems*

TEK was integral to the initial development of the monitoring system in Brazil, as well as its adoption by local Arapaima fishers in Guyana. The survey method is scientifically reliable, and was shown to be more effective than capture-recapture methods. Iwokrama scientists provide support in the analysis and interpretation of growth rates and other survey data. The surveys also seem to have given the initiative a sense of continuity for many villagers, thus maintaining community interest, awareness and support. The training associated with the monitoring regime, and the project in general, seems to have been an empowering experience for most of the individuals involved, and their communities.

3.5.c. *Community benefits from biodiversity conservation and environment improvements*

i. *What direct benefits were observed?*

The number of Arapaima counted in the North Rupununi system has increased markedly in the last three years. Harvesting has not occurred since the project began, resulting in no-direct income generation. However, high value markets were identified for the future sale of harvested Arapaima. Marketing at these levels would result in a projected doubling of fishers' income. Indirect income generation has occurred with Arapaima counters earning a salary during the annual two month survey. The ban also led to the development of an Aquarium trade, which has so far generated G\$1,964,000 (CAD\$6,504) in community wages and profit for the NRDDDB.

ii. *What indirect benefits were observed (awards and recognition; publicity)?*

The NRDDDB was sighted as an institutional model in Guyana's Poverty Reduction Strategy.

3.5.d. *Livelihood strategies, coping and adapting*

i. *How did involvement in the project affect other livelihood pursuits, negatively or positively?*

Involvement in the project does not require major input of time or resources. However, enforcement of the ban inevitably led to lost income and more time needed to produce the same volume of fish meat for sale. Most villagers however, said that they have not been seriously impacted because of the abundance of alternative fish resources, and the reduction in demand for Arapaima meat. The associated inflow of capital through wages and the Aquarium project led to the improvement in fishing gear for some participants and a resulting increase in harvest and sale of alternative fish species.

- ii. *How did the project affect the ability of households and the community to adapt to changes?*

Increased income has potentially improved the ability of households to adapt to changes. However, the number of people earning income directly from Arapaima management, and the associated Aquarium project, is limited. In addition, no saving options (e.g., banks) are available to villagers, and income is often spent shortly after being acquired.

3.5.e. *Resilience of communities, livelihoods and management systems*

- i. *Did the project add options (e.g., livelihoods, alternative management possibilities, new coping and adapting strategies)?*

As a result of the project, harvest of Aquarium fish was developed, resulting in increased livelihood options. The creation of this additional livelihood was timely, since Arapaima as an income source had all but disappeared with the near local extirpation of the species. Future managed harvests and effective marketing of Arapaima could re-establish it as a sustainable livelihood in the area. The project also led to management plans becoming a common aspect of local projects, as in the Aquarium harvest and recently proposed “Food-fish” management plan.

- ii. *Did the project create learning opportunities?*

Funding allowed some local community members to travel to Brazil and gain first hand exposure to an alternative and innovative management approach.

Training workshops in Guyana involved both Guyanese and Brazilian fishers, thus facilitating two way learning and the generation of context specific approaches. Also see *d. Learning* under *1. Community Organisation*

- iii. *Did the project create self-organization opportunities?*

Social organization was a project objective, and efforts focused on the creation of Community Fisheries Committees and an Executive Fisheries Committee. The EFC is still functional, but meets infrequently. Although many of the CFCs are inactive, members still participate in EFC meetings. CFC inactivity is partly due to a lack of harvesting, which was the primary function of the committees. The sustainability of these institutional structures therefore cannot be fairly assessed until harvesting begins.

- 3.5.f. *Lessons from this EI case*
i. *Which lessons were likely transferable? Why?*

Capacity building

“I think it [being a CEW] was a learning something for me, because we do whatever we learn in our villages”

- Former CEW, Kwataman

“We had training...particularly interpersonal, and leadership, and oral communication and them kind of thing. So that built my skills more, I have more confidence in me, and how to lead the people and them kind of thing”

- Annai community member

Arapaima conservation is just one of the many NRDDDB initiatives that emphasise training and capacity building. For most NRDDDB capacity building exercises, training needs were identified collaboratively, through joint meetings with Iwokrama, the NRDDDB and other community members. The resulting training programs were very situational and needs-based (e.g., communication and report writing). Participants therefore developed skills that were practical and context specific. The application of these practical skills, re-enforced by follow-up training, facilitated a “learning by doing” approach in many of the NRDDDB projects. Some of the participating individuals have gone on to become influential in their communities, and key players in local conservation and development projects. Former CEWs, for example, have since been elected to village councils and Tousehau positions. The increase in local capacity has also contributed to the strengthening of community and regional level institutions. Stronger institutions have, in turn, led to more effective implementation of additional capacity-building programmes.

These training programmes, and the collaborative processes that led to their development, can be used as models in similar community-based initiatives. In particular, the training associated with the CEW, Conservation Contract, and Forest Ranger programmes offer innovative approaches to local capacity building.

It is important to note, however, that there is still a significant gap in local institutional and management capacity. Currently, management capacity is still very concentrated at the leadership level, and within particular families. As a result, many institutional and leadership positions are filled by the same pool of individuals, with persons stretched thin for time and energy. Local capacity, although on the increase, still continues to be a limiting factor in achieving true community-based natural resource management in the North Rupununi.

Collaborative institutions and mechanisms

“We had the CEW, who contributed heavily towards this same Arapaima...[be]cause they had people on the spot actually looking after the Arapaima”.

- Toka community member

As previously mentioned, improved local capacity was linked to the strengthening of existing regional institutions, and the creation of new local-level resource management mechanisms. These institutions have their origins in both the community (CEWs) and outside agents (Conservation Contracts), but were developed in collaborative processes. The NRDDDB itself was initially developed as a mechanism for more effective collaboration between the communities and Iwokrama. It has since become a key organisational agent in the transfer of capacity and institutions to the community level.

Some structures like the CFCs and Conservation Contracts have been slow to take hold, and may be inappropriate under current conditions. This may be due to a high dependence on external groups for institutional and financial support, or they may be the right institution at the wrong time, as with the CFCs. That said, these institutions were key to increasing local awareness and support for conservation and natural resource management.

Other institutions, like the NRDDDB and CEWs for example, seem to have been more effective at achieving their mandate. This may be related to a pre-existing community interest in a regional organisation (NRDDDB) and “community rangers” (CEWs). They have also maintained a high level of activity since their creation, and have received consistent financial, technical and organisational support from community members and partner organisations. These institutions, in combination with the aforementioned programmes, seem to have contributed to the re-emergence of a local environmental ethic (Table 3), and increased confidence in collective action. The NRDDDB and CEW therefore represent useful models for local governance, collaboration, and effective natural resource management.

Time

“You can’t plant a mango tree today and expect mangoes tomorrow”

- Rewa Fisher

Developing effective institutions is a long-term commitment. The institutions associated with the Arapaima project are relatively new and still adapting. For instance, the role of CEWs as advocates of Arapaima conservation seems to have led to increased local support for the Arapaima ban and the broader re-emergence of a local conservation ethic.

This institution was only three year old when it was recently terminated, but it achieved much in the way of local environmental education and awareness. Unfortunately, these types of achievements are hard to measure and are often not given much weight in evaluations by funding groups. Yet these accomplishments tend to have the most impact; in this case a change in local perceptions and the linked recovery of Arapaima populations. Even after the project's closure, some former CEWs continue to be advocates of conservation and Arapaima management in their respective communities. If community-based conservation is to be effective, funding groups must be committed to the long process of institutional development, and place more emphasis on qualitative indicators of success, such as change in the perceptions of resource users.

Time and patience are also needed as the Government considers their position on the APM. Government support and the legal approval of the plan will take some time, and require significant commitment from local fishers and the community in general. The NRDDDB and local fishers have fulfilled most of their requirements under the APM, and do seem committed to seeing the process through. However, without Government endorsement, the communities are not equipped to take legal action on outsider harvesters, and the species continues to represent a *de facto* open access resource. The total lack of community jurisdiction is thus arguably the biggest threat to the continued survival of the species in Guyana. The Government recently endorsed the plan in principle, promising to pursue its approval. The communities and the Arapaima continue to wait.

Jurisdiction and rights

Unless the Government can support us and give us the authority and help us to enforce the law then, and only then, you can get the Arapaima program really on the go, and it would work, and everybody would benefit.

- Surama community member

As previously mentioned, the major obstacle to Arapaima co-management in Guyana is Government's failure to pass the new Fisheries Act, and thus facilitate the approval of the AMP. This lesson speaks to the importance of resource access and jurisdiction. In this case, the Government has full jurisdiction to the resource, and is either slow or unwilling to transfer user rights to the communities and NRDDDB. This may be related to a number of factors, including little Government experience with co-management regimes, and the low national economic importance of this fishery. The Ministry of Fisheries may also be apprehensive about setting precedence, since it currently maintains full jurisdiction over all National fisheries. Unfortunately, without jurisdiction the communities cannot access the resource or, more importantly, access the benefits of resource management.

For the project to be successful, jurisdictional boundaries and management responsibility has to be aligned with the geographical distribution of the resource.

The major challenges therefore seem to be the strengthening of local and regional management institutions, tied to the distribution of jurisdictional and management authority between the communities and Government. The latter is difficult in Guyana, where initiating this level of Government action usually requires significant political and/or economic power, power that both the NRDDDB and Iwokrama currently lack.

Horizontal learning

We went for one month, and stayed in Mamirauá. We had camps set up and next morning we would go out to count with the other fishermen. That was fun I liked it, and I learn a lot how to count Arapaima, and fish and I learn about the community, and how they live there.

- Brazilian trained Rupununi fisher

The transfer of knowledge and experience from the Mamirauá project was a critical step in the creation of the Guyana initiative. Although there were major cultural and language differences between the two groups of fishers, similar local contexts allowed for the development of an effective local monitoring regime. It also fast-tracked project development by avoiding the long process of creating and standardising a new survey method. For many interviewees, the Brazilians seem to have represented the benefits of an ecologically and economically successful initiative. The international exchange may have therefore fostered increased local support for the development of a Guyanese initiative.

Local Knowledge as an entry point

“We used to watch them [Arapaima], and we could tell where they would come up next time, although sometimes they does outsmart you”

- Aranaputa fisher

The use of local knowledge in monitoring has demystified management for many community members. They see that their existing knowledge can play an important role in the conservation of their resources. This aspect of the initiative therefore seems to have been empowering for many of the individuals involved. Counters also act as community advocates of the ban and contribute to local awareness of management efforts.

Community-based Monitoring

“...we also was able to get our people trained to count using an approved scientific method, so which means that our counts now, people can’t really dispute the counting system...like now we could actually go to the government”

- Toka community member

As the primary actors in the monitoring programme, trained counters are exposed to resource conditions at a regional scale. As a result, many seem to have gained more of a regional perspective on management and monitoring. Their involvement in monitoring also leads to increased local ownership of the survey findings, and more support for future management interventions.

Alternative livelihoods

“We can be involved in ecotourism and other things like selling crabwood oil now”

- Apoteri fisher

The NRDDDB has been involved in developing new livelihood opportunities for residents of the North Rupununi. For instance, the development of an Aquarium trade was specifically linked to the Arapaima conservation effort. This project was intended to provide an alternative income source for the individuals involved in the fishery. However, many former Arapaima fishers have yet to directly benefit from the Aquarium project. This is particularly evident in the river communities, where many who were involved in the Arapaima trade are not employed as Aquarium harvesters because they are geographically isolated from the project headquarters. Recent discussions between the EFC and project personnel have focused on options for including these fishers; however it will be some time before Arapaima fishers can access this new livelihood option.

Many of the people interviewed still seemed to be encouraged by the creation of these new opportunities, seeing it as evidence of progress. They feel that these projects, although still quite small, will eventually benefit everyone in the area. As a result, they are willing to support conservation efforts, and in some cases defer benefits in the short term (no Arapaima, more fishing effort), with the belief that they will gain in the long term. This is particularly interesting in that it is often assumed that communities and individuals are unwilling to defer benefits in the name of conservation.

ii. Which lessons were not transferable? Why?

Social and cultural fit

“The awareness drive came about, and then you had more eyes watching”
- Toka community member

“To make it a business, you got to make it your business”
- Surama community member

In the North Rupununi, the harvest of Arapaima is fairly recent, and many interviewees recalled a time when they were afraid to eat the fish. Arapaima harvesting as a livelihood is therefore fairly new to the Makushi, and many of the fishers do not see the ban as impoverishing. They seem to have accepted the ban, with many saying “...we just catch other fish”.

Most North Rupununi communities are small, with strong interpersonal relationships being a fundamental part of the local culture. CEW activities and other in-situ education and awareness campaigns were able to tap into this informal network, benefiting significantly from interpersonal, word of mouth communication. This has manifested in increased community-level monitoring and social pressure to adhere to the ban. These informal mechanisms currently appear to be the most effective means of monitoring and enforcing the moratorium on Arapaima harvest.

Committed local leaders and NGO personnel

“I felt that getting into it would help to show that Amerindian people can actually manage, to help them to put that mark on the nation that the people are capable of managing, so putting those things together and being a leader I did not want to see it fail”

- EFC member

Committed leaders were integral to the development and implementation of the initiative. Most of the pre-NRDDDB organisational capacity existed at the leadership level. This has since been strengthened by the formation of the NRDDDB, and has been expanded to include more actors. As a result, the NRDDDB has become quite an effective link between their constituent communities and powerful outside groups. North Rupununi leaders have also been relatively successful at balancing power among themselves in collaborative structures like the NRDDDB. That said, local leadership and governance requires further strengthening and organisational support if Arapaima management and other programmes are to be effective in the long run.

Individuals from other national and international organisations also contributed significant time and energy to the Arapaima project and other NRDDDB activities. These individuals were key to stimulating local organisation and subsequent

project development. Although the primary (local and outside) actors may have had different sources of motivation, their interaction seems to be generally based on common goals and established relationships of trust and respect. Most also appeared genuinely committed to collaborative decision-making and were dedicated to the process. Unfortunately, committed individuals are usually a non-transferable resource.

External agents of change

“I will always thank Iwokrama for how far I have come up to today”

- Wowetta community member

Iwokrama played a key role in both the formation of the NRDDDB and the development of the Arapaima project. Community development has been one of Iwokrama’s primary objectives since its creation, and it has dedicated substantial funding and effort to the development and strengthening of local institutions.

Iwokrama’s collaborative approach has also resulted in the development of a strong relationship with the community. This relationship appears to be based on a high level of trust, consistency and reciprocity. For instance, Iwokrama recently lacked the funding to conduct a thorough timber inventory of its Reserve. In response, the NRDDDB offered to organise and conduct the inventory at lower costs, citing the history of reciprocity between the NGO and local communities. The heart of this organisational relationship therefore seems to be the rapport and personalities of the individuals involved.

On the downside, this close association also may have created a dependency, where the NRDDDB’s owed its existence to Iwokrama support. This may have overly exposed the NRDDDB, and its associated projects, to Iwokrama’s influence. Although the relationship between these institutions remains close, the NRDDDB has moved towards increased self-sufficiency by creating linkages with other partner institutions and the government independent of Iwokrama. It remains to be seen whether the NRDDDB can exist in its present form without continued support from Iwokrama. However, this relationship has given the NRDDDB a solid foundation that may be sufficient for it to continue its mission of sustainably developing the people and natural resources of Guyana’s North Rupununi.

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5.0 Appendixes

Appendix 1 – Analysis of the NRDDDB.

Questions based on an International Institute for Sustainable Development (IISD) analysis of 2002 Equator Initiative finalists.

What were the key factors that led to the success of the initiative?	<p>Link to the Iwokrama Forest conservation area as a source for support and as a major development partner</p> <p>Facilitating community participation and communication</p> <p>Revitalization of native language and knowledge</p> <p>Promoting community-based management of threatened areas and developing local leadership and governance skills (linked to training and other opportunities)</p> <p>Developing alternatives for local income generation (eco-tourism, craft, Arapaima)</p>
Where is support needed?	<p>Business development and marketing for new products</p> <p>Sustainable agricultural processes and marketing</p> <p>Improved communication mechanisms among communities</p> <p>Improved governance and partnerships between Government and communities</p> <p>Alcoholism and other health and social issues (malaria, HIV)</p> <p>Assessment and development of markets for alternative products (NTFPs, Arapaima)</p>
How can the lessons learned be scaled up and out?	<p>Initiative demonstrates the benefits of community participation and empowerment in resource management</p> <p>Development of new and alternative forest products</p> <p>Production of detailed, ground-proofed maps through participatory methods.</p> <p>Lessons learned, process oriented that can be transferred to similar efforts</p> <p>Culturally relevant exchange experiences, e.g., Mamirauá Sustainable Development Reserve (Brazil); Canadian linkages e.g., Visits by community leaders to First Nations, Ghost River Rediscovery exchanges</p>
Did the initiative lead to alternative forms of livelihood?	<p>Eco-tourism opportunities</p> <p>Aquarium fish and Arapaima in development</p> <p>Employment in conservation, research and management (Rangers, Researchers)</p> <p>Sales of knowledge based products – books on local knowledge</p> <p>Better access to markets for craft and other NTFPs</p>
Did indigenous knowledge play a role in the success of the project?	<p>Indigenous knowledge was essential in the:</p> <p>Knowledge based industries</p> <p>Co-management of selected species and areas</p> <p>Identification of sites for eco-tourism, guiding</p>
What social groups are involved, and how did their involvement affect the success of the project?	<p>The 14 communities that make up the NRDDDB – village leaders in councils</p> <p>Women's groups developing women leaders and business opportunities for women</p> <p>Youth groups (wildlife clubs)</p> <p>Village elders involved through greater respect for local knowledge systems</p> <p>All communities involved; leadership skills developing within communities as a result of forum for discussions (NRDDDB) and increased access to training</p>

Did the initiative lead to institutional change?	<p>Development of the NRDDDB</p> <p>Shifts in the way decisions are made in the area including changes in local empowerment</p> <p>Empowerment of village councils</p> <p>Linked formation of the Guyana Action Party as a representative voice for Amerindians</p> <p>National policy and institutional changes toward co-management</p>
Who were the key catalysts?	<p>Community leaders from key villages</p> <p>Amerindian Research Unit at the University of Guyana</p> <p>Red Thread Women's Organization, NGO in Georgetown</p> <p>Iwokrama International Centre for Rainforest Conservation and Development</p>
How was the initiative financed?	<p>Through funding from the Global Environment Facility grant to Government of Guyana to set up Iwokrama</p> <p>IDRC funding to Red Thread (local NGO) for community outreach program, and through UNESCO's Caribbean Office for the setting up of Radio Paiwomak (community radio station).</p> <p>Government of Guyana and UNDP Poverty Eradication Programme in the North Rupununi</p> <p>DFID funding to Iwokrama for Sustainable Human Development</p> <p>CIDA funding for community based ecotourism</p>
Did the initiative lead to any policy changes and, if so, how did they come about?	<p>Greater focus on co-management in Guyana National Biodiversity Action Plan</p> <p>Shifts in focus for draft legislation for Fisheries (toward management planning for areas)</p> <p>Greater focus on consultative processes for policy and legislation in Guyana (Ministry of Amerindian Affairs)</p> <p>Model institutional structures for representation in Amerindian communities</p>
Did the initiative spread to other communities?	<p>Several requests have been made by other communities to be part of the initiative, with recent addition of 14th member community. Recent addition of Karanambu Trust (privately owned ranch) to Board.</p> <p>Concept of NRDDDB also being viewed by other sub-regions; but not yet adopted</p>
Were the technologies/approaches used new to the community and, if so, where did they come from?	<p>Radio technologies improved communication</p> <p>Participatory decision making approaches</p> <p>Through partnerships with NGOs like Iwokrama and UNESCO</p>
Did the project deal with post-disaster situations?	No
Did the project lead to the restoration/protection of threatened species?	<p>Recovery of Arapaima (CITES II species) stocks ongoing</p> <p>Conservation of Black Caiman, Giant River Otters, and Jaguar resulting from programme</p>

Appendix 2 – History of area and events leading to development of Arapaima project.

Year	Conditions in area	Primary activities	Arapaima populations
Pre 1800s	Loose social structures, kin-based settlements. Local belief system including a number of socially enforced food taboos.	Semi-nomadic, complex of hunting, fishing, gathering of wild food, shifting cassava cultivation. Some trade networks for curare, pottery, gold.	No harvest.
Mid 1800s	Permanent missionary outposts, settlements becoming more nucleated; evangelisation of Makushi, increased exposure to colonial structures.	Traditional subsistence activities, with some trading in new items to the missionaries.	No harvest.
Late 1800s	Movement of some Europeans settlers and businessmen into area from the capital. Served as representatives of the Crown at local level. Creation of roads and infrastructure, increasingly nucleated villages.	Traditional subsistence activities, Establishment of large-scale cattle ranching and balata (rubber substitute) trade. Movement of Wapishana Amerindians, and other settlers into the area for employment.	Taboo still recognised by Makushi. Small-scale harvesting by settlers, Wapishana Amerindians, whose folklore lacked Arapaima taboos.
1900 – 1950s	Establishment of regional administrative centres, followed by Amerindian village and district councils.	Traditional subsistence activities, employment in ranches/balata; widespread abusive debt-peonage systems. Breakdown of local culture, belief systems with integration into the cash economy.	Taboo begins to break down, some fishing by locals, mostly for food, most harvest still by settlers, small-scale.
1952	Fisheries Act forbids harvest of Arapaima. Evidence suggests that law resulted from request by well established British settler, and overharvesting of Arapaima populations closer to coast.	Traditional subsistence activities, employment in ranches/balata.	Continued fishing by locals, mostly for food, most harvest still by settlers, small-scale.
1950s - 1960s	Increased movement between Brazil and Rupununi; transfer of fishing technology from Brazil.	Traditional subsistence activities, employment in ranches/balata; seasonal employment in Brazil. Beginning of wildlife trapping; trade in Black Caiman skins, Giant Otter pelts and Arapaima to Brazil.	Large-scale Arapaima harvest; commercial harvest started by a Brazilian-Peruvian; said to have taught the people of the North Rupununi Arapaima harvest techniques.
1969	Rupununi Uprising. Cattle ranches attempted to create a separate, independent state in the Rupununi. Government suppressed uprising, confiscated cattle.	Collapse of cattle ranching as major economic activity in the region.	

1970s - 1980s	Establishment of Annai Amerindian District (Reserve). Recognises right to fraction of traditional land; includes 5 villages of NRDDDB. Outsider overharvest raised by community members at regional meetings with government; short-lived, follow-up police patrols. Arapaima trade illegal in Brazil.	Traditional subsistence activities; seasonal employment in Brazil; wildlife trapping; some Government subsidized peanut farming; little ranch employment; balata trade closes.	Large-scale Arapaima harvest primarily by Brazilians and settlers from the coast. Community members used as guides, labour.
1992	Establishment of the Iwokrama Rainforest Reserve and Field Station. Completion of Georgetown Lethem Road which passes through area.	Some new employment in Field Station functioning and Iwokrama research activities.	Harvesting continues, drastic reduction in Arapaima populations, tighter borders regulations, weakening of market.
1996	Creation of the NRDDDB.	Creates new opportunities for training and employment as Iwokrama Forest Rangers and in joint NRDDDB - Iwokrama conservation, development and research projects.	Harvesting continues to fall as population becomes scarce.
1998	Meetings between Iwokrama, Government and local communities. Discussions between Iwokrama and communities, alternatives to Arapaima fishing identified, including bee keeping, Aquarium fish trade, aquaculture, brick making, and Crab Oil production.	Iwokrama rangers active in Iwokrama – NRDDDB outreach campaigns and workshops conducted in area. Conservation of endangered species primary message.	Low level of harvesting, some trade with Brazil.
1999	Experimental surveys by Iwokrama and CEWs to determine if counting feasible. Creation of links with Mamirauá; visits by 3 CEWs. Government conducts Aquaculture feasibility study for area; low potential found.		Low level of harvesting, some trade with Brazil.
2000	Meetings between NRDDDB, Iwokrama; UK and Brazilian scientists and Dept. of Fisheries officials. NRDDDB decides to adopt ban, develop Management plan. Establish Fisheries Task Force under the NRDDDB. Four persons appointed to examine local fisheries, plan, and livelihood alternatives. Some communities interested in Arapaima aquaculture.	Community Environmental Workers established in communities. One or two local part-time workers in each village. Iwokrama provides link to market for locally produced NTFPs, including Crab Oil and honey production.	Occasional harvesting, some trade still occurring, but greatly reduced.

2001	<p>Brazilians train 13 local fishers.</p> <p>First count conducted in March with Brazilians.</p> <p>Second count conducted in November. New fishers trained in counting methodology.</p>		<p>Occasional harvesting, some trade still occurring, but greatly reduced.</p> <p>First training count shows a population of 422; second larger count later in year show a population of 888.</p>
2002	<p>Meeting between Brazilian scientist and representatives from the communities, NRDDDB and Iwokrama to develop draft management plan.</p> <p>Community visits by three person team of Iwokrama and Brazilian scientists and NRDDDB representative to present draft plan.</p> <p>Formation of CFCs.</p> <p>Meeting to develop 2nd draft management plan. EFC formed through elections at general meeting.</p> <p>EFC present plan to NRDDDB, plan approved, 2 members appointed by NRDDDB.</p> <p>Elections to structure EFC.</p> <p>3rd draft prepared, presented to Ministry of Amerindian Affairs, Ministry of Fisheries Crops and Livestock, MLG & RD and the EPA.</p>	<p>NRDDDB Aquarium Trade begins with first shipments of fish from the area.</p> <p>Local harvester employed to harvest, with profits reinvested in project and other NRDDDB initiatives.</p>	<p>Few reported cases of harvesting, some accidental catches.</p> <p>Third survey shows an increase to 1000.</p>
2003	<p>Meetings between EFC president and Minister of Fisheries; Approval of Plan discussed.</p> <p>River patrols by EFC members.</p> <p>Outreach meetings held in river community.</p> <p>Meetings held in two villages outside of the North.</p> <p>Rupununi that fish in the area. Arapaima Management Plan presented.</p>	<p>Tour guide training, with one representative from each community; some employment with Iwokrama and visiting tourists.</p>	<p>Two cases of harvesting reported to EFC. EFC members visit the homes of the accused harvesters; in both cases; the catch was said to be accidental.</p> <p>CEW program comes to an end.</p>
Late 2003-2004	<p>Fourth Arapaima count conducted; additional fishers trained.</p>		<p>Survey finds a population of 1200. Increase lower than expected; exact cause, whether natural or harvest related, uncertain.</p>

Appendix 3 – Evaluation of Arapaima management in the North Rupununi (Prepared specifically for community use)

Questions	Common answers	What might happen if fishing starts too soon	How to get ready for fishing
How is the ban working?	All felt Arapaima was coming back. Most felt it was because of a change in attitudes, and people were scared because “More eyes watching”. Still cases of harvest; one report of over 80 baby Arapaima being caught by one man for sale in Brazil. “Police themselves selling”	Return of Arapaima fishing might cause more illegal catching. Most think that everybody will be allowed to fish. May result in more movement of Arapaima to Brazil. Involvement of “police” in sale will affect EFC’s ability to control harvest. “Nobody could do me anything if police doing it”.	Need to have things in place, e.g., working CFCs, checkpoints, etc. Need to work with police and other local authorities to prevent illegal harvest.
How well do you understand the plan?	Most know of the plan and have a basic understanding of the project. However, many expect to be able to fish Arapaima once plan is approved. Also expect local use and sale in community.	May lead to more Arapaima caught than quota, causing another drop in numbers. Persons upset, feeling “left out” by the project. “...will cause a lot of underhandedness”	A new set of meetings are needed to better explain the rules of the plan to the communities. Radio programs and pamphlets focusing on rules also useful. Have discussions with local traders.
How are the CFCs working?	Most not working; some never met. Few persons still active in awareness drive some communities. But many people paying attention to what others are doing; people are scared because “More eyes watching”	Not ready for harvesting, no one to monitor/coordinate harvest in the communities, would cause illegal fishing.	CFC formation can be done during the awareness meetings in the communities. Need to select dedicated persons; set up a regular reporting system; maybe be part of village council; and have a regular voting system.
How is the EFC working?	Active through NRDDDB meetings; Most happy with activities. Some complaints include few general meetings; no elections Some lack of trust: “EFC don’t have much river people”; “Member themselves doing illegal catching”	EFC will receive a lot more attention when harvesting starts. May have to deal with a lot more complaints. Some already questioning EFC ability to do anything to illegal harvesters.	May need to hold new elections; have a special representative from river communities; be prepared to enforce penalties on illegal harvesters. Must have a system for dealing with conflicts between fishers. In the end it will have to show to the ministry and the people that it is able to manage the project.

Questions	Common answers	What might happen if fishing starts too soon	How to get ready for fishing
How are the checkpoints working?	Apoteri and Rewa not working; Hiawa working a little, with some data sheets; but not a lot of fishing recoded. “Checkpoints not a good idea” “Can’t stop people”; “A lot of travelling at night and changing movements” “Will never be able to catch determined people.”	No way to really stop/check people; Will need more money and people to work. Persons may also change their movements to get past checkpoint. Hard to do catch people that don’t want to get caught. “Boat patrols better, but they expensive and people could still hide from you”.	Will only work if people are always at the checkpoint and they have some way of making sure that people stop in. May also be possible to use the money that would be spent on the checkpoint to run boat patrols. This can be done with an engine and/or with CFC members going out in their canoe and checking.
How are the counts working?	Most satisfied with counts. Some concern. No one has been retested. “They didn’t count some lakes”; “More counters added, some might not be as good as others.”	If counts used to fix quota, people will take a bigger interest in the counts. May get more complaints about who counting and how they are counting. “Saying more Arapaima around than what they actually count”. Could lead to people doing their own thing.	Need to retest the counters. Have a count and then a complete harvest of the pond to check if the count is the same as the real amount of fish in the pond. Have some sort of training period for new counters and then have them tested when a pond is being harvested.
How should harvesting happen?	Most feel harvest should begin. Some from river communities think populations still too low; ‘Savannah people still coming here and fishing’. “We need another couple of years, let them come back to how they were”. Others say different communities should get different quotas, because everybody depends on it differently.	Some problems could happen when fishermen from one community fish in areas close to another community. River communities may say that they are not represented, because there are not a lot of river people on the EFC. Some communities might also argue for larger quotas.	EFC and community members will have to: Decide how long to wait before starting harvest. Develop a plan of how to settle disagreements between different communities about fishing areas. Decide who will catch and what is the best way of sharing quotas. Can use Aquarium fish harvest system as model.

Appendix 4 – Contact Details

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