The Amazon Protected Areas Program (ARPA): Participation, Local Development, and Governance in the Brazilian Amazon

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RESUMO – A gestão das unidades de conservação (UCs) no Brasil tem lentamente incorporado o conceito de governança participativa, promovendo o envolvimento e a participação das populações locais. O Programa Áreas Protegidas da Amazônia (ARPA), lançado pelo governo brasileiro em 2002, apoia um total de 59,2 milhões de hectares de UCs, tornando-se o programa de conservação da biodiversidade mais ambicioso no mundo. Com base nos princípios de gestão descentralizada e participativa, o ARPA também dá suporte às comunidades locais para desenvolverem e implementarem estratégias de uso sustentável dos recursos naturais. Particularmente, o subcomponente "integração das comunidades" apoiou 30 planos de ação na Fase II, com base nas salvaguardas sociais e ambientais do Banco Mundial. Este estudo apresenta os resultados de 14 planos de ação monitorados e avaliados entre 2013 e 2016. A metodologia incluiu oficinas participativas com gestores das UCs, juntamente com pesquisa de campo para a realização de atividades com as partes interessadas. Além disso, os planos de ação foram avaliados ao longo de relatórios de progresso, atas de reuniões e outros documentos relacionados com a execução dos planos. Os resultados positivos incluem o estabelecimento de parcerias entre diferentes organizações (por exemplo, organizações locais, ONGs, universidades e institutos de investigação); o empoderamento das comunidades locais e uma maior participação das partes interessadas nos conselhos das UCs; melhorias de intercâmbios de comunicação e de conhecimentos entre as partes interessadas – as comunidades e os gestores; e o fortalecimento do diálogo institucional. Os principais desafios relativos à implementação bem-sucedida dos planos de ação incluem a falta de recursos humanos, a alta rotatividade de pessoal e a burocracia relacionada com a execução de recursos financeiros. Nós concluímos que o desenvolvimento local pode contribuir significativamente para a gestão eficaz e a conservação das UCs.

Palavras-chave: Governança; áreas protegidas brasileiras; planos de ação; integração de comunidades; participação comunitária.

ABSTRACT – The management of Protected Areas (PAs) in Brazil has been slowly incorporated the concept of participative governance, promoting the involvement and participation of local populations. The Amazon Protected Areas Program (ARPA) is a program launched by the Brazilian government in 2002 that supports 59,2 million hectares of PAs, making it the most ambitious biodiversity conservation program in the world. The main objectives of the ARPA include to protecting representative samples of biodiversity, ecosystems and associated landscapes, as well as maintaining of the environmental services. Based on decentralized and participative management principles, the Program also supports local communities, developing and implementing strategies of sustainable use of natural resources. Particularly, the subcomponent "integration of

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communities" supported 30 action plans in Phase II, based on social and environmental safeguards of World Bank. This study presents the results of 14 action plans monitored and evaluated from 2013 to 2016. The methodology included participative workshops with PAs managers and beneficiaries, along with fieldwork research for accomplishing activities with local stakeholders. Moreover, we evaluated action plans throughout progress reports, meetings acts, and other documents related to the implementation of the projects. We found that positive results include establishment of partnerships among different organizations (e.g., local agencies, NGOs, universities, and research institutes); empowerment of local communities and more participation of stakeholders in the councils of PAs; improvements of communication and knowledge interchanges between stakeholders, communities, and managers; and strengthening of institutional dialogue. The main challenges concerning the successful implementation of the action plans include lack of human resources, high staff turnover, and bureaucracy related to the financial resources execution. We conclude that local development can significantly contribute to the effective management and conservation of PAs.

Keywords: Governance; Brazilian protected areas; action plans; integration of communities; community participation.

RESUMEN – El manejo de Áreas Protegidas (APs) en Brasil ha incorporado poco a poco el concepto de gobernanza participativa, promoviendo la participación e implicación de la población local. El Programa de las Áreas Protegidas de la Amazonia (ARPA) es un programa puesto en marcha por el gobierno brasileño en 2002 el apoyo a un total de 59,2 millones de hectáreas de áreas protegidas, convirtiéndose en el programa de conservación de la biodiversidad más ambicioso en el mundo. Los principales objetivos de ARPA incluyen muestras representativas de protección de la biodiversidad, los ecosistemas y los paisajes asociados, y el mantenimiento de los servicios ambientales. Sobre la base de los principios de la gestión descentralizada y participativa, el programa también apoya a las comunidades locales para desarrollar e implementar estrategias de uso sostenible de los recursos naturales. En particular, el subcomponente "integración de las comunidades" tiene apoyado 30 planes de acción en la fase II, sobre la base de las salvaguardas sociales y ambientales del Banco Mundial. Este estudio presenta los resultados de 14 planes de acción monitoreados y evaluados entre 2013 y 2016. La metodología incluyó talleres participativos con los administradores de áreas protegidas, junto con la investigación de campo para la realización de actividades con las partes interesadas. Además, los planes de acción han sido evaluados por los informes de progreso, actas y otros documentos relacionados con la ejecución de los planes de reuniones. Hemos encontrado que los resultados positivos incluyen el establecimiento de asociaciones entre las diferentes organizaciones (por ejemplo, organizaciones locales, ONGs, universidades e institutos de investigación); potenciación de las comunidades locales y una mayor participación de los interesados en las juntas de las áreas protegidas; la mejoras de comunicación y intercambio de conocimientos entre las partes interesadas, las comunidades y los administradores; y el fortalecimiento del diálogo institucional. Los principales desafíos para la implementación exitosa de los planes de acción incluyen la falta de recursos humanos, alta rotación de personal, y la burocracia vinculada a la aplicación de los recursos financieros. Llegamos a la conclusión de que el desarrollo local puede contribuir significativamente a la gestión y conservación eficaz de las áreas protegidas.

Palabras clave: Gobernabilidad; áreas protegidas en Brasil; planes de acción; integración de las comunidades; participación comunitaria.

Introduction

Environmental and natural resource management has evolved away from a top-down, regulatory style, to one that features close and diverse partnerships and collaborations between management agencies and local communities, resource users, other management agencies, non-governmental organizations (NGOs), and the private sector (Dovers *et al.* 2015).

Participatory governance of protected areas is a concept that was barely recognized until a decade or so ago. Some early, innovative ways of making sense of it emerged on the Vth IUCN World Parks Congress (Durban 2003) where, for the first time, an entire stream of events was dedicated to the topic. Since then, concepts and practices have evolved and consolidated into a new, rapidly expanding and developing field of inquiry (Borrini-Feyerabend *et al.* 2013). One of the recommendations of the Vth World Parks Congress is that protected areas should help reducing

local poverty or minimally not exacerbate it. Hence, protected areas management bodies should build capacity as a key initiative to integrate residents into the management processes, as well as to support conservation and development projects (Scherl *et al.* 2004).

Scherl *et al.* (2004) stress that establishment and management of protected areas should at least not make the living conditions of poor rural and indigenous communities worse off than they are already. According to the authors, IUCN states that pro-poor conservation is not just an ethical response but "an opportunity to contribute to the growth of the environmental sphere of sustainable development by proving its fundamental importance to economic and social outcomes in some of the world's poorest but most biologically diverse regions."

Many local communities and indigenous peoples possess customary organizations with a role in governing nature and natural resources – some with centuries of experience, others relatively new or recently revived in contemporary forms. What most have in common is that they represent local rights-holders – people first in line to pay the price for wrong management decisions and possessing the traditional knowledge, skills and the accumulated local experience necessary to protect or restore specific sites and use natural resources in sustainable ways. Despite their diversity and complexity, and possibly because of that, customary and local institutions appear to function efficiently and make outstanding contributions to conserve natural and modified ecosystems (Borrini-Feyerabend and Hill 2015).

Effective governance for the conservation of nature involves building active and coherent connections among the people, sectors and decision-making levels that determine the many factors and conditions that contribute to, or impede, conservation. Territories under shared governance or directly conserved by indigenous peoples, local communities and private landowners provide conservation benefits at little cost to society (Borrini-Feyerabend and Hill 2015). Such idea is reinforced by a sense of belonging and ownership from settled human communities living around and within territories turned into protected areas (Calegare & Higuchi 2013).

Questions of legacy and customary tenure (for example who holds the legal or customary rights over land and resources) are obviously important, but not the sole determinant of governance. While legal, customary and socio-political influences vary widely, the critical management decisions for a protected area are most directly related to biodiversity, natural resources use, and people. These decisions are crucial for the achievement of the objectives of the protected area (management effectiveness), determine the sharing of relevant costs and benefits (equity), help to prevent or manage social conflicts. Governance is not only about who holds authority, but also who makes decisions, and about how these decisions are made. So questions of governance go beyond a formal attribution of power and responsibility; they also include questions about both formal and informal processes of taking decisions, and the roles of legal, customary and culture-specific institutions (Borrini-Feyerabend *et al.* 2013).

Notably, the role of capacity development in protected areas is increasingly recognized at all levels (individual, institutional, national and global), including the Convention on Biological Diversity (CBD) and Aichi Targets, especially Target 11. Capacity development at the protected area level have to be able to clearly answer 'capacity for what' and 'capacity for whom', and focus on specific abilities required to accomplish clearly defined goals under particular circumstances (e.g., technical, environmental, political and financial) in which these goals must be reached (Müller *et al.* 2015).

This article investigates advances and challenges in the implementation of the action plans from Amazon Protected Areas Program (ARPA), as well as which lessons can be drawn from this process. The action plans from ARPA Program remind the trajectory of Demonstration Projects (PDA) of the Tropical Forests Protection Pilot Program in Brazil (PPG7), closed in 2012 (Szlafsztein 2012). These projects aimed to support local communities to develop alternative and innovative management of natural resources, strengthening their ability to find sustainable local development solutions in the Amazon and Atlantic Forest biomes (Guerra and Ascher 2006).

Amazon Protected Areas Program (ARPA)

Amazon Protected Areas (ARPA) is a Brazilian government program led by the Brazilian Ministry of the Environment (MMA) and managed by the Brazilian Biodiversity Fund (FUNBIO). The Program is supported by Global Environmental Facility (GEF) – through the World Bank, the government of Germany – through the German Development Bank (KfW), and WWF.

Since it was launched at the World Conference on Sustainable Development in 2002 (Rio +10), ARPA has been the most successful protected area creation program in history. The Program has created new protected areas (PAs)[1] and supported the consolidation of existing PAs that had largely been "paper parks" without effective management structures in place before receiving ARPA's support. Currently, ARPA supports the consolidation of 114 Protected Areas (PAs) in the Amazon forest, totaling 59,2 million hectares, reaching almost its goal of 60 million hectare[2]. Besides, ARPA has led to significant conservation planning and capacity upgrades that have improved the management of protected areas across the Brazilian Amazon (WWF 2016).

ARPA Program was created to expanding and strengthening the National System of Conservation Units (SNUC) in the Amazon. The program has contributed to protect a representative sample of the biodiversity, ecosystems and associated landscapes, to maintain environmental services, as well as to reduce carbon emissions caused by the destruction of the Amazon rainforest. Soares-Filho *et al*. (2010) estimated that the expansion of protected areas created under ARPA from 2003-2008, by 2050, will reduce deforestation by 68,000 square miles, thereby avoiding 5,1 billion tons of CO2 emissions into the atmosphere, which represents ~16% of global CO_2 emissions per year.

Based on principles of decentralized and participatory management, the program supports local communities to developing and implementing strategies to strengthen the sustainable use of natural resources. The financial support to PAs management is given in two ways. First one includes consolidation of PAs through several indicators, such as land tenure, protection and management (including enforcement actions), research and monitoring, development or revision of the Management Plan, and community participation through Advisory or Deliberative Council (depending on the PA category), among others. ARPA also supports the development of Terms of Commitment for Strictly Use PAs and Real Concession Use Law for Sustainable Use PAs (MOP 2015[3]).

The second and more specifically way to promoting community empowerment is given under so-called "Integration of Communities" subcomponent. Such indicator includes support to traditional populations through Sustainable Action Plans (*Plano de Ação Sustentável* or PAS), and Indigenous Peoples Action Plans (*Plano de Ação para Povos Indígenas* or PPI), which benefits to the integration of actions between PAs and Indigenous Lands. These plans are justified in respect of potential impacts resulting from the creation and consolidation of protected areas in the livelihood of local communities. The rules and procedures of the subcomponent "Integration of Communities" are defined in the Operational Manual Program, and approved by the ARPA Program Committee. These guiding documents are based on social and environmental safeguard policies of the World Bank[4].

Concerning initial implementation of the Integration of Communities subcomponent, ARPA supported 14 action plans in Phase I (2003 to 2010), with total financial investments of 2,85 million reais (Araujo *et al*. 2010). The subcomponent 2.3 began to be implemented in 2007,

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[1] In Brazil, we broadly define Protected Areas (PAs) as all public areas under land-use restrictions that contribute to protecting native ecosystems, even if they were created for purposes other than environmental conservation (Soares-Filho *et al*. 2010). In this study, PAs refers to Conservation Units strict sense according to SNUC, including strictly protected and sustainable-use conservation reserves (IUCN categories I–VI).

[2] Available at http://programaarpa.gov.br/lista-de-ucs-2/

[3] Available at http://programaarpa.gov.br/wp-content/uploads/2015/10/MOP-ARPA-FASE-III-outubro.pdf

[4] Available at http://www.programaARPA.gov.br/wp-content/uploads/2012/10/anexo3-SalvaguardaIndigena.pdf

although disbursements started only in 2008. All projects were implemented by non-governmental organizations. The results achieved by these projects are scarce. Kahn (2009) highlights some initiatives, including capacity-building of non-indigenous agroforestry agents surrounding Serra do Divisor National Park; diversification of economic activities in the riverine from the Upper Juruá River; sustainable fishing activities at the Corumbiara State Park; and support for the creation of a cooperative at Resex Unini. About 50% of NGOs could not complete the financial execution of their projects.

In phase II (2010-2017), 30 action plans were selected through three calls for proposals (one by PA), including 14 action plans in 2013, 9 in 2014, and 7 in 2016, respectively. The execution time of the action plans should vary between 18 and 24 months. The total invested in this subcomponent was 5,8 million reais[5] (about 1,7 USD).

While the proponent and implementing agency of the action plans in Phase I of ARPA was civil society, in Phase II the proponent were public institutions of protected areas. From 30 selected proposals, Chico Mendes Institute for the Biodiversity Conservation (ICMBio) was the leading proponent with 21 proposals, followed by the Environment Secretariat of the Amazonas State with 7 proposals, Naturantis Institute (Tocantins State) and Environment Secretariat of the Acre State with one proposal each. The present study refers to fourteen action plans selected in 2013, including 12 PAS and 2 PPI (Table 1, Figure 1).
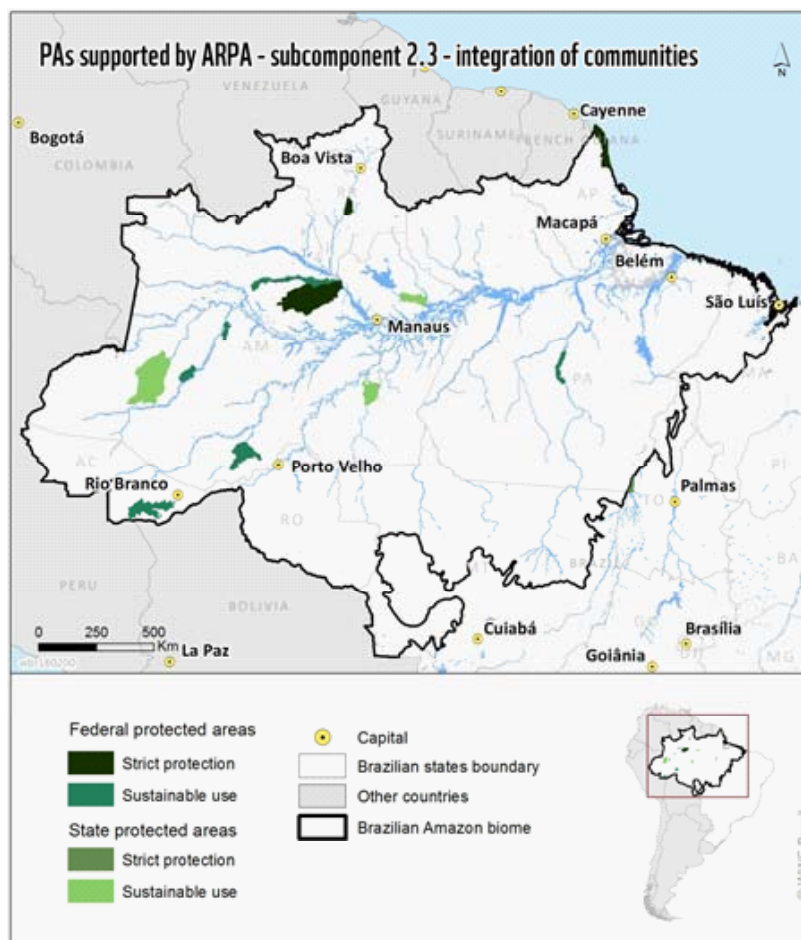

Figure 1 – Map of the 14 action plans selected in 2013 by "Integration of Communities" subcomponent of the ARPA Program.

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[5] Available at http://programaarpa.gov.br/wp-content/uploads/2017/03/Miss%C3%A3o-de-Supervis%C3%A3o-Dez-2016.pdf

Table 1 – Action plans supported by the ARPA Program in Phase II. (Legend: ER=Extractive Reserve; NP=National Park; SDR=Sustainable Development Reserve; SEMA= Secretary of State for the Environment).

Project name	State	Protected area	Proponent organization
Actions for participative management of fishing in the north of Amapá State	Amapá	Cabo Orange NP	ICMBio
Capacity building of local communities to increasing benefits of visitation in the Viruá National Park	Roraima	Viruá NP	ICMBio
Community conservation of chelonians in the Ituxi River Extractive Reserve	Amazonas	Ituxi ER	ICMBio
Community empowerment as a tool to support alternative income generation activities in the Juma Sustainable Development Reserve	Amazonas	Juma SDR	SEMA
Indigenous monitoring of the Karajá and Javaé Territories around Cantão State Park	Tocantins	Cantão State Park	Naturatins
Integration plan for strengthening communities at Middle Juruá Extractive Reserve	Amazonas	Médio Juruá ER	ICMBio
Management of pirarucu - community organization, participatory management, and income generation at the Unini River	Amazonas	Rio Unini ER	ICMBio
Young Protagonists of the Unini River	Amazonas	Jaú NP	ICMBio
Promoting sustainable territorial management and biodiversity conservation through the exchange of knowledge and practices among indigenous and riverine people from the Middle Xingu ER	Pará	Rio Xingu ER	ICMBio
Promoting technical and scientific knowledge to strengthen native cocoa productive chain in the Chico Mendes Extractive Reserve	Acre	Chico Mendes ER	ICMBio
Strengthening of the productive chain through the introduction of photovoltaic electric energy in Uatumã SDR	Amazonas	Uatumã	SEMA
Strengthening participatory management at the Cujubim SDR	Amazonas	Cujubim SDR	SEMA
Sustainable Action Plan for community monitoring and environmental education in the Lower Juruá ER	Amazonas	Lower Juruá ER	ICMBio
Training in environmental conservation practices and sustainable use of natural resources in Maracanã ER	Pará	Maracanã Marine ER	ICMBio

Methodology

Monitoring and evaluation (M&E) of the action plans included progress reports on accomplishing the goals in the action plans, regular meetings and participatory workshops with beneficiaries and managers, and fieldwork activities related to the action plans. Each manager should also send a quarterly report of activities of the action plans, based on questionnaires previously

elaborated by the authors. Nevertheless, one of the main difficulties for the M&E process was the little response of managers to deliver progress reports, as agreed at the beginning of action plan implementation. As a result, monitoring of the activities scheduled to be carried out by mid-term and final reports were affected in some PAs, including Viruá National Park, Juma and Cujubim Sustainable Development Reserve.

A mid-term evaluation was held between 9 and 10th of December 2014 at Manaus, Amazonas State. Managers of 15 action plans, Brazilian Environment Ministry, Amazon government, and FUNBIO representatives attended the workshop. A final evaluation of 23 action plans was carried out between 9 to 13th July 2016 at Manaus, with the participation of 55 people, including managers, PA residents, and partners. This meeting aimed to systematize the learned lessons from all action plans carried out from 2013 to 2016.

Concerning the fieldwork, between 2014 and 2015 we visited six protected areas (almost 50% of the monitored projects) to monitoring specific activities related to the action plans (e.g., capacity-building activities, fisheries meeting, community surveillance, among others). The visited PAs included the Middle Xingu Extractive Reserve, Cantão State Park, Medio Juruá Extractive Reserve 2015, Baixo Juruá Extractive Reserve, Jau National Park, and Ituxi Extractive Reserve.

Results and discussion

Advances in the Action Plans

We organized principal activities supported by action plans in five categories, including management and conservation of natural resources, capacity-building in environmental conservation practices and sustainable use of natural resources, integrated management of PAs and Indigenous lands, community surveillance activities additional to enforcement actions supported by ARPA, and alternative activities to traditional agro-extractive production. Some highlights about advances concerning targets proposed in the action plans are described below.

Conservation and management of natural resources

Three action plans focused on conservation and management of natural resources, including Cabo Orange National Park (NP), Unini Extractive Reserve (ER), and Ituxi ER.

In the Cabo Orange National Park (*Parque Nacional do Cabo Orange*), the primary objective of PAS included establishing a database of scientific and traditional knowledge to support economic development activities in the fishing sector, along with management, conservation, and sustainable fisheries resources use in the coastal zone of the Amapá State.

Institutional partnerships represented a critical aspect to the success of the implementation of this action plan. The PAS advanced in resolution of fisheries conflict, through greater cooperation among ICMBio, universities, research institutes[6], and artisanal fishers. In total, six field trips were carried out to collecting data on fish and crab populations between 2014 and 2015. Researchers identified 14 genera and 40 fish species (n=2,080 individuals), along with reproductive data of crab populations. Researchers also collected ethnobiological data related to spawning, breeding, and feeding of the main commercial fish species caught on the coast and around the park. Advances in scientific knowledge will be important indicators for the implementation of fisheries management rules around the park, especially regarding protection of nurseries areas and establishment of minimum sizes of captured fish.

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6   Federal University of Amapá, Amapá State University, and Institute of Scientific and Technological Research of the State of Amapá.

Studies also addressed the socioeconomic aspects of fishing activity in the municipality of Oiapoque, Amapá State. From January 2014 to October 2015, researchers interviewed 215 local artisanal fishers aged between 17 and 70 years (average of 37 years). Results show that creation of the PA displaced most fishers from their original sites. Such information can be very useful in decision-making regarding the territorial reordering of the region. PAS also supported four meetings and a participatory workshop to identify conflict spots with stakeholders in the Cabo Orange Coast. Participatory mapping with 21 artisanal fishermen and researchers identified more than 15 conflict fishing spots along the coast, mainly with commercial fishers from Pará state. Finally, a signatory of the commitment agreement between government and communities has strengthened with the possibility of the creation of a new Marine Extractive Reserve as a compensatory alternative to restrictions of fisheries resources use at the Cabo Orange NP.

In the Unini Extractive Reserve (*Reserva Extrativista do Unini*), PAS supported the participation of 126 fishermen in the planning and evaluation fisheries meetings, along with workshops on accounting, computer and internet skills (n=57 people), good practice for fish processing (n= 28 people), and monitoring of fishing and use of GPS (n= 9 fishermen). The plan also offered opportunities for exchange of knowledge to 14 fishers, and two certifications in counting techniques of *Arapaima gigas* (*pirarucu*). In 2015, the sale of pirarucu generated income to 30 families from Unini ER (USD 6,068 in total).

The training processes in environmental conservation practices and sustainable use of natural resources added scientific, empirical and traditional knowledge, encouraging the engagement of local communities in the conservation of their areas. In this sense, Unini ER PAS has been essential to involve communities in the management of *pirarucu*, as a priority action of the PA management plan. Support to fisheries management of *Arapaima* has promoted an intensive exchange of knowledge in counting activities with experienced fishers from other PAs, notably the Mamirauá Institute. As a new activity, the action plan has provided training of fishers in counting activities, fishing techniques, and fisheries marketing. Such activities have contributed to the zoning and protection of fisheries in the Unini River, as well as to increase income generation for local communities.

In the Ituxi Extractive Reserve (*Reserva Extrativista de Ituxi*), PAS focused on conservation of breeding site of aquatic turtles, including *Podocnemis expansa*, *P. unifilis*, and *P. sextuberculata* species. Protection of turtle nests began in 2008, same year of establishment of the PA (Aleixo 2011a), in two communities (Vila Victoria and Mangutiari) through the *Preservida project*. The project resulted from the exchange of knowledge among communities of Ituxi and Purus rivers (Aleixo, 2011b). Lack of technical support stimulated communities to be researchers and inventors of their practice (Andrade 2013). During the preparation of the Ituxi ER management agreement in 2013, five other communities joined the project. Currently, seven communities (out of 15) protect beaches during the spawning period of turtles from May to November. Between 2008 and 2012, communities released about 7,100 animals on these shores (Andrade 2013).

Action plan offered technical, institutional and financial support to *Preservida Project*. Activities included training of 16 monitors[7], as well as one field trip to exchange knowledge with communities from Middle Purus ER. By the end of 2015, about 3,424 individuals were released alive on the beaches of Ituxi River and tributaries. Communities report biological dataset through standardized data to Brazilian Institute of the Environment (IBAMA). About 112 people took part of environmental education activities to releasing turtle in the beaches.

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[7] Two voluntary monitors are responsible for each beach, but many people are involved in the protection activities. The primary job of a volunteer beach guard consists of ensuring a predator-free environment where adult females can lay their eggs. When turtle eggs hatch, individuals are transported to water tanks in the communities (so-called nursery), until their navel are healed (about one to two months).

Capacity-building in environmental conservation practices and sustainable use of natural resources

Two action plans focused on capacity building for environmental conservation practices and sustainable use of natural resources, including *Young Protagonists of Unini Project* at Jau National Park (*Parque Nacional do Jaú*), and *Capacity-building in environmental conservation practices and sustainable use of natural resources of forestry communities* at Maracanã Marine Extractive Reserve (*Reserva Extrativista Marina Maracanã*).

The *Young Protagonists of Unini* Project trained 567 young people at Jaú NP and Unini ER (initial target was 100 young people), through eight modules of environmental education. Training of youth was based on environmental education methodology, developed to empower young stakeholders to take part in the management, as well as to renew leadership of protected areas (Rodrigues and Anciães 2015). Particularly, recovery of history and identity was especially important for youth who did not take part of the struggle process for the creation of these PAs.

Outcomes included the increasing participation of young people in the council meetings from 3 people in 2012 to 24 in 2015. The total number of participation of youth in the planning meeting of Unini ER also increased from 22 youth in 2013, to 27 in 2014, and 47 in 2015. As a result, PAS influenced in the creation of a seat for young people in the Council Board of the Unini ER, and two seats on the board of the Association of Unini River (AMORU).

The project also stimulated the exchange of knowledge among the youth of different region (e.g., Rio Negro SDR), and participation in the Extractive Youth Meeting at Soure ER, and Forest Call from National Council of Rubber-Tapper at Tapajos-Arapiuns ER in 2015. The successful implementation of this action plan can be acknowledged to work of an environmental educator from partner NGO Vitoria Amazon Foundation, as well as the full-time dedication of a technician from ICMBio.

At the Maracanã Marine ER, 2,285 people were trained (the target was 600 people) in eight courses and two workshops in topics concerning rights, environmental laws, associations, and fisheries management agreements. The primary outcomes included the creation of 19 community committees and review of management agreements in 20 communities of the PA.

Results achieved of the Viruá National Park (*Parque Nacional do Viruá*) included the consolidation of a network of partnerships involving the tourism sector, along with the acquisition of donated materials (mainly seized timber) and equipment (e.g., trucks and tractor) for the implantation of the infrastructure of visitation in the park. However, the manager did not present the final report, which made it impossible to analyze the execution of this action plan concerning the established goals, particularly regarding the capacities that should be carried out with the communities around the Park.

Integrated territorial management of PAs and Indigenous Lands

Two action plans focused on the integrated territorial management of protected areas and indigenous territories, Rio Xingu ER (*Reserva Extrativista do Xingu*) and Cantão State Park (*Parque Estadual do Cantão*).

In the Xingu ER, primary activities included six meetings among indigenous and riverine youth during 2014, and women meeting in 2015. It is important to highlight the strengthening of neighborhood relationships among extractive communities and Araweté and Parakanã ethnic groups, as well increasing of institutional dialogue between ICMBio and Brazilian Indian Foundation (FUNAI) to address issues related to integrated management of the territory. PPI also facilitated the participation of different groups in the training process (e.g., youth, women, ethnic groups, uses), along with intergenerational and intercultural exchanges. The main challenge of the PPI Xingu ER included insufficient involvement of ICMBio managers in the monitoring of PPI, since a

consultant executed most field activities alone. Another limitation of this project included lack of a multidisciplinary technical team (e.g., anthropology, agroecology), and inadequacy of pedagogical methodology to deal with complex intercultural issues.

In the *Cantão State Park*, PAS supported training activities of voluntary environmental agent to 30 indigenous living surrounding the Park. Activities also included two workshops to deal with conflicts related access of natural resources uses. First workshop reviewed the Conduct Adjustment Agreement among government representatives (e.g., Funai, ICMBio, Federal Public Ministry, and Naturatins State Institute), Karajá and Javaé Indigenous people, which lands are entirely overlapped to Araguaia National Park, and contiguous to the Park. The second workshop mediated conflicts among indigenous leaders, concerning commercial fishing, sports fishing, livestock, use of fire, and enforcement actions. In total, 44 indigenous leaders attended both workshops, reaching around 30% of 140 indigenous families living in the villages surrounding the Cantão State Park. The action plan also supported the purchase of equipment for enforcement actions. Nevertheless, vehicles and equipment to be used in the operations surveillance requested in 2013 just arrived in 2016 (3 years later), so not delivered on time to performing the planned activities.

Community surveillance activities additional to enforcement actions supported by ARPA

Action Plan in the Lower Juruá ER (*Reserva Extrativista do Baixo Juruá*) supported community monitoring of breeding sites of aquatic turtles and lakes for fisheries of *pirarucu*. Community surveillance in the Lower Juruá River began in the 1970s with education movement of the Catholic Church. Monitoring of turtles in the *Lower Juruá ER* started in 2004 with *Pé de Pincha* Program, carried out by the Federal University of Amazonas. Since 2006 this activity has been technically supported by environmental agencies (initially IBAMA and after ICMBio).

Currently, three communities (Botafogo, Antonina and Forte das Graças) protect beaches during the spawning season of turtles. The program aims to develop the participatory management of turtles through population monitoring, along with protection of site nests. PAS supported community surveillance through staple food[8] and diesel. In total, 29 people are involved in monitoring, fourteen people in Botafogo and eleven people in Forte das Graças. Humans, in addition to losses associated with natural depredations, represent main threats related to the protection of nests.

Also, PAS supported management fisheries of *Arapaima gigas* through fuel donation (on average 35 liters/week) for community surveillance activities. Since 2007 communities of Lower Juruá ER monitor lakes for the management of *pirarucu*. Currently, communities protect about ten lakes. The quota of adult *pirarucu* caught was 80 individuals in 2007, 334 individuals in 2014, and 400 individuals in 2015. Since quota released by IBAMA based on counting is increasing, probably fisheries management has been efficient to protecting fish stocks of *pirarucu*. One of the bottlenecks is the commerce of *Arapaima*, which is sold in the local market for five reais per kg (1,59 USD), while costs involved to produce a kilo of managed fish were $ 6,50 reais (2,07 USD) in July 2015.

In the Middle Jurua ER (*Reserva Extrativista do Baixo Juruá*) PAS activities were focused on enforcement actions and supporting of community surveillance of lakes and beaches, as well as capacity building of local communities for income generation. Management of lakes for commercial fisheries of *pirarucu* began in 2009 at the São Raimundo (Middle Juruá ER) and Xibauazinho communities (Uacari Sustainable Development Reserve). Since 2012, eight communities take part in the fisheries management activities, including five communities at the Middle Juruá ER and

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[8] $500 reais (USD 147) per monitor for two months of activity.

four communities at the Uacari SDR. PAS supported several meeting for the fishing planning of *pirarucu*, and a workshop for 30 environmental monitors about fisheries legislation. Dataset of the Rural Association of Carauari[9], in 2015 eight communities caught 512 individuals of *pirarucus* (32,561 kg), with an average of 64 kg per fisherman. According to Campos-Silva and Peres (2016), community-based management of pirarucu induced to a rapid stock recovery of pirarucu in the Middle Jurua River. Annual population counts showed that protected lakes on average contained 304.8 arapaimas, compared to only 9.2 in open-access lakes. Protected lakes ensure an average annual revenue of U$1046.6 per household, significantly improving socioeconomic welfare.

Another activity supported by the PAS included community surveillance of nesting sites of the aquatic turtles. Monitoring of turtles began in 2004 through a partnership with Federal University of Amazonas. Currently, 15 communities from Middle Jurua ER and Uacari SDR work together in the protection of beaches during the nesting season of turtles. In 2015, local communities captured and marked 3,857 turtles. PAS supported the donation of staple food, equipment, and signaling plates in the protected beaches.

Alternative activities to traditional agro-extractive production

Two PAS supported forestry communities, either through new techniques of agro-extractive production of native cocoa at Chico Mendes ER (*Reserva Extrativista Chico Mendes*) or by encouraging the use of solar energy for sustainable use of natural resources, as occurred in the Uatumã SDR (*Reserva de Desenvolvimento Sustentável Uatumã*).

The action plan of Chico Mendes ER supported an inventory of native cocoa, training of 100 people for management activities, along with the exchange of knowledge with producers of Arapixi ER (n = 15 producers). Outcomes of PAS include knowledge of native cocoa stocks at the Chico Mendes ER, increasing opportunities of market, and possibility of continuity from other financing sources. Limiting aspects pointed out by the manager included delay of FUNBIO (almost two years) to hiring a consultancy responsible for the inventory of native cocoa, along with challenges of transportation of the product, and low human resource capacity of ICMBio to implement the activities.

At the *Uatumã* SDR, PAS supported the acquisition of a photovoltaic solar energy equipment for the preservation of perishable extractive products, such as fruit and fish. One of the main difficulties pointed out by the manager was to find a supplier for the acquisition of equipment. Another challenge included finding a specialized company to install equipment properly. Currently, the photovoltaic system is generating energy only for two freezers (the original proposal should operate with ten freezers). As a result, only 11 families have been attended by the project. The manager expects that new revisions in the equipment can enhance the capacity of photovoltaic power generation to attend other five communities of Uatuma SDR.

Challenges and lesson learned in the implementation of the action plans

Main challenges for the implementation of the action plans were related to financial management, along with a lack of human resources (Table 2). Between December 2013 and April 2016 it was executed $1,776,420 reais (about 546,764 USD), corresponding to 35% of the monetary amount invested in the action plans (Table 3). After 16 months, only four action plans executed more than 50% of the resources. Action plans with higher financial performance included

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9   *Associação dos Produtores Rurais de Carauari* (ASPROC) show that fisheries caught of *Arapaima gigas* are increasing during the past five years (1.025kg in 2005, 415 kg in 2008, 1.165kg in 2010, 2.047kg in 2011, 3.288kg in 2012, 2.774kg in 2013, and 3.638kg in 2014). Total costs involved in all stages of fisheries management (planning, counting, fishing, and marketing) were R$ 158,708.00

Maracanã ER, Uatumã SDR, Cabo Orange NP, and Jau NP. The action plans with lower execution included Cujubim and Juma Sustainable Extractive Reserves (<2% of financial performance), which have no results to be presented. Lack of human resources of PAs, along with bureaucracy of financial manager system consisted on main causes related to slow financial implementation of the action plans, which in turn caused a delay in delivery of equipment, hiring services, and so forth.

Table 2 – Number of times each challenge was cited by managers of protected areas in the management of action plans (n=14 action plans).

Challenge	Total	Frequency (%)
Delay in delivery of equipment and/or hiring services	8	66,7
Limit of linked bank account	5	41,7
Lack of human resources	4	33,3
Exchange of staff	2	16,7
Stakeholders engagement	2	16,7

Table 3 – Financial resources applied and executed in the community projects supported by ARPA from December 2013 to April 2015 (Value expressed in reais). (ER=Extractive Reserve; NP=National Park; SDR=Sustainable Development Reserve).

Protected Area	Planned	Spent	% Financial execution
Maracanã ER	189.900,00	135.559,40	71,38%
Uatumã SDR	190.000,00	135.216,68	71,17%
Cabo Orange NP	190.000,00	109.868,61	57,83%
Jaú NP	189.910,00	106.698,02	56,18%
Rio Xingu ER	185.650,00	83.760,43	45,12%
Rio Unini ER	189.900,00	73.287,35	38,59%
Rio Ituxi ER	178.830,00	62.452,80	34,92%
Baixo Juruá ER	189.900,00	54.462,16	28,68%
Cantão State Park	189.850,00	53.472,17	28,17%
Médio Juruá ER	190.000,00	42.132,53	22,18%
Chico Mendes ER	164.300,00	24.796,00	15,09%
Viruá PN	190.000,00	20.224,37	10,64%
Cujubim SDR	188.125,00	10.889,00	5,79%
Juma SDR	124.600,00	2.211,50	1,77%
Total	**2.550.965,00**	**915.031,02**	**35,87%**

More than 60% of managers mentioned the delay in delivery of equipment and hiring services as the primary challenge in the implementation of the action plans. Notably, bureaucracy related to financial execution plays a significant barrier to successful implementation of the action plans. The focal point of the MMA and FUNBIO evaluate and approve requirements of PA managers, on a virtual platform in real time so-called *brain system*, managed by FUNBIO. Araujo (2010) considered the *brain system* as a breakthrough in optimizing the financial resources management of the ARPA. However, because of implementation of the annual operational plans

are entirely based on a virtual manager system, which depends on the efficient operation of the Internet, we need to rethink how far this model has been adequate to the reality of the protected areas in the Amazon.

Another significant challenge cited by 67% of managers included lack of flexibility of the ARPA to increasing limit of the *linked bank account*. A single bank account for two different systems (Operational Annual Plans and Action Plans) requires much greater volume and frequency than only one to operate. Consequently, delay on payment of suppliers, purchase of goods and services, caused loss of credibility of ICMBio with service providers and communities. A failure such as not to delivering equipment on time or not hiring a professional or institution could jeopardize the achievement of the goals set out in the planning done by managers and communities.

According to 50% of managers, another challenge for the implementation of the action plans included lack and insufficient qualification of personnel, along with exchange of staff in the PAs (Table 2). Analysis of Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) shows that staffing consists on one of the main challenges of PAs management effectiveness in Brazil and need a greater attention from managers, policymakers, and other stakeholders to tackle conservation targets in PAs (ICMBio and WWF-Brasil, 2012).

Some suggestions to leverage the financial performance of the action plans by FUNBIO include developing an offline module of the brain system, and allocation of a full-time professional responsible for financial operations of the action plans (*e.g.*, procurement of goods, contracting of services, delivery of equipment, analysis of accountability, and so forth). Furthermore, competent partners, such as public (*e.g.*, universities, research institutes, etc.) and private organizations (*e.g.*, NGO) should support execution of the action plans to cope with a lack of human resources in PAs.

Main lesson learned resulted from implementation of the action plans according to managers and beneficiaries are listed in Table 4. Most sensitive topics included planning and management, community engagement, technical assistance, training and exchange, institutional arrangements (partnerships), and integrated territory management. Evaluation of action plans from ARPA show some similarities with PDA from PPG7, which key success factors included beneficiary participation, training, exchanges and technical assistance. On the other hand, the main problems identified are related to the management, planning, the level of social organization and social mobilization, production, processing, marketing, cultural barriers, and external context (Brazil 2004).

Table 4 – Main lesson learned reported during the final evaluation workshop of the Action Plans from ARPA placed from 9 to 13th 2016 at Manaus, Amazonas State.

Topic	Lesson learned
Planning and management	• Limit the scope of the proposal according to its capacity of implementation • Dialogue with community should be carried out directly by the management team • Financial manager of the ARPA (FUNBIO) must ensure the execution of projects in time, especially concerning to reduction of the bureaucracy for hiring consultant services and purchasing of goods
Community engagement	• Involve the community in the planning, preparation, execution and evaluation of the project (appreciation of traditional knowledge for planning would be a plus) • Contemplate different social and gender groups, especially youth, women and elderly • Encourage autonomy of community organizations for their self-land management • Projects must look beyond the boundaries of the PA
Technical assistance	• Identify strategies and experienced/qualified professionals for technical implementation of the projects
Training and exchange	• Support community workshops with appropriate methodologies and key partners, focusing on income generation and technical qualification • Exchange of knowledge is a powerful tool for capacity development and empowerment of the communities

Partnerships	• Formalize institutional partnerships to ensure commitment of the institutions throughout the planning and implementation of the action plan • Increase partnership network, as well as encourage the involvement of local partnerships • Open reference terms for implementation of the projects to other executing agencies and/or institutions (e.g., NGOs, universities)
Integrated territory management	• Strengthen dialogue between institutions and communities, as well as between different ethnic groups (e.g. Indigenous and traditional people) • Strengthen partnership between indigenous organizations and ICMBio • Strengthen actions to supporting implementation of public policies (e.g. territorial and environmental management plan for Indigenous Lands and management plan for PAs)

Conclusions

The results presented by the Subcomponent Integration of Communities demonstrate its relevance to implement activities in general not supported by ARPA Program. Such activities include integrated management of the territories (e.g., Rio Xingu ER and Indigenous Lands), participatory management of natural resources (e.g., management of pirarucu at Unini ER), and new practices and technologies for sustainable management (e.g., photovoltaic energy at Uatuma SDR and extraction of native cocoa at Chico Mendes ER). The program has also supported resolution of conflicts over access to natural resources (e.g., Cabo Orange NP and Cantão State Park), and empowered socially vulnerable groups such as youth and women (e.g., Maracana ER and Jau NP).

Some lessons learned related to successful implementation of the action plans include involvement of communities, exchanges of knowledge, committed institutional partnerships, appropriate methodologies and technical assistance, along with participation of different social, gender and generational groups such as youth, elderly, and women. Exchange of knowledge with other protected areas and surrounding also consisted on a powerful tool for capacity development of the communities. However, one must take into account that learning is a continuous process of creating knowledge grounded in experience and need ongoing investments (Müller *et al*. 2015).

One of the main challenges for the implementation of the action plans included lack of human resources, which in turn require enhancing and qualifying the limited staff in protected areas. One of the coping strategies to deal with the lack of technical ICMBio staff can be the establishment of partnerships with the government and non-governmental agencies, whose viability has been variable in different contexts.

Concerning to institutional arrangements, the partnership was a key aspect of the success or failure of a project. In general, action plans implemented through institutional partnerships were more successful. On the other hand, PAs which institutional arrangements were not successful or failed to fulfill its role, the action plans faced many difficulties. One of the lessons learned is that institutional arrangements should be formalized to ensure commitment and shared responsibilities of partner institutions involved throughout the planning and implementation of the action plan.

Besides, to optimize investments and efforts involved, it is necessary to manage protected areas in a participatory way, focusing on a social and environmental agenda. In particular, action plans should address more efficiently to the involvement of communities in all phases of the management process, including planning, execution, and evaluation of the project. In addition, continuity of projects depends on continuous support funds.

Several suggestions were proposed to improve the efficiency of the financial manager system, such as the inclusion of an offline module of the brain system, a full-time professional dedicated to the activities of this subcomponent, and an independent bank account to the action plans. Because of implementation of operational plans are entirely based on a virtual manager system dependent on the efficient internet, we need to rethink how far this model is suitable to the reality of protected areas in the Amazon.

Finally, conservation of PAs in the Amazon must take into account the importance of social and economic actions for local populations. Results of the action plans demonstrate the relevance of these activities supported by subcomponent 2.3 present in the first two phases of ARPA. Since "Participative Management" in Phase III includes only supports the participation of indigenous and traditional people on the advisory boards and deliberative councils of the PAs, ARPA should consider to adding a particular component of social organization and economically sustainable activities for development of local populations.

Acknowledgements

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