

# Central Amazon Conservation Complex

## 2020 Conservation Outlook Assessment

### SITE INFORMATION

**Country:** Brazil

**Inscribed in:** 2000

**Criteria:** (ix) (x)



The Central Amazon Conservation Complex makes up the largest protected area in the Amazon Basin (over 6 million hectares) and is one of the planet's richest regions in terms of biodiversity. It also includes an important sample of varzea ecosystems, igapó forests, lakes and channels which take the form of a constantly evolving aquatic mosaic that is home to the largest array of electric fish in the world. The site protects key threatened species, including giant arapaima fish, the Amazonian manatee, the black caiman and two species of river dolphin. © UNESCO

### SUMMARY

#### 2020 Conservation Outlook

Finalised on 02 Dec 2020

##### GOOD WITH SOME CONCERNS

Overall, the values of this site remain in good condition, even if showing some localized impacts. Increasing visitation pressure and road expansion, especially caused by the Rio Negro Bridge construction, are likely to represent a growing pressure over the conservation units, comprising this World Heritage site, mainly the Anavilhanas National Park, requiring improvement of infrastructure and better management of tourism in order to contribute to the conservation of these areas. Recent management effectiveness evaluations of individual conservation units comprising the site show a relatively good level, nonetheless they require better financial resources and more human capacity. Main concerns are related to potential impacts caused by climate change and construction of dams in the broader Amazon Basin, which could result in negative impacts on the site's hydrological and ecological processes and which require a regional approach to data collection, information analysis and management.

# FULL ASSESSMENT

## Assessment information

### Threats

#### Current Threats

Low Threat

The construction of the Río Negro Bridge and road development have already shown an increase in certain activities in the area, such as subsistence agriculture, hunting, fishing, and extraction of timber and non-timber forest products. On the other hand, tourism, with a rapid increase in visits in Jaú NP and a high number of tourists without registration control in Anavilhanas NP, represent a challenge for the management. Despite existing protocols and tools, the monitoring of legality of visits and compliance with the regulations is still ineffective. The management of fishing quotas for protected species in Mamirauá and Amanã Sustainable Development Reserves, is indicating greater sustainable use of this resource, which should continue to be monitored; however, there is evidence that some fishing practices are representing a risk for other protected species, requiring a better control.

#### ► Tourism/ visitors/ recreation

Low Threat

*(Increase in visitation)*

Inside site, localised(<5%)

Construction of Rio Negro Bridge in Manaus has increased the accessibility to nearby towns and municipalities and tourism visitation. In January 2017, Anavilhanas and Jaú NP floating HQs and Visitor Centers were closed to the public and severely understaffed. According to the questionnaires undertaken with professionals of the National Park of Anavilhanas in 2014, a lack of structure for visitors to this Park, pollution and degradation of trails were all recognized as impacts caused by tourism visitation (Azevedo, 2019). Number of visitors is growing at Jaú NP, between 2013 and 2017 visitors' numbers increased by a 336%. The increase is not so high for Anavilhanas NP, with about 18 %, but with a higher number of visitors, 7781 compared to the 2649 in Jaú NP in 2017. However, it is estimated that visitation in Anavilhanas NP can reach 30 thousand visitors a year, in an unregistered way. Also, communities of Manaus recognized a lack of many joint actions that guarantee adequate tourism, identifying irregular and illegal river trips using private boats with the potential of non-compliance with the established rules for the environment (Detzel Consultores Associados, 2018). Institutions also recognize disorderly presence of vessels as one of the main threats to the Anavilhanas NPA's biodiversity (MMA et al, 2017). The fastest growing touristic attraction in Anavilhanas is the interactive tourism with Amazonian pink dolphins (*Inia geoffrensis*). This potentially detrimental activity is now organized by the National Park authorities to minimize the impact on wild pink dolphin populations (Parque Nacional Anavilhanas, n.d). Despite the fact that no Federal or State laws regulating interactive tourism with river dolphins are in place, some management measures exist (Vidal et al, 2013). Proposed management measures for this type of tourism have showed a significant reduction of the risk of accidents and increased the benefits that dolphin-based tourism generates. Nonetheless, different intensity of impact on natural behavior of animals by the supply of food is still documented (Vidal, 2018; D'Cruze et al., 2017). Recreation activities demonstrate change of behaviour of one of two species of river dolphins (*Inia geoffrensis* and *Sotalia fluviatilis*) protected within the site, and with the continuous increase of visitors and low management capacity, the severity of impacts affecting vegetation and ecological balance could also increase.

#### ► Hunting and trapping, Logging/ Wood Harvesting, Collection of non-timber forest products (NTFPs), Other Biological Resource Use

Low Threat

Inside site, scattered(5-15%)

Outside site

*(Small riverside settlements and associated resource use )*

Human activities pressuring Anavilhanas NP are increasing as a result of the Rio Negro Bridge in the State of Amazonas. Research around the area under direct influence of the bridge, which includes this National Park, reported, after field observations, an expansion of production of fruits and vegetables and

fish ponds along new side roads (Pacheco et al., 2018). Comparing deforestation of the three years after the inauguration of the bridge in 2011 with data of previous seven years, rate of deforestation was almost the double in the immediate vicinity of 10 km of Anavilhanas National Park (MMA et al., 2017). A recent report indicates low population numbers in these natural areas, estimating 971 inhabitants in Anavilhanas NP, 4722 in Jaú, 6131 in Mamirauá and 4722 in Amanã (Prüssmann et al., 2017). For Anavilhanas and Jaú NPs activities like turtle fishing, sand collection and logging are carried out for community consumption as traditional activities, however, sales to commercial companies are increasing (OECD, 2015).

Harvesting of arumã leafstalks (for vegetable fiber handicrafts) is forbidden in areas surrounding the town of Novo Airão; some alternative areas for harvesting were suggested and monitored for three years and results showed no increase in growth rate neither recovery of leafstalk density (Nakasono et al., 2016).

► **Temperature extremes**

**High Threat**

*(Climate change and increasing frequency and severity of forest fires)*

Inside site, scattered(5-15%)  
Outside site

Fire is an increasing threat for natural areas. Previous reports related different events: in 2015 the Amazonas State broke its own record of forest fires with 15,170 sources of heat, and in 2016 one thousand hectares of the Jaú NP were affected by fire (INPE, 2020). The Amazon State has showed an increasing number of active fire focus detected by satellite monitoring in the recent years, indicating more than 11,000 focus every year since 2015 (INPE, 2020). The 2019 was the year with most fires in Amazon Basin for over a decade, indicating to the Amazon State as the 10th state with most number of fires. The negative synergies between deforestation, climate change, and widespread use of fire is increasing and representing a major threat for Amazon System flip to a non-forest ecosystems in eastern, southern and central Amazonia at 20-25% deforestation rate (Stewart, 2019). Climate change also affects ecology balance, as hydrology is the major extrinsic driver of assemblage structure of fishes inhabiting floodplain habitats; significant changes in Amazon floodplain fish assemblages were recognized after the strong drought of 2005 (Ropke et al., 2017).

► **Fishing / Harvesting Aquatic Resources**

**High Threat**

*(Fishing)*

Inside site, scattered(5-15%)

**Other targeted species names**

**Pirarucu (*Arapaima gigas*)**

After a 22-year time series of standardized surveys for dolphins, botos (*Inia geoffrensis*) and tucuxis (*Sotalia fluviatilis*), within the Mamirauá Reserve, results showed that these species are declining most likely due to the direct and incidental mortality caused by fishing activities, as a result of use of gillnets (da Silva et al., 2018).

The piracatinga fishing using black caiman and dolphins as bait is practiced in the mid-Solimões region including Mamirauá and Amanã Sustainable Development Reserves (Pimienta et al., 2018; Botero et al., 2014). However, caiman population is the most abundant game species in the várzea at MSDR (Pimienta et al., 2018).

In 2019, fishing quota of pirarucu (*Arapaima gigas*) increased in these areas. Measures are being taken as a result of the growing strengthening of sustainable pirarucu fishing in the Amazon. For this year this fish species management included 48 riverside communities, 3 fishing colonies, 1 fishermen's association and 1 fishermen's union (Instituto de Desenvolvimento Sustentável Mamirauá, 2020a).

**Potential Threats**

**High Threat**

Potential threats include increasing of visitation and impacts of ships traffic, which are both low threats, requiring better monitoring and control. Possible negative impacts of climate change on ecological processes, especially because of the vulnerability of hydrological balance of igapos ecosystems, increasing frequency of forest fires and construction of dams across the Amazon region, are all representing potential drivers that could substantially modify the site's current ecosystems and species compositions.

► **Tourism/ visitors/ recreation**

**Very Low Threat**

*(Potential increase in visitation )*

Inside site, localised(<5%)  
Outside site

Accessibility to Anavilhanas NP by road development as a result of the Rio Negro Bridge construction, and increased tourism in different natural areas, could result, without an effective management, in negative impacts. Activities and services to support visitation have been proposed for the Anavilhanas National Park and the Jaú National Park based on the socio-environmental, institutional and public use factors (Detzel Consultores Associados, 2018), which can help develop better capacity for potential visitation. Expansion of recreational activities without careful planning, including of infrastructure capacity, could increase the pressures on the ecological balance of the site and its freshwater diversity.

### ► Shipping Lanes

Low Threat

*(Cargo ships in the waters of the Anavilhanas archipelago )*

Inside site, localised(<5%)

Outside site

Location of Anavilhanas NP along a navigable portion of the lower Negro river exposes the area to the regular transit of large ships and to potential risks of oil spill (IUCN, 2003). The 2019 oil spill in the Brazilian coastline, considered the worst oil spill in Brazil's history and one of the largest on record in the world, demonstrated institutional unpreparedness for the prevention of such events and inadequate legal frameworks (Lopes et al., 2020). Location of cities like Manaus and Novo Airão close to Anavilhanas NP, represents a constant flow of visitors throughout the year. Boats are one of the main tourism transportation, and rigorous control is also required for larger vessels in order to reduce pollution (Azevedo, 2019). A cargo ship accident involving chemical products would result in a very high risk of pollution and impacts on hydrological and biological values of the conservation units.

### ► Temperature extremes

Low Threat

*(Climate change and risk of large scale forests fire )*

Inside site, throughout(>50%)

Outside site

Models suggest that by the year 2050, temperatures in the Amazon may increase by 2–3°C. Jointly with an anticipated decrease in rainfall during dry months this will significantly increase the vulnerability of forests. Longer and more severe droughts will result in substantial changes in seasonality and in the risk of large-scale forest fires (WWF, 2016). Drought can potentially change forest species composition and biomass as it affects trees selectively. It also results in massive amounts of carbon being released into the atmosphere due to reduced plant growth and dying trees (Philips et al., 2009). Recently, the Regional Climate Change Index which indicates how temperature and precipitation changes will be distributed throughout the Amazon biome, showed a middle level for Anavilhanas and Jaú NP and a low level for Amanã and Mamirauá. Nonetheless, wetlands are highly influenced by climate and land-use changes, which represent a major threat for the hydrological cycle and carbon balance (Resende et al., 2019).

### ► Renewable Energy

High Threat

*(Dams construction in the Amazon Basin)*

Outside site

Potential effects on the ecosystem balance as a result of dam construction in the Andean Amazon area have been recognized. According to the study developed in the Lakes Mamirauá, Piranha and Castanho, manatee's migration is affected by the narrowing of channels that connect the floodplain area, the frequency and length of these bottlenecks can further exacerbated by climate- or dam-induced extreme droughts (Arraut et al., 2017). A study on Central Amazon, including the Jaú River (Jaú area), recognized a potential change in the landscape downstream of the igapos forest as a result of the alteration of the community of seedlings in the Uatumã area caused for the building of the Balbina dam (Rocha et al., 2020). Alterations in the sedimentation process in the Anavilhanas Archipelago have been shown to be a consequence of construction of dams on the Branco River (Ribeiro et al., 2020).

### ► Water Pollution

High Threat

*(Plastic pollution)*

Outside site

The disposal of trash in the rivers of the Amazon Basin is the result of poor public policies and a general lack of environmental awareness, coupled with a lack of investment in waste treatment infrastructure and a reduction in the use of single-use plastic items (Backer, 2005; Giarrizzo et al., 2019; Silva, 2009). Plastic constitutes 15.7% of the total solid waste produced in the Amazon, a percentage that represents more than twice the national average (MMA, 2015). In general, when plastics are widely available in the environment, they can negatively impact organisms, for example, causing choking, entanglement, stress

and internal damage when ingested (Andrady, 2011; Cole et al., 2011; Anderson et al., 2016), which easily occurs with smaller plastic residues (meso and microplastics). In addition, plastics also contain additives in their composition, such as plasticizers, flame retardants, thermal stabilizers, antimicrobial agents and dyes that are known as persistent organic pollutants (POP's) (Andrady and Neal, 2009; Cole et al., 2011; Rochman et al., 2014). Heavy metals and persistent organic pollutants present in the environment can adsorb on the surface of plastics (Ashton et al., 2010; Avio et al., 2017; Camacho et al., 2018). Recent studies have revealed the presence of microplastics in the digestive tract of 13 freshwater fish species in the lower Xingu River and 14 marine species in the Amazon estuarine region, many of these species are commonly consumed by the local population (Andrade et al. 2019; Pegado et al., 2018). The same problem is occurring in small Amazonian bodies of water. Where in a recent study 98% of the twelve individuals analyzed had contamination by microplastic (Ribeiro-Brasil et al., 2020). New evidence of discarded plastics in the vast Amazon basin clearly demonstrates the magnitude and complexity of this global environmental challenge (Giarrizzo et al., 2019).

## Protection and management

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### Assessing Protection and Management

#### ► Management system

Mostly Effective

The Jaú National Park management is undertaken by Chico Mendes Institute for Biodiversity (ICMBio) and the Fundação Vitória Amazônica (FVA), with most of the inputs for research, management, and environmental education provided by this Foundation. The Anavilhanas National Park (NP) is administered by ICMBio with headquarters in the municipality of Novo Airão. The Amazonas State Sustainable Development Reserves (SDR) of Mamirauá and Amanã are managed by the Centro Estadual de Unidades de Conservação (CEUC) in partnership with the Mamirauá Institute for Sustainable Development (MISD) a research unit of the Ministry of Science, Technology, Innovations and Communications (MCTIC), through a program of participatory management informed by research. By 2008 the Anavilhanas was reclassified from protected ecological station to national park by the Law Number 11.799 of 29 October 2008. As a result, an updated Management Plan was required in 2012 and presented in 2017. Plan's updating was developed with the participation of community, organizations and different research and governmental agencies. A revision of the Management Plan of the National Park of Jaú was expected to be delivered by 2018 (Detzel Consultores Associados, 2018). The Management Plan for the Mamirauá Sustainable Development Reserve (RDSM) was first approved in 1998, but a second version was updated by 2010. The delivery of the Management Plan for the Amanã Reserve is being developed by the Mamirauá Institute and the Amazonas State Secretariat for the Environment, jointly with the Brazilian Biodiversity Fund (Funbio) and the Amazon Protected Areas Program (ARPA), presently the plan is available for the consultation phase (Amazonas Governo do Estado et al., 2019). Management plans are including measures and identifying threats and vulnerabilities including the conservation values recognized in the Central Amazon Conservation Complex, they are also establishing education and visitation planning.

#### ► Effectiveness of management system

Mostly Effective

Results of management effectiveness before 2016 and reported in previous reports ranked very high for Jaú NP (82%), low to Anavilhanas NP (55%) (Rodrigues et al., 2012) and good to Mamirauá SDR (70%) and Amanã SDR (74%) (WWF Brazil, 2011). The Mamirauá SDR and Amanã SDR show positive results from their management. Reduction of the pressure from commercial fisheries and timber extraction companies, the recovery of wildlife populations including alligators, turtles and pirarucu, the stabilization of other hunted species, such as the red howler monkey; and the recovery of endangered species such as the jaguar, white uacari, and black-headed squirrel monkey are noted among positive outcomes (UNDP, 2012). Approval of a new management plan is currently pending in the Amanã SDR. The management plan of the Mamirauá SDR was updated in 2010. In recent years, Brazil has developed the Management Analysis and Monitoring System (SAMGe) created by the Management Monitoring and Evaluation Division (DMAG), for analyzing and monitoring management effectiveness of Conservation

Units. Management effectiveness evaluation was carried out in 2017, 2018 and 2019 for Jaú NP and Anavilhanas NP, data for Mamirauá SDR and Amanã SDR currently appears not available on this platform (as of May, 2020). Jaú NP has maintained from 2017 to 2019 an evaluation ranking of "effective" (66%, 69% and 62% respectively), with main challenges in tourism, sustainable production and use of species and habitats management for conservation topics. In the case of Anavilhanas NP, evaluation varied from "Moderate Effective" (54%) in 2017 to "Effective" (61%) in 2018 and Moderate Effective (58%) in 2019. Main low indicators for this area are related to incompatible uses associated mainly with hunting, fishing, wood extraction and visitation without planning (ICMBio, 2020). Presently, SAMGe is operating with updated information, available and accessible, facilitating the comparison and analysis of management across different indicators through time and for two of the four natural areas included in the Amazon Complex Nature Reserve.

#### ► **Boundaries**

**Some Concern**

The configuration of the Amazon Complex Nature Reserve allows the connectivity of Jaú NP, Amanã SDR and Mamirauá SDR, while Anavilhanas NP is separated by a forested corridor consisting of state extractive reserves and an indigenous reserve (IUCN, 2003). The management plans recognize limits and inclusion of natural areas within other designations. Last Management Plan of Anavilhanas NP, updated in 2015, recognized the absence of planning in all marginal areas. In 2015, an adjustment of the boundaries was undertaken using satellite imagery, and the current surface of the park is 350,469.79 ha (MMA et al., 2017). Management Plan of Amanã (currently in consultation phase) recommended expanding the conservation unit boundaries to include the entire current buffer zone until integrating the current extreme southern limit of the conservation unit in order to guarantee the appropriate use of the area's resources (Amazonas Governo do Estado et al., 2019).

#### ► **Integration into regional and national planning systems**

**Mostly Effective**

The national parks and sustainable development reserves, which comprise this World Heritage site, are well integrated into the national (SNUC) and state systems (SEUC) of protected areas and through them to the wider planning systems. The Lower Rio Negro Mosaic including Jaú NP, Anavilhanas NP and Amanã SDR also facilitates the integration of areas into the broader landscape scale to manage limits, which is undertaken through a committee and a joint plan, allowing park managers to share expertise, infrastructure and equipment and better engage with communities residing in border areas (OECD, 2015). Also, The Amazon Region Protected Areas program (ARPA) launched in 2002 and one of the main funding programs for the conservation areas in Brazil, included specific actions for the Jaú NP (Silva et al., 2017) and supported the delivery of the Management Plan for the Amanã Reserve (Amazonas Governo do Estado et al., 2019). The Global Environment Facility (GEF), approved the Amazon Sustainable Landscapes Program (ASL) to bring together three countries—Brazil, Colombia, and Peru—aimed at strengthening biodiversity conservation, reducing deforestation, improving living conditions of local communities, and maintaining the integrity of local, regional, and global ecosystem services in the Amazon Biome; which involves protected and productive landscapes in nine Brazilian Amazonian States, including the conservation units of the Central Amazon Conservation Complex (GEF, 2019).

#### ► **Relationships with local people**

**Mostly Effective**

By the Law No. 9,985 / 2000 all Conservation Units require Management Councils, which are used as platforms to promote permanent dialogue with the society. These councils can be deliberative or consultative, depending on the category (Ministerio do Planejamento, Desenvolvimento e Gestao, 2018). Presently, all components of the World Heritage site have Management Councils, for Jaú NP and Anavilhanas NP these are advisory and for Amanã RDS and Mamirauá RDs are deliberative. Between 2010 and 2014, Jaú NP and Anavilhanas NP participated in the System of Social and Environmental Indicators for Conservation Units – SISUC. SISUC was a tool to support the work of management councils and strengthen the participatory management in the Conservation Units of the Brazilian Amazon (ISA and Grupo NSC, n.d). Results show that implementation of SISUC improved local governance of natural areas through monitoring, evaluation of indicators and actions, and adaptive management practice, while also helping in Management Councils' activities (Marinelli, 2016). Updating of Anavilhanas NP Management Plan and present elaboration of Amanã RDS Management Plan have included participatory



stages for local communities (IDESAM, 2017; Instituto de Desenvolvimento Sustentável Mamirauá, 2019a; Instituto de Desenvolvimento Sustentável Mamirauá, 2019 b). Mamirauá Sustainable Development Institute has developed a successful co-management model for biodiversity conservation based on a collaborative work with local communities, researchers, and governmental and nongovernmental organizations (Pimenta, et al., 2018). Relationships in Jaú NP and Anavilhanas NP depend mainly on the localization of population; approximately 50 of the 100 communities estimated in the areas, established a more effective relationship with the UCs, mainly due to the proximity to the margins of the Anavilhanas NP, the southern part of the Anavilhanas NP have a better communication with Amazonas Environmental Protection Institute (IPAAM) than with ICMBio. On the other hand, Jaú NP is not so closely related to the actors at the Barceló's headquarters. Both areas have a close relationship with the city of Novo Airão, where also main service providers for visitation are located (Detzel Consultores Associados, 2018). Community involvement in sustainable productive system is recognized in the Mamirauá and Amanã Sustainable Development Reserves; in 2019, pirarucu management included 48 riverside communities, 3 fishing colonies, 1 fishermen's association and 1 fishermen's union. Also, the creation of the Federation of Managers of Pirarucu in the Region of Mamirauá (Femapam) was made official, and the seal of Geographical Indication (IG) of the management pirarucu process is in the final stage for producers can receive a fairer value for the production (Instituto de Desenvolvimento Sustentável Mamirauá, 2020 a). In some cases communities are perceiving that only few families benefit from tourism activities, for example from the tourism with dolphins in Novo Airão (Vidal et al., 2019). New improvements to develop tourism activities with better benefits for local communities in order to strengthen conservation and incomes is proposed through different activities and infrastructure to promote longer stays inside the areas, especially in Anavilhanas NP. Main challenges lie in the organization of vessels. In 2018, a new association has registered with the management of Anavilhanas NP to perform water transport services (Detzel Consultores Associados, 2018).

► **Legal framework**

**Mostly Effective**

Jaú National Park was established by Federal Decree in 1980 (Fundação Vitória Amazônica, 1998). The Anavilhanas conservation unit was declared an Ecological Station by Federal Decree in 2001, and later re-categorized as a National Park in 2008 (MMA, et al., 2017). The Amanã Sustainable Development Reserve was created in 1998 by Decree 19.021 and the Mamirauá Sustainable Development Reserve in 1990 by Decree 12.836, both areas are managed by the State governmental level (Instituto Socioambiental, n.d). Anavilhanas NP recognizes the absence of a legal management tool in relation to subsistence fishing (MMA et al., 2017). Also, in Jaú NP and Anavilhanas NP, prospective tourism development recognized, according to the legal framework, the suitability with the Management Plans and the Public Use Plans of the current and proposed activities, and the conditions that should apply for some of the cases (Detzel Consultores Associados, 2018).

► **Law enforcement**

**Some Concern**

According to the management effectiveness evaluations of last years for Jaú NP and Anavilhanas NP (ICMBio, 2020), control of illegal use of resources requires more inspection. Use of amazon river dolphins for fishing piracatinga was a practice threatening this species; as a result the Brazilian Government placed a 5-year moratorium on fishing for piracatinga in 2014, but the practice still continues illegally (Asher, 2018). In some portions of the Mamirauá Reserve, the piracatinga fishing activity has declined in the past two years, probably related to law enforcement, awareness and environmental education activities (Botero et al., 2014).

► **Implementation of Committee decisions and recommendations**

**Data Deficient**

The 2003 World Heritage Committee decision approving the extension of the World Heritage site encouraged the State Party to "re-nominate the subsidiary area of Mamirauá Sustainable Development Reserve once it fully meets the conditions of integrity." No follow-up is known as of today.

► **Sustainable use**

**Mostly Effective**

The twin objectives of conservation and sustainable resource use are the focus of management for the Sustainable Development Reserves. Sustainable production in the conservation units include the use of fishery resources, timber, non-timber forest resources, agroforestry systems, and ecotourism. Projects and control over the use of resources are integrating local communities and bringing benefits for both natural conservation and local benefits. The construction of the Agroextractive Plant of the Union of Residents of Rio Unini for the production of dehydrated chestnuts is the pilot project in the Negro River basin, which brings inland opportunities for non-timber forest products to riverside dwellers (ICMBio, 2017). Quotas for pirarucu fishing and programs are demonstrating positive results for both, recovery of the specie and incomes for local fishermen. Since 1999, pirarucu population increased from 2,500 to more than 190,500 in 2018 thanks to the introduction of fishing quotas. Also, recovery of the alligator population as a result of the prohibition of hunting and the creation of the reserves, are outcomes of community and institutional collaborative monitoring and conservation efforts (Instituto de Desenvolvimento Sustentável Mamirauá, 2020a; Science X Network, 2019). However, fishing practices still require major control, as some studies demonstrates the accidental mortality of tucuxis and botos in nets (da Silva et al., 2018).

► **Sustainable finance**

**Some Concern**

Recent policy developments in Brazil have resulted in several reductions of financial resources for conservation management and are making more flexible the environmental control. The freezing for 20 years of the Ministry of the Environment MMA budget by the Constitutional Amendment Proposal PEC 241 and the approval of the Decree No. 9471 of March 2019, which cut 46.36 million USD from the Ministry of the Environment, can reduce the capacity of monitoring and control of impacts in protected areas (de Area et al., 2019).

Last management effectiveness evaluations from 2019 in Jaú NP and Anavilhanas NP, recognized financial resources as a main requirement for actions required in different processes (ICMBio, 2020). The Amazon Region Protected Areas program (ARPA) was launched in 2002 and is one of the main funding programs for conservation areas in Brazil. In 2014, different sources amounted to \$215 million to fund ARPA areas over the next 25 years, but also, expecting federal funding increases over this time as the main source of financing (WWF, 2014). Recent events are indicating difficulties for the funding and financing of this program, for example the freezing of approval of new Amazon Fund grants as result of the Ministry's review of all NGOs for misuse of funds, and also the delays from the Amazon Fund due to disagreements between the fund donors (Germany and Norway) and the Government of Brazil (WWF, 2019).

► **Staff capacity, training, and development**

**Some Concern**

Anavilhanas NP includes 3 environmental analysts, 3 administrative assistant employees and 17 outsourced services, especially for surveillance. The NP has 4 operational bases for surveillance, visitation, housing and garage. Jaú NP includes 1 analyst, 1 administrative technician; 8 outsourced service and 3 employees from the Motivation and Success Project in the Management of Federal Conservation Units – MOSUC. The Park is composed of three operational bases. Both Parks have and use the same Administrative Headquarters (SA), located in the municipality of Novo Airão with a system that is shared with managers of three Conservation Units: Jaú NP; Anavilhanas NP and Rio Unini Extractive Reserve (Detzel Consultores Associados, 2018). The Mamirauá Sustainable Development Institute, initially concentrated in the Mamirauá and Amanã Sustainable Development Reserves and presently expanding to other areas of the Amazon, reports on the website a total of 300 staff, 9 laboratories, 8 floating field bases and Headquarters in Tefé with 4,000m<sup>2</sup> and facilities for research and collections, laboratories, library and classrooms, and a representation Office in Belem (Mamirauá Sustainable Development Institute, 2020b). Availability of staff is still limited, and is also recognized as one of the main requirements in the last management effectiveness evaluation for Jaú NP and Anavilhanas NP (ICMBio, 2020).

► **Education and interpretation programs**

**Mostly Effective**

Educational programs are developed in different conservation units, comprising this World Heritage site, with multiactoral support, and focused on strengthening of community skills for the management and



conservation of natural areas. The ARPA developed the Young Protagonists of Unini Project, which trained 567 young people at Jaú NP and achieved the increasing of the participation of young people in the council meetings from 3 people in 2012 to 24 in 2015 (Silva et al., 2017). Also, training actions at Novo Airão for transportation drivers in environmental interpretation have been carried out in order to bring the local community and UC management together (Detzel Consultores Associados, 2018). Moreover, in the Lower Rio Negro Mosaic, turtle protection program included strategies for environmental education, which by 2016, have been implemented in nine communities; further requests for these courses and increasing understanding of the ecological importance of turtle species in local communities were positive outcomes (WCS, 2017). Other programmes with international partnerships have resulted in the elaboration of materials for environmental interpretation in the Anavilhanas National Park and educational training for the pirarucu sustainable management with the Mamirauá SDR (USAID, 2017). The Centro Vocacional Tecnológico (CVT) of the Mamirauá Institute focuses on the training and technical improvement of young rural producers who work in the management of natural resources in the Amazon. CVT trains leaders capable of facing difficulties imposed on communities far from large centers. To date, 80 students have been trained (IUCN Consultation, 2020).

### ► **Tourism and visitation management**

**Mostly Effective**

Jaú NP and Anavilhanas NP do not have available food and beverage facilities, with restricted options in the region near the headquarters of Novo Airão, and mainly taken in the boats. Accommodation is usually offered on boats or in wild campsites, which can be set up by the drivers of the groups with local wood and tarpaulins for setting up the nets. Both parks have offered courses for drivers in Novo Airão aiming to qualify them in environmental interpretation and driving visitors in general (Detzel Consultores Associados, 2018). Evaluation of tourist attractions at Anavilhanas NP showed that walking trails, aquatic trails and the River Dolphins tourism are priority attractions, however the area has practically no tourism infrastructure (Silva, 2019). In the Mamirauá and Amanã Reserve, the Uakari Lodge has been built using sustainable approaches, such as use of solar energy and rainwater. Presently this lodge is managed by the local community and the Mamirauá Institute (Uakari Lodge, 2020). The proposal of the Amanã Management Plan includes a sub-program for tourism and recreation (Amazonas Governo do Estado, 2019). Jaú NP and Anavilhanas NP face a challenge to manage impacts due to low present capacity and increasing of visitation, recognizing impacts like pollution from vessels, impacts on trails and animal contact activities (Azevedo, 2019; Vidal, 2018; D´Cruze et al., 2017). The community based ecotourism in Mamirauá and Amanã Reserves have been proposed since the beginning with a conservation approach and as a low intensity activity, defining measures to control number of visitors, establishing some restrictions for boats, offering information to visitors about the rules, offering the service of visitation with local and trained guides, and recognizing tourism as complementary to subsistence and productive practices to avoid displacement of these activities (Peralta et al., 2019). A national guide to manage tourism in a sustainable way in national parks was released recently (Leung et al., 2019).

### ► **Monitoring**

**Mostly Effective**

Monitoring in federal conservation units is coordinated by the ICMBio through the “Monitors Program - National Biodiversity Monitoring Program” - and one of its objectives is to generate qualified information for the ongoing assessment of the effectiveness of federal UCs and the National System of Conservation Units in meeting their biodiversity conservation objectives (ICMBio, 2018). The information of the conservation units is available through the Biodiversity Portal managed by ICMBio and the Ministry of the Environment (MMA), which contains fauna and flora registers for each conservation unit (ICMBio, n.d). As for fire monitoring, the portal Queimadas is continuously monitoring outbreaks of wildfires and forest fires detected by satellites, calculating and predicting vegetation fire risk, and registering updated information per biome and state, even with the chance to focus on protected areas (INPE, 2020). Other monitoring system is the SIMUR, managed by the Fundação Vitória Amazonica (FVA), and operating since 2008 for aquatic chelonians, game, fisheries, collection of non-timber forest products, crop production, and deforestation monitoring with coverage including the National Park of Jaú and the Sustainable Development Reserve of Amanã. Some of the longest and most recognized community based monitoring initiatives in the Amazonas is the one developed in the Sustainable Development Reserve Mamirauá, including the monitoring of the Pirarucu (*Arapaima gigas*) fishery and community forest management. Generally, monitoring programs develop databases with information partially

available and not easily accessible to external users (Costa et al., 2018). For the Lower Rio Negro Mosaic a proposal for a monitoring system including different fauna and flora resources was established (Didier et al., 2017). Financial support, data quality, and data generation and retrieval require improvement to ensure the accuracy of data and more open data access policies to have a bigger impact on the management of the areas (Costa et al., 2018).

#### ► Research

Mostly Effective

Anavilhanas and Jaú NPs have operational bases for surveillance (Detzel Consultores Associados, 2018), while Mamirauá Sustainable Development Institute has laboratories and floating field bases and Headquarters with facilities for research and collections (Instituto de Desenvolvimento Sustentável Mamirauá, 2020b). Vitória Amazônica Foundation (FVA) undertakes research for different conservation units including Jaú and Anavilhanas NPs and Amanã SDR, with headquarters in Manaus and a Geoprocessing Laboratory (Fundacao Vitoria Amazonica, 2020). Mamirauá Sustainable Development Institute consists of research groups in different topics including primates, fish, aquatic mammals, and forest ecology, among others (Instituto de Desenvolvimento Sustentável Mamirauá, 2020a). The Amazonian Biodiversity Studies Centre (CENBAM) was created in 2009 and has been undertaking a Research Program on Biodiversity (PPBio) created in 2004 including several regional centers, including in Jaú and Anavilhanas NP and Mamirauá SDR (PPBio/CENBAM, 2012).

### Overall assessment of protection and management

#### ► Assessment of the effectiveness of protection and management in addressing threats outside the site

Some Concern

Main potential pressures on the conservation units comprising this World Heritage site caused by external dynamics, such as climate change and construction of dams, require a better regional perspective for planning and management, for example, at the Lower Rio Negro Mosaic and Amazônica Biome.

#### ► Best practice examples

The agreements with local community for collaboration in ecotourism management and local guidance for accessing to the Mamirauá and Amanã Reserves (Peralta et al., 2019) demonstrate to be effective for services quality and tourism management. Community based monitoring programme developed in the Lower Rio Negro Mosaic for turtles monitoring and conservation (WCS, 2017), achieved positive results for raising awareness among community about conservation and sustainable use of these species.

## State and trend of values

### Summary of the Values

#### ► Assessment of the current state and trend of World Heritage values

Trend: Stable

## Additional information

### Benefits

#### Understanding Benefits

► **Importance for research,  
Contribution to education**

Research and community monitoring programs are improving local community capacity for sustainable use (Science X Network, 2019; WCS, 2017).

► **Food,  
Legal subsistence hunting of wild game,  
Collection of wild plants and mushrooms,  
Fishing areas and conservation of fish stocks**

The natural resources of the property provide for subsistence livelihoods of small indigenous communities within the property.

Factors negatively affecting provision of this benefit :

- Climate change Impact level - Low, Trend - Increasing
- Overexploitation Impact level - Low, Trend - Increasing

The current lack of law enforcement and park rangers due to lack of funding may encourage overexploitation of fishing stocks and game. The effects of climate change are more difficult to predict but it is expected that it will affect rainfall patterns, which can negatively affect food availability.

► **Direct employment,  
Tourism-related income**

The pirarucu population has recently showed recovery trends thanks to the introduced sustainable management practices, which could better support benefits for local fishermen (Instituto de Desenvolvimento Sustentável Mamirauá, 2020a). Community based tourism is representing opportunities of employment and additional incomes for local communities in Mamirauá and Amanã Sustainable Reserves (Peralta et al., 2019).

Factors negatively affecting provision of this benefit :

- Overexploitation Impact level - Low, Trend - Continuing

## Summary of benefits

The community based tourism in Amanã and Mamirauá Reserves and the community monitoring programs are contributing to the sustainable use of biodiversity. As a result of these efforts, the knowledge and incomes of local communities are improving as well as their participation in the conservation.

## Projects

### Compilation of active conservation projects

Nº	Organization	Brief description of Active Projects	Website
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1	Mamirauá Institute of Sustainable Development	BioREC: Mamirauá-Conservation and Sustainable Use of Biodiversity in Conservation Units: project for the training and assisting of agroforestry multipliers to promote and implement practices to reduce and transform practices causing deforestation, like the implementation of solar energy systems, inventory and monitoring of forest species, reforestation with native species, and other actions. Social Technologies-Water, Energy and Sanitation: promote solutions to create models with alternative technologies for social inclusion and improve the quality of life of families with limited access to public services. Project Várzea Forests: has included a first and second phase to study the main aspects of the ecology of the floodplain forests that accompany the main channel of the Amazon Basin, the Solimões-Amazonas.	<a href="https://www.mamiraua.org.br/">https://www.mamiraua.org.br/</a>
2	Instituto de Pesquisas Ecológicas IPE	Have developed specific projects in the Lower Rio Negro focused on sustainable production, environmental conservation, ecotourism and protection of the biodiversity: Eco-Poles Amazônia XXI: Creation and development of sustainable production chains for the Amazon Navigating Education in the Amazon Conservation of Amazonian Manatee Form and implement the governance of the Mosaic of Protected Areas of the lower Rio Negro SocioBiodiversity Community Based Tourism.	<a href="https://www.ipe.org.br/projetos/baixo-rio-negro">https://www.ipe.org.br/projetos/baixo-rio-negro</a>
3	Ecology and monitoring of vegetation in oligotrophic wetlands in the Central Amazon (PELD MAUA)	Monitoring the tree, shrub and herb vegetation in permanent plots already implanted in PELD-MAUA I in Jaú National Park and others conservation units.	<a href="https://peld-maua.inpa.gov.br/">https://peld-maua.inpa.gov.br/</a>

4	Fisheries Management Program and the Nucleus of Innovation and Sustainable Technologies (Nits) Mamirauá Institute of Sustainable Development, SEBRAE, Ministry of Agriculture, Livestock and Supply, Chico Mendes Institute for Biodiversity Conservation (ICMBio), Tefé City Hall.	The project “Geographical Indication Pirarucu Manejado de Mamirauá” is a marketing tool to attract buyers from outside the state of Amazonas and regulate the price of the domestic market so that the producer receives a fairer value for the production	<a href="https://www.Mamiraua.org.br/noticias/manejo-pirarucu-teve-aumento-na-producao-pescado">https://www.Mamiraua.org.br/noticias/manejo-pirarucu-teve-aumento-na-producao-pescado</a>
5	Partnership for the Conservation of Amazon Biodiversity of USAID	Development of interpretative products for guides and boat operators in Anavilhanas National Park.	<a href="https://pcabhub.org/en-us/news/pcab-news-highlights/new-products-will-help-visitor-experience-at-anavilhanas-national-park">https://pcabhub.org/en-us/news/pcab-news-highlights/new-products-will-help-visitor-experience-at-anavilhanas-national-park</a>
6	Mamirauá Institute of Sustainable Development, The Sense of Silence Foundation, Commonwealth Scientific and Industrial Research Organization, Amazonas Federal University (UFAM) and the Gordon and Betty Moore Foundation	The Providence Project installed prototype units in April 2018 in the Mamirauá Sustainable Development Reserve with camera traps, a thermal sensor, and a microphone to capture images and sounds of animals in tall trees.	<a href="http://www.projectprovidence.org/about-us/">http://www.projectprovidence.org/about-us/</a>
7	Mamirauá Institute of Sustainable Development, Sinchi Institute, Pronaturaleza, Cornell Lab of Ornithology, Florida International University and the Wildlife Conservation Society.	International network for connecting people and organizations throughout the Amazon Basin with the collecting and sharing of information to understand Amazon fish migration and the environmental factors that influence them.	<a href="https://www.amazonienciaciudadana.org/english/network/">https://www.amazonienciaciudadana.org/english/network/</a>
8	Institute for Ecological research	LIRA project - Integrated Legacy of the Amazon Region, approved in 2018, by the Brazilian Development Bank (BNDES), with R\$ 45 million from the Amazon Fund for the strengthening and consolidation of management of 83 protected areas in the Legal Amazon, including the Lower Rio Negro.	<a href="https://www.ipe.org.br/en/">https://www.ipe.org.br/en/</a>



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9	Chico Mendes Institute for Biodiversity Conservation (ICMBio) US Forest Service (USFS), US Agency for International Development (USAID) German Cooperation for Sustainable Development (GIZ).	'Gosto da Amazônia' project, consists on the achieving of special markets in Rio de Janeiro for the sustainable managed pirarucu.	<a href="https://www.Mamirauá.org.br/noticias/manejo-pirarucu-teve-aumento-na-producao-pescado">https://www.Mamirauá.org.br/noticias/manejo-pirarucu-teve-aumento-na-producao-pescado</a>
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