

Amacayacu Natural Park – Environmental Resilience Plan
Neil Brinckerhoff

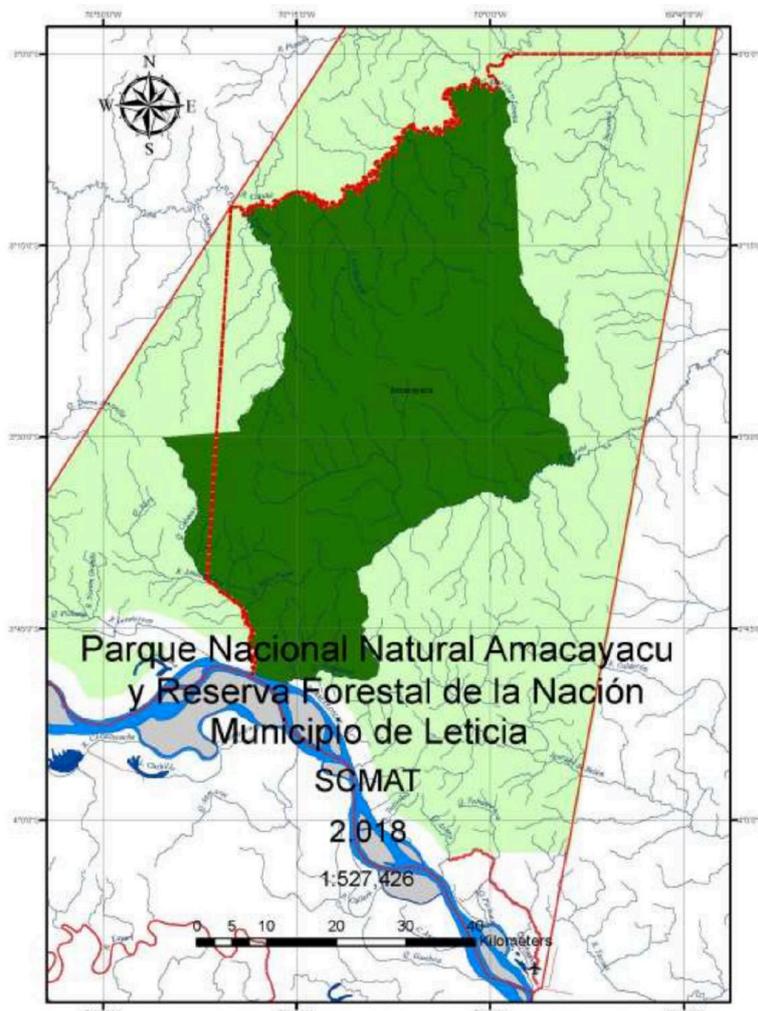


Table of Contents

1.0 ANP NATURAL PARK OVERVIEW	3
1.1 SAN MARTIN DE AMACAYACU	3
2.0 ENVIRONMENTAL CHARACTERISTICS	4
3.0 TOURISM CHARACTERISTICS	5
3.1 TOURISM IN SAN MARTIN	5
4.0 GOVERNANCE	6
4.1 STAKEHOLDERS	6
5.0 ENVIRONMENTAL IMPACTS	6
6.0 ENVIRONMENTAL ACTION PLAN	11
6.1 SYSTEM RESILIENCE	11
6.1 DEFORESTATION	12
6.2 FOOD VULNERABILITY	13
6.3 FLOODING/CLIMATE CHANGE	15
TABLE 1 – AMACAYACU NATURAL PARK (ANP)	3
TABLE 2 - HOUSEHOLD EMPLOYMENT IN SAN MARTIN DE AMACAYACU	3
TABLE 3 - VISITOR CHARACTERISTICS AND CONTRIBUTIONS IN ANP	5
TABLE 4 - STAKEHOLDERS	6
TABLE 5 - BASELINE OF ENVIRONMENTAL IMPACTS	10

Executive Summary

The Environmental Resilience Plan for Amacayacu Natural Park reviews the overall Environmental-Social resilience of the tourist system in the community of San Martin De Amacayacu, Colombia. The action plan applies resilience thinking by identifying exact causes of environmental impacts, and prioritizing actions based on severity and local resources available within the overall system. The identified environmental impacts covered in this report are deforestation, food vulnerability, and flooding caused by climate change. Systematic actions with specified objectives have been provided, including expected timelines, costs, and stakeholder involvement in line with reasonable local resources. The aim of the designed actions is to ensure long-term resilience for the tourism system in Amacayacu Natural Park amid mounting external pressures socially and environmentally.

1.0 ANP Natural Park Overview

Colombia’s first National Natural Park, Amacayacu Park, was founded in 1975 and expanded to its full size with an area of 293,500 hectares in 1987 (Ochoa-Zuluaga, 2019). The park is located in the Southern Amazonian Trapeze, where Brazil, Colombia, and Peru’s borders all meet in the Amazon Basin. The Colombian region, including the Natural Park is within the jurisdiction of the municipalities of Leticia and Puerto Nariño (PNN, 2013), further park details can be found in *Table 1* below.

Location	<ul style="list-style-type: none"> • Tri-border region between two larger destinations: Leticia and Puerto Nariño (Munoz, 2020). • The area of ANP extends from the Amazon River, between the Pamaté creek and the Lorena creek to the north and from the Cabimas creek to the west, and to the Purité river to the east.
Facilities	<ul style="list-style-type: none"> • Observation decks • The interpretive trail "El camino de la Selva" • "Chambira" Housing for Park volunteer rangers and researchers (6 beds) with shared kitchen & electricity • "La Hormiga" Administrative cabin for rangers and volunteers in Amacayacu Sector (2 beds) (PNN, 2003).
Access	From the interior of Colombia: Leticia must be reached by air from Bogota. Then 1 hour and 30 min fast boat ride to PNN Amacayacu (PNN, 2013).

Table 1 – Amacayacu Natural Park (ANP)

10% of the park area overlaps with indigenous territories, a majority belonging to the Ticuno ethnic group with a lesser extent parts of the Yagua and Cocoma groups (Munoz, 2020, SWF, 2021a). These communities have a culture of living as a part of the environment, and expect to maintain their indigenous sovereignty without lawmakers overstepping their rights (Ochoa, 2013; SWF, 2021b).

1.1 San Martin De Amacayacu

San Martin De Amacayacu is an indigenous community with a population of 534 and is a member of the Ticoya Reserve (Munoz, 2020), giving the community sovereign land rights and adding complications to park governance (PNN, 2013). This community is the most distant to access in the ANP region and receives fewer tourist numbers than neighboring communities (Ochoa-Zuluaga, 2019). The community has been working with ANP since the mid-1990 (Bermúdez, 2013) and the Casa Gregorio Ecolodge is central to tourism in the community. This lodge is owned by a local community leader and a foreign researcher who manages tourism operations, and can host a maximum of 16 at a time (Casa Gregorio, 2022). Casa Gregorio visitors employ locals through daily forest, wildlife, and agricultural excursions as well as through employment in the cooking and cleaning of the ecolodge.

Employment	% of households involved
Sale of food and agricultural products	81.25%
Tourism contract work	62.5%
State contract work	50%
Sale of handicrafts	25%
Sale of bushmeat	18.75%

Table 2 - Household employment in San Martin de Amacayacu (Bermudez, 2013)

Food production is of great importance for the sustenance of the households and agriculture has the ability to provide additional income to families (Bermudez, 2013). Though tourism is of interest to most of the population, independent and contract work is unpredictable so most households earn income in multiple employment areas. Of 71 households in San Martin De Amacayacu, 75% of the households interviewed said they work in at least 2 areas, 25 work in at least 3 areas, and 18.75 of the households work in at least 4 areas (Bermúdez, 2013).

Agricultural production is maintained through the traditional cultivation of *chagras*, for which households maintain an average of 2.2 hectares of planted area, and are outside the community at a distance of between half an hour to an hour's walk. They mainly plant cassava, banana and pineapple (Bermúdez, 2013).

While relationships are fluid, the community is cooperative with national and regional authorities and has recently signed a political agreement with National Natural Parks of Colombia in 2017 (Munoz, 2020). The Indigenous Environmental Guard was founded in San Martín De Amacayacu due to the many environmental pressures affecting the surrounding area, including the ANP – notably illegal logging and illegal poaching. But they have also provided many other services like waste remove and path maintenance (SWF, 2019; SWF, 2021b).

2.0 Environmental Characteristics

ANP has an Amazonian Ecosystem typical for the equatorial jungle (PNN, 2013), humid with frequent mist. The average temperature in the area is 26.4°C and the humidity has an annual average above 90% (PNN, 2013).

Flood levels fluctuate seasonally reaching their peak in the month of May, flooding much of the entire region. The lowest water levels occur in September, when the beaches become visible (PNN, 2013). In the Park there are two main types of water:

- a) White water, from the upper Andes that drain the Amazon - alkaline, turbid, and transport heavy sediments
- b) Black water, which drain between the Andes and Guyanese Shield, dark tea-coloured due to humic acids and sandy

Many ecosystems are represented within the ANP including the tropical humid forest, floodplain forests, swamps, and river systems representative of the Amazon rainforest. Providing many ecosystem services to the local populations, including food, water, and food supply (PNN, 2013).

Benefiting from 50 years without development, ANP is an extremely biodiverse area with over 468 species of birds, and 150 mammals among which 12 are primates. The park has the largest number of reptiles counted in the country (PNN, 2013) and conservation should maintain a top priority (Lopera, 2011)

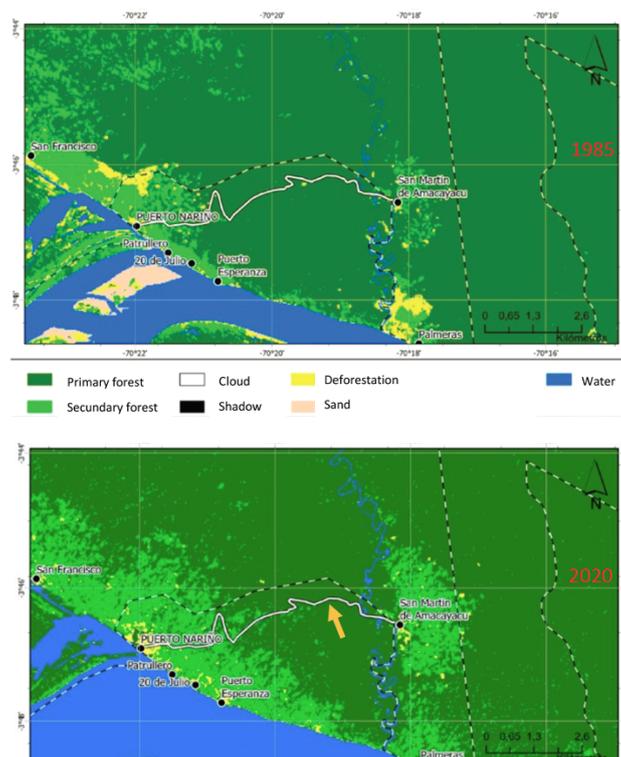


Figure 1 - Spatial Organization of Canopy 1985 and 2020 (SWF, 2021c)

3.0 Tourism Characteristics

Ecotourism in ANP began with the opening of the Yewaé Visitor Centre in 1987 (Ochoa, 2013) which attracted the first visitors and introduced locals to the economic benefits of tourism (Parathian, 2019). In 2004, as the policy towards ecotourism concessions brought ownership of park operations to Colombian’s largest resort chain, Decameron, tourist numbers grew rapidly alongside tourism infrastructure, especially near Leticia where flights and long boat rides arrive (Ochoa-Zuluaga, 2019). In 2012, due to large flooding, the Visitor Centre shut down, followed by the private park concessions coming to an end (Parathian, 2014). This marked a period of stagnancy in park management, which lasted until in 2020 when the municipality of Leticia municipality took funding and planning further into its own hands (Munoz, 2020).

The ANP is in the design phase of a community tourism scheme in which the communities around the park are seeking the effective distribution of benefits of tourism including execution of activities (USAID, 2015).

Most tourists come to ANP for the nature and the indigenous culture (Bermudez, 2018; Munoz 2020), both of which are in danger if tourism grows beyond it carrying capacity. The growth of tourism can be noted in the growth of tourism businesses in recent years, rising from 151 registered travel agencies, accommodations and tour guides in the district of Leticia in 2017, to 174 in 2018, to 193 in 2019, and 233 in January 2020 (Munoz, 2020).

Visitor Profile	Average Age: 43 years (range from 20-86 years); 74% with higher education 83% separate waste at home Monthly Tourist Spending: US\$990 (COP1,980,000)			
Visitor Demographics	79% Colombians 21% Foreigners (USAID, 2015)			
	2016	2017	2018	2019
Total visitors hosted in Amazona’s Department Annually	87,186	96,357	97,559	102,637
Visitors who contributed to Leticia municipal tourism tax	52.444	45.971	39.846	41,071
Total Annual municipally collected through Contribution (COP) (Munoz, 2020) *collected at Alfredo Vasquez Cobo International Airport	1.101.324.000	1.379.130.00	1.275.072.000	1.437.625.000

Table 3 - Visitor Characteristics and Contributions in ANP

Mandatory tourist contributions are destined for several resources, as per *Municipal Agreement No. 31* from 2019, including 10% of municipal contributions received going to the communities within the municipality who participate in tourism (Munoz, 2020). The other focuses of the investments are on infrastructure or competitive improvements in the tourism market for the city of Leticia. Aims to connect with regional municipal agents involved in tourism is listed as a priority for use of the funding received through visitor contributions, (Municipio De Leticia, 2019) and national pilot efforts are taking place, such as the recent workshop, *Wildlife trafficking enforcement cooperation training: Peru and Colombia* (Fundación Entropika, 2022).

3.1 Tourism in San Martin

San Martin’s developed tourist infrastructure has centered around Casa Gregorio which has 18 beds in 6 different rooms, and recently a new central Maloca has been constructed for tourists (SWF, 2021a). Outside of the community can be found Yoi Ecolodge which is operated by the local community as well (Yoi Ecotours, 2022). Meals at both accommodations are made with a majority of organic food produced locally, and sustainable practices are taken into account for food waste and water management (Casa Gregorio, 2022; Yoi

Ecotours, 2022). San Martin de Amacayacu is accessible via boat ride 25 minutes down from where the Amacayacu River meets the Amazon River between Leticia and Puerto Nariño (Casa Gregorio, 2022).

Activities for tourists who stay in San Martin range from forest trekking, agriculture tours, visiting a monkey rehabilitation center, pink dolphin boat trips, and bird watching (Casa Gregorio, 2022). The seasonality of rainy and dry season in the Amazon can impact possibilities for certain activities, but the communities would prefer to maintain consistent tourism (Parathian, 2019).

4.0 Governance

The ANP is managed through the National System of Protected Areas by Colombia’s Ministry of the Environment, Housing and Regional Development (PNN, 2013). Since the departure of private management of the park in 2012, ANP management has not been robust or very active as the most recent park management plan dates to 2003 (PNN, 2003; Munoz, 2020). More recent collaborative management initiatives by the municipal government of Leticia led to conservation agreements with local communities, and fall in line with prioritized objectives listed by the *Parques Nacionales Naturales de Colombia* (PNN) (PNN, 2021).

If referring to Glasbergen’s 5 governance models, elements of shared governance and non-governmental governance models are showcased throughout the ANP system (1998). The department of the Amazon has a community association, which is part of the Community Tourism program and is formalized before the Amazon Chamber of Commerce (Munoz, 2020). These organizations, much like communities and their various internal organizations are often disorganised and have proven difficult to communicate with (Ochoa-Zuluaga, 2019; Munoz, 2020) by external stakeholders.

4.1 Stakeholders

Table 4 below lists relevant stakeholders to the ANP system in San Martin De Amacayacu.

Stakeholder	Description
National Natural Parks, Peru (PNN)	National Parks Management providing funding and leadership
Amacayacu Natural Park (ANP)	Park Management Authorities staff, and rangers
Municipality of Leticia	Leticia Municipality is leading management efforts of AMC
Community groups	Representatives of indigenous communities (Including: PAINU Intercommunity Association)
Private companies	5 transportation companies – Over 200 tourism services like accommodations & guides across Leticia Municipality
International Organizations	USAID, CWTG, US Department of the Interior
San Martin Community	75 Families – Employed in multiple sectors
Casa Gregorio Ecolodge	Locally operated eco lodge in San Martin De Amacayacu (max. 16 pax)
Local NGO’s	Small World Foundation (SWF), Entropika, Maikuchiga Foundation
Indigenous Environmental Guard	Community founded in 2015 to patrol Ticoya/ANP reserves for illegal activities such as logging and poaching.
Tourists	Economic benefits of tourism are highly sought after by rural communities.

Table 4 - Stakeholders

5.0 Environmental Impacts

The boom in tourism visitors to the ANP has brought benefits to the infrastructures and lives of local communities, while these visitors have also brought an increased pressure on the area’s ecosystem (Verner, 2009). This baseline review of environmental impacts focuses on current issues caused by tourism alongside possible system weaknesses that should be addressed by an array of stakeholders connected to the ANP. Focus of this baseline review is limited to San Martín de Amacayacu whose tourist impacts are centered in the long-standing Casa Gregorio ecolodge, although the suggested actions that follow may be reach more broadly. Casa Gregorio often houses academic researchers and funds several programs through its tourism revenue as mentioned below (SWF, 2021). Though this review is narrow in focus, it does not discount the system

connectedness that is especially present in the Amazonian Rainforest Social-Economic System, and aims to ensure systems thinking through applying actions that combat many interwoven impacts and weaknesses in the region.

Impacts are prioritized for action based on several factors – namely the severity of the impact and resources available for action. Severity was identified through quantity of recent academic and journalistic articles published concerning the topic, as well as the frequency the issues were mentioned in local publications like the *SWF Newsletters* and the *Entropika Foundation Annual Report (2021, 2021b)*. Aspects like relative cost to respond, feasibility of implementation, and other current issues are also prioritization factors mentioned in *Table 5* below.

Impact	Causes	Justification for Impact	Prioritized for Action?
Deforestation	<p>Lack of planning and management efforts (PNN, 2021). Governance surrounding illegal practices is not prioritized or sufficient enough to minimize current negative impacts to the area (Piponiot, 2019).</p> <p>As noted in PNN, 2021, there is an urgent need for an updated park management plan (2021). The last published ANP management plan was written in 2004, and was simply completed as a task to fulfill a requirement (Ungar, 2012).</p> <p>The current municipal efforts are not sufficient or focused on conservation of the resources within ANP (Muñoz, 2020).</p>	<p>The cedar has been defined as one of the priority species for conservation by the <i>Indigenous Reservations of the Southern Sector of the</i> (Munoz, 2020) thus should be a focus of environmental programmes.</p> <p>Many ecosystem services could be provided by the logged tree's including supporting local biodiversity and storing carbon (Piponiot, 2019).</p> <p>Illegal logging is deforesting areas across the Amazonian region and illegally harvested wood is being exported to the bordering Peru and Brazil from ANP without any kind of control (Lopera, 2011; Badia i Dalmases, 2020)</p>	<p>Yes – Strategic intervention must be planned and organized by the park management authorities (Elias, 2021) due to the complexities of logging within the ANP's location in the tri-border region (Muñoz, 2020) This has been recognized as an extreme priority by the National Parks of Colombia in its <i>Mapa De Riesgos Y Matriz De Oportunidades</i> report (PNN, 2021).</p>
	Disjointed conservation efforts between ANP and the local communities (PNN, 2021).	The inability to properly manage the natural resources of the park has led to the community acting in its place by founding the Indigenous Environmental Guard to prevent the large-scale illegal logging (Badia i Dalmases, 2020).	<p>Yes – Developing positive community attitudes and involvement in conservation is integral (Parathian, 2019) and the park authorities financial support of the Guard will further support the connectivity between stakeholders within the system. (Elias 2021).</p>
	Lack of alternative supply chain options (Parathian, 2014; Ochoa-Zuluaga, 2019)	The wood that was previously obtained locally, in the jungle by taking advantage of fallen trees, is now shipped from the Peruvian side to use in tourist products and to construct new tourist lodges. (Ochoa-Zuluaga, 2019)	<p>Yes – Financial schemes have proven to be beneficial in incentivizing Amazonian communities to further their commitments to cooperate in regional conservation efforts (Elias, 2021)</p>
Food vulnerability	Supplying of food for tourists requires the importing of goods to supplement the local agricultural production (Ochoa-Zuluaga, 2019).	The transportation emissions, packing materials, and increased cost have many impacts across the Amazonian environmental system. (Ochoa-Zuluaga, 2019; SWF, 2021b)	<p>Yes - The ability to benefit the local communities and reduce the leakage of potential income due to importing products is feasible within the operational abilities of an Ecolodge (SWF, 2021b; Casa Gregorio, 2022).</p>

	Local agriculture production must also increase to support tourist needs (Lopera, 2011; Ochoa-Zuluaga, 2019)	The impact on the common pool resources of the protected area due to the growth of agriculture must be managed to sustainably maintain the forests ecosystem services (Stronza, 2009; Pinillos, 2020).	Yes - Integrating the local agricultural production within the tourist system benefits the community who practice sustainable agriculture (Pinillos, 2020) and prioritize resilience farming systems.
	More time spent working in the field of tourism than traditionally spent maintaining agriculture (Ochoa-Zuluaga, 2019)	Losing the cultural knowledge passed down through generations due to time spent working in tourism (Ochoa-Zuluaga, 2019)	No - Low severity to system as people who are working in tourism can afford to buy more food products
	Over fishing resulting in depleting population supplies (Ochoa-Zuluaga, 2019, SWF, 2021c),	Fish is 90% of the protein intake for the 9people (PNN, 2003) and the pressure to feed tourists has lent to fish populations being caught beyond carrying capacity (Ochoa-Zuluaga, 2019)	No - As the protected area overlaps with indigenous areas who have autonomous control and land rights, the park authorities mut cooperate alongside the community
	Growing rates in illegal bushmeat hunting (Svensson, 2016) of previously taboo species that the Tikuna people of San Martin are now hunting and consuming (Maldonado, 2020).	Growth in illegal hunting rates due to overfishing impacting consumption patterns and changes in market demands (Fraser, 2017). No conservation coordination currently led by National or Regional authorities in ANP (PNN, 2021). Hunting of vulnerable monkey species like the churuco monkey (<i>Lagothrix lagotricha</i>), is growing (USAID, 2015) in the Amazon region.	Yes – Illegal hunting of protected species in the protected area is high priority for the park authorities and has been effectively managed in neighboring community, Mocagua, utilizing financial compensation (USAID, 2015). As noted by local researcher, Hannah Parathian, "Care needs to be taken in the management and ongoing assessment of these resources, to ensure their long-term viability." (864, 2010).
Climate Change	The diverse biome within The Amazon is particularly vulnerable to extreme changes being caused by climate change, including extreme flooding events which are taking place at a higher frequency and magnitude in the Amazon region (Prüssmann, 2016).	Closure of Visitor Center in 2012 due to high floods has resulted in the National Park to no longer collect tourist collection tax (Parathian, 2014) and the unpredictability of future flooding is one of the reasons the center has not been rebuilt (SWF, 2021b)	Yes - Collecting visitor money supports the conservation efforts of the park by funding the many services park authorities (USAID, 2015) while supporting access to local communities in the ANP along the Amazon River (Fonseca, 2013).
	In rural areas, fumes from boat motors are higher than average due to rarity of modifications and new technology. (Hernández-Fontes, 2021).	A major contribution by tourists to climate change is the use of boats for transportation as this is the only way to access the community	Yes - the rising cost of gasoline has increased the severity of this impact and applied pressure to the search for alternative transportation methods. PNN Risk analysis

		and transport resources (Pöhlker, 2019; SWF, 2021b)	prioritizes climate action for is protected natural parks (PNN, 2021)
Land Degradation	New <i>Ecovia</i> pathway could bring agricultural expansion and be impacting biodiversity see <i>Figure 1</i> (SWF, 2021c).	As seen in the updated canopy footage in <i>Figure 1</i> (SWF, 2021c), the newly completed <i>Ecovia</i> trail between San Martin and Puerto Nariño is reducing canopy coverage, albeit minimally. Could lead to habitat loss, if agriculture expands along the path.	No - There does not seem to have been a sudden expansion of the agricultural area along the <i>Ecovia</i> path after the development of the route (SWF, 2021c).
Plastic Pollution	Waste collection must be managed by the community itself and with the growth of tourism and other sources of income, purchases of packaged processed foods and other products have increased dramatically (SWF, 2021d)	Waste must be shipped to larger cities Leticia or Puerto Nariño. Many people give bags full of their plastic waste to tourists to take away upon departure (SWF, 2021d). Leticia and Puerto Nariño are only collection facilities and plastic must be further shipped before being processed (SWF, 2019).	No - Waste management is currently well managed by the community who is already recycling at a rate of 95% (SWF, 2021d).
Lack of potable water	Local communities in the Department of Leticia and Puerto Nariño continue without potable water, or energy infrastructure, and the few improvements that are made are for the tourists. (Ochoa-Zuluaga, 2019).	Neighboring ecotourism destination, Puerto Nariño's issues with water didn't stop after the town's sustainability certification (Ochoa, 2013).	No – A drinking water point has been provided by the FAO (CWF, 2021d), and further points may come once solar systems in nearby communities are proven successful (Entropika, 2021).

Table 5 - Baseline of Environmental Impacts

6.0 Environmental Action Plan

The presented Action Plan is integrated into several projects that overlap in objectives, with aim to support a more resilient tourist system in San Martin De Amacayacu. Primarily, the development and implementation of an updated management plan is highest priority for ANP management, which should include the project listed below with further planning. The overarching projects are:

- Community conservation
- New solar boat route
- Local products project

In order to ensure responsible management, the *WCPA Management Effectiveness* framework was to develop actionable suggestions as suggested in the *IUCN Tourism and Visitor Management in Protected Areas* handbook (Eagles, 2002) and is referenced throughout the action plan.

Previous action plans have labeled areas of ANP zones as inaccessible areas, buffer zones, and others as high-density zones (PNN, 2003). These zones haven't moved but have grown in size and will be prioritized following relative zoning in the suggested actions.

Stakeholders who are most capable to involve in the specific action have been noted alongside their specific duties. Actions have specifically been designed to apply to a broad range of stakeholder to spread the cooperatively and collaboration of the regional community.

Funding:

- National Funding: It is assumed PNN Priorities listed in the National Park's *Mapa De Riesgos Y Matriz De Oportunidades* plan (2021) are within the national parks operating budgets (PNN and ANP).
- Local NGO's contribute donations to community organisations, and offer logistic support in regards to accommodation and regular community contact.
 - Entropika's donations total 929,593 COP or \$2,050 USD annually (Entropika, 2021)
 - SWF 2020 Annual Financial donations totals 5562 euros annually (SWF, 2021a)

6.1 System Resilience

System resilience of San Martin De Amacayacu as a tourist destination requires planning for uncertainty as stated in Schulter's *Principles for building Resilience* (2015). Ensuring the seven principles of resilience within the Social-Environmental System requires specific caution as this tourist system takes place in a protected area, ANP. Thus, Cocrane's *Sphere of Tourism Resilience* has assisted in identifying the human and non-human factors important for the success of the tourist system leading to a prioritization in actions focused on leadership, stakeholder cohesion, and harnessing market forces (2010). Furthermore, this plan identifies system elements within the local, regional, and global perspectives in order to provide the greatest clarity and adaptability.

The community of San Martin De Amacayacu need to focus on broader participation (P6) throughout the tourist system so that many locals can receive the economic benefits of visitors to the community (P2). This can be managed regionally through transportation planning and through proper management of the protected area (P1) to prioritize sustainable options for travelers (P4) and support local conservation efforts (P7). The contribution to global greenhouse gases and climate change (P3) can be further managed through park ranger enforcement and the global lessons in emissions management can inspire further actions (P5) within ANP.

6.1 Deforestation

The actions of this plan have been designed to require minimal bureaucracy or regulatory requirements as these as the region’s biggest barriers towards sustainable supply chains (Elias, 2021). The objective requiring most efforts by a multitude of stakeholders will be the implementation of a Park Management Plan, although this plan will encompass several of the actions listed below and lead to further Polycentricity (P7) within actors across the ANP system. Funding for community-led conservation efforts offer diverse responses to ecosystem impacts (P4 – CAS Thinking) and national support of novel agricultural practices teach (P5 - Learning) and expand the diversity (P1) of the local economy.

Objective	Action	Indicator	Monitoring Method	Timeframe	Budget/Costs	Stakeholders
Park Management Plan (PNN, 2021)	Park Authorities must prioritise development of a management and action plan following the Leticia mayors Municipal Development Plan for 2020-2023 (Munoz, 2020), referencing the most recent ANP action plan from 2003 (PNN, 2003), and utilizing documents sourced from the national level of Colombia Parques PNN, 2021).	Publication of plan (Eagles, 2002; PNN, 2021)	Annual Publication of ANP Report to verify status of current projects within the park (PNN, 2021)	9 months – by end of 2022	Average As a suggested national priority, the development and guidance of the management plan fall under the PNN National budget (PNN, 2021).	ANP Authorities - Develop and publish ANP environmental management plan. (PNN, 2021). Must be prepared to implement actions within ANP as well. PNN – Funding, and providing management plan guidance documents
Strengthen the relationship and coordination processes between the Amacayacu Park and the local communities to support conservation efforts (Elias, 2021; PNN, 2021).	Park provides funding for indigenous community patrol overlapping with ANP conservation efforts (USAID, 2015; Entropika, 2021) as part of conservation agreement. This supports tracking and reporting illegal uses of ANP by the Indigenous Community Guard. Which has been successful in the opinion of the local ecolodges (SWF, 2021a)	Less illegal logging reported in community patrol annual logs of ANP compared to previous years (Piponiot, 2019).	Indigenous community patrol tracks and reporting all illegal logging in northern region of ANP annually. (Munoz, 2020)	Begin instituting financial support over next 9 months as the guard already performs these tasks. Continue to provide financial support for 5-10 years (Munoz, 2020; PNN,2021)	Annual cost for a park volunteer monthly is at least 500,000 COP (PNN, 2013) Funding for conservation is prioritized in the ecolodge’s lodge budgets, with NGO, Entropika, donating 57,770 COP to the Combating Wildlife Trafficking Group in 2021 (SWF, 2020; Entropika, 2021).	Community Patrol -Indigenous community patrol leadership is recognized and supported by the community of San Martin their diverse efforts ANP Authorities – Provide funding and ensure conservation patrol is occurring

Utilize generational knowledge to produce handicraft alternatives for wood (Parathian, 2019)	Chambira, a non-timber forest product made from the fibers of the young leaves of the chambira palm and has been proposed by the Small World Foundation as an alternative to produce handicrafts such as hammocks, bags, necklaces etc. through workshops.	Planted Chambira palms following agroforestry method (Vasquez, 2008)	Photos of planted palms	12 months (Vasquez, 2008)	\$10,481 USD to cover 1 years expense to fulfill the project from start to finish (Vasquez, 2008)	<p>Coordinator and Workshop Specialist from ANP- Will be expected to lead educational and research workshops with local community</p> <p>Community – If interested anyone with land can learn to sustainably grow palms, or learn how to make products to sell, or both (Rodrigues, 2018).</p> <p>Tourists – By purchasing the chambira products, tourists are financially supporting the alternative agroforestry</p>
	A balance between chambira palm leaf production and extraction is essential. So workshops to understand palm management and long-term sustainability growth are offered along-side craft skill-building workshops (Vasquez, 2008).	Sales of new Chambira handicrafts	Higher number of Chambira products offered for sale in Casa Gregoria (Vasquez, 2008)			

6.2 Food Vulnerability

Impacts local communities feel from tourism pressure can result in changes of the daily diets, which incentivizes the local population to participate in agricultural projects that may benefit them in the long-run (P6 – Participation and P3 – Feedback). The self-determination provided by community-driven projects supports the polycentric governance of the overall system (P7 – Polycentricity) by supporting farmers financial to focus on effectively and sustainably managing their agriculture production. This can further add to destination branding possibilities (P4 – CAS Thinking), and supports accessible opportunities in the growing marketplace for the entire community (P1 - Redundancy) (Santafe-Troncoso, 2021).

Objective	Action	Indicator	Monitoring Method	Timeframe	Budget/Costs	Stakeholders
Strengthen sustainable agriculture systems to ensure they can support additional capacity	Incentivize sustainable local agricultural development (of <i>Chagra's</i>) by further local purchasing through indigenous food systems by Casa Gregorio like the Chakra system supported in the Ecuadorian Amazon tourism project by Santafe-Troncoso (Stronza, 2009; Santafe-Troncoso, 2021).	Local produce bought in higher rate by Casa Gregorio	Casa Gregorio Ordering Records	Biannual data reporting - for a minimum of 2 years	Medium Additional investment by farmers requires more time and resources (PNN, 2011).	Community (Farmers) – Adapt their agriculture systems to produce a higher quantity of surplus to sell to Casa Gregorio. Casa Gregorio – Announce to local farmers their ambitions to purchase higher quantity of local goods including sharing a list of top priority items. Tourists – Can learn how sustainable living, farming, and forestry are intertwined aspects of the local lifestyle (Sidali, 2016).
Reduce imported food for tourists by 30%	Casa Gregorio can institute sales from community enterprises selling consumable goods for visitors, and online if successful. Local food products can be sold to tourists with revenue returning directly to the family who produced the good (Rodrigues, 2018).	Local consumable good are bought at beneficial price for the community (Janer, 2015)	Casa Gregorio Product Sales Records	Monthly sales profited returned to families as incentives for further goods to stock. (Rodrigues, 2018).	Market driven – Initial 3 months to test product offer popularity, before prioritizing most profitable products (Janer, 2019).	Locals – Able to get involved in the tourism supported economy without the daily pressures or need for education (Rodrigues, 2018) while still independently managing their own enterprise (Sidali, 2016). Tourists – By providing an income for their farming, tourists can showcase to the community that there are sustainable alternatives to logging or hunting while still profiting from the forest (Maldonado, 2020).
Monitor and support community cooperation to combat illegal wildlife trafficking. (PNN, 2021)	Fund further cross-border conservation workshops and meetings (Entropika, 2021) as these have the opportunity to engage a variety of stakeholders that can continue to aid in preventing illegal wildlife trafficking (PNN, 2021).	Growing number and diversity of professionals in attendance at the biannual conservation workshops (Fundación Entropika, 2022).	Follow up report of workshops, including attendance lists and meeting minutes (PNN, 2021; Fundación Entropika, 2022)	Biannual funded workshop series announced in 2022 after the successful pilot in November 2021 (Fundación Entropika, 2022).	Average Cost for planning and leadership of biannual meetings can be assumed within the Leticia Municipal Development Plan to be paid for by the department tourism concessions income.	ANP Authorities – Lead conservation workshops and develop biannual themes to address. ANP Rangers, International Natural Park staff (from Brazil and Peru), Veterinarians, Researchers, Police, and Army Patrols – Attend meetings and workshops to learn from and meet others whose goals/tasks overlap (Fundación Entropika, 2022).

					(Fundación Entropika, 2022; Munoz, 2022).	
	Communities must sign agreement to not hunt any vulnerable or endangered species (USAID, 2015) as a requirement to receive funding through the conservation funding proposed in 6.1.	Rise in churuco monkey (<i>Lagothrix lagotricha</i>), population by 25%. in 2 years (USAID, 2015).	Maikuchiga Foundation annual reports (USAID, 2015)	3 months to have community sign the agreement	Low Costs are tied to conservation funding and showcases an enhanced purpose of commitment. Current funding is 57,770 COP from Entropika and 793 euros from SWF annually (SWF, 2021a; Entropika, 2022), the higher the annual funding, the more often the patrol can go out.	ANP – Offer financial incentive alongside conservation agreement Indigenous Environmental Guard – Understand agreement to not hunt any illegal wildlife Communities – Follow agreement to not hunt any illegal wildlife

6.3 Flooding/Climate Change

The only access to ANP and the communities overlapping it is through a boat ride down the Amazon River (Casa Gregorio, 2022). Park Management authorities can effectively manage visitors' connectivity (P2) to the communities connected to the park along this route. By controlling management of this transportation funnel, ANP authorities can have further observance and control over park access with ability to institute sustainability measures along the route and to manage overall park traffic (P3 – Slow variables) which can be piloted through smaller local projects.

Objective	Action	Indicator	Monitoring Method	Timeframe	Budget/Costs	Stakeholders
Manage ticket control and visitor monitoring services	<p>Institute management of boat route Leticia – Puerto Nariño, led by Park authorities.</p> <p>Ticket cost includes the reinstated ANP visitor contribution fee.</p> <p>After pilot project below, boat may be run on solar motor (Kabir, 2016).</p>	Profits reported and distributed to local communities (Eagles, 2002).	Annual reports of total tickets sold and profit for ANP. Separate staff will be hired to lead day-to-day management.	2 years – Once tourism numbers are steady at pre pandemic levels, the new boat line will be instituted at optimal timing 15:00, later than other boats allowing for later flight arrivals.	<p>High</p> <p>Upfront costs will be required for new equipment and consistent ridership is necessary in order to cover running costs.</p> <p>Cost of current communal boat ride from Leticia is 27,00COP. (SWF, 2021a)</p>	<p>ANP (Management) – Lead the introduction of a new transportation line to the market. Focused online marketing at eco minded tourists.</p> <p>ANP (Staff)– Operate daily boat line, including ensuring itinerary and costs are clearly communicated to communities.</p>
Lower measurable boat emissions by 30% in community.	Donate five (5) solar engines to the community of San Martin to utilize whenever, but when transporting tourists especially (Guamán, 2015; Hernández-Fontes, 2021).	Air pollution measured through daily atmosphere and particulate matter measurement (Cárdenas, 2018).	Launched from Leticia, the municipal meteorologist will be able to measure the specific air quality of San Martín de Amacayacu regularly using <i>glidersonde</i> technology without additional costs (Lafon, 2014)	Daily flights of the region will be taking place continuously, and the flight over San Martin can be arranged monthly (Lafon, 2014)	<p>High, but cost-effective if running in long-term.</p> <p>Efforts and coordination will both take much tie to organize air quality measurement. The upfront cost of materials will also be costly if not funded through donations (Lafon, 2014).</p>	<p>ANP – Manage donation five solar engines</p> <p>Municipality of Leticia (Meteorologist) – Measure air quality of region, prioritizing San Martin de Amacayacu monthly.</p> <p>International NGO – ANP can apply for and receive funding for solar project from USAID.</p> <p>Community (Boat Users) – Prioritize use of new motors, especially when transporting tourists.</p>

References

- Bermúdez R. (2013) *Estudio exploratorio sobre la situación de las economías domesticas en comunidad nativa San Martín de Amacayacu*. Leticia: Fundación Entropika. [Online]. Available from: <https://www.entropika.org/_files/ugd/beb95d_3f902ce9ddc149b290ed5d632d6ba97f.pdf>. [Accessed 30 March 2022].
- Cárdenas, A. M., Rivera, L. M., Gómez, B. L., Valencia, G. M., Acosta, H. A., and Correa, J. D. (2018) Pollution-and-greenhouse gases measurement system. *Measurement*, 129, pp. 565-568.
- Cochrane, J. (2010) The sphere of tourism resilience. *Tourism Recreation Research*, 35 (2), pp. 173-185.
- Badia i Dalmases, F. (2020) José Gregorio: o preservamos la selva amazónica o tomará venganza. *El País* [Online], 27 August. Available from: <https://elpais.com/elpais/2020/08/24/planeta_futuro/1598275570_625662.html>. [Accessed 4 March 2020]
- Casa Gregorio (2022) *More Info – Casa Gregorio*. [Online]. San Martín de Amacayacu: SWF. Available from: <<https://www.casagregoriolodge.com>>. [Accessed 2 March 2022]
- Drumm, A. and Moore, A. (2005) *Ecotourism Development: a guide for planners and managers. Vol. 1: An introduction to ecotourism planning*. Arlington, Virginia: The Nature Conservancy, pp. 59-64.
- Eagles, P.F.J., McCool, S.F. and Haynes, C.D.A (2002) *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management*. Cambridge, UK: IUCN.
- Elias, A. A., Donadelli, F., Paiva, E. L., & Araujo, P. P. B. (2021) Analysing the complexities of sustainable wood supply chain in the Amazon: a systems thinking approach. *The International Journal of Logistics Management. The International Journal of Logistics Management*, 32 (4), pp. 1481-1505.
- Entropika (2021) Annual Report 2021 [Online]. Available from: <https://www.entropika.org/_files/ugd/beb95d_8b15d9f2c6db481fa1ab7bf86f78eeac.pdf>. Leticia, Colombia: Entropika Foundation. [Accessed 25 March 2022].
- Fundación Entropika (2022) Wildlife trafficking enforcement cooperation training: Peru and Colombia 2021. [Online video], November 2021. Available from: <<https://youtu.be/ICu9ZSLx6p4>>. [Accessed 22 March 2022].
- Glasbergen, P. (1998) Cooperative environmental governance: public-private agreements as a policy strategy. *Springer Science & Business Media*. Dordrecht: Kluwer Academic Publishers.
- Guamán, F., Ordoñez, J., Espinoza, J. L., and Jara-Alvear, J. (2015) Electric-solar boats: an option for sustainable river transportation in the Ecuadorian Amazon. *Transactions on Ecology and The Environment*, 6 (195), pp. 439-448.
- Hernández-Fontes, J. V., Maia, H. W. S., Chávez, V., and Silva, R. (2021). Toward More Sustainable River Transportation in Remote Regions of the Amazon, Brazil. *Applied Sciences*, 11 (5), pp. 2077.
- Janer, I. C. (2015) Indigenous way of seeing tourism and conservation in the Colombian Amazon. *International Journal of Sociology and Anthropology*, 7 (4), pp. 92-98.
- Jayawardena, C., and Sinclair, D. (2010) Tourism in the Amazon: conclusions and solutions, *Worldwide Hospitality and Tourism Themes*, 2 (2), pp. 201-210.
- Kabir, S. L., Alam, I., Khan, M. R., Hossain, M. S., Rahman, K. S., and Amin, N. (2016) Solar powered ferry boat for the rural area of Bangladesh. *Advances in Electrical, Electronic and Systems Engineering*. pp. 38-42
- Lafon, T., Fowler, J., Jimenez, J. F., Tamayo Cordoba, G. J. (2014) Viable alternative for conducting cost-effective daily atmospheric soundings in developing countries. *Bulletin of the American Meteorological Society*. 95 (1). pp. 837-842.

- Lopera M. C., Gregorio J., Gregorio M., and DaSilva R. (2011) Distribution of Useful Plants With Conservation Needs at San Martín De Amacayacu Colombian Amazon. Big Bear Lake, USA: Society for Conservation.
- Maldonado, A. M., and Waters, S. (2020) Ethnoprimatology of the Tikuna in the southern Colombian amazon. *Neotropical ethnoprimateology*. Basel, Switzerland: Springer Nature Switzerland AG (Ethnobiology Series). pp. 89-107.
- Municipio De Leticia, (2019) ACUERDO MUNICIPAL No. 031 DE 2019. [Online] Available from: <https://leticiaamazonas.micolombiadigital.gov.co/sites/leticiaamazonas/content/files/000507/25343_acuerdo-03120200115_16563090.pdf>. [Accessed 30 March 2022]
- Muñoz, J. L. M., (2020) Plan De Desarrollo Municipal 2020 – 2023: Juntos Por Una Leticia Mejor. [Online]. Available from” <<http://www.leticia-amazonas.gov.co/planes/plan-de-desarrollo-municipal-2020-2023-juntos-por-una>>. Leticia, Colombia: Alcaldía de Leticia.
- National Planning Department (DNP) (2004). *Document 3296 of 2004: Guidelines to Promote Private Participation in the Provision of Ecotourism Services in the System of National Natural Parks*. Bogota: SPNN.
- Ochoa, F. A., James, J., and Marquez, G. (2013) Communities' vision of benefits derived from ecotourism in Amacayacu National Park (Amazon region, Colombia). *Gestion y Ambiente*, 16 (1), pp. 17-32.
- Ochoa-Zuluaga, G. I. (2019) Influencias del turismo global sobre el territorio amazónico. *Bitácora Urbano Territorial*, 29(2), pp. 127-134.
- Parathian, H. E., and Maldonado, A. M. (2010) Human–nonhuman primate interactions amongst Tikuna people: perceptions and local initiatives for resource management in Amacayacu in the Colombian Amazon. *American journal of primatology*, 72 (10), pp. 855-865.
- Parathian, H. E. (2014) *Ethnoecology in the Colombian Amazon: Tikuna-Wildlife Interactions in Amacayacu National Park*. [Ph.D. thesis]. Oxford University.
- Parathian, H. E. (2019) Understanding Cosmopolitan Communities in Protected Areas: A Case Study from the Colombian Amazon. *Conservation & Society*, 17 (1), pp. 26-37.
- Pöhlker, C., Walter, D., Paulsen, H., Könemann, T., Rodríguez-Caballero, E., Moran-Zuloaga, D., and Andreae, M. O. (2019) Land cover and its transformation in the backward trajectory footprint region of the Amazon Tall Tower Observatory. *Atmospheric Chemistry and Physics*, 19 (13), pp. 8425-8470.
- Prüssmann J., Suárez C., Guevara O. and A. Vergara. (2016) Vulnerability and climate risk analysis of the Amazon biome and its protected areas. [Online]. Available from: <<https://portals.iucn.org/library/sites/library/files/documents/2016-092-En.pdf>>. Cali, Colombia: Amazon Vision, REDPARQUES, WWF, UICN, FAO, PNUMA. [Accessed 20 March 2022].
- Parques Nacionales Naturales de Colombia (PNN) (2011) Guía Metodológica para el monitoreo impactos del ecoturismo y determinar capacidad de carga aceptable en la Unidad de Parques Nacionales Naturales de Colombia. [Online]. Available from: <<https://www.parquesnacionales.gov.co/portal/wp-content/uploads/2021/12/metodologia-para-el-monitoreo-de-impactos-del-ecoturismo-y-determinacion-de-la-capacidad-de-carga-aceptable.pdf>>. [Accessed 20 March 2022].
- Parques Nacionales Naturales de Colombia (PNN) and Ministerio del Ambiente y Desarrollo Sostenible (2013) Parque Nacional Natural Amacayacu Información General Para Guarda parques Voluntarios. [Online]. Available from: <<https://www.parquesnacionales.gov.co/portal/wp-content/uploads/2015/06/Descripcion-PNN-Amacayacu-2015.pdf>>. [Accessed January 30 2022].
- Parques Nacionales Naturales De Colombia (PNN) (2021) Mapa De Riesgos Y Matriz De Oportunidades. Bogotá: D.C Grupo De Control Interno. [Online]. Available from: <<https://www.parquesnacionales.gov.co/portal/wp->

content/uploads/2021/05/informe-1-seguimiento-mapa-de-riesgos-y-matriz-de-oportunidades-2021.pdf>.
[Accessed March 5 2022].

- Pinillos, D., Bianchi, F. J., Pocard-Chapuis, R., Corbeels, M., Tiftonell, P., & Schulte, R. P. (2020) Understanding landscape multifunctionality in a post-forest frontier: supply and demand of ecosystem services in eastern Amazonia. *Frontiers in Environmental Science*, 206.
- Piponiot, C., Rutishauser, E., Derroire, G., Putz, F. E., Sist, P., West, T. A., and Hérault, B. (2019) Optimal strategies for ecosystem services provision in Amazonian production forests, *Environmental Research Letters*, 14 (12).
- Rodrigues, C. B., and Prideaux, B. (2018) A management model to assist local communities developing community-based tourism ventures: a case study from the Brazilian Amazon. *Journal of Ecotourism*, 17 (1), pp. 1-19.
- Santafe-Troncoso, V., and Loring, P. A. (2021) Indigenous food sovereignty and tourism: The Chakra Route in the Amazon region of Ecuador. *Journal of Sustainable Tourism*, 29 (2-3), pp. 392-411.
- Schlüter, M., Biggs, R., Schoon, M. L., Robards, M. D., and Anderies, J. M. (2015) Reflections on building resilience: interactions among principles and implications for governance. *Principles for building resilience: sustaining ecosystem services in social-ecological systems*. Cambridge University Press, Cambridge, UK.
- Sidali, K. L., Morocho, P. Y., and Garrido-Pérez, E. I. (2016) Food tourism in indigenous settings as a strategy of sustainable development: The case of Ilex guayusa Loes. in the Ecuadorian Amazon. *Sustainability*, 8 (10), pp. 967.
- Stronza, A. L. (2009) Commons management and ecotourism: Ethnographic evidence from the Amazon. *International Journal of the Commons*, 4 (1), pp. 56–77.
- Svensson, M. S., Shanee, S., Shanee, N., Bannister, F. B., Cervera, L., Donati, G., and Nijman, V. (2016) Disappearing in the night: an overview on trade and legislation of night monkeys in South and Central America. *Folia Primatologica*, 87 (5), pp. 332-348.
- SWF (2019) Newsletter 87 November 2019 [Online]. San Martin de Amacayacu, Colombia: SWF. Available from: <<http://smallworldfoundation.org/?p=1050>>. [Accessed 4 March 2022].
- Small World Foundation (SWF) (2021a). Annual Report 2020. [Online]. Available from: <http://smallworldfoundation.org/?page_id=648>. San Martin, Colombia: Small World Foundation. [Accessed January 27 2022].
- SWF (2021b) Newsletter 98 September 2021 [Online]. San Martin de Amacayacu, Colombia: SWF. Available from: <<http://smallworldfoundation.org/?p=1157>>. [Accessed 4 March 2022].
- SWF (2021c) Newsletter 95 March 2021 [Online]. San Martin de Amacayacu, Colombia: SWF. Available from: <<http://smallworldfoundation.org/?p=1125>>. [Accessed 4 March 2022].
- SWF (2021d) Newsletter 97 July 2021 [Online]. San Martin de Amacayacu, Colombia: SWF. Available from: <<http://smallworldfoundation.org/?p=1137>>. [Accessed 4 March 2022].
- Ungar, P. and Strand, R. (2012) Inclusive protected area management in the amazon: the importance of social networks over ecological knowledge. *Sustainability*, 4 (12), pp. 3260–3278.
- USAID (2015) Identificación De Elementos Prioritarios Para Establecer Esquemas De Incentivos Económicos En Comunidades Indígenas: Caso Mocagua, Leticia. [Online] Available from: <https://www.conservation-strategy.org/sites/default/files/field-file/Caso_Mocagua_Leticia_Victorino_alta.pdf>. Colombia: Conservación Estratégica [Accessed 30 January 2022].

- Vasquez, J. G. (2008) Project Proposal for Conservation of Natural Resources. [Online] San Martín de Amacayacu: Cabildo Indígena San Martín de Amacayacu. Available from: <<http://smallworldfoundation.org/wp-content/chambira-project-san-martin-de-amacayacu-colombia.pdf>>. [Accessed 20 March 2022].
- Verner, D. (2009) Tourism and Indigenous Peoples-Lessons from recent experiences in eco and ethno tourism in Latin America and the Caribbean. *The World Bank*.
- WTO (2018) Report on Status, Trends and Relevant Activities [Online]. Available from: <<https://www.cbd.int/tourism/doc/cop-14-tourism-background-document-en.pdf>>. Egypt: Secretariat of the Convention on Biological Diversity, World Tourism Organization. [Accessed 30 March 2022].
- Yoi Ecotours (2022) *Amazon Tours – Yoi*. [Online]. San Martin de Amacayacu: Yoi Ecotours. Available from: <<http://www.yoiecotours.com/tours.html#cabinpics>> [Accessed 24 March 2022].