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Strategies for territorial tourism planning in natural protected areas (NPAs): Alto Mayo Protected Forest (BPAM), Peru

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Abstract

The Alto Mayo Protected Forest ("Bosque de Protección Alto Mayo", or BPAM for its Spanish acronym) is one of the largest natural protected areas (NPA) in Peru. The BPAM has several tourist attractions owing to its great biodiversity of ecosystems and species. However, the BPAM does not have an optimal offer of tourism services because of the lack of infrastructure articulated to the multiscalarity of its territory. The objective of this research is to propose integral strategies for permitted tourism uses of the BPAM, considering its plans and planning instruments oriented to the conservation of the ecosystem through sustainable projects. To diagnose the site and collect data, participatory workshops were held with local inhabitants and authorities involved in the administration of the BPAM. As a result, the BPAM was structured into five tourist zones to propose intervention strategies at three scales: territory, community, and architecture. At the territorial scale, a network of infrastructure and tourist circuits has been proposed. At the community scale, the suitability of each tourist zone was evaluated to propose activities classified as ecotourism, adventure, or rural. At the architectural scale, sustainable tourism equipment was configured through schematic strategies that considered the architectural object, connectors, and site. Finally, this study is synthesized as an example of an intervention instrument to promote sustainable tourism in NPAs with similar characteristics in the Peruvian Amazon.

Keywords Natural protected area, Tourist attractions, Integral strategies, Territorial scales, Planning instruments

Introduction

Natural protected areas (NPAs) are defined as geographic spaces delimited and managed by legal means to conserve nature, ecosystem services and cultural values (Casado-Montilla and Pulido-Fernández 2020). Globally, the highest land protection index is found in Latin America and the Caribbean, with 24.21% land coverage and 23.02% territorial waters. In contrast, the lowest index is in the Middle East with 3.82% land cover and 1.11% territorial waters. The International Union for Conservation of Nature (IUCN) has proposed management categories that promote the sustainable use of natural resources through field projects, sustainable development policies, laws, and best practices such as sustainable tourism (IUCN 2021). Thus, sustainable tourism includes World Heritage Treaties, Ramsar, the Convention on Biological Diversity (CBD), the UNESCO World Network of Biosphere Reserves (WNBR), and the alliance of Key Biodiversity Areas (KBAs), where standards for the conservation, monitoring, and restoration of these territories are established (IUCN 2021). Therefore, tourism planning is currently seeking strategies for sustainable tourism to conserve the biological, ecological, and landscape biodiversity of protected areas and to contribute to the socioeconomic benefits of the local population to reduce anthropogenic impacts (Muñoz Barriga 2017; Trisic et al. 2020).

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In Peru, 76 NPAs exist, 44 of which provide ecotourism activities. NPAs are classified into nine categories including "Protected Forests". There are six protected forests in Peru (three in the center and three in the north of the country). The largest protect forest is the "Alto Mayo Protected Forest" ("Bosque de Protección Alto Mayo" or BPAM for its Spanish acronym), which has diverse resources: landscapes (natural, rural and fluvial), biological biodiversity (including endemic species), tourist attractions (such as the area with the most bird watching), native Aguaruna' population, and migrant settlers (Gamboa Moquillaza 2019; Morales 2019).

In 1979, BPAM territory was fragmented by the construction of a national road infrastructure (Fernando Belaunde Terry road network) to connect the northern jungle with the coast and highlands of Peru. Consequently, illegal settlements, hunting, and wildlife migration occurred in the untouched forest. In this context, the Peruvian State intervened with studies and technical reports to declare BPAM as a "Protected Forest" in 1987, and other scientific research discovered new species of flora and fauna in the Mayo River basin (Benavides et al. 2008, p. 16). BPAM presents socio-environmental conflicts as a result of anthropization. As a result, the National Service of Natural Protected Areas (SERNANP for its Spanish acronym) is developing intervention strategies through sustainable tourism conservation agreements with communities (5.18% are dedicated to tourism and 94.82% are dedicated to agriculture or other activities) (SERNANP and Internacional 2017, pp. 32–33).

Currently, 33 attractions have been registered in the BPAM, of which eight have basic conditions for tourism. The rest are restricted in terms of accessibility, infrastructure, and tourism services (BPAM-SERNANP 2019). The BPAM presents a diversity of natural and cultural tourist attractions, with a lack of operational strategies to be activated and integrated at the territorial scale. Therefore, the study argues under the following research question: What are the integral strategies of projective character to dynamize the tourist territory of Natural Protected Areas (NPAs) considering their spatial scales, territorial patterns, and operative logics?

The objective of this research is to propose integral intervention strategies (compatible with the permitted uses of the NPA) for the systematic articulation of tourist attractions in the BPAM territory, developed at three scales: territory, community, and architecture. The purpose is to ensure that sustainable tourism contributes to conservation, recreation, and education by promoting new sustainable activities among the population. In relation to compatible uses, the proposed strategies are aligned with existing planning instruments: The Master Plan (MP) and Tourism and Recreational Use Plan (PUTR, for its Spanish acronym) of the BPAM (Benavides et al. 2008, pp. 105–152; Gamboa 2017, pp. 17–80).

Natural protected areas (NPAs) in Peru

In Peru, Natural Protected Areas (NPAs) were created in 1997 and occupy a land area of 17.90% of Peruvian territory (Ley de Áreas Naturales Protegidas) (SERNANP 2022; SINIA 1997). NPAs are administered by the National Service of Natural Areas Protected by the State (SERNANP for its Spanish acronym), which is a specialized technical agency under the Ministry of the Environment (MINAM for its Spanish acronym) of the Peruvian government. SERNANP prepares, publishes, and updates the official list of NPAs in the Peruvian territory known as the System of Natural Areas Protected by the State (SINANPE for its Spanish acronym) (SINANPE 2023). The SINANPE list comprises three groups: National Administration Areas, Regional Conservation Areas (RCAs) and Private Conservation Areas (PCAs). RCAs and PCAs are considered complementary, with the aim of conserving biological diversity, culture, landscape, and scientific value (Fig. 1). Peru's Natural Protected Areas consist of 76 areas classified into ten categories: National Parks (15), National Sanctuaries (9), Historic Sanctuaries (4), National Reserves (17), Wildlife Refuges (3), Landscape Reserves (2), Communal Reserves (10), Protected Forests (6), Hunting Reserves (2), and Reserved Areas (8). The classifications of existing NPAs in Peru correspond to categories II and VI of the UINC (Solano 2009, p. 8). The NPAs have a Master Plan as national guidelines and the master plans elaborated in their "Resource Management Plans," "Site Plans," and "Public Use Plans for Research-tourism" (Brack and Alfaro, 2009, p. 44). The latter plan has two forms of contracts in its territory: "Agreements" with public and/or private institutions, and "conservation agreements" with the people living in or around the NPA. By 2020, SERNANP had 757 conservation agreements: 13 for tourism and 744 for agroforestry production, aquaculture, fishing, agriculture, and livestock. Of these agreements, 599 belong to BPAM (Borg Rasmussen 2021, p. 12).

Tourism in Peru's NPAs is defined as a conservation strategy for these territories and an opportunity to promote the development of local communities (Esparza et al. 2020a, p. 5). However, bureaucratic limitations impede the formulation of infrastructure projects, implementation of tourism services, and economic development opportunities for the local population in proportion to the biological biodiversity potential of Peru's NPAs (Barrantes and Fiestas 2013, p. 17; Cajas et al. 2021, p. 3; Esparza et al. 2020b, p. 5; Mercado et al. 2020, pp. 14–15).

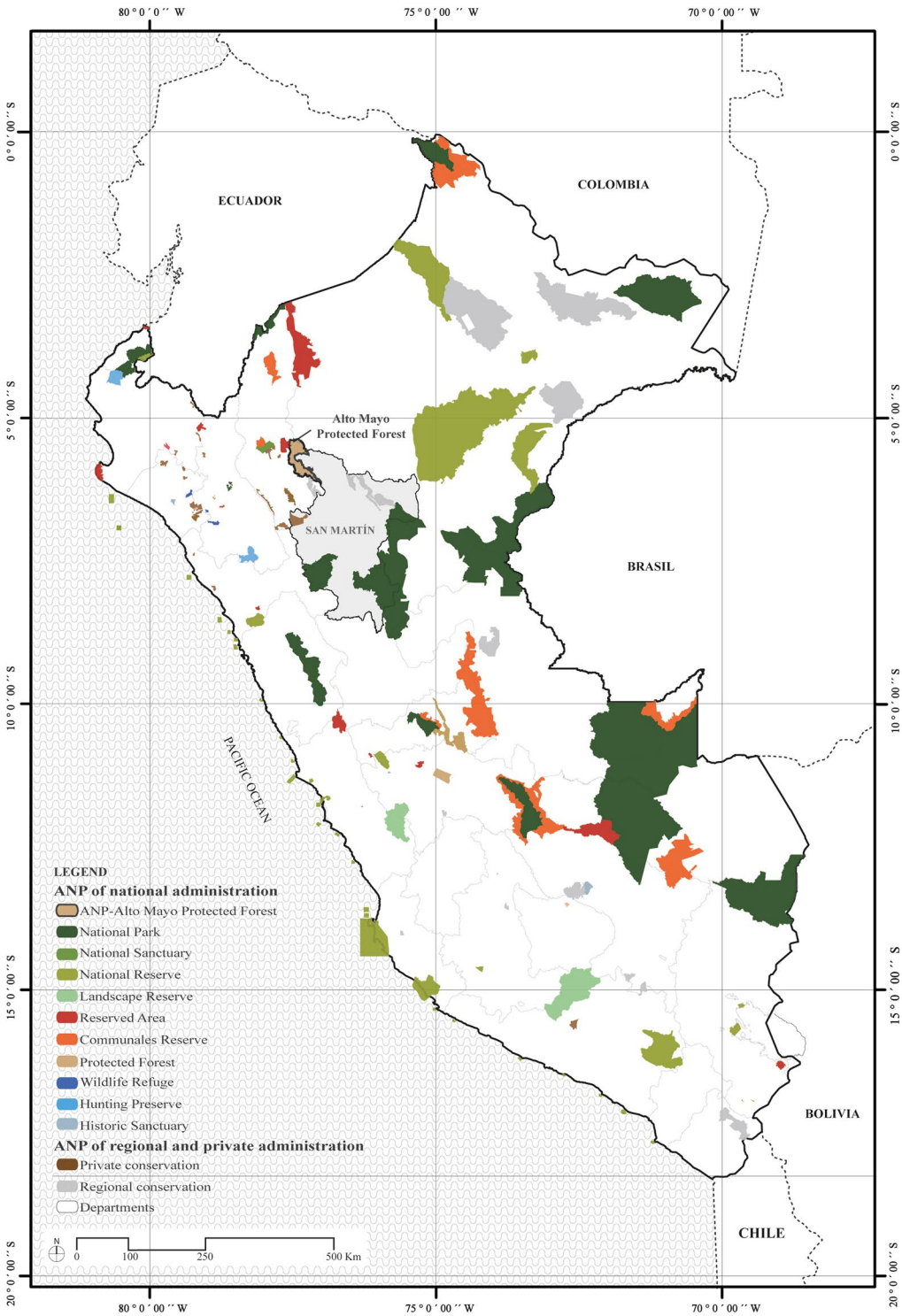

Fig. 1 Classification of Natural Protected Areas (ANP for its Spanish acronym) of Peru. Source: Author, elaboration with data from SERNANP (2020)

Methodology

Study site

The study site was the natural protected area "Bosque de Protección Alto Mayo" (Alto Mayo Protected Forest or BPAM for its Spanish acronym) and its Buffer Zone (ZA for its Spanish acronym). BPAM is located mainly

in the department of San Martin and occupies territories of the departments of Loreto and Amazonas (Fig. 2). The BPAM has a territorial surface of 182,000 ha, with an altitude that varies from 700 to 4000 m.a.s.l., consisting of high jungle mountains to scrublands. BPAM comprises four altitudinal levels (high jungle, fluvial Yunga, Quechua, and Puna) and therefore has landscape resources and biological biodiversity of endemic species for the practice of natural tourism, such as bird watching and observation of flora and fauna (Vidal 2014). In addition, the BPAM also possesses resources with religious, historical, and archaeological potential, which is a legacy of the Chachapoyas culture (eighth century) (Gamboa 2017, pp. 59–80). On the other hand, the BPAM is the Natural Protected Area (NPA) with the largest settled population (approximately 1500 families in its territory), which is why productive activities have been developed, generating socio-environmental impacts.

Data collection

The research methodology was structured in two phases: (1) diagnostic and data collection and (2) processing of the information collected (Fig. 3). In the first phase, technical documentation (plans and reports) on BPAM's administrative and tourism management was reviewed (Benavides et al. 2008; MINCETUR 2019; SERNANP and Internacional 2017; Williams et al. 2005). In addition, the literature was reviewed to structure the surveys and interviews that were applied in the field visits to two participatory groups (Eshun and Tonto 2014; Gamboa 2017; Głąbiński and Duda 2017; Lekgau and Tichaawa 2020; Yu 2021).

- The first participatory group comprised 35 villagers who were owners of individual tourism enterprises, and 10 authorities representing communities with community enterprises. The surveys focused on diagnosing tourist attractions and activities. In addition, walks (along routes directed by the local population) were conducted to identify tourist attractions through observation and photographic recordings.
- The second participatory group consisted of 15 representatives of public institutions related to tourism: local and regional government officials, technical staff at the BPAM headquarters, and representatives of NGOs ("Asociación Ecosistemas Andinos"—ECOAN and "Conservación Internacional"—CI) (CI 2022; ECOAN 2022). The interviews focused on diagnosing the public–private management capacity to improve tourism services and infrastructure (e.g., market research, ecotourism promotion, sustainable tourism guidelines, and identification of key stakeholders).

Finally, cartographies were made using figures provided by the BPAM's management, such as statistical data on subscribers to the conservation agreements, the annual report of tourist visits, and geo-referenced data from thematic maps.

Participatory workshops with BPAM communities

During the diagnostic phase, participatory workshops were held with the local population of the BPAM, using the methodologies proposed by Alberich et al. (2009) and Candelo et al. (2003). The work plan for the participatory workshops was oriented towards the identification, evaluation, and subsequent evaluation of proposals for integrated strategies for tourism attractions. To this end, the boards of directors of each community were convened to establish a schedule for workshops held in the community houses. The techniques applied in the participatory workshops were initially self-reflection and self-criticism, followed by SWOT analysis of the territory. Subsequently, the "Matrix of Questions and First Ideas" was applied, where a table of questions was proposed on the tourist potential of the BPAM: cultural and natural resources, tourist routes and equipment, frequency of tourist visits, retention of income from tourism, agreements with travel agencies, the media, and the involvement of the population in decision-making.

In response to the questions posed, the villagers stated that of the 33 existing tourist attractions in the BPAM and ZA, only nine had some type of infrastructure (signage, lookout points, and rustic tambos) or tourist services (local guides, recreational and cultural activities, restaurants, sale of agricultural products, and raising small animals). For this reason, they stated that limited tourism infrastructure needs to be implemented to attract tourists. They also indicated that the trails leading to tourist attractions are in precarious conditions despite community efforts to maintain them with materials that are perishable in the local climate. The villagers commented that in the past, BPAM was rarely visited by foreign tourists. The flow of visitors increased when birdwatching tourism began, and BPAM is now part of the "Bird Routes of the North Amazonian Tourist Corridor".

In addition, locals stated that the summer season (May–November) is very popular with tourists because it coincides with vacation periods (between July and August) and festivities (e.g., the San Juan festival) in the San Martin region. In addition, during this season, accessibility to tourist attractions is optimal because of the absence of rain, unlike during the winter season (December–April), when some tourist sites are inaccessible due to rainfall that damages the roads. The villagers stated that the economic income from tourism is low because tourists only stay for one day because of the lack

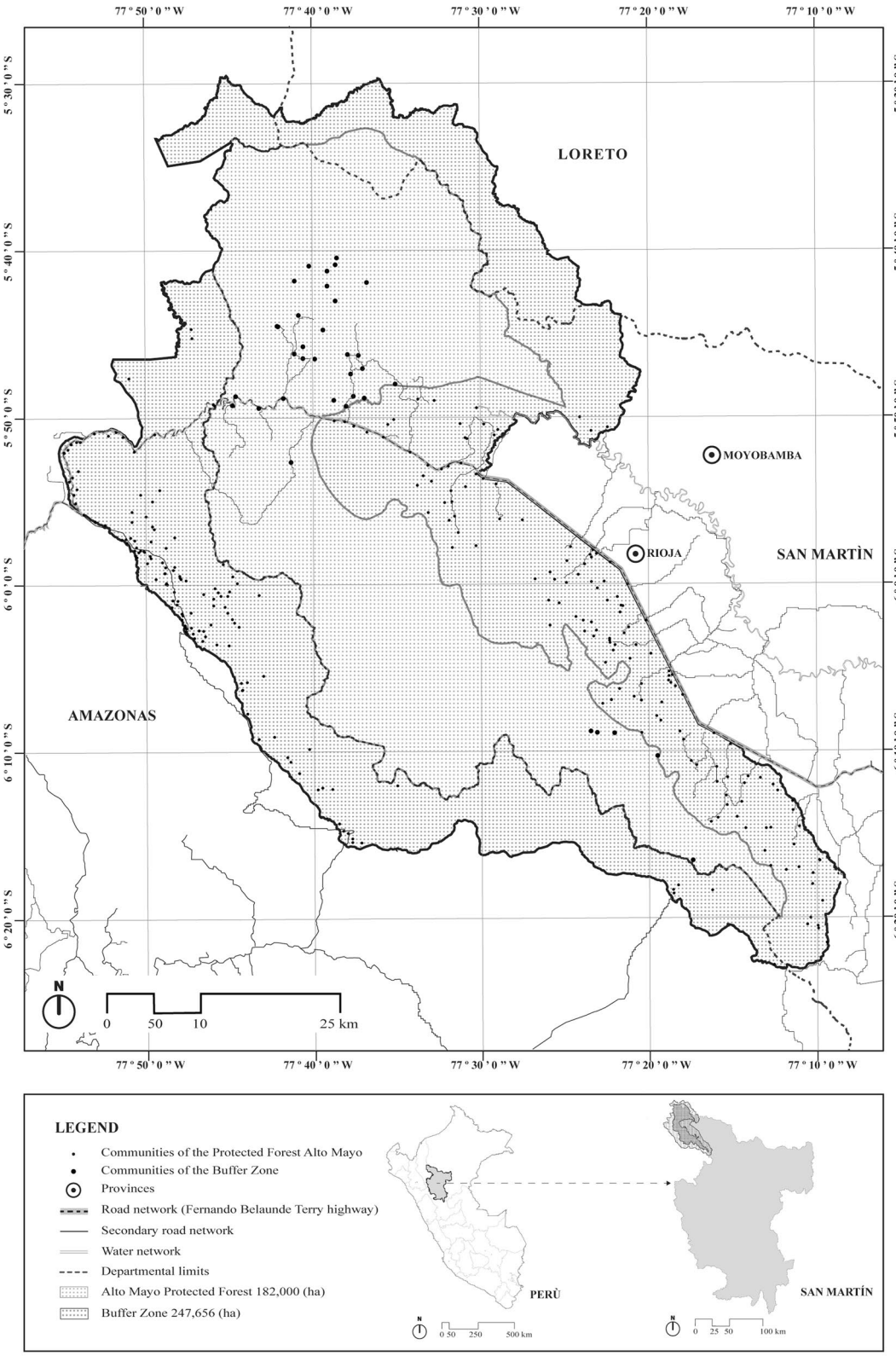

Fig. 2 Location of the Alto Mayo Protected Forest (BPAM) and its Buffer Zone (ZA). Source: Author, elaboration with data from Autoridad Regional Ambiental (2018); BPAM-SERNANP (2019)

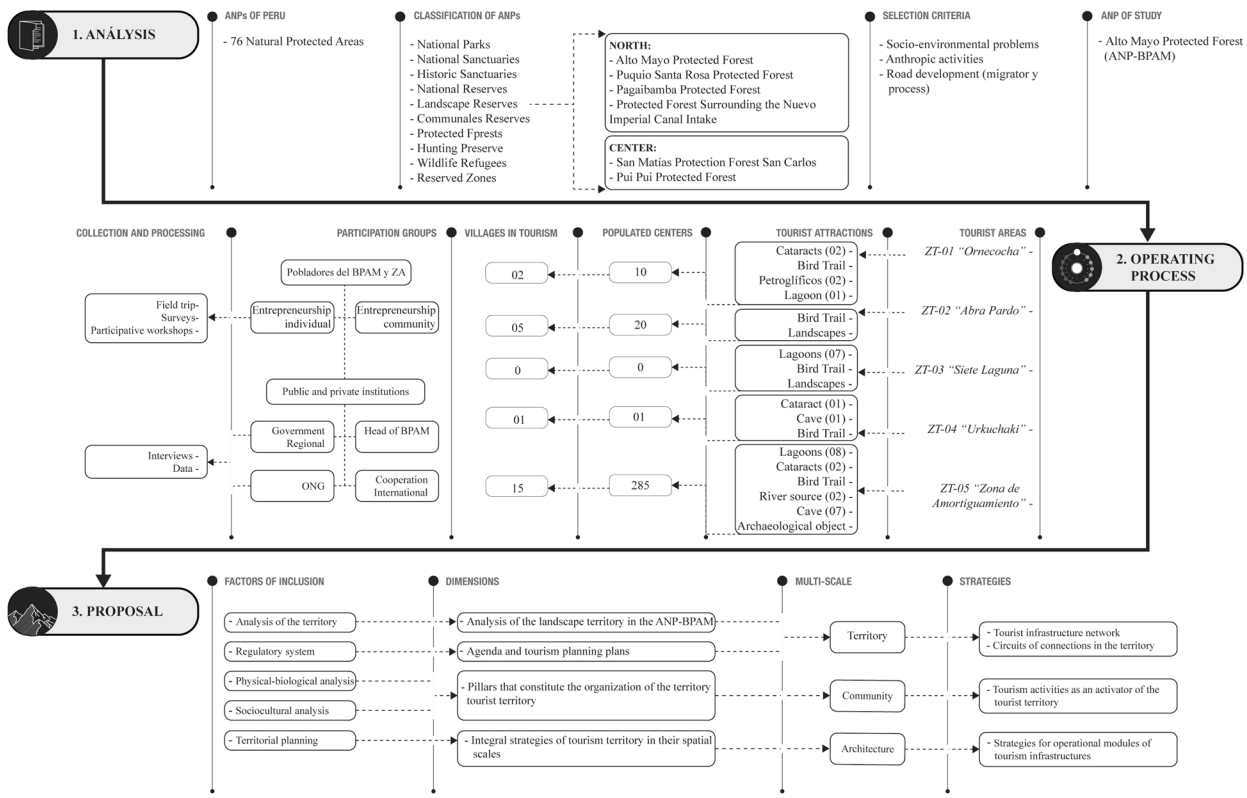

Fig. 3 Methodological scheme for planning integrated strategies for territorial tourism planning in the BPAM and ZA. Source: Author

of lodging and other services. In addition, the local people stated that there are few tour operators offering tourism services in the BPAM and that they are promoted privately because there is no working agreement between tour operators and SERNANP.

Currently, SERNANP's technical staff explain that the dissemination and promotion of tourism in the BPAM is promoted through its Facebook page, reports on TVPerú (national television channel), PromPerú (government office in charge of promoting tourism), tourism fairs, and informational brochures produced by BPAM staff. However, locals expressed that tourists ask for detailed information about the site, and without the appropriate material, it is not possible to offer a quality service. Evidently, the study participants (local people and SERNANP technical staff) were aware of the limited economic resources because the only support they received was from the private sector (NGOs and corporations) to improve their tourism offerings. Respondents believe that having a tourist attraction is not enough, and that it needs to be upgraded by developing infrastructure and services. To achieve this, it is essential that public institutions collaborate with the active participation of local communities to start developing the tourism dynamics of the BPAM and its ZA.

Participatory workshops also included drift (or transect) and community mapping as part of their diagnostic activities. The drift consisted of a guided tour with local people through the BPAM to exchange impressions and questions about what was observed during the tour. The educational tool "Community Mapping" consisted of empowering the population through the planning of their territory using base maps of the tourist areas. The comprehensive diagnosis resulting from the participatory workshops allowed the researchers to develop a wealth of information to support the proposal of comprehensive strategies to improve the tourist services offered by the BPAM: infrastructure systems (networks and modules), circuits, and tourist activities.

To prepare the material for the participatory workshops, SIGRID and Google Earth geospatial platforms were used to identify the locations of the BPAM territory's tourist attractions (SIGRID 2022). Geographic information system software such as QGIS, ArcGIS, and Global Mapper were used for the diagnosis of the site and proposal of the Master Plan through cartographies.

BPAM tourism planning instruments

The planning instruments are institutional documents that guide proposals for integrated strategies for the

development of tourism activities in BPAM. These documents are framed in the plans and norms of tourist use of NPAs, and in turn, are aligned with the National and Regional Plans of tourism in Peru (Benavides et al. 2008; Brack and Alfaro 2009; Gamboa 2017; MINCETUR 2019; Silva 2016). The main planning instruments related to tourism in NPAs are as follows:

- SERNANP Master Plan: Determines the planning components, such as land use planning, the connectivity approach, and the corridors to be interconnected in the Buffer Zone (ZA) considering land use and resource exploitation practices.
- Alto Mayo Protected Forest Master Plan: Stipulates the zoning of the ANP area, showing the potential uses of each zone to be considered in the proposal of integral strategies (BPAM 2013, 2023).
- BPAM Tourism and Recreation Use Plan (PUTR for its Spanish acronym): These indicate the guidelines for infrastructure equipment, transportation displacement, interpretation (environmental, cultural, and information), and the regulation and monitoring of tourism and recreation activities (SERNANP 2017).
- Site Plan: It orders tourism activity, develops criteria for architectural design, regulates the flow of tourists, and measures the carrying capacity (number of visitors within the permitted range).

The guidelines and strategies for tourism development in Peru are as follows.

- Regional Strategic Tourism Plan (PERTUR for its Spanish acronym): This is aligned with the national plan to diversify and consolidate the tourism market and supply.
- National Strategic Tourism Plan (PENTUR for its Spanish acronym): Focuses on competitive destinations, specialized tourism, investment, human capital development, diversification of tourism services, and connectivity.

Similarly, the 2030 Agenda for Sustainable Development has three goals that contribute to the development of sustainable tourism with the following targets: promote fair employment conditions and sustainable economic growth (SDG8); promote good sociocultural practices of sustainable tourism in collaborators, customers, and suppliers (SDG12); and contribute to the sustainable enjoyment and conservation of terrestrial ecosystems and biological resources (SDG15).

These tourism planning instruments focus on conservation, recreation, and education, which are oriented towards ecotourism products, environmental interpretation, scientific information, infrastructure, and transportation (Fig. 4). Therefore, based on the sustainable tourism plans of the BPAM, integrated planning strategies are proposed at territorial, community, and architectural scales. The strategies start from the analysis of the territory with spatial variables (relationship of the environment with tourist activity) and conclude with criteria in architectural project strategies.

Results

Analysis of landscape territory in BPAM

The BPAM territory is located in the middle and southern parts of the eastern mountain range, and forms the upper part of the Mayo River watershed. Owing to its geographic location, the physiography of the BPAM is characterized by deep to shallow mountainous relief with slopes ranging from 20 to 70%. The condition of the soil in areas degraded by agricultural activities poses risks of rain erosion, rock outcropping, and landslides. The vegetation cover of the BPAM originates from the characteristics of the forest ecosystem, with climates ranging from 24 °C to 6 °C (Fig. 5). The physical-biotic elements that make up BPAM are relief, climate, geology, soil, vegetation, land use, and fauna. This fauna consists of birds, mammals, reptiles, amphibians, and invertebrates. As such, the BPAM ecosystem promotes nature tourism, and conservation of its territory is a priority. BPAM has four types of forest cover: premontane, cloud forest, pygmy or dwarf forest, and grasslands.

- Premontane forests (700–1200 m.a.s.l.): This represents 6.14% of the BPAM's surface, characterized by timber trees that reach up to 45 m in height, and is the ecosystem with the greatest anthropogenic activity.
- Cloud forests (1200–2500 m.a.s.l.): 72% of the BPAM's territory are very humid and cold mountains that capture large amounts of water. These mountains are characterized by trees that are 25 m high and a variety of epiphytes, such as orchids, bromeliads and ferns.
- Pygmy or dwarf forests (2500–3200 m.a.s.l.): These occupy 15% of the territory and show stunted vegetation of 10 m height with mosses and terrestrial bromeliads.
- Pajonales (2900–4000 m.a.s.l.): Occupy 4.5% of the territory and are located on the highest ridges of the BPAM. It is characterized by hydromorphic soils and vegetation of three meters high herbaceous and shrubs (ichus).

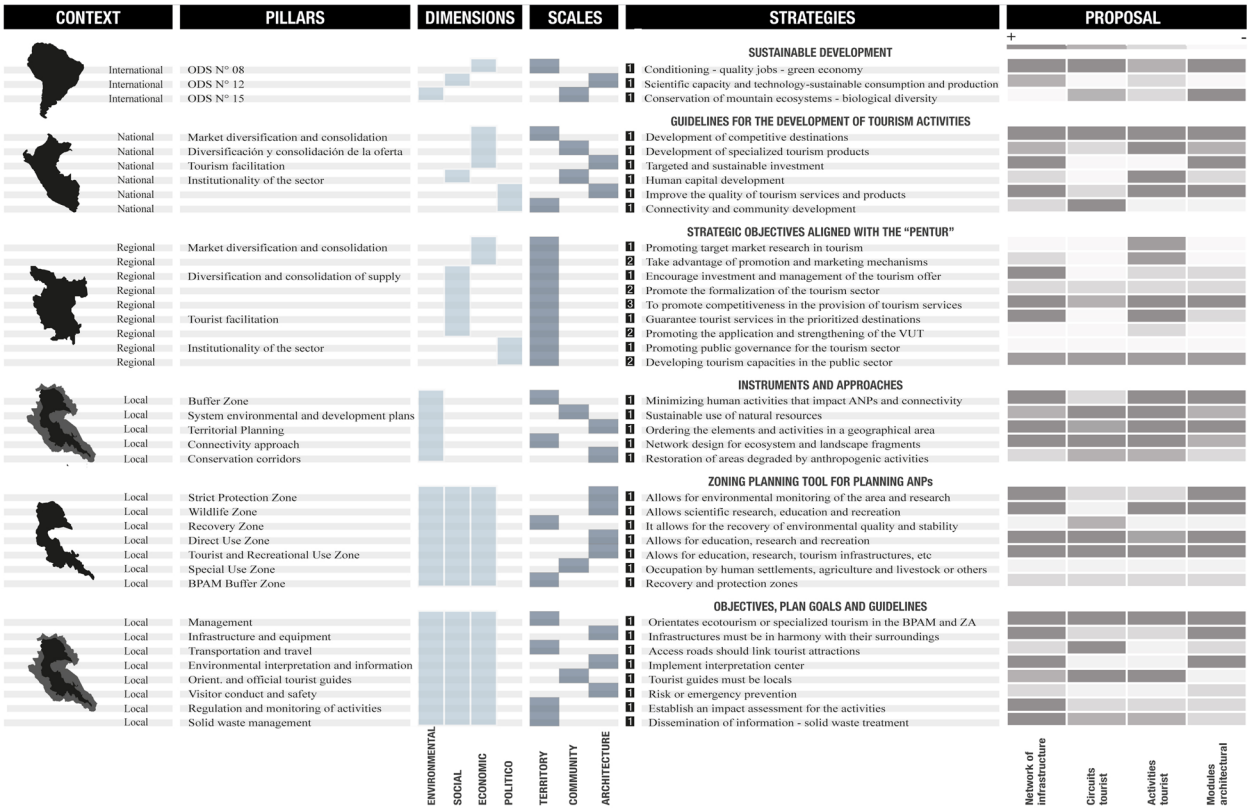

Fig. 4 Agenda and plans that guide integral strategies of the BPAM tourism territory. Source: Author, elaboration with data from Brack and Alfaro (2009); Gamboa (2017); MINCETUR (2019, 2021); Silva (2016)

The BPAM has five tourism use zones that contain natural resources (geomorphological and biogeographical attractions) and cultural resources (historical attractions with ancient architecture and typical towns) that make natural tourism development compatible with their management category possible. The five tourism zones have the following natural and cultural resources:

a) (ZT-01) Ornecocha: Lagoons, waterfall circuits, petroglyphs, and three populated centers.
b) (ZT-02) Abra Pardo (full name: Abra Pardo Miguel-Serranoyacu): bird watching trails, flora observation (orchids), endemic species such as the yellow-tailed choro monkey, waterfalls, and scenic scenes.
c) (ZT-03) Urkuchaki: Waterfall, orchid garden, meliponarium, production of organic products, bird watching, and flora.
d) (ZT-04) Seven lagoons: Set of seven lagoons with lengths greater than 10 km, bird watching, and Queñuales forest.
e) (ZT-05) Buffer Zone: Waterfalls, river springs, trails to caves, caves, butterfly beach, bird watching, agricultural landscapes, and religious historical and archeological resources of the Chachapoyas culture.

The main attraction of the tourist areas of the BPAM is bird watching, since this geographical area has the largest number of species (birds) in the North Amazonian Tourist Corridor (PROMPERÙ 2014; Silva 2018, p. 10; Williams et al. 2005, pp. 5–10). For this reason, SERNANP, through the administration of the BPAM, together with the NGO "Conservación Internacional" (CI), has encouraged nature tourism ventures in the population centers of these areas (SERNANP and Internacional 2017, pp. 26–36). Therefore, the BPAM is considered a dynamic system because of the relationship between geographic space and the population that inhabits and models it. For this reason, it is necessary to define intervention strategies for tourism use in territories that do not cause the degradation of natural ecosystems.

Scales in the BPAM tourist territory

The organization of the tourist territory of the BPAM is configured in territorial patterns: nuclei, nodes, and connectors. These patterns articulate a systemic whole in the tourist territory on three scales: territory, community, and architecture (Vitoria-Gasteiz 2014, p. 17).

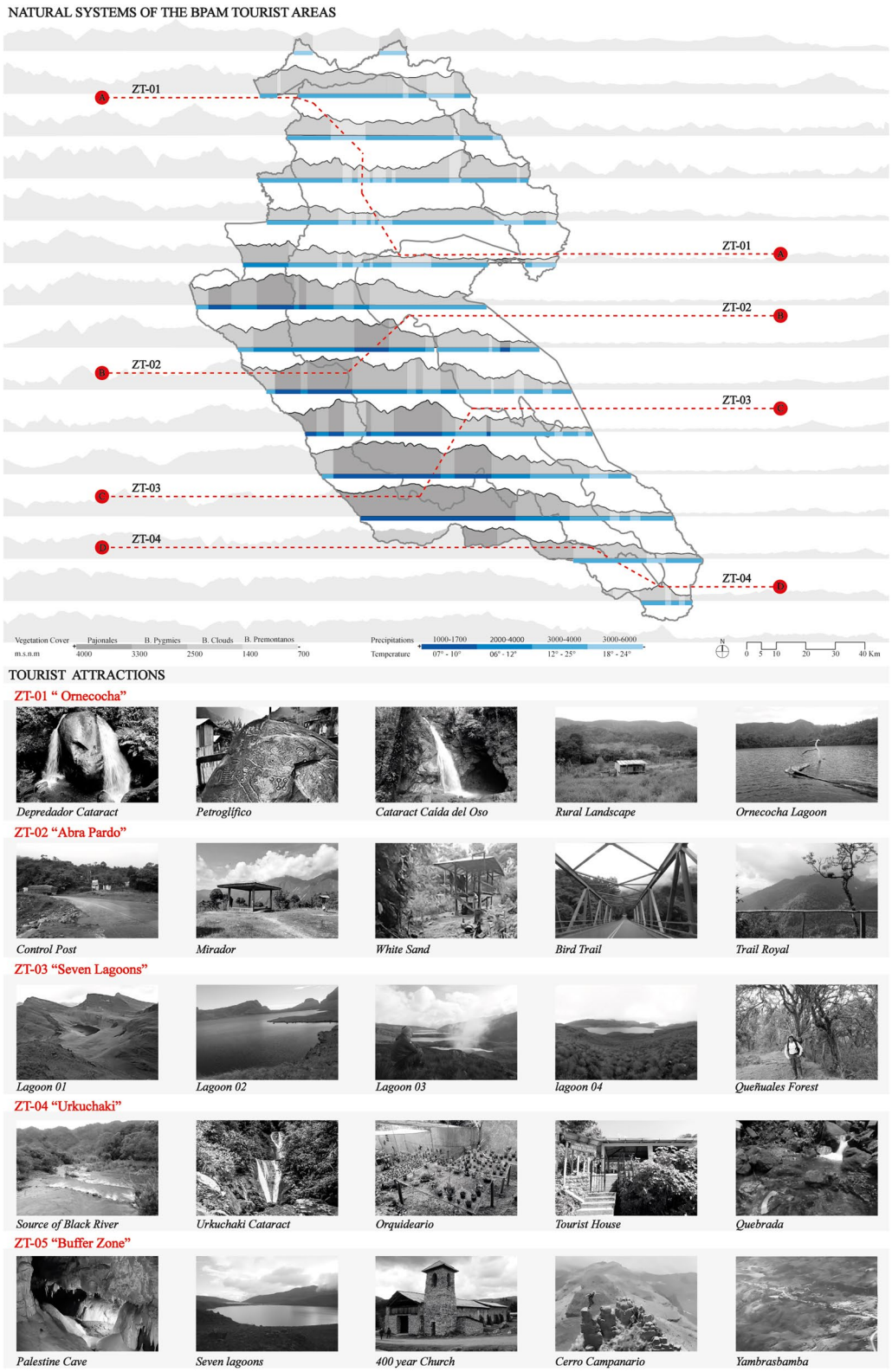

Fig. 5 Natural systems and attractions in the five touristisc zones of BPAM and ZA. Source: Author,elaboration with data from BPAM-SERNANP (2019)

a) Connectors: These are developed on a territorial scale. The connectors are composed of linear elements whose function is to allow the interconnection between the core elements and nodes in the five tourist zones of the BPAM.
b) Core elements: These were developed on a community scale. The core elements are communities that host tourism adjacent to tourist attractions.
c) Nodes: These are developed on an architectural scale. The nodes consist of tourist attractions dispersed in the territory with greater and lesser grouping.

The integration of the BPAM territory is structured around the road axis (Fernando Belaunde Terry Highway) that connects 174 km in the Buffer Zone (ZA) and 23 km in the Urkuchaki zone. The road axis is connected to dirt roads and bridle paths, leading to communities and tourist attractions.

There are 33 tourist attractions in the BPAM distributed in tourist zones: "Buffer Zone" (16 attractions), "Abra Pardo" zone (7 attractions), "Urkuchaki" zone (5 attractions), "Ornecocha" zone (4 attractions) and "Seven lagoons" (one attraction). However, these tourist attractions are not territorially interconnected because there is no operational plan compatible with the permitted uses of the resources and dynamism of the tourist territory.

BPAM communities are conditioned by context, population, and natural resources. Thus, the location of the communities developed in flat areas with little slope, resulting in loss of forest cover. However, areas with steeper topographic slopes remain isolated from human occupation. In addition, the inhabitants have modified the ecosystems from their natural state through socioeconomic activities, such as cattle ranching, agriculture (coffee planting), and timber extraction. The local population has designed their own access roads, mainly for two purposes: daily connection to their communities and extraction of agricultural products. These roads are characterized as dirt tracks without defined borders, and their width depends on the population size of the connected communities (between 30 and 80 inhabitants). The houses are built with local materials such as wood and adobe, are located in the same agricultural fields, and are part of the rural landscape (seven communities are located near a tourist attraction).

In BPAM, the architecture of the tourism sector developed in a disjointed manner in the territory. This architecture, elaborated by local inhabitants, follows autochthonous characteristics, using predominant materials from the immediate context. Architectural typologies of infrastructure have been found to provide tourist services such as restaurants, lodging, bird/landscape viewpoints, orchid gardens, and rest huts along the trails. This local architecture fulfills the immediate function for which they are built; however, it does not follow technical construction or architectural criteria. This lack of specialized advice is due to the fact that these infrastructures have been built by the local population with their own economic resources, either individually or collectively, depending on the type of project. It was found that only some attractions in the tourist zones "Abra Pardo", "Urkuchaki", "Seven lagoons" and "Buffer Zone" have some type of infrastructure due to their distant geographic location and difficult access. These characteristics on an architectural scale are evidence of the disintegration of infrastructure in BPAM's tourist territory.

The natural ecosystems of the BPAM are vulnerable to anthropogenic activities (Fig. 6). Nevertheless, the territory of the BPAM has the potential for nature tourism development through the development of integrated strategies based on an analytical and collective view of the physical environment (territorial patterns). These integral strategies will allow structuring the organization and development of tourism based on its operational logics at three spatial scales (territory, community, and architecture).

Integral strategies of tourism territory on spatial scales. SERNANP has tried to develop tourist attractions to propose a sustainable tourism strategy in search of new activities for the local people and conservation of the BPAM. However, they continue to have incomplete interventions because the development of tourist attractions has been carried out individually and in a disjointed manner. At least one of these elements has been implemented in tourist attractions: infrastructure, accessibility, and services. However, the project criteria are neither contextualized with the environment nor articulated at the territorial level in the BPAM to integrate the five tourist zones. Therefore, for tourist attractions to be conditioned and linked in the territory, they must be developed at three spatial scales (territory, community, and architecture) with integral intervention strategies to provide tourist services according to the BPAM norms. The proposal of this research is organized as follows: territory scale (infrastructure network and connecting circuits), community scale (activating tourism activities), and architecture scale (architectural configurations).

Scale of territory

Tourist infrastructure network The proposal for a BPAM tourism infrastructure network comprises 16 architectural modules that are located in the territory near a nucleus (or node) and linked by connectors. For this purpose, compatible relationships have been established with natural resources and/or attractions. In other words,

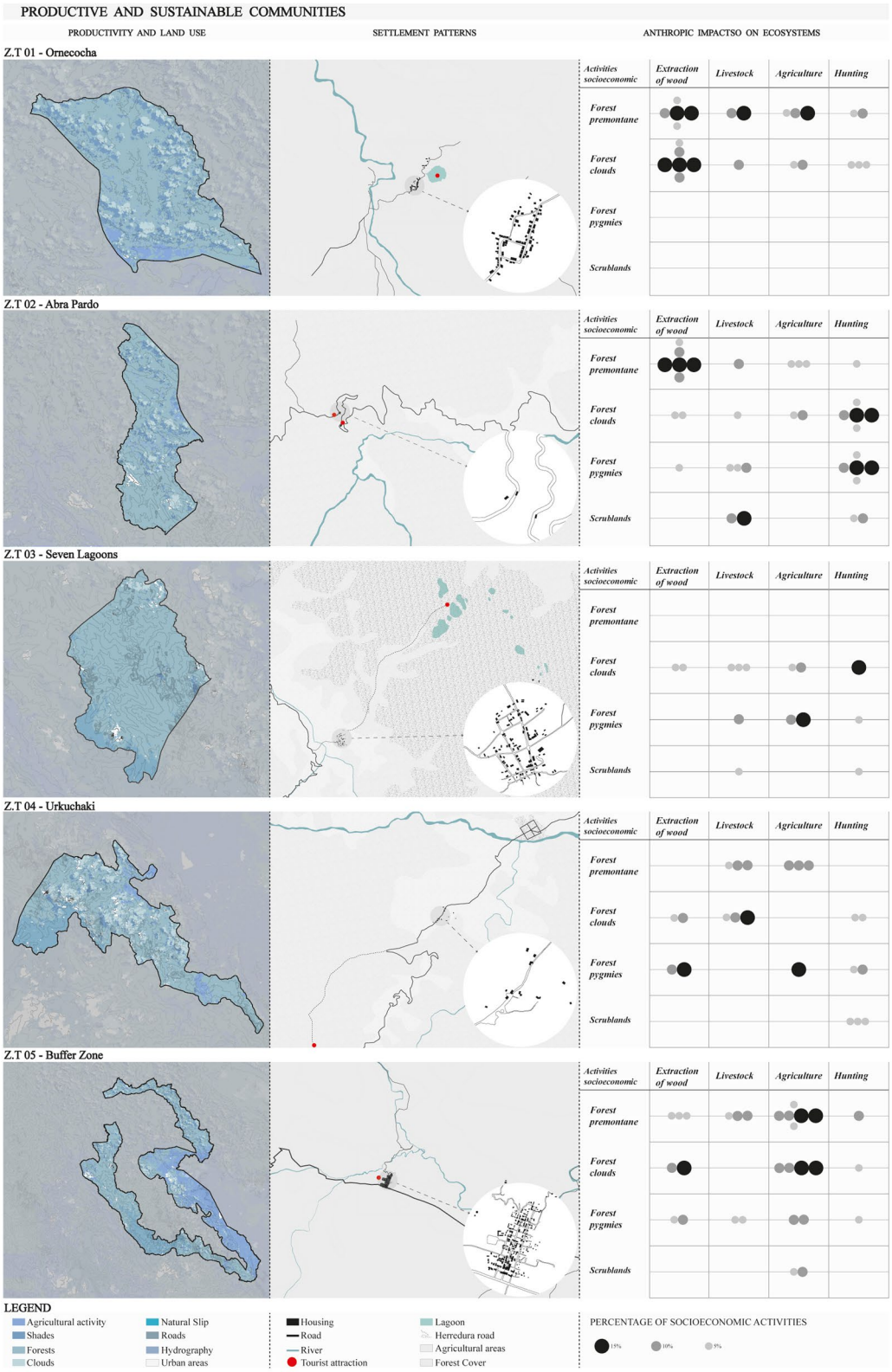

Fig. 6 Communities with proximity to tourist attractions: Occupation and location in the BPAM and ZA territories. Source: Author, elaboration with data from BPAM-SERNANP (2019)

the site (delimited area), activity (socio-economic), and technique (typology and/or architectural category) were integrated. For this reason, the architectural modules were grouped into five thematic categories (ecological, educational, cultural, agricultural production, and health equipment) following the guidelines for tourism uses of the ANP (Benavides et al. 2008, pp. 127–178; Gamboa 2017, pp. 28–34). The ecological and educational infrastructure will teach and involve specialized and amateur tourists in all activities to conserve the natural environment. Cultural infrastructure is intended to raise awareness about the importance of NPA. Agricultural production infrastructure will support the agricultural activities of the inhabitants. Health infrastructure will allow for the development of tourist services such as lodging, food, and first aid (Fig. 7). To achieve this, through the anasilis of the site, compatibility relationships, and classification of categories, a connection system is proposed in the five tourist zones on the scale of the territory.

Connection circuits in the territory The proposal of circuits to territorially connect the BPAM seeks to reduce the distances between tourist areas, improve existing routes, and innovate new connection infrastructure. For this purpose, territorial connections have been structured into three types of factors: ecological, diverse, and intermodal (Sechi et al. 2020, pp. 6–7).

- Ecological: The components of the territory are tourist attractions, population centers, lagoons, streams, forest cover, and deforested areas.
- Diverse: The distribution of tourist circuits in the territory is based on two circuits: terrestrial and aerial. The terrestrial circuit consists of an interpretive trial, river transportation, and corridors (ecological and biological). This circuit starts from a central axis (the national road FBT) that crosses the BPAM (and ZA), connecting the interpretive trails and corridors that lead to tourist attractions, natural habitats, and proposed infrastructures. The aerial circuit proposes an ecological cable car line to reduce transportation time between tourist areas without destroying the forest cover. This aerial circuit is located throughout the territory, with strategic station points near attractions or communities that are difficult or inaccessible to land. In addition, this terrestrial circuit offers tourists the possibility of observing microclimates and landscapes while the cable car travels through the altitudinal levels of the BPAM.
- Intermodal: The tourist route through the five tourist zones uses an intermodal transportation organization: cable car, trolley, horseback riding, and walking. Cable cars connect the five tourist zones and include inclusive transportation. Vehicles will be used where roads exist, horses will be used in hilly terrain, and walking will be used in less accessible areas. Water transportation is rarely used, and guaros and boats are used to cross rivers because there is no road infrastructure (bridges) (Fig. 8). Based on their location and function, each circuit was adequately articulated according to the physiography and geomorphology of the BPAM.

Ecological restoration processes of BPAM ecosystems In the BPAM, there were areas degraded by deforestation in the five tourist zones. The most affected are the "Buffer Zone" (45%) and "Ornecocha" (23%) and the least affected are "Abra Pardo" (17%), "Urkuchaki" (10%) and "Seven lagoons" (5%). Degradation and deforestation of terrestrial ecosystems are due to anthropogenic activities, such as timber extraction, forest burning, and shifting agriculture. Therefore, the territorial scale includes a proposal for ecosystem restoration (natural recovery in large areas and active regeneration in more degraded sites) through strategies that respond to activities that promote deforestation and the current characteristics of the soil (Cardoso et al. 2022, pp. 5–7):

- Timber harvesting: Natural recovery-type restoration is proposed in large areas with nutrient-rich soil but with habitat loss. For this, a natural regeneration strategy will be used (regrowth) and seed dispersal by biological species, where there will be minimal human intervention by monitoring (Rahayu et al. 2022, p. 8). This applies to the "Seven lagoons" and "Ornecocha" tourist areas.
- Forest burning: An active regeneration type of restoration was proposed because it is a site of greater degradation and is prone to erosion. For this, the strategy of microbial resources will be used to develop enzymes and combat the instability of the soil nutrient cycle (Guan et al. 2022, pp. 2–3). This will be applied in tourist areas "Abra Pardo" and "Ornecocha" Ornecocha'.
- Migratory agriculture: An active regeneration type of restoration is proposed because it is a site with greater degradation and an arid soil. For this purpose, a multi-layer agroforestry system strategy will be used to improve soil quality. This strategy consists of incorporating annual crops with different forest trees to improve soil fertility, as well as the presence of fauna and production of organic matter such as leaf litter (Purnama et al. 2022, pp. 8–12). This applies to the tourist zones "Buffer Zone", "Abra Pardo", "Urkuchaki" and "Ornecocha".

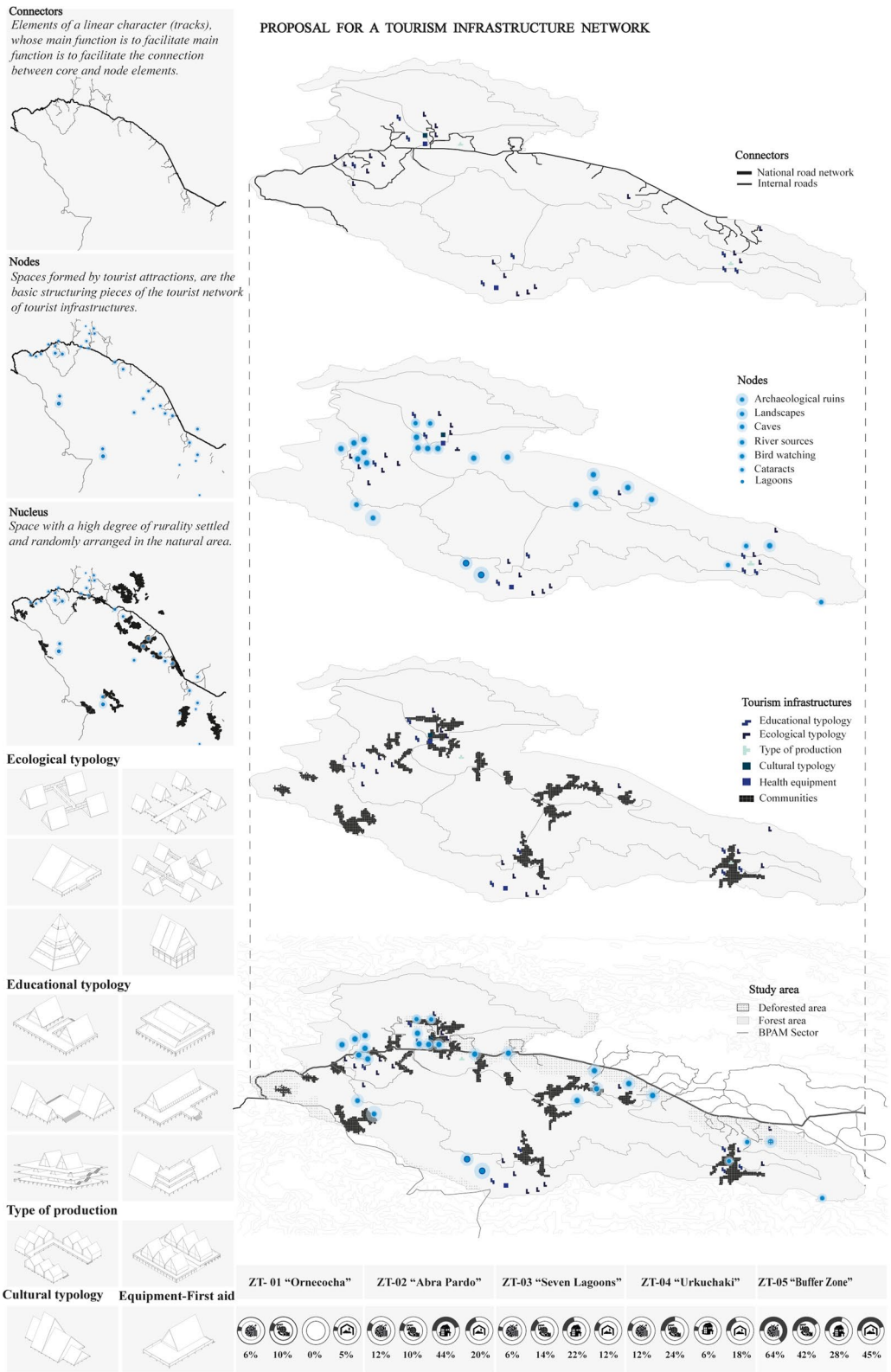

Fig. 7 Territorial patterns and proposals for tourism infrastructure networks. Source: Author, elaboration with data from BPAM-SERNANP (2019)

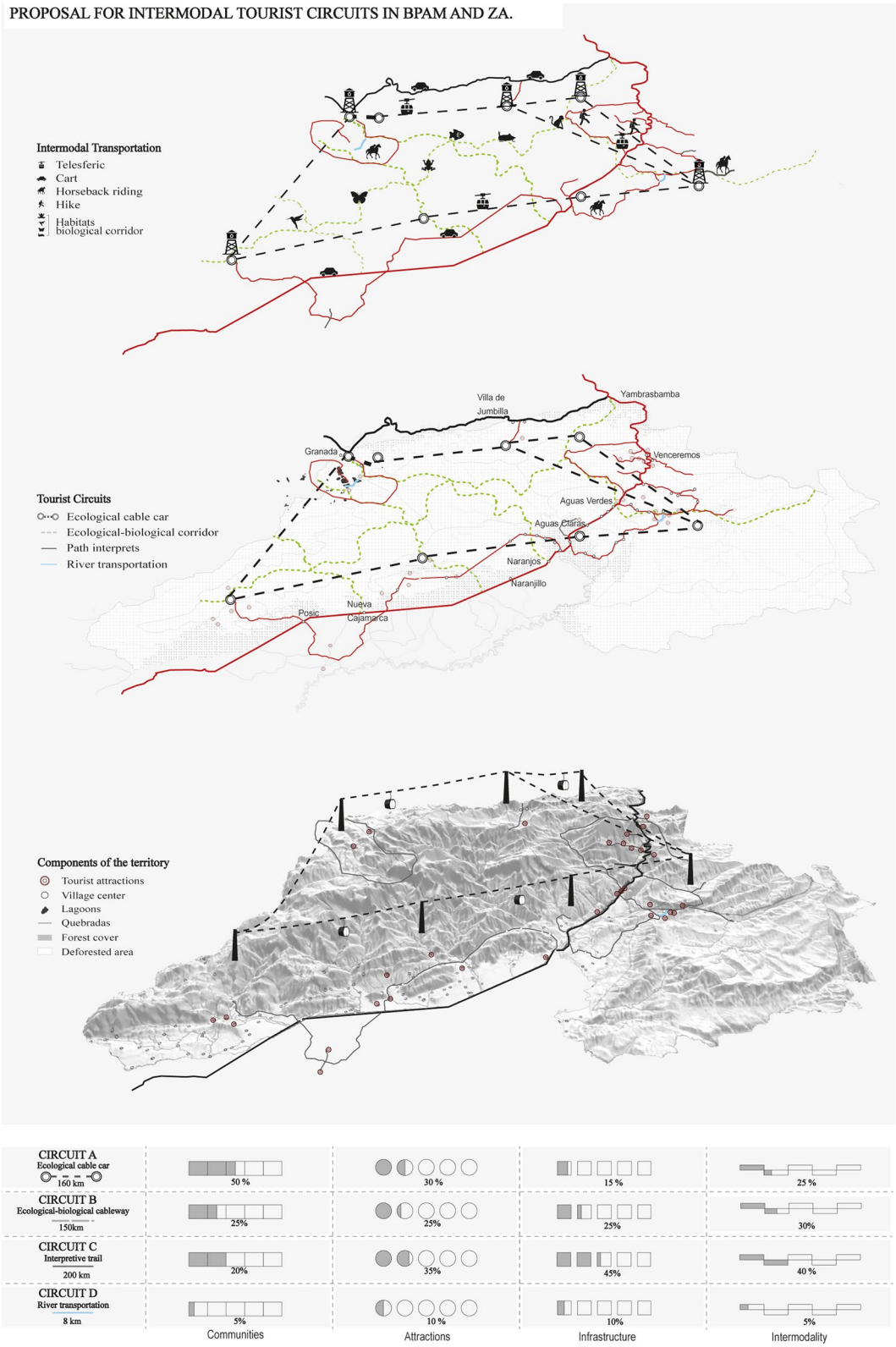

Fig. 8 Diagrammatic design of tourist circuits in five tourist use zones. Source:Author, elaboration with data from BPAM-SERNANP (2019)

Community scale: productive and sustainable communities

Tourist activities as activators of tourist territory The evaluation to determine the suitability of the BPAM territory for the proposal of tourism activities used the methodology of Nájera González et al. (2021, pp. 12–14). The territory's aptitude is classified into four categories: "ecotourism", "adventure", "rural/community" and "strict protection/low aptitude". Similarly, tourism activities were proposed for each aptitude. The following results were obtained:

- Ecotourism: 48.2% of the BPAM territory is considered highly suitable for tourism activities. The proposed activities include nature observation (flora, fauna, and landscapes), interpretive hiking, photographic safaris, and participation in biological research projects.
- Adventure: A total of 17.2% of the BPAM territory was considered to have medium-value suitability. Adventure activities involving physical exertion, land, water, and aerial activities have been proposed.
- Rural/community:11.4% of the BPAM territory is considered to have a low evaluation aptitude. Agrotourism activities, gastronomic workshops, handicrafts, and traditional medicine have been proposed.
- Strict protection/low suitability:7.2% of the BPAM territory does not allow any type of tourism.

Considering this classification, five tourism zones were proposed with the following activities: ZT-01 "Ornecocha": ecotourism; ZT-02 "Abra Pardo": major in extreme adventure and minor in agrotourism; ZT-03 "Seven lagoons": ecotourism, historical-cultural and community-based; ZT-04 "Urkuchaki": ecotourism and agrotourism; and ZT-05 "Buffer Zone": major in ecotourism and adventure (Fig. 9). The evaluation of the suitability of the territory allowed the proposals for tourism activities to be complementary to offer the tourist diversity of the BPAM.

Architectural scale: configuration of tourist infrastructure

Operational modules of the tourism infrastructure The architectural premises for the design of tourism infrastructure are based on four schematic strategies of modules that are configured by means of their components. These strategies respond to the characteristics of the four thematic categories and the context of the BPAM. The schematic strategies are composed of common components, such as connectors and landscapes, so their differentiation is established in the architectural composition. Strategy 01: single object; Strategy 02: vertical object; Strategy 03: horizontal object-thematic courtyards; and Strategy 04: biomimetic object. The variation in these components has allowed the operational proposals of variable designs that respond to the location of the types of landscapes and climatic conditions of the altitudinal floors. The landscape types were plain (valley) and mountain (foothills, slopes, and summit). The altitudinal floors are: Rupa rupa, Yunga, Quechua and Jalca. Considering these factors, the proposed tourism infrastructure is optimally organized into four groups: Valley-Rupa rupa, Foothills-Yunga, Slopes-Quechua, and Summit-Jalca.

The tourism infrastructure proposal was designed based on sustainability principles to reduce the impact on the habitat of natural ecosystems. The criteria and recommendations were followed with reference to other studies (Gálmez 2016, pp. 6–12; Yarasca-Aybar 2021, pp. 8–10). It was deemed necessary to use bioclimatic principles to implement local materials in building construction systems. For this reason, the roofs were designed at 60° angles for warmer geographic zones and 45° angles for cooler geographic zones. Both roofs serve as eaves to protect the spaces and walls from the effects of sunlight and heavy rain. The proposed interior heights are 2.85 and 3.20 m in cold areas and 3.50 and 3.85 m in warm areas. Moreover, considering that the infrastructure is located in a protected area, it was proposed to raise buildings above the ground so as not to degrade the habitat of the ecosystems. The infrastructure will be elevated from the ground level by means of piles at + 0.45 m, + 1.20 m, + 2.10 m and + 2.80 m in ascending form according to the relief of the four groups (Valle-Rupa rupa, Pie-Yunga, Ladera-Quechua and Cima-Jalca). Finally, the connecting element fulfills the function of uniting the architectural object and exterior space to interact and contemplate (Fig. 10).

Discussion

The development of project strategies as a tourist intervention in BPAM is based on the following four axes:

- Analysis of landscape context: Consists of physiography, vegetation cover, ecosystems, biological biodiversity, tourist areas, and anthropogenic activities. These elements are interrelated in territorial dynamics (geography, population, and architecture).
- The scales in the BPAM territory: The territorial patterns (connectors, nuclei, and nodes) are organized to articulate the territory at three scales (territory, community, and architecture) and in the five tourist zones. It also recognizes the potential and challenges of habitat (context, population, and natural resources), rural architecture (indigenous criteria, tourism activities, and predominant materials), and integration (road axis, communities, and attractions).

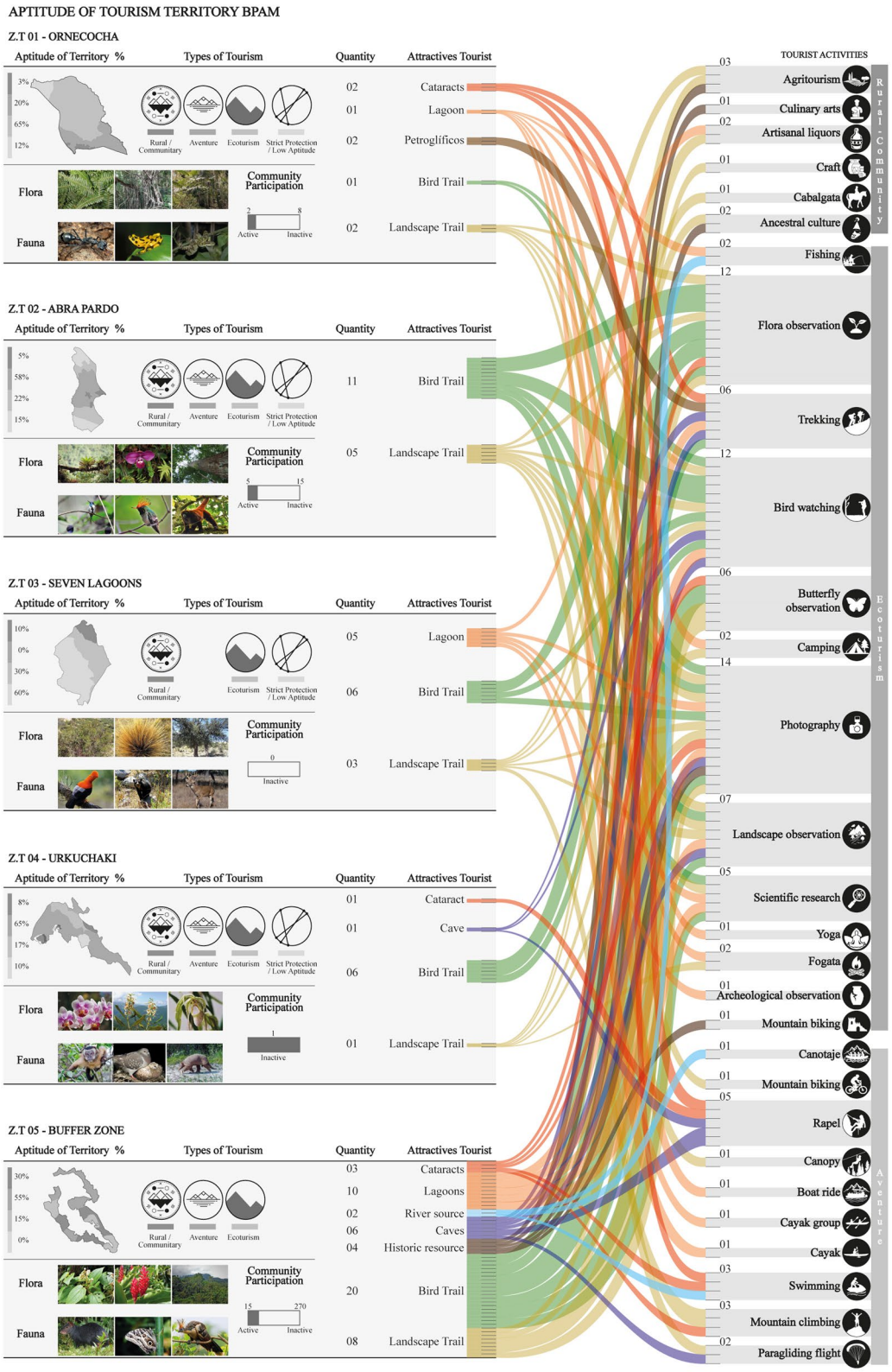

Fig. 9 Evaluation of the suitability of the tourism territory and proposal of tourism activities. Source: Author

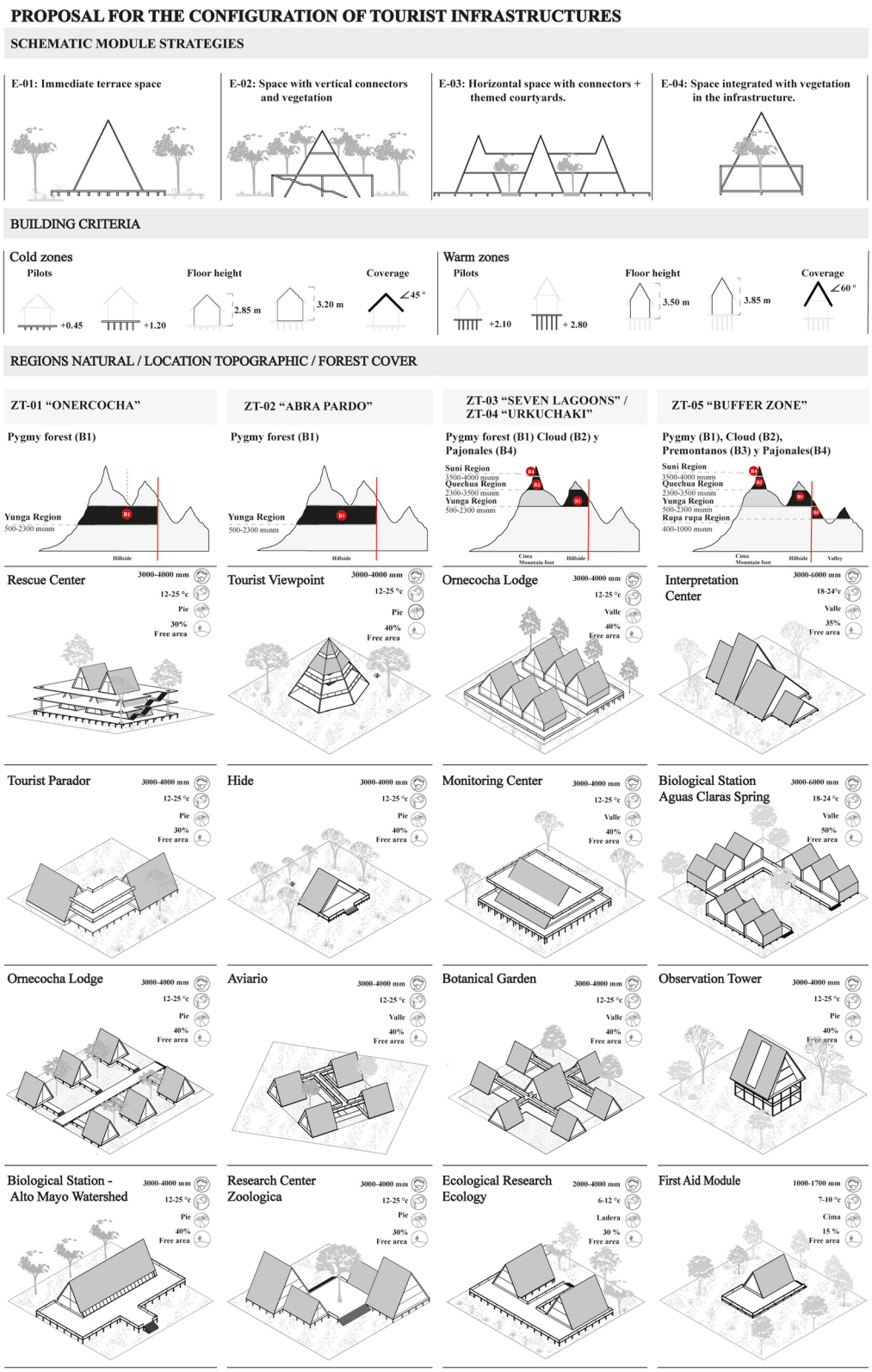

Fig. 10 Design of proposal modules for tourism infrastructure. Source: Author

- Agenda 2030 and planning instruments: This documentation guides the planning and design of sustainable tourism from an international, national, and local approach with guidelines to direct the proposal of project strategies in protected natural areas.
- Infrastructure configuration: The design of schematic modules that respond to variables such as location, climate, context, construction system, and building function is proposed.

In this context, this research articulates strategies with three approaches: (I) conservation of the territorial environment, (II) conditioning of tourist areas to be activated, and (III) exchange of socioeconomic activities of local people. These approaches foster a solid relationship between population, territory, and sustainable development based on the zoning of permitted uses in protected natural areas and their compatibility with BPAM plans. Therefore, the construction of an effective instrument (pedagogical tool for intervention in natural protected areas with tourism potential) with operational intervention strategies is supported by four principles: (1) territorial systems; (2) study problems; (3) normative frameworks; and (4) project strategies for the territory. Likewise, the three spatial scales (territory, community, and architecture) present the following strategies to dynamize the operational logic of the BPAM: (a) infrastructure network and tourist circuit, (b) tourist activities, and (c) configuration of 16 schematic modules (Fig. 11).

Comparison with international studies

The landscape components of the tourist territory in the BPAM comprise a forest ecosystem grouped into four types of forest cover (premontane, cloud forest, pygmy, and grassland). In contrast to the BPAM, in a context of rock field ecosystems in Brazil, the landscape and vegetation is characterized by three types of mosaic in open vegetation (grasslands, savannah with scrub and scattered mountain tops) (Fernandes et al. 2020, p. 3). Tourist use of the BPAM has been divided into five tourist zones (according to the PUTR plan), where bird watching and orchid observation are the main attractions. In the context of the Caribbean NPA (Cuba), there is also an institutional plan that establishes four tourist zones where attractions have been grouped into three categories (focal, complementary, and support services), highlighting the observation of the landscape environment (Ramón Puebla et al. 2020, p. 13). In contrast, in the European context (Poland), the Carpathian Mountains spatially organize their tourist attractions in three natural elements (mountain relief, water, and landscape), highlighting the diversity of mountain landscapes (Wieckowski 2020, p. 8).

The 2030 Agenda for Sustainable Development, the 2008 Master Plan, and the BPAM Tourism and Recreation Use Plan (PUTR) provide general guidelines for tourism management. However, there are gaps in project intervention for protected natural areas where there are communities (impacts of anthropogenic activities) despite the fact that there is zoning for operational planning. This gap is also evident in the Segua Wetland for Tourism (Ecuador) because its Management Plan proposes generic planning and lacks specific regulations for planning processes, public use programs, and land use zoning. Likewise, there is no administrative unit for the management of wetlands (Rivera-Mateos and Doumet-Chilán, 2021, pp. 37–38). This problem is similar in Brazil, where NPAs are created without management plans and the necessary infrastructure for their operation due to a lack of public resources, resulting in poor management of the territory (consolidation, implementation, and maintenance) and failure to comply with the conservation function (Araujo et al. 2019, p. 9). The BPAM administration has developed technical and economic support actions for communities so that they voluntarily opt to change activities that degrade the ecosystem for more sustainable activities (such as ecotourism) and, in this way, reduce socio-environmental conflicts. This type of management of the population is different in China () where its guidelines are coercive and governed by national conservation laws. Nanwan's administrative management excludes the local population from its intervention plans and prohibits them from any use of natural resources, causing greater conflict between communities without receiving ecological compensation (Cui et al. 2021, pp. 6–10).

The intervention strategies in the BPAM are organized on three scales (territory, community, and architecture), which are linked to the development of sustainable tourism in an operational architectural project plan (articulation and conditioning of the five tourist zones). In the case of nature-based solutions for NPA tourism development, Mandić (2019, p. 13) proposed tangible interventions for small (trails) and large-scale (green infrastructure projects) spatial planning in the territory. The strategies proposed for BPAM respond to the deficit of accessibility, infrastructure, and tourism services; they also propose technical criteria of sustainability for the design of architectural modules. In contrast, in the protected areas of Primorsky Krai (Russia), the design of ecotourism infrastructure follows three principles: sustainable development of the territory, reduction of environmental impacts, and functional spaces (Maslovskaia et al. 2020, p. 6). In addition, the most popular

	Indicators	ZT - 01 Ornecocha	ZT - 02 Abra Pardo	ZT - 03 Urkuchaki	ZT - 04 Seven Lagoons	ZT - 05 Buffer Zone
TERRITORY	Extension of Territory (ha)	44 mil (ha)	47 mil (ha)	43 mil (ha)	46 mil (ha)	243 mil (ha)
	Floors Altitudinal Rupa-Rupa Yunga Quechua Suni/Jalca					
	Accessibility					
	Most visited	10%	45%	9%	13%	23%
	Potential Tourist	Cataracts	Bird watching	Lagoons	Agriculture	Walks
COMMUNITY	Impacts from Activities Anthropic	Agriculture 45%	Wood extraction 45%	Hunting 30%	Agriculture 35%	Agriculture 35%
	Communities with Service Tourist	Tourist guide	Birdwatching Circuits	Regional Gastronomy	Tourist guide	Lodging / Gastronomy
	Distance from the Communities Attractions	0.69 km	18 km	10 km	6.5 km	16 km
	Use of Materials	Wood 100%	Bamboo 17% Brick 35% Wood 48%	Adobe 75% Stone 15% Brick 10%	Brick 22% Wood 78%	Adobe 15% Brick 65% Wood 20%
ARCHITECTURE	Infrastructures Tourist Existing	Does not have	• Restaurant (03) • Hosting (01) • Resting Tambo (02) • Hyraulics (01) • Parking (01) • Trail (04) • Mirador (02)	• Tambo for camping (01) • Tambo de descanso (02) • Restaurant (01) • Rustic cabin (01)	• Tourist house (01)	• Restaurant (05) • Hosting (04)
	Infrastructures Tourism Proposals	• Ornecocha Lodge • Rescue Center • First aid module • Tourist Parador	• Biological station for the watershed conservation Alto Mayo • Mirador • Hide • Aviario • Biological station of the moustached owl • Zoological research	• Tourist Lodge • Monitoring Center for the Alto Mayo basin • Mirador • Hide • Observation tower	• Tourist Parador • Botanical Garden • Tourist Lodge • Hide • Ecological Research Center BPAM	• Hide • Naciente Biological Station of Aguas Claras (agricultural production) • Interpretation Center BPAM • Observation Tower • Tourist Lodge • Mirador • First aid module
	Types of site	Mountain foot	Mountain foot Valley	Hillside Cima	Mountain foot	Valley Mountain foot Hillside Cima
	Configuration Arquitectural	E-01 E-03 E-04	E-01 E-02 E-03 E-04	E-01 E-02 E-03	E-01 E-03	E-01 E-03

Fig. 11 Spatial scales in BPAM and ZA tourism territories. Source: Author

architectural objects to be developed in Russia are vertical structures (open towers) for research, monitoring, emergencies, and educational purposes (Vavilova and Vyshkin 2018, pp. 7–9). In the case of natural protection areas in Poland, strategies for new designs, applications, and functionality of the architectural object in relation to the context of the area and its accessibility have been proposed to improve the tourist experience (Maciejko and Wojtyszyn 2019, p. 3).

Recommendations

It is recommended that the methodology of this study be considered in Natural Protected Areas (NPAs) of the Peruvian Amazon with similar geography and tourism activities for the development of project strategies. These NPAs are: National Parks (Rio Abiseo, Tabaconas Namballe, Yanachaga Chemillén and Tingo María), National Sanctuaries (Cordillera Colan and Megantoni), National Reserves (Tambopata, Pacaya Samiria), Communal Reserves (Amakaeri, Purús, El Sira, Ashaninka, Yanesha and Machiguenga), Protected Forests (Pui pui and Pagaibamba) and Reserved Zones (Santiago Comaina). Likewise, it is recommended that the faculties of architecture in Peru guide the research of integral projects focused on sustainable development to apply for an annual scholarship contest in research on NPAs. It is also suggested that the public sector should make an inter-institutional agreement between SERNANP and the National System of Evaluation, Accreditation, and Certification of Educational Quality (SINEACE) to promote accreditation programs for universities where their research is oriented towards contributing knowledge for natural resource conservation. Finally, it is recommended that SERNANP incorporate this research into the new updates of the "Master Plan" and the "Tourism and Recreation Use Plan (PUTR)" to seek funding for the implementation of the strategies proposed in this research.

Conclusions

This research exposes a methodological process of analysis to the tourist territory of the Natural Protected Area "Bosque de Protección Alto Mayo" (BPAM) through its environmental, spatial (territorial patterns), and normative technical variables. From this, integral strategies of projective character were developed to articulate the tourist territory of the BPAM using three spatial scales: territory, community, and architecture. These scales are interrelated with the generation of dynamics within the territory. Therefore, each scale considers the protection of natural ecosystems and integrates dynamic elements that make it possible to develop sustainable tourism.

- The territory scale configured territorial patterns (communities, tourist attractions, and connecting routes) as a systemic set to understand the elements that make tourism development operative. A network of tourist infrastructure was proposed under four categories related to their context and the needs of the places where they were located. Likewise, the design of air and land tourist circuits allows for the connection and dynamism of all attractions.
- The community scale evaluated the aptitude of the territory, which included the tourist attractions and activities of the population, in order to propose tourist activities as activators of the territory in three categories: ecotourism, adventure, and rural.
- The architectural scale configured the tourist infrastructure from four module schemes composed of three components: the object, connector, and site. These components are transformed by their category, and the design solutions consider sustainability criteria.

Finally, this study has demonstrated the implications of interventions in natural protected areas with tourism potential. The planning of extensive territories far from urban centers remains a complex field of research and is in continuous rediscovery to provide sustainable intervention proposals. Finally, this study encourages the development of future research that proposes new integrated planning and architectural strategies that can serve as pilot projects to be replicated in the natural protected areas (NPAs) of the Peruvian Amazon.

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Author contributions
AN conceived and designed the research, collected the data, performed the analysis, and wrote the paper. AA conceived and designed the research, contributed analysis tools, and wrote the paper. CY conceived and coordinated the study, contributed analysis tools, and structured the manuscript. All authors read and approved the final manuscript.

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Declarations

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Publisher's Note

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