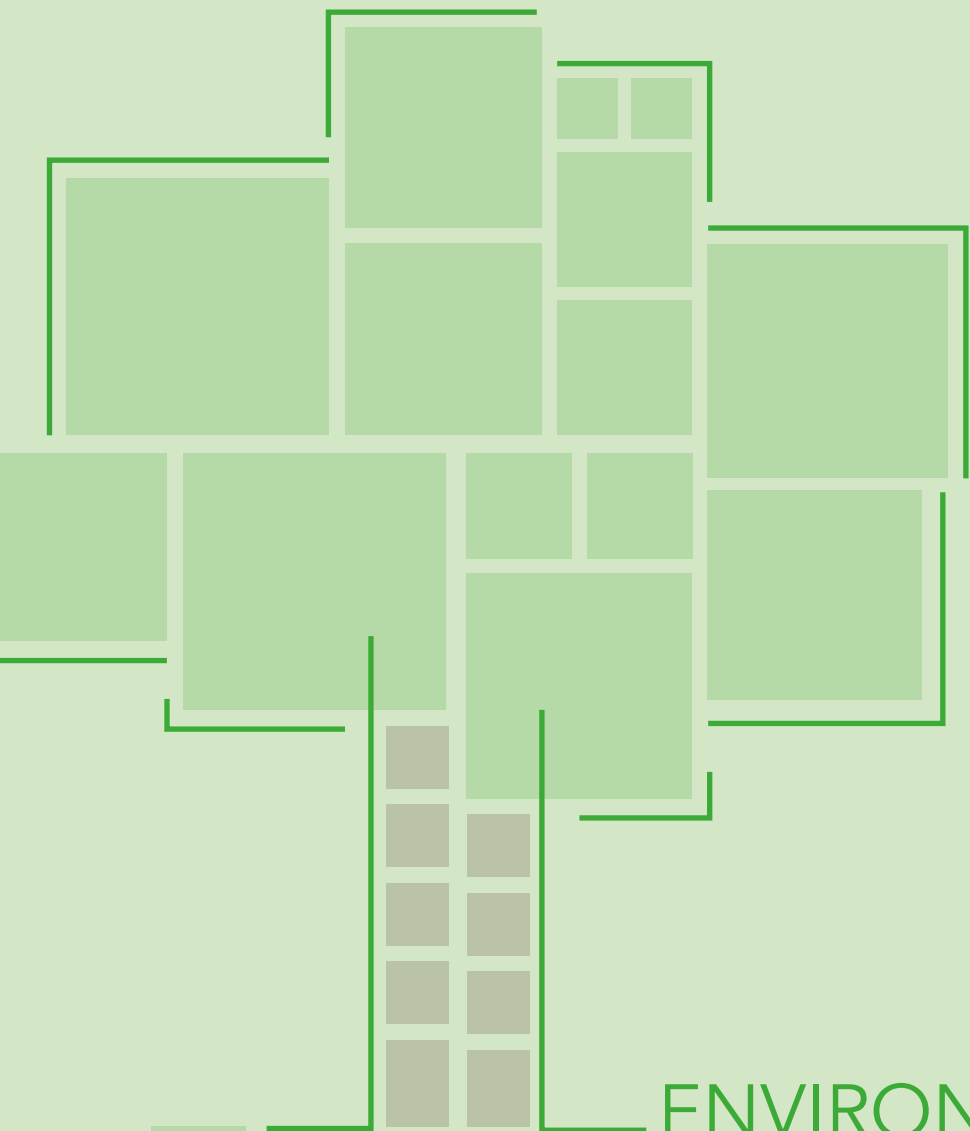


ENVIRONMENTAL EDUCATION EXPERIENCES IN BIOSPHERE RESERVES OF PERU







ENVIRONMENTAL
EDUCATION EXPERIENCES IN
BIOSPHERE RESERVES OF PERU

Editors

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TO RENÉ VALENCIA

Pioneer in initiating and consolidating the management of the Huascarán National Park, Professor René Valencia gave 40 of the best years of his life working in what most filled him with passion and pride, conservation of our natural heritage and especially its mountains.

He began this great journey in 1973, participating in the process of promoting the creation of the park, and then becoming part of the technical team and later head of his beloved Huascarán.

His contribution has been enormous to the consolidation of the concepts of conservation not only of the Huascarán National Park, but of the Biosphere Reserve of the same name, highlighting its role in research of the Andean flora together with the researcher David Smith.

The personal commitment he made to the park also led him to venture into environmental education, becoming one of the greatest icons in this important issue within the national system of natural areas protected by the state, whose legacy is present to this day.



Also called “*the master of the mountains*”, Professor René knew how to reach the hearts and minds of the local people, as there was no person who he did not make reflect after asking his famous question, do you know where the water we drink comes from?

We will always remember his musical compositions that accompanied the joyous dances of the APU HIRCA, character of his creation with which he enlivened his presentations to the different actors in the protected area.

Huascarán National Park and its Biosphere Reserve will stand for present and future generations thanks to the teachings of Professor René, who left sown in the hearts of Peruvians love for conservation and environmental education.

Until then, professor ■



ACRONYMS

ACCA	Association for the Conservation of the Amazon Basin
ANIA	Association for Children and their Environment
APECO	Peruvian Association for the Conservation of Nature
ASAAM	High mountain auxiliary association
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
BR	Biosphere Reserve
BSCC	Biological Station Cocha Cashu
CECOBO	Education Campaign for Forest Conservation
COPREDAM	Council of Programmes of Environmental Education
DESCO	Center for Studies and Development Promotion
DIRCETUR	Directorate of Foreign Trade and Tourism
DRE	Regional Directorate of Education
ECOBOS	Education and Conservation of Dry Forests Programme
EE	Environmental Education
EENP	Environmental Education National Policy
EESP	Environmental Education Strategic Plan
FZS	Frankfurt Zoological Society
GDRBE	General Directorate of Regular Basic Education
HBR	Huascarán Biosphere Reserve
HS	Historical Sanctuary
ICAA	Initiative for Conservation in the Andean Amazon
IEEP	Integrated Environmental Education Projects
INRENA	National Institute of Natural Resources
LEMU	Local Education Management Unit
MAB	Man and Biosphere Programme
MINAM	Ministry of Environment
NP	National Park
OAYBR	Oxapampa Ashaninka Yanasha Biosphere Reserve
PNA	Protected Natural Areas
SDZG	San Diego Zoo Global
SERFOR	National Forestry and Wildlife Service
SERNANP	National Service of Protected Natural Areas
SMSCPF	San Matías San Carlos Protected Forest
UNESCO	United Nations Education, Science and Cultural Organization
WWF	World Wildlife Fund
YChNP	Yanachaga Chemillén National Park
YEB	Yanachaga Ecological Brigade

INTRODUCTION



Since their establishment and process of implementation, biosphere reserves present countless experiences related to the purposes of their creation. In that sense, we can highlight various conservation actions or sustainable development strategies implemented, of which are also involved logistical actions and the generation of knowledge which precisely tune, conservation, development and human beings as managers and beneficiaries of this relationship. Likewise, Peru is no stranger to this experience because it currently has four biosphere reserves.

In this sense, one of the goals we pursue with this document is to highlight the different experiences of environmental education implemented in the four biosphere reserves. In this way, you will get to know the experience of young volunteers of the province of Oxapampa, who formed the Yanachaga Ecological Brigade (YEB). Likewise, you may also take note of the experience of education and conservation of dry forests in schools of the Northwest Reserve (ECOBOS for its acronym in Spanish), in coordination with decentralized bodies of the Ministry of Education; as well as the incorporation of the biosphere reserve approach in regular basic education through the local education management unit (LEMU) in the Huascarán BR or in the case of the Manu Biosphere Reserve, the experience of intercultural environmental education in the tropical Andes.

These experiences are the result of the intervention of various actors, among which are the managers of protected areas (biosphere reserves), sectorial authorities and different levels of government. They have also been the result of the participation of other strategic partners such as financial sources themselves with important projects. The effort that these players have made and continue to make is arduous, and all this has allowed the development of different initiatives on environmental education as part of the ongoing process of awareness of the importance of biosphere reserves and their contribution to the country. For this reason, it is necessary to note that these spaces offer Peru models of sustainable development, and, ultimately, these experiences in environmental education will serve other territorial areas, and especially local authorities or local managers so they can develop articulated programmes between development and conservation, which have the human being as a supreme goal.

It is worth mentioning that major challenges that go beyond the World Congress of Biosphere Reserves, and among them to think about sustainability is fundamental. The continuity of these experiences requires joint efforts and resources, but also the transmission or reproduction of these experiences to other intercultural regional areas or other protected areas of the

country. So it is increasingly evident that awareness processes of a transversal manner are part of the pillars of these models of development, that have as a course harmony between sustainable development and conservation, where the common interest is a priority.

Finally, another of the challenges of the BR is the exchange of intercultural experiences via networking. We can assume that challenge in Latin America and it will allow us to enrich ourselves in this shared path of good living, with greater environmental awareness and culture that allows authorities and citizens to do things better from the BR and the protected natural areas in mega diverse countries and with a great cultural richness as ours ■

Pedro Gamboa Moquillaza
Chief of SERNANP

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THE BIOSPHERE RESERVES AS EDUCATIONAL LABORATORIES

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This book is part of an important process of reflection and systematization on behalf of the biosphere reserves of Peru to expound their long history of environmental education. Taking as a landmark the IV World Congress of Biosphere Reserves, to be held in March 2016 in Lima, various institutions and entities involved and interested in environmental education in Peru have wished to participate in this process. Besides the immediate result, reflected in this book, the enormous potential of biosphere reserves to be authentic educational laboratories is glimpsed.

Environmental education as a tool that generates ability to analyse with foundations the reality and propose solutions to problems collaboratively, is also a means to enhance resilience among the population and awareness of their role in the proper conservation and management of their environment.

The Man of the Biosphere (MAB) programme began in 1971, and has been supporting the creation of participatory spaces for conservation for 45 years and today is a global network in 120 countries, consisting of 651

biosphere reserves, including 15 transnational areas. The objective of the MAB programme and of the biosphere reserves is to promote development based on scientific knowledge and the inhabitant populations, to be inclusive, equitable and sustainable, in order to improve the lives of people and ensure management resources for better conservation.

Therefore, the Biosphere Reserves are ideal places to test sustainable means of livelihoods and imagine synergies between participation, management and education. Likewise, the MAB programme encourages the exchange of information between biosphere reserves, boosting reproducible results and sharing successes in networks.

In the following pages, the four biosphere reserves in Peru recount the most important milestones of their history in environmental education and describe a concrete experience. As these chapters' form most of the book, it follows that the interest lies precisely in the different ways in which the potential of each reserve as an educational laboratory, is understood, where it is possible to utilize the resources that the

environment gives the population and directs it to consciously participate in sustainable development.

This collection of experiences, invites us to reflect and to consider the importance of periodically reviewing where we are in order to direct the path towards the common goal.

We want to thank all the people who have collaborated in the creation of this book, from those who have invested their time in collecting experiences, who have dedicated their time to develop environmental education processes and even those who have participated, unconscious sometimes that

they are building a liveable present with every little action.

We hope that people who look at these experiences find inspiring ideas or patterns that connect us around the world and among all men and women; continue taking advantage of the opportunities offered by the biosphere reserves to be educational laboratories, complement to formal education within the classroom and of the community education, and also become suitable places of meaningful learning, research; in vivid and inspiring ambients and recognized for their special natural and cultural features ■



2 ENVIRONMENTAL EDUCATION IN PERU

Enhancing environmental education in relation to biosphere reserves: Cross-cutting proposals of the ministries of Education and Environment

Along with achievements in the world, Peru has been promoting during several years the planification, implementation, monitoring and evaluation of programmes, projects and environmental education initiatives in relation to the natural areas protected by the state, including biosphere reserves. This effort has been increasing in a multi-sectoral way and from different levels of government, in order to enhance and strengthen the biosphere reserves and so link them to the growth of formal educational systems and processes and informal ones in as much as these spaces are educational resources par excellence and contribute to improving the quality of life and the environment in general.

In this context, the Environmental Education National Policy (EENP), approved by Supreme Decree N° 017-2012-ED, contains a set of policy guidelines related to conservation, care and sustainable use of protected areas, including biosphere reserves.

The EENP focuses its efforts on developing an environmental education that has, as its starting point, the recognition of the environment as an inseparable reality of individuals, their societies and cultures. To this

end, it incorporates the environment and development relationship, and seeks to achieve the shift towards a united, democratic and just society in which economic growth is achieved while respecting the natural and cultural heritage of our country through the active participation of the population in environmental management processes, thanks to the existence of citizens aware of their duties and environmental rights.

In sum, the EENP seeks for citizens to have a strong environmental ethical awareness, exercise their rights and environmental duties responsibly, be mobilized in an organized and peaceful manner, undertake environmental initiatives in their home, neighbourhood or community in general, with a GLOCAL (think global – act local) vision.

The National Environmental Education Plan 2016-2021 (PLANEA for its acronym in Spanish), in the process of being approved, highlights in its strategic actions (2.1.1, 2.1.2 and 2.1.3) the importance of raising awareness on the protection of biodiversity, promotion of environmental awareness, sustainable management of natural resources

and care of natural spaces, through its recognition and use as an educational resource. Also, the importance of joint work is highlighted with the institutions that guard these natural areas and coordination with local and regional governments as well as civil society, in order to schedule visits and use these iconic natural areas as an educational resource.

Currently, the Ministry of Education (MINEDU) is carrying out an awareness-raising and advocacy activity that encourages comprehensive training processes of managers, specialists and teachers in pedagogical strategies of initial, primary and secondary education, with authorities and specialists in environmental education of the regional directorates of education (RDE) and local education management units (LEMUs).

To implement the PLANEA, the Environmental Education Unit (EEU) of the General Directorate of Regular Basic Education (GDRBE), the agency in charge of guiding its implementation, presents the strategy of Integrated Environmental Education Projects (IEEP) to develop in a transversal way the components with an environmental focus: Institutional Management and Education, Education on Climate Change, Eco-efficiency, Health and Disaster Risk Management.

The IEEP respond to active learning, offer challenging situations, encourage collective work and constant research. Teachers are encouraged to listen to students, motivate them, share their knowledge, provide creative materials in a climate of affection and appreciation of diversity, gender equity, with an intercultural approach and environ-

mental responsibility. In IEEP students are assumed to be the managers of their own learning, make informed decisions that contribute to the overall task of recovering and caring for planet Earth.

In this sense, one of the IEEP proposals is directly related to the conservation and use of biosphere reserves as an educational resource. This proposal is called ViVe (for its acronym in Spanish): Life and Green and seeks to strengthen the evaluation and use of protected natural areas (PNA) and other natural areas and biodiversity. In order to contribute to the fulfillment of the paragraph i) of Article 2° stated in Law N° 26834 on Protected Natural Areas, which states that: means and opportunities for educational activities as well as for the development of scientific research should be provided.

With the aim of encouraging the active participation of educational communities in developing good environmental practices, the EEU-GDRBE of MINEDU, in coordination with the General Directorate of Education, Culture and Environmental Citizenship of MINAM, promotes a set of school competitions and national awards. For example, the Best Practices Contest of Environmental Management has a category called “Protected Natural Areas Take the Schools” and is linked to biosphere reserves. This category aims to raise awareness in children and adolescents on the importance and social and environmental benefits of natural spaces. Also, the “Antonio Brack Egg” National Environmental Prize has a category called “Environmental Education”, in which teachers from various educational institutions related to biosphere reserves present themselves. In these awards, educational

institutions located in the reserves of the Oxapampa-Ashaninka-Yanesha biosphere, such as educational institutions Tupac Amaru, Our Lady of the Rosary, Niño Manuelito, among others, have been recognized.

Similarly, as part of the implementation of the EENP and the 2030 Agenda of Sustainable Development Goals (UNESCO), the MINEDU and MINAM propose, as a plausible option, environmental education for sustainable development. According to the proposal, educational institutions should become dynamic spaces of healthy interaction between educational communities (students, teachers, administrative staff, service workers, etc.) and their environment. This process of change will involve a curricular adjustment with an environmental approach, which considers the spaces in the classroom and outside it, and

the use of methodologies and outdoors pedagogical strategies (personal, interactive, meaningful experiences). It may also involve the redesigning of educational spaces and physical environments of educational institutions, including the provision of green areas (productive, protective and not only ornamental), recovery of disused educational spaces, implementation of healthy kiosks, relocation of clean points, changes towards eco-efficiency in lighting and ventilation systems, responsible water use both in irrigation and human consumption, reuse of grey water, among others. These variations in educational spaces should foster a climate of well-being and comfort that contributes positively to education, friendship and fairness, and have an opening to interact with the natural areas of the community and the region in which they develop.

On the other hand, MINEDU and MINAM, aware of the importance of having a National Environmental Education Plan (PLANEA for its acronym in Spanish) have coordinated with other public and private entities, as well as civil society in the preparation of this document which is currently in the approval process. The PLANEA will greatly contribute to the articulation of thousands of educational experiences, in both the formal and community environments. In this sense, its approval will be very valuable for the purposes of preserving, protecting and using in a sustainable way the biosphere reserves as part of education for sustainable development ■



3 EXPERIENCES OF ENVIRONMENTAL EDUCATION IN BIOSPHERE RESERVES IN PERU

3.1. Oxapampa-Ashaninka-Yanesha Biosphere Reserve (OAYBR)

“Training environmental leaders for a different future”

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1. The biosphere reserves and the environmental education

The Oxapampa Ashaninka Yanesha biosphere reserve (OAYBR) covers the whole of the province of Oxapampa with its eight districts: Constitución, Chontabamba, Huanca-bamba, Oxapampa, Palcazú, Pozuzo, Puerto Bermudez and Villa Rica. It has an area of 1 801 663.58 ha, 35% of these are protected natural areas (PNA) of national administration: Yanachaga Chemillén National Park (YChNP), San Matías San Carlos Protected Forest (SMSCPF) and the Yánesha (YCR) and El Sira communal reserves (SCR) (**Figure 1**).

These PNA fulfill the function of conserving biodiversity and maintaining ecosystem services and are a fundamental and strategic support for sustainable production systems in the OAYBR. It is important to mention

that the core of the OAYBR area is made up of the YChPN, the buffer zone by the SMSCPF, YCR and SCR and finally the transition zone which integrates other towns in the province of Oxapampa.

In the OAYBR there are three ecoregions identified, the Humid Puna of the Andes, differentiated by exposure to extreme winds and low temperatures; the Peruvian Yungas, which for much of the year, especially on the higher grounds of the ecoregion, there are constant dense layers of clouds that soak the tops and trunks of trees, favouring the presence of epiphytes (bromeliads, orchids); the Rain Forests ecoregion of Ucayali, where you can find emergent trees that reach up to 45 metres high and forests with a

canopy of 30 metros (Vásquez et al. 2005; Municipalidad Provincial de Oxapampa, 2010). An important aspect in the OAYBR is multiculturalism. In its scope are ethnic groups such as the Ashaninka, Yanasha and Asheninka communities (belonging to the Arawak ethno-linguistic family). In the town of Pozuzo, there are mainly the descendants of the Tyrolean and Austrian-German settlers; and across all of the province there are national migrants mostly from the central highlands of the country. The OAYBR has a population of approximately 93 201 inhabitants, mainly concentrated in rural areas (INEI, 2009).

Threats and potentialities

Various human activities such as illegal forest felling, burning, excessive use of chemicals in agriculture, opening up roads without comprehensive planning and without environmental certification, illegal trade of wild orchids, hunting and overfishing, inappropriate land use, among others, are generating frequent negative effects on natural resources and the environment in OAYBR.

Among the potentialities of the OAYBR are cultural tourism and nature, the eventual supply of ecosystem services, adequate conditions for the development of productive activities such as coffee, cocoa, aquaculture and beekeeping. Furthermore, the existence of protected natural areas and areas with high biodiversity to develop research, monitoring and environmental education.

Plan of environmental education of the region and institutions involved

In the scope of the OAYBR, through the Regional Directorate of Education, the Regional Environmental Education Programme is being implemented in the eight districts of the province of Oxapampa, consisting of training activities and educational support to strengthen the capacities and attitudes of teachers and students in the educational system, promoting multiculturalism, environmental education, among others. Also, students are incorporated into a new concept of valuation and sustainable management of natural resources and the environment, through forestry projects and plans for ecobusinesses (Programa Regional de Educación Ambiental Pasco, 2014).

Similarly, SERNANP, through its communication strategy of PNA, seeks to educate and sensitize the population, highlights, therefore, the environmental benefits offered by these spaces and uses cross-cutting approaches to multiculturalism, gender and participation (SERNANP, 2010).

BR commitment with EE

The Action Plan 2015 - 2021 of the OAYBR, in its strategic focus on education and culture, states: "...education is the cornerstone of human development in the province of Oxapampa". In that sense, it considers actions related to the strengthening of environmental education and cultural identity in educational institutions and the general public, through partnerships with companies, institutions and civil society.

II. Experience of the biosphere reserves in environmental education

Although the OAYBR was established on 2nd June 2010, the activities of EE in the province date from the mid 80s and in greater measure from the 90s until the present. These multiple efforts are beginning to show results, principally between the children and young people of school age.

Among the various activities related to environmental education the Education Campaign for Forest Conservation (CECOBO for its acronym in Spanish) in Oxapampa-Pozuzo, Central Selva, Peru (2005-2007), stands out. It had the spectacled bear (*Tremarctos ornatus*) as a flagship species and its purpose was to generate pride and a sense of ownership of forests and the diversity of the area. The campaign was developed by Pro-naturaleza in partnership with 12 other institutions and organizations working in the region (Laura, 2007). Diverse actions were developed such as discussions, field trips to learn about forest management, elaboration of posters related to the importance of water as an ecosystem service provided by the forests. Radio spots were issued with messages like “forests are our pride, they give us water and much more.”

From 2004 until 2011, the Missouri Botanical Garden NGO worked with school and family orchards in seven native Yánesha communities of the Palcazú district and obtained the participation of more than 1 000 students from preschool, and primary and secondary. Work in the orchards included

lectures and environmental videos related to the best use of land resources, water and forests. A manual for growing vegetables and a booklet with information on the main vegetables in the Palcazú Valley was also managed to be developed as educational material.

In addition, during 2010 and 2011, this same NGO, within the implementation of the project documentation and preservation of ancestral botanical knowledge of medicinal plants associated with cultural traditions and language of the Yánesha communities of the Valley Palcazú, worked with 14 wise Yánesha people of the communities of San Pedro de Pichanaz-Annex San Francisco, Loma Linda and 7 de Junio-Villa America. As a result of this work 350 species were recorded, of which 126 were selected for having more medicinal value and a photographic guide was developed.

On the other hand, since 2010, as part of various celebrations of the environmental calendar of the province, drawing and painting contests are held, and recycling fairs, which are promoted mainly by local municipalities in the scope of the OAYBR, some NGOs and headquarters of protected natural areas (YChNP, YCR and SMSCPF).

Since 2011, SERNANP, through the Head of the YChNP, has been working on the installation of school vegetable gardens to promote respect for nature and sustainable

management of natural resources. From the outset of this activity strong support from the Local Education Management Unit (LEMU) Oxapampa, the Missouri Botanical Garden NGO and the Daniel Alcides Carrión National University, Oxapampa Headquarters was given. Currently, there are 12 educational institutions located in the area of the districts of Oxapampa, Huancabamba and Chontabamba which have incorporated the implementation of school vegetable gardens as part of their formation, cultivating various species of vegetables. Also, the NGO Desco, in coordination with the Head of the SMSCPF and YCR has installed, school vegetable gardens in six educational institutions in the district of Palcazú.

An environmental education experience with increasing acceptance is the implementation of the Yanachaga Ecological Brigade (YEB). This activity, sponsored by the Head of the YChNP, started in 2010 and, since then, has had the support of the Oxapampa LEMU and the Missouri Botanical Garden. From 2015, the Provincial Municipality of Oxapampa and Daniel Alcides Carrión National University, Oxapampa Headquarters have also participated. Currently, the YEB has 212 members, who have taken a positive attitude towards the loss of environmental values, as well as commitments for future challenges.

III. “Forming environmental leaders for a different future”

The Yanachaga Ecological Brigade (YEB) is an experience of environmental education which rose from the search for initiatives

that help to generate environmental awareness and change attitudes in the adult population, and on the evidence of little interest in topics of conservation and constant threats towards the centre of the OAYBR area.

Thus, in 2010, the Head of the YChNP of SERNANP promoted public participation and decided to convene children and youths as volunteers in educational institutions located in the city of Oxapampa, an area which is part of the buffer zone of the YChNP and OAYBR. At the first call he managed to form a group of 23 members, consisting of boys and girls from educational institutions in Oxapampa. As it was composed of school children it was called The Yanachaga School Brigade and those who were part of it were called brigadiers.

The girl and boy brigadiers were trained on issues related to leadership, biodiversity conservation and cultural aspects of the province of Oxapampa. These actions were strengthened through awareness campaigns and the celebration of the environmental and cultural calendar.

In 2011, the number of brigadiers increased to 52 members, including children and youths. This made the members of the brigade show greater commitment and enthusiasm, the first work plan was developed with the active participation of the brigadiers and the slogan “Seeds for a different future” was established. In the same year, from the good reception among the children in Oxapampa, and at the request of other educational institutions, it was decided to expand the scope of intervention of the brigade in the town centre of Quillazú (district

of Oxapampa) and in the sector of Grapanazú (Huancabamba district). 212 people were integrated including children, youths and even two adults aged 33 and 42 years.

On having increasing acceptance not only among children and youths but also among adults, the Head of YChNP, in coordination with members of the brigade, decided to change the name of Yanachaga School Brigade to Yanachaga Ecological Brigade (YEB). Following this, a work plan was developed with the participation of all members and the hours and days of the week for the educational sessions were defined.

At present, the specific actions performed by members of the YEB cover areas of the districts of Oxapampa, Huancabamba and Chontabamba, turning the brigade into a strategic player that helps the population to value and conserve the biodiversity and

natural resources, not only in its core area –constituted by the YChNP-, but also in the different areas of the OAYBR.

The YEB now has more than 210 children and youths that participate, previous training, in specific actions related to the conservation of biodiversity and natural resources as well as to sensitize adults in caring for the environment.

Overall objective of the Yanachaga Ecological Brigade

Contribute to changing attitudes favourable to the environment, biodiversity conservation and sustainable use of natural resources.

Specific objectives

- Encourage youth leadership committed to the care and conservation of the envi-



2015 Closing of environmental education activities with the YEB.

ronment inside and outside their homes and educational institutions.

- Rescue natural values and encourage others to adopt friendly behaviour to the environment, natural resources and the sustainable use of them.
- Involve members and other participants in concrete actions regarding the care of the environment.
- Promote the importance of the PNA for local and national development.
- Involve young people in managing the YChNP.

Why is the YEB important as part of the OAYBR?

Increasing threats to the centre of the OAYBR area, such as the extension of the agricultural frontier, given mainly to passion fruit and chili pepper crops, overuse of agrochemicals used for the development of these crops, the contamination of water sources with solid waste, the lack of appreciation of the role that protected natural areas play, limited knowledge on biodiversity conservation, constant fires, illegal logging and the illegal extraction and marketing of orchids in the buffer zone and the transition area in the OAYBR, excessive hunting and selling of wildlife animals meat in restaurants in the area, among others, led them to seek a strategy to generate environmental awareness among the adult population and contribute to shape it among the youngest.

How does the YEB work?

Each beginning of the school year begins, the Head of the YChNP, under SERNANP, invites students of educational institutions in the districts of Oxapampa, Huancabamba

and Chontabamba, to join as volunteers to the YEB and assume a leading role against threats to the conservation of biodiversity in the core area and therefore the OAYBR.

As part of the YEB, each brigadier is committed to participate and attend voluntarily and responsibly the different environmental education activities that are planned, cooperate in actions that favour the change of the brigadiers' behaviour towards biodiversity conservation and natural resources, transmit messages for conservation, help to promote the sustainable use of natural resources as well as to know and appreciate the importance of the YChNP and OAYBR.

“Throughout my long career as a teacher in the area of Science, Technology and Environment of the Divina Pastora Emblematic School I have witnessed the remarkable changes in attitude that each student, member of the Yanachaga Ecological Brigade, has acquired during their formation process and integral growth as people.” - Mg. Irma Soledad Valdivia Mamani

These commitments are signed by the brigadiers and their parents, who provide the appropriate authorization for their children to participate in activities of the YEB outside school hours. The activities carried out follow a work plan developed by the same brigadiers for each sector, the same that are prioritized according to three criteria: 1) respond to local problems, 2) viable/feasible to conduct by brigadiers, and 3) contribute to the awareness of the brigadiers and the general population.

Information and achievements obtained are systematized by SERNANP according to three work components: a) Training b) Coaching and c) Sensitization to develop during the year. In addition, at the beginning of every year (strategically and using time criteria), the age of the brigadiers and the distance from their homes in relation to the administrative headquarters of the YChNP, the schedule of activities of the YEB is set in a participatory manner.

Thus, weekly, the brigadiers develop different environmental education activities. On Tuesdays from 15:00 to 17:30 the educational sessions are developed with the brigadiers of the Grapanazú sector, who are children and youths from 10 to 16 years old. On Thursdays, between the hours of 15:00 and 17:30 work is done with the brigade in the city of Oxapampa, composed of children from 9 to 11 years. On Fridays, at the same time, the activities take place in the town centre of Quillazú with children and youths aged 10 to 17 years and Saturdays from 8:30 to 13:00 am in the city of Oxapampa, work is done with young people from 12 to 20 years of age.

The development of these components is done through educational sessions in the classroom, using audio-visual equipment and teaching materials. The staff of SERNANP from the YChNP is in charge of most of these sessions, with the support of specialists from public and private institutions for issues related to first aid, organic agriculture, among others. Workshops for the development of educational materials and outreach are also performed.

“The brigade helped me a lot in my learning and growth. It also helped me to know and to realize the importance of the environment. Likewise, it helped me to know what I have, such as the Yanachaga Chemillén National Park and all the resources offered to me and to the entire population. In addition, during the time I’ve been in the YEB I have noticed a greater commitment of the population to our awareness campaigns for the conservation of the environment”. - brigadier

In a complementary manner, field activities where YEB members participate are developed. Among these activities are interviews and population surveys, home visits, study trips within the PNA or other natural places in the scope of the OAYBR and awareness and dissemination campaigns to the local population and visitors to the OAYBR. Awareness and dissemination activities, aimed at the local population and visitors, include film screenings, exhibition of information and photographic panels, delivery of communication materials (posters, brochures and leaflets), puppet shows and educational games.

The YEB and SERNANP carry out several campaigns, among them are those related to environmental health, which have strong support from the headquarters of the Oxapampa Ministry of Health, (cleanups of rivers, streams, streets, public spaces and others). Similarly, backed by the Provincial Municipality of Oxapampa, the National Service of Forestry and Wildlife (SERFOR

for its acronym in Spanish) Oxapampa and local media, were able to develop the “Do Not Buy Wild Orchids” awareness campaign during 2015.

Additionally, the brigadiers’ work is to spread environmental values and the importance of the PNA through different events organized by various institutions in the scope of the OAYBR, which are related to building a team of children and youths with environmental leadership to adopt a positive attitude towards biodiversity loss and to contribute, with their actions, to generating change in attitudes among the local population, conservation and maintenance of the core ecosystem services in the OAYBR area.

To give continuity to this experience, a Cooperation Agreement between the Head of the YChNP and the Oxapampa LEMUs was subscribed in 2012, which was later renovated in 2015. Other strategic partners that contribute to strengthening the YEB are the Botanical Garden Missouri NGO, the Oxapampa Headquarters of the Daniel Alcides Carrión National University, the Selvámonos Association, the Association for Children and their Environment (ANIA) NGO, among other actors.

The work of the Head of the YChNP is crucial in this initiative and, in particular, it is worth highlighting the role of the park ranger Humberto Cristóbal Espinoza, a professional with over 15 years of dedicated work in the Yanachaga Chemillén National Park and responsible for the environmental education activity.

What are the results obtained by the YEB?

The YEB is an environmental education initiative that year after year has been growing, from having 23 to 212 brigadiers that operate in three of the eight districts of the OAYBR. It should also be noted that although work began with children and youths of different educational institutions, gradually young people with higher education are also getting involved in the initiative. Currently there are seven brigadiers with this level of education.

On the other hand, the high participation and involvement of women (girls and youths), who accounted for 65% (138 members) of the members of the brigade during 2015 is to be highlighted. It is also seen that secondary level students are the ones who participate the most in the brigade, representing in 2015 69% (149 members), 76% (134 members) during 2014 and 73% (84 members) in 2013.

Among the achievements of the 2010-2015 period we can mention the following:

- There is a growing trend in the number of members of the Yanachaga Ecological Brigade, with an annual growth rate of 55.93%.
- The establishment of the first Children’s Forest in the OAYBR. When the Selvámonos Association, ANIA NGO, UNALM and Hassinger family knew the important work that the YEB does regarding the conservation of biodiversity, in the scope of the OAYBR, they joined to contribute and strengthen environmental education actions with the creation of the first Children’s Forest. This forest of

Figure 2. Number of YEB members 2010-2015

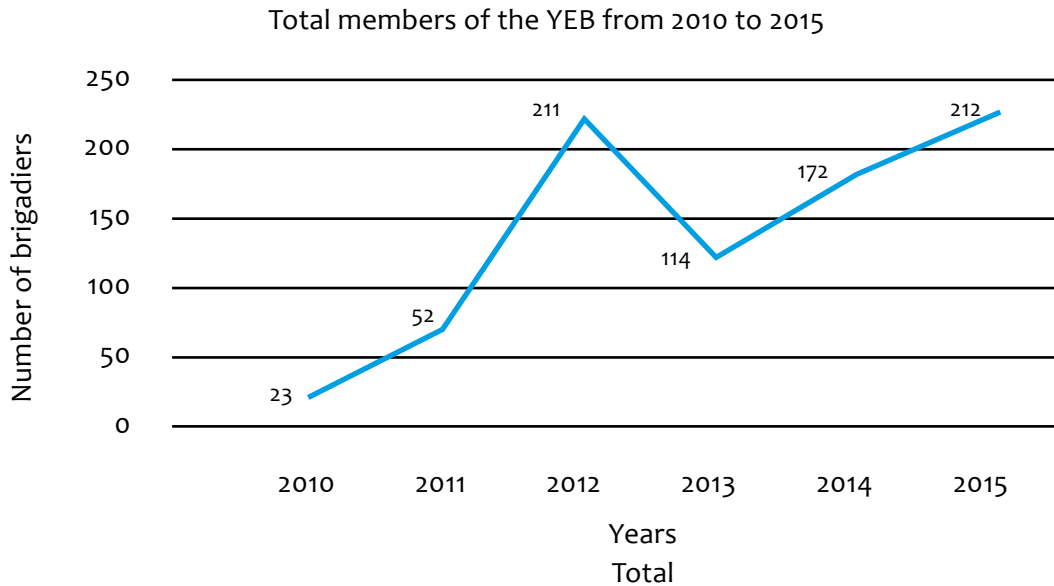
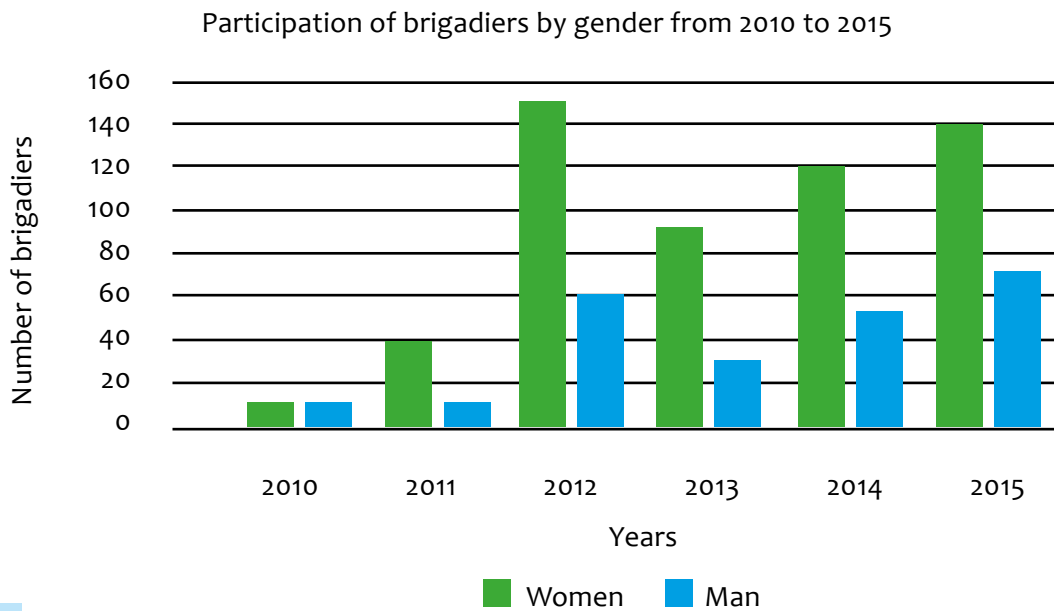


Figure 3. Number of men and women participating in the YEB 2010-2015



- 5 000 m², located in the city of Oxapampa, was donated by the Hassinger family for 10 years for members of the YEB to take care of life in that place, contribute to theirs and other people's welfare and nature. Also, this space is used as a recreation, tourism and research area involving the brigadiers.
- The residents of the Grapanazú, Quillazú, Chacos and Acuzazú sectors have been included in collection of solid waste days. More than 150 adult residents of these sectors are actively involved in clean-ups. In the first clean-up, 1.2 tons of solid waste were collected, and in the last one, held in 2015, 0.5 tons were collected.
 - Formation of new local and regional leaders. Six members of the YEB have participated in the Young Womens' Political National Encounter, held in the city of Oxapampa. A brigadier has also been appointed regional coordinator of Pasco within the organization Tierra Activa.
 - Thirty brigadiers of the Town Centre of Quillazú lead awareness workshops in their respective educational institution carrying out activities within the environmental calendar.
 - Six brigadiers participate as local guides in nature tourism activities in the area of the OAYBR. They are responsible for conducting and interpreting nature for visitors through agencies of the Oxapampa city.
 - The population of the Chacos, San Alberto, Acuzazú, Quillazú, Navarra and Grapanazú sectors, adjacent to the core area of the OAYBR, knows the importance and benefits of the OAYBR and dialogue about it due to the sensitizing of environmental education days, undertaken from 2010 to present day.
 - With the support of various institutions, it has been possible to reduce the illegal trade in wild orchids in the city of Oxapampa. Before the awareness campaign "Do not Buy Wild Orchids" there were seven traders. Currently, two people are seen still sporadically engaged in this activity. In addition, the population is becoming aware of conserving orchids in their natural habitat.
 - The reduction of the use of plastic bags, which are starting to be replaced with cloth bags and baskets for shopping in the markets, is evident.
 - The adoption of the spectacled bear as a flagship species of the OAYBR has been strengthened. In that sense, people have become aware of the importance of the conservation of this species for the ecosystem's health and now sees it as an opportunity to promote nature tourism.
 - From 2010 to 2015, 784 children and youths have actively participated in the YEB valuing the importance of conserving biodiversity and natural resources of the OAYBR.
 - Some brigadiers have developed interesting research within the Yanachaga Chemillén National Park, aimed at solving environmental problems of their surroundings, which has allowed them to participate in scientific events of great significance such as the National Fair of Science and Technology and the 2011 International Science and Engineering Fair. Also in 2016, in the US, they left the name of Peru in high regard when competing with students from 75 countries of five continents around the world.

IV. Conclusions

Active and constant participation of children and youths who make up the YEB is contributing towards the adoption of favourable attitudes towards the conservation of biodiversity by the population of the OAYBR. In that sense, capacity building of the brigadiers in leadership has been key, as well as in biodiversity conservation and management of natural resources. Thus, constant work related to the formation of the brigadiers has made it possible to involve them in the development of concrete actions such as campaigns to reduce the extraction of orchids, collection of solid waste in the rural environment adjacent to the core area, so that their actions are generating the change in attitudes towards conservation in the OAYBR.

This environmental education initiative has allowed the involvement of institutions such as: the Botanical Garden of Missouri NGO, the Oxapampa headquarters of the Daniel Alcides Carrión National University, the Oxapampa headquarters of the Ministry of Health, the National Police of Peru, through the Commissariat of Oxapampa, the Provincial Municipality of Oxapampa, the District Municipality of Huancabamba, the Selvámonos Association, the Association for Children and their Environment (ANIA for its acronym in Spanish) NGO, the National Agrarian University (UNALM for its acronym in Spanish), the Forest and Wildlife National Service (SERFOR for its acronym in Spanish) Oxapampa and the PROSOYA NGO, based in the town centre of Quillazú. These institutions have been involved through technical assistance, training, materials and supplies,

printing of educational materials, among others, thus contributing to the achievement of the objectives of the YEB.

What are the next steps of the EE in the OAYBR?

- Continue with the experience of the YEB and cause more actors to join through commitments in order to continue with the training of environmental leaders in the scope of the OAYBR.
- Reproduce the experience of the YEB in other sectors of the OAYBR, with participation of other headquarters of the PNA (YCR, SCR and SMSCPF).
- Systematize other environmental education experiences developed in the scope of the OAYBR, which can be developed through local governments, to make them visible and repeat them.

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YEB performing cleanup day in the town of San Alberto.



Tomato production in the orchards of the native community of Loma Linda, Lake of the Palcazú district.



Educational workshop w





Park ranger of YChNP delivering communication materials to the brigadiers of the YEB.



YEB making a presentation on the Oxapampa-Ashaninka-Yanesha biosphere reserve.

with the YEB in the Children's Forest with the support of the ANIA NGO.



3.2. Huascarán Biosphere Reserve (HBR)

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1. Incorporation of the Huascarán Biosphere Reserve in regular basic education: environmental education experience

The Huascarán Biosphere Reserve (HBR), a **space of life and development**, was created on 1st March 1977. It is located in the department of Ancash-Peru and is part of the Central Andes and three water basins: Santa, Pativilca and Marañón and extends in an area of approximately 11 558 km². In 2009, to promote its greater knowledge, the HBR was defined as “the only Andean space with the largest concentration of tropical glaciers in the world. It has a natural diversity and cultural richness. It represents an opportunity, challenge and need for conservation and sustainable development of Ancash”¹.

The HBR is zoned in (see Fig. 4): core area (340 000 ha), represented by the Huascarán National Park (HNP), whose objective is conservation. The park was created on 1st

July 1975 and in December 1985 UNESCO declared it a “Natural Heritage”; 2) buffer zone (170 200 ha), composed of the rural area, which seeks the development and reduction of threats to the core area; 3) and the transition area (645 600 ha), composed of the two economic corridors Huaylas and Conchucos, plays the role of cooperation for the development and conservation of the reserve².

The main features of the HBR according to their areas are:

Core area: has the largest intertropical glacier in the world: The Cordillera Blanca. Predominated by grasslands (41.50%) alternating with steep slopes with projections of rocky areas (34.55%), glaciers (14.84%), forests (3.40%) and shrubs (2.65%). It presents

¹ Concept generated the 26/8/09 in the Elaboration of the Strategic Plan of the Huacaran Work Group workshop, developed within the Communication and Sensitization of the HBR project.

² Zonification proposed in 1988 by the administration of the Huascarán National Park to the then General Directorate of Protected Natural Areas of INRENA (for its acronym in Spanish).

a very unique biodiversity of global significance comprised of 901 species of flora and symbolized by the world’s largest bromeliad, the Puya raymondi, the native tree queñual or queuña (Polylepis spp.) and orchids; as well as 241 species of fauna, composed of mainly of a group of birds (210), followed by mammals (25), reptiles (4) and amphibians (2). It is the main area of provision of ecosystem services for Ancash and Peru³.

Buffer zone: consists of properties belonging to peasant communities, smallholders and population centres. Agriculture is the main economic activity and in some cases mining and hydroelectric development. The HNP ecosystems have continued in the buffer zone, therefore it is necessary to ensure that the activities carried out in this area are compatible so as not to affect the viability of the identified ecosystems.

The transition zone: this space brings together the largest urban population compared to the other areas (**Table 1**) and it depends directly and indirectly on ecosystem services in the core area. The most important centres of production and services are concentrated here and public participation in resource conservation is required.

Table 1: Population of the Huascarán Biosphere Reserve

Area	Population	Description
Core	548 inhabitants	Located in 50 small settlements
Buffer	82 499 inhabitants, equivalent to 8% of the population of Ancash	957 families have access to tourist activities in 9 sub-basins 6 000 families have access to pasture use in the 42 sub-basins
Transition	645 600 inhabitants of the urban area of the Callejón de Huaylas and Conchucos	100% of the public and private institutions are located in this área 95% of the tourist operators. Greater number of educational institutions

Source: SERNANP Huascarán National Park

The large cross-cutting HBR problems are **climate change, inadequate water management, disorganized development of tourism and erosion of biodiversity (overgrazing, illegal logging, poaching)**.

³ SERNANP, Master Plan 2011-2015 of the Huascarán National Park.

Besides, each zone presents environmental problems with its own characteristics:

In the **core area** (HNP) environmental pollution is linked to small-scale and artisanal mining installed before the creation of the HNP. There are conflicts over the right to use natural resources, soil erosion, presence of solid waste as a result of tourism and retreat of glaciers due to climate change. According to the unit Glaciology and Water Resources, the emblematic Pastoruri glacier has lost 40% of its glacial surface, going from 1.8 km² in 1995 to 1.4 km² in 2001 and 1.1 km² in 2007. The effects of this irreversible process will be drastic not only on the necessary water resources for human activities in the reserve, but also on the risks of glacial origin.

In the **buffer and transition areas** there is a decline in native vegetation cover because of the change in land use and urban and rural growth, the introduction of exotic flora and fauna such as eucalyptus and kikuyo, water pollution due to the increased activities of settlers and disposal of mineral waste into waterways.

Given this context, SERNANP in the 2010-2015 Master Plan of the Huascarán National Park, still in force, proposed that the management of this protected area be not limited only to the area of the park, but to the other areas that make up the biosphere reserve, where most actors who benefit from the environmental services provided by the PNH are located, but by using the resources exert pressures on ecosystems. By defining the territory of the HBR as a space managed by the HNP, the environmental education

programme stresses that the concept of HBR be transmitted to the entire population so that it fully understands and generates actions for conservation, development and cooperation. The HNP master plan is being updated and environmental education will have the biosphere reserve prioritized.

In 2015, after a participatory process, the Head of the HNP adopted and is implementing the Environmental Education Strategic Plan (EESP), with the mission to “*contribute to the formation of a local culture of conservation, providing educational opportunities that promote values, knowledge and proactive support towards the management of World Heritage Site of Humanity, HNP and Huascarán Biosphere Reserve*”. This plan makes clear the actors and skills to be achieved (**Table 2**).

Other plans in the Ancash region are the Regional Educational Project of the Regional Directorate of Education and local educational projects of the 20 provinces. These management tools include a strategic axis related to environmental protection and sustainable development, basis for the different actions of environmental education in the region. They highlight Huaraz’s local educational project, whose strategic axis Environmental Education for Sustainable Development promotes the “*taking action for the protection, preservation and responsible use of protected natural areas and the Huascarán biosphere reserve*”. This document is input for curriculum planning of educational institutions.

Table 2: Abilities promoted in the participants of the HBR

Participants	Abilities
Teachers	Understand and apply the knowledge of the HBR and HNP for conservation and sustainable development as part of the institutional, pedagogical management and improvement plan in the EB and ES
Visitors	Are committed to applying basic elements and processes in the use and visit to the HNP and HBR
Local authorities	Manage funding processes and strategic alliances that allow them to assess the importance and improve services of the HNP and HBR
ASAAM and minor activities	Are committed to implementing processes to improve production of goods and the provision of services considering safety, maintenance and quality control
Users of pastures	Understand and apply elements and processes for the conservation and use of goods that are within the HNP
Businessmen	Are committed to implementing processes to improve the delivery of services considering safety, maintenance and quality control

Undoubtedly, environmental education in the biosphere reserve is an important focal point for its development, for the following considerations:

- To generate knowledge on natural resources and the environment in which people live.
- To raise public awareness about threats to the environment and the potential of rational, sustainable and enterprising use of natural resources and ecosystems of the HBR.
- Encourage participation in the conservation of resources and ecosystems of the HBR.
- To encourage use and management aimed at sustainable development in the HBR.
- The population, especially students, need to develop values associated with the conservation and development of the HBR.
- It is necessary to exchange experiences of environmental education among teachers and schools in different parts of the world.
- Motivate students to be key participants in the generation of green spaces in educational institutions.

II. Experience of the Huascarán Biosphere Reserve in environmental education

The experience of environmental education (EE) in the HBR is promoted mainly by the Head of the Huascarán National Park. It is broad and has been sustained since the implementation of the first master plan of

Source: EESP of the HNP, 2015

the HNP (1990) to the present. Different reports, such as the one carried out by the GPAN-PROFONANPE (2004) project and others highlight the activities performed annually:

- Implementation of environmental education modules on biodiversity and conservation of the HNP for students of educational institutions of the HBR.
- Design and implementation of awareness and motivation modules to users of natural pastures of the HNP periodically to disseminate the importance of protected areas, environmental goods and ecosystem services and contribution to local and national development.
- Design and implementation of motivational workshops, sensitization and training of teachers.
- Workshops, courses, lectures, meetings, conferences for different audiences and organizations that provide tourist services, students of higher and primary schools, authorities, National Police, and others.
- Coordinates the GLOBE programme in Ancash, Peru.

APUHIRKA: the God of the mountain, an Andean apu, who on behalf of the other mountains of Huascarán National Park has assumed the role of teacher, of amauta to teach men and women, youth and children, to preserve nature. It was created by René Padilla Valencia.

For the development of these activities the leadership of the HNP has:

- The Apuhirka, a character created as a means to fulfill the purposes of strengthening a harmonious relationship between people and the environment.
- Interpretation centres in Llanganuco and Pastoruri.

III. Significant experience of EE in the BR: incorporating the Huascarán Biosphere Reserve in regular basic education

The significant experience of environmental education in the Huascarán Biosphere Reserve is related to the process of incorporation of the RBH in the regular basic education, which was implemented in two stages:

First stage: pilot experience and lessons learned

In 2007, Dr. Miguel Clüsener-Godt, representative of THE MAB-UNESCO programme, visited the Huascarán Biosphere Reserve (HBR) in order to promote conservation and development actions between actors in the region. Product of this visit, UNESCO, through the MAB programme, the Antamina Mining company, through the Ancash Association, and the Huascarán National Park joined efforts to implement pilot projects in education and communication in the Huascarán Biosphere Reserve in March 2009. These projects were part of objectives 21 and 22 of the Action Plan of Madrid⁴.

⁴ Celebrated with contracts UNESCO 4500049851 y 4500107179.

As part of UNESCO's Man and the Biosphere (MAB) programme, reserves have been established to promote and demonstrate a balanced relationship between humans and the biosphere, little commitment has been assumed by our country due to limited management of spaces with this approach. Since its inception, the Huascarán Biosphere Reserve was disseminated as an international recognition to the Huascarán National Park and the mythical character Apuhirca was created to represent it. However, the concept and objectives of a biosphere reserve have not been sufficiently disseminated or understood by the people, especially leaders, managers of the Ancash region, teachers and children. Similarly, teachers inculcate in a limited way attitudes and knowledge for the conservation of Huascarán National Park. However, it is not advisable that students perceive the HNP as a coercive space "forbidden" but framed in

a learning process and taking advantage of opportunities in a larger space, such as the HBR.

Citizens, being unaware of their territory as HBR, do not assume a more proactive role in its conservation and development and to achieve a more sustainable knowledge these issues must be addressed from basic education. Only through incorporating the contents of HBR in the regional education curriculum this purpose will be achieved.

The pilot was implemented in the sub-basins of Huaritambo (district of Huari and Cajay, in the province of Huari) and Quillcay (district of Independencia in the province of Huaraz), and involved the Huascarán National Park (HNP), authorities of units of teaching management, teachers and students.



Snow-capped Huascarán (6768 m above sea level).

The aim was to insert contents of the HBR in the curriculum so that students:

- Know and value the importance of the Huascarán biosphere reserve and the environmental services it offers; thereby become sensitized and make their own the values of the HBR and spread in their families the importance of conservation and development.
- Identify the actors and their roles to demand participation in the conservation and development of the Huascarán biosphere reserve.
- Identify the interrelationship of the areas of the BR to promote conservation and sustainable development.
- Know the development opportunities that allow them to generate income in the buffer zone and reduce threats (climate change, pollution and decreased biodiversity) to the Huascarán National Park (core of the reserve).

The implementation of the pilot permitted the generation and comparing of the following result:

Before	After
Lack of knowledge of the HBR by teachers and students, although this space was established as such in 1997	174 teachers and 4 300 students of the Huaritambo and Quillcay sub basin coming from urban and rural areas know and value its territory as the Huascarán Biosphere Reserve
Absence of contents of the HBR in the educational curriculum	New and adapted curriculum with focus on biosphere reserve

Products provided during the pilot study are listed in **Table 3**.

Table 3: Products generated during the pilot implementation

2009 results	2010 results
54 teachers received information on the management of the HBR and teaching methodologies for curriculum integration	120 teachers and 2 700 students from the Huaritambo sub basin from urban and rural areas know and appreciate their territory as the Huascarán Biosphere Reserve
More than 1 500 children developed educational materials of the HBR, HNP and Quillcay sub basin product of a school competition	New and adapted contents to the curriculum with focus on the biosphere reserve
30 representatives of LEMUs of the Ancash region had knowledge of the experience in the UNESCO projects	1 500 students toured the Huascarán Biosphere Reserve, identified zoning of its territory and developed attitudes for conservation and development
3 educational strategies implemented by 40 teachers in E.I. strengthened the knowledge of HBR in students	

The key activities that contribute to achieving the results were designed in a participatory manner with the educational institutions and the process followed was:

- **Development of training plan for teachers:** with regards to different contexts presented for training teachers of urban and rural areas on issues of HBR, the training plan called Insertion of the HBR in formal basic education was developed. This document details the methodology applied to training courses.

- **Meeting with specialists of local education management units (LEMUs):** in order to sensitize specialists of the LEMUs to formalize the intervention of SERNANP-HNP in E.I. and jointly plan the implementation of the project.
- **Courses workshops:** implemented to train teachers in the contents of the Huascarán Biosphere Reserve and implementation of educational management tools for incorporation into the regular basic education. Together with teachers, knowledge of the sub-basins support material for curricular diversification, adaptation of the activities planned for the E.I. with the theme of HBR and working arrangements were built.
- **Implementation of educational activities:** by adequacy/adaptation of learning units or project formulation. The educational activities implemented were:

 - Awareness talks aimed at 310 parents.
 - Guided tours for students to viewpoints of the biosphere reserve, to the HNP or forestry nurseries.
 - Development of models, wall newspapers, reforestation, products from training sessions and a school competition.
- **Implementation of the Huaritambo sub-basin learning project:** as a result of the first actions the following were consolidated; a learning project which included activities such as the visit of Apuhirca, with whom the children sang the “Apuhirca” song and a Biostreet for students to identify, represent and show the biodiversity of different areas of the HBR. The application needed four learning sessions.

Second stage: expansion and dissemination of experience

For the promotion of abilities (Table 4), validated in the pilot, we proceeded to the expansion and dissemination of the experience through the generated educational materials and experience gained. This stage was fully taken over by the Head of the Huascarán National Park and had the collaboration of educational authorities such as GDEE, LEMUs and the directors.

Table 4: Skills promoted in students of the HBR

Capacities	Knowledge
Understand the concept of the HBR, functions, zoning and environmental services	Huascarán Biosphere Reserve
Value the importance of conservation of the HBR and the HNP	Functions, values, zoning of the territory
Assume positive attitudes about the roles and institutional management functions of the HBR	Environmental services provided by the HNP
	Basins and sub-basins

The teachers of different educational institutions were provided with the insertion guide in the curriculum developed in the first stage (previously updated and improved), digital information and printed materials to facilitate the completion of their training sessions on the HBR. Communicational elements like “Educational Institution allies in conservation!!!!” were added. Table 5 shows the extent achieved during the last years.

Table 5: Training goals during the expansion phase

Year	E.I.	LEMU	Number of beneficiaries		Total
			Students	Teachers	
2012	7	2	1 062	54	1 116
2013	9	1	745	64	809
2014	23	10	4 230	343	4 573
2015	14	4	1 825	171	1 996
Total	53	17	7 862	632	8 494

Source: HNP

The experience of environmental education developed in the HBR allows us to reach the following conclusions:

1. The executed practice is a unique experience in the country in managing the BR which has considered education as a sustainable strategy to position the values of the biosphere reserve.
2. Knowing the reserve allows students to value their territory comprehensively and brings teachers closer to the space where they work. Leading sustainable development institutions formed in this process are a showcase of motivation, commitment and creativity to demonstrate the harmonious relationship between people and nature. The benefits are:

For the future citizens in general

- Promotes a broader and inclusive sense of environmental management of the HBR, something more tangible for the promotion of sustainable development.

- Helps to recognize the territory of the Ancash region and especially of the HBR.
- Encourages the commitment to cooperation and development in the HBR.

For the teacher

- Facilitates the creation of educational materials on the HBR.
- Generates greater dialogue with children about the environment in the HBR.

For the students

- It allows them to communicate their previous knowledge with greater confidence and adequately convey their knowledge.
- Generates pleasant spaces for capacity building and knowledge.

3. The biosphere reserve is a more inclusive concept compared to natural protected areas and validated experiences will be disseminated more easily in other spaces, mainly in the 5 561 teachers and 78 900 students of the HBR.

Some lessons from the significant experience recommended to continue this process are:

1. Before entering the biosphere reserve topic, it is necessary to strengthen within teachers' knowledge of the characteristics of the territory, such as the watershed approach.
2. One teacher training session can lead to confusion between the concepts of PNA and HBR.
3. The animation of the HBR with the Apuhirca and music creates feelings, identification and respect, especially in children at the primary level.

4. The acceptance of new terms in basic education and environmental services, sustainable development and conservation. These concepts facilitate understanding of the HBR.

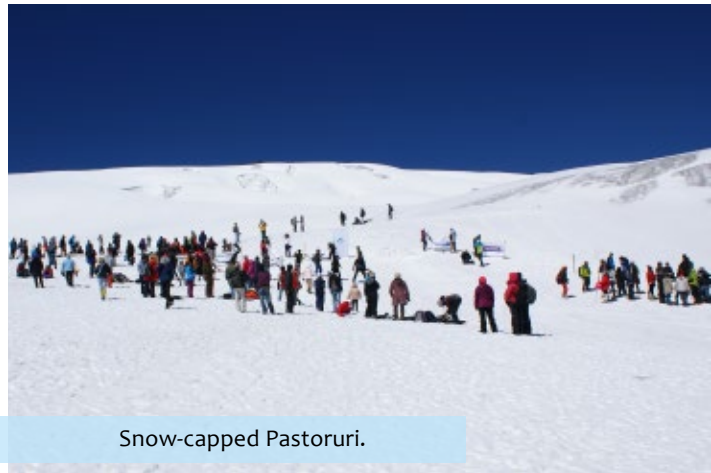
To consolidate the incorporation of the HBR in the regular basic education, the challenges and next steps to be taken to the generation of synergies between the SERNANP, the Regional Directorate of Education and the National University Santiago Antunez de Mayolo are as follows:

1. Define and organize learning projects for different levels of education, according to the problems encountered in the HBR: “attack a particular problem every year”
2. Promote diploma courses for teachers on environmental issues, science and technology with an HBR approach in order to enhance the opportunities for sustainable development in the region and reduce threats to the HNP.
3. Make a programme of environmental education through the social responsibility area of universities.
4. Create campaigns with students based on the environmental calendar and promote educational activities with an HBR approach.
5. Under an agreement between GDEE and HNP, generate a regional policy that promotes guidelines for incorporating BR in the curricular development of the EI of Ancash.
6. Improve or update the insertion guide of the HBR in the EBR, considering the skills and capabilities proposed by the Ministry of Education, which will help teachers strengthen students’ abilities.

7. It is necessary to form a permanent team in environmental education whose members are Quechua speakers, to develop planned activities, so as to ensure the expected results in the 2016-2020 Master Plan.
8. Generate various teaching aids (maps, models, artistic drawings, prints, etc.) that facilitate the understanding of the proposed topics on the HBR.

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Snow-capped Pastoruri.

René Valencia, specialist of the HNP, talking about the benefits of the Huascarán Biosphere Reserve to students from the E.I. Fidel Olivas Escudero.



Presentation of the bulletin board of a student from the E.I. Jorge Basadre Huaraz.



Students of the E.I. San Martín de Porres, Huaraz, Áncash, enjoying the visit of the Apuhirka.



Teacher from the E.I. John Paul II from Huallín exposing his training session about the Huascarán Biosphere Reserve.



Biostreet of the E.I. 86335 of Cajay.



The Apuhirca sharing the cons...

Dynamic with Apuhirca i



Representation of biodiversity of different areas of the HBR.





ervation message to children of the HBR.



Educational materiales created by the students of the E.I. 86328.

n E.I. Jancapampa, located in the buffer zone of the Huascarán Biosphere Reserve.



3.3. Northwest Biosphere Reserve (NWBR)

Editor: Warner Flores, Juan La Rosa, Aldo Aguirre, Rosa García
Contribution: Jeff Pradel

I. Location

The Northwest Biosphere Reserve is located on the northern end of the Peruvian seacoast. It includes the ecosystems hosted in the Peruvian Coastal Mountain Range, or Mountain Range of the Amotapes, occupies part of the provinces of Zarumilla, Tumbes, and Contralmirante Villar of the Tumbes region and the Talara and Sullana provinces of the Piura region.

II. Extension

The Northwest Biosphere Reserve occupies an area of 236 034.21 ha, of which 151 767.49 belong to Cerros de Amotape National Park (core area), 65 000 ha to the El Angolo Hunting Reserve and 19 266.72 to the Tumbes National Reserve (buffer zone).

III. Biological diversity

It is located in the ecoregion denominated Dry Forests. According to the classification made by Antonio Brack (1988), the NWBR is located in the Equatorial Dry Forest and the Tropical Equatorial Forest of the Pacific ecoregions. According to the classification of the life zones of Holdridge, inside

the Northwest Biosphere Reserve we find the following: very dry tropical forest, dry tropical premontane forest, tropical desert scrub, tropical thorn woodland, tropical pacific desert and a transition between the tropical pre-montane desert scrub to tropical desert scrub.

IV. Importance of biodiversity

This region is counted as one with great biological importance, recognized as a centre of biological irradiation and a Pleistocene refuge due to its abundance of species and its high degree of endemism in a relatively small area. The Pleistocene Museum of the University of California recognizes Mancora as the only region in Peru where Pleistocene invertebrates are reported. It is estimated that of the 6 300 species of vascular plants existing in the region, approximately 1 200 can be endemic; in fact, many of them are known only in very small forest areas, of few square kilometres.

Vertebrates of this region are equally diverse and some groups, such as birds, show similar levels of endemism similar to those of plants. More than 800 species of birds in the western region of Ecuador have been

reported, of which, 40 species and 140 subspecies are restricted to the Ecuadorian dry forest and the Peruvian northwest habitat. In the Northwest Biosphere Reserve more than 388 bird species have been reported including endemic and unique species for the country.

Also, several species of mammals have the status of threatened or endangered such as the howler monkey (*Allouatta palliata*), northwest otter (*Lontra longicaudis*), ocelot (*Leopardus pardalis*), midden dog (*Procyon cancrivorus*) spectacled bear (*Tremarctos ornatus*), among others.

Peru is the second country in America with the highest number of threatened species, 31 of which correspond to birds, of which 20% depend on dry forests. We have identified 89 key areas where these birds are distributed; of these areas, Cerros de Amotape National Park ranks first with 11 endangered species, for being in the area of endemism of the Tumbes region of Ecuador and Peru, with 12 endemic species reported.

V. Socioeconomic aspects

Human activities of direct use of resources in the area that are affected in what the biosphere reserve offers – provinces of Zarumilla, Tumbes and Contralmirante Villar, part of the province of Talara and part of the province of Sullana (Piura) - vary depending on water availability, physiography, climate, species concentration and other variables. So where there is water throughout the year (valleys of Zarumilla, Tumbes and Chira) there is a greater concentration of popu-

lation and economic activities, contrary to places where the resource is scarce. In the same way, in the rainy season, production increases unlike the dry season. Other natural elements such as soil, plant communities, water sources and landscapes with its variation- also determine the development of human activities (rain-fed agriculture, logging, farming, fishing, hunting, tourism), as they are described by each political-social space (province).

[Environmental education plan in the region and institutions involved](#)

The environmental education plan of the Northwest Biosphere Reserve 2010-2015 had the participation of:

- ↪ The Regional Education Directorate of Tumbes and Piura
- ↪ The Local Educational Management Unit (LEMU) of Tumbes, Zarumilla, Admiral Villar and Sullana.
- ↪ The AECID Project
- ↪ The Embassy of Finland

[Commitment of the BR with the EE](#)

- ↪ Promote environmental culture in educational population and knowledge of protected areas of the NWBR. With this objective, strategies related to the care and protection of species living in harmony with nature and its relationship with human communities are developed to improve environmental conditions and quality of life.
- ↪ Ensure a change of attitude in school, teachers and the general community on the conservation of biodiversity and ecological balance of the NWBR.



Lemon production chain, initiative with development potential for the local population of the Northwest BR.

- Contribute to the development and promotion of environmental education with the participation of educational institutions and citizens, based on the conservation and sustainable use of renewable natural resources.

VI. Biosphere Reserve experience in Environmental education

In Tumbes, specifically in the towns of Fernandez, Barrancos, Pajaritos, El Tamaringo, Averías, Trigal, Carretas, Santa Maria, Peña Blanca, La Angostura, Nuevo Progreso, Matapalo, among others, Pro Naturaleza Foundation, through the programme SUEÑO II and the Education and Conservation of Dry Forests Programme (ECOBOS for its acronym in Spanish), has developed environmental education experiences related to teacher training, implementation of infrastructure, ecological production projects in educational institutions (bioorchards, algarrobo producing farms, beekeeping and minor animal husbandry: birds, guinea pigs, sheep, etc.). They have also generated visits to exchange experiences of teachers, students and parents of educational institutions with which they are working, who visit educational institutions in other departments such as Cajamarca, and vice versa, in order to know their experiences to take into account the lessons learned from lines of work that can be adapted to different contexts in which they operate. Also, the literary, production through story contests, “cumananas” (improvised singing composed in quatrains or tenths that often are intoned with harps and guitars, typical of mulattos and mestizos in the towns of Piura,

Tumbes, Lambayeque and Saña on the coast northern of Peru) and songs related to natural resources and the environment, as well as publishing newsletters.

With the Environmental Education Plan 2005 to 2010, successful experiences of environmental education in the Northwest Biosphere Reserve (NWBR) and the buffer zone of the PNA were held, which seek to strengthen the capacities of all the actors. The following can be mentioned.

- The promoters of conservation are leading citizens of the communities in the buffer zone and they receive training from the PNA headquarters, to carry out talks and environmental awareness campaigns in their communities and surrounding areas supported by official park rangers and volunteers.
- The rural environmental education networks, formed in coordination with decentralized bodies of the Ministry of Education, which are recognized formally through sectoral resolutions. There are about eight around the NWBR, which are composed of rural educational institutions.
- Conformation of friendly networks of the PNA in the province of Sullana, composed of educational institutions, colleges and universities in this city.
- Educational material has been developed with the technical teams, teachers and specialists of the PNA that are part of the NWBR: pedagogical documents, instructional sheets and posters on flora and fauna. In those materials representative

species of the only tropical rainforest of the Pacific and the equatorial dry forest and the map of the Peruvian Northwest Biosphere Reserve are stressed.

- ↪ The productive educational projects are intended to implement innovative initiatives seeking, from the school and the community, to develop eco-efficient environmental educational experiences. They are selected through contests and there are now six implemented. For example, the raising pig projects in the Educational Institution Maria Parado de Bellido of the Captain Hoyle Community from 2007 to 2009, the raising of minor birds in the Educational Institution Susana Higuchi of the Tutumo hamlet from 2007 to 2009.
- ↪ The former INRENA and the coordination of the Algarrobo Project in Tumbes have developed environmental education experiences in pilot schools within its area of intervention such as a course-workshop of teacher training on environmental issues, awareness parades, environmental painting and drawing contests, implementing demonstrative and productive infrastructure (improved stoves, chutes for handling goats and sheep, etc.), training for the elaboration of carob syrup “algarrobina” and other carob derivatives, promoting participation in local fairs for the marketing of elaborated products.
- ↪ Training and monitoring of the process of diversification of curricular content about the dry forest, was also provided, which included the elaboration and execution of diversified didactic units and

the evaluation of capacity building of teachers and students participating.

- ↪ In Piura, the Ñari Walac NGO executed a collaborative environmental education project with then INRENA and the Coordination of the Algarrobo Project in Tumbes in its intervention area. It includes the incorporation of capacities and themes referring to the environment and the dry forest in the primary curriculum of educational institutions with which they work, as well as the development of appropriate teaching material for the rural work.

VII. Significant experience of environmental education in the biosphere reserve

Education and conservation of dry forest in schools in the biosphere reserve ECOBOS- Pronaturaleza and Regional Education Directorate of Tumbes.

In 1998, Pronaturaleza, with the support of H.E.L.P Foundation, began the Education and Conservation of Dry Forests Project (ECOBOS) with the participation of 10 schools in the whole area of the Northwest Biosphere Reserve of primary and secondary levels, and even the conversion of a secondary technical school, where a curriculum specially adapted to the natural reality of dry forest was imparted. The project lasted until 2004.

The experience was directed to 904 students from 7 to 16 years, 97 teachers and 493 parents from several schools in the

region. Its aim was to contribute to the improvement of the quality of education in 14 schools in the Northwest Biosphere Reserve, by integrating productive activities on the sustainable use of natural resources in their location through curricular programmes.

Why was this experience / project developed?

The project includes the diagnosis of the problems that took place at the Environmental Education Plan, which suggested the following problems:

- Indiscriminate or predator use of natural resources of the NWBR.
- Lack of knowledge about sustainable management of natural resources of the NWBR.
- Limited access to information and knowledge (western and cultural of the region).
- Poor dissemination of the PNA and of the NWBR.
- Scarce identification of the population with the NWBR.
- Low environmental awareness of the population about the values of biodiversity, conservation and environmental protection.
- Indifference of authorities.

Project development

The strategic proposal consisted in performing productive ecological projects, teacher, students and parents training workshops; ecological journalism committees and informative newsletters, as well as exchange of experiences among students and parents.

The project was conducted in a participatory manner, through an agreement between the Regional Directorate of Education of Tumbes and the NGO Pronaturaleza. Regarding the method, we worked with the Decroly approach, skills curriculum, through processes of curricular diversification and productive projects as means of learning.

The main topics were deforestation, rational use of natural resources, awareness, importance of biological diversity, content of production modules: forest management, livestock management, haymaking of pastures, storage of carob fruit, tree and fruit nurseries, organic fertilizers, horticulture, raising of small animals. There was presence of local knowledge and local reality, as the revaluing and rescuing local techniques of management of natural resources, as carob fruit, forest management, organic fertilizers, among others, based on the customs of each location. But also the knowledge of the relationship between humans and nature, applying modern technologies was promoted.

Among the teaching material there are sheets, models, bulletins, brochures, maps, drawings, paintings; curricular programmes and teaching units; compendia of contests and others. They are validated by the Education sector.

Results obtained with the implementation of the project

Results were achieved in the teaching and educational field and in the organization, installation and operation of the production modules. Students actively participated, advised by their teachers; learners were

motivated and became more communicative, expressive, participatory, creative, dynamic, enthusiastic and innovative, valuing natural resources and the importance of using them sustainably. As regards teachers, they integrated the project activities to different areas of learning in their curriculum programmes, both in schools and in colleges. The products obtained from the production modules in schools were consumed by students and marketed for the purchase of uniforms, school supplies and other goods for the benefit of themselves. In addition, schools were winners of different contests and competitions organized by the Ministry of Education and other public and private entities.

The incursion of the project in the classrooms of Tumbes has been one of the most successful practices of environmental education in the country as reflected in several awards at the regional, and national level and even in Ecuador:

The schools participating in the programme have obtained top positions in:

- The 2nd National Contest of Educational Innovation
- The National Innovation Contest of Institutional Management
- The 1st Contest of Educational Innovation of Institutional Management organized by the Ministry of Education in 2002.

In addition, several have been enrolled in the registry of innovative school centres of institutional management of the Regional Directorate of Education in Tumbes (RDET) in a definite way and one of them held the 4th place in the First Binational Science and Technology Fair in the area of ecology, developed in Loja, Ecuador.

In terms of influence in the community, the region and the education sector, in general the results were shown in a positive attitude,



Rural tourism in Cerros de Amotape National Park, core area of the NWBR.

specifically by authorities, parents and community in the activities of the project. The activities product of the project were imitated and reproduced by parents and surrounding communities; associations of parents actively participated in conducting productive modules; parents were organized in committees to support project activities in general; the community appropriated the project; there was support from other public and private institutions (Ministry of Agriculture, Regional Government, National Service of Agricultural Health-SENASA (for its acronym in Spanish), the old Algarrobo Project, the North Forest Project and municipalities).

The Regional Directorate of Education of Tumbes RDET is very interested in this innovative educational experience and considered it as a model for other schools in the region.

VIII. Conclusions

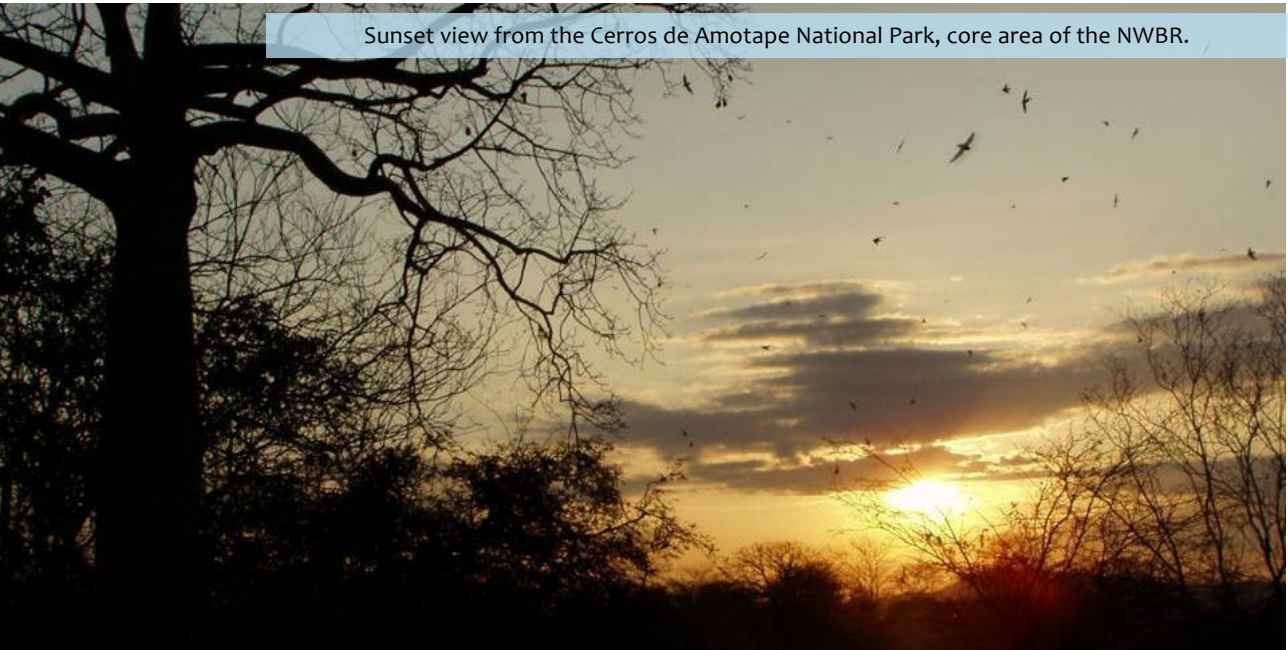
Challenges faced and meaningful learning

Reassignment of teachers trained by the project to other schools or higher levels. Replacements need to be trained and mentored for the work already achieved in schools to have the continuity it deserves. That is why parents and other villagers are trained each year in the conduction of the modules that each school manages.

The Ministry of Education, in its Office of Rural Education, wishes to reproduce the ECOBOS model, because it considers it as an innovative experience based on sustainable use of natural resources.

It is possible also to apply it in other rural areas with similar characteristics, because the experience is based on proper manage-

Sunset view from the Cerros de Amotape National Park, core area of the NWBR.



ment of natural resources of the area, changes in attitude and appropriate lifestyles of the local community. It is also a tool for improving educational quality and the standard of living of rural populations, by integrating the project contents in the curricular programming of schools.

It is necessary to reinforce or work with new training, a community environmental education, so as not to centralize this education towards sustainable development in schooling, but with a community participatory vision.

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Pasture in the dry forests of the buffer zone of the Peruvian Northwest Biosphere Reserve, provide conditions for the development of livestock activity by the communities.



Colour contrast of the dry forest of the El Angolo Hunting Reserve, Buffer Zone of the NWBR.

3.4. Manu Biosphere Reserve (MBR)

Editors: Ingrid Chalán (FZS)

Paulina Conde (FZS)

José Antonio Ochoa (FZS)

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Manu Biosphere Reserve: intercultural environmental education in the tropical Andes

1. Manu Biosphere Reserve and Environmental Education

Declared in 1977 by UNESCO, the Manu Biosphere Reserve (Manu BR) is located in the southeast of Peru, in the regions of Cusco and Madre de Dios and has an area of 1 881 200 hectares (SERNANP, 2014). The Man and Biosphere Programme of UNESCO aims to establish a sustainable basis to improve relations and ways of life of the communities with their environment, in geographical areas with representative habitats (UNESCO, 1996).

One of the main features of the Manu BR is the wonderful biodiversity it harbours. Its range (200 to 4 000 metres above sea level) makes it a privileged area for thousands of species of fauna and flora that annually causes surprise with new records and unique species: 1 307 butterfly species, 1 025 bird species and 221 mammals species, only in its core area.

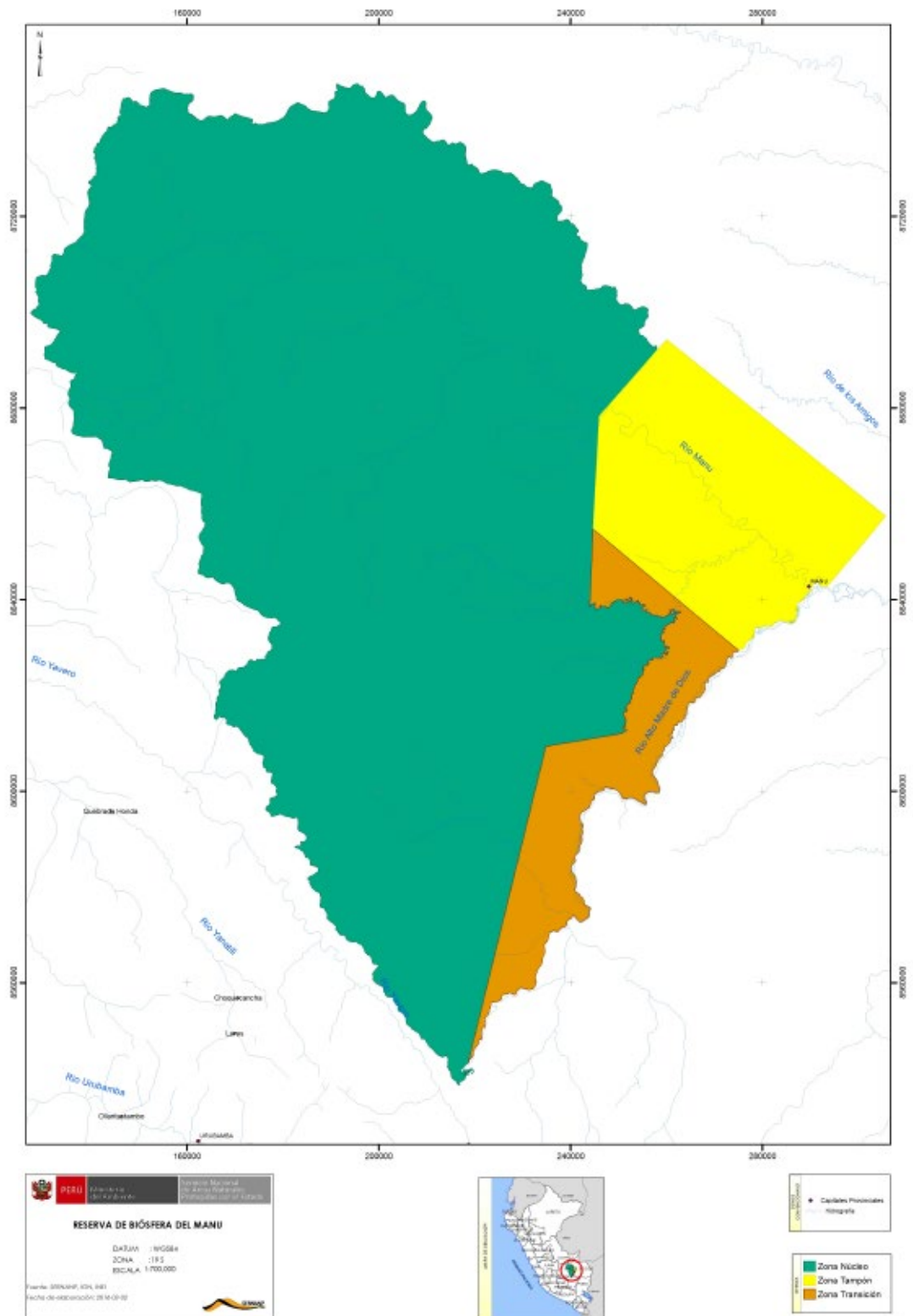
Also, Manu BR is home of a variety of human populations ranging from peasant communities in Cusco, through the cloud forest

settlers and reaching indigenous communities in the far areas of the jungle. Cultures and different languages are concentrated in the largest biosphere reserve of Peru, which gives it an unbeatable added value, but also represents a challenge for effective conservation of the area.

In addition, the Manu BR is also vulnerable to threats such as livestock in the high Andean zone, illegal logging and expansion of the agricultural frontier through deforestation in the K'osñipata-Shintuya-Boca Manu axis of penetration (CBC, 2004). In recent years, drug trafficking and political interests (translated for example in the construction of unplanned road infrastructure) are added to the challenges that the area must overcome.

These threats not only entail other illegal activities, they pollute and damage valuable ecosystems that are our source of life, and also deplete natural resources of the area (goods and environmental services) and

Figure 6. Location Map of Manu BR



impact rapidly in the economy, lifestyles and livelihoods of the people who depend on the reserve. (APECO, 2011). It is a great challenge to join efforts to achieve and consolidate an extremely diverse, biological and cultural space.

It is essential to work with people to build a better understanding of the direct and indirect benefits of living in a space recognized twice by UNESCO (its also a World Heritage Site). It is equally important to promote sustainable actions that contribute to improve the economy and quality of life of these groups, maintaining forest resources with a view to becoming a model of community management for conservation. The communities then become the main allies and actors of the Manu BR.

The focal point for UNESCO, regarding biosphere reserves in Peru, is the National Service of Natural Protected Areas (SERNANP). The Manu National Park, managed by SERNANP, is the core of the biosphere reserve area and in it is also one of the main promoters of Manu BR. It supports this area on several levels and proposes the integration of populations in their strategy of work.

Currently, Manu NP presents in its Master Plan 2013-2018 a vision that looks to preserve the biodiversity and the historical and cultural heritage of Manu BR. One of the six strategic objectives of the plan aims to promote environmental education (EE) and scientific research. Management guidelines of Manu NP include EE activities and awareness with the population that live in Manu BR, both school-age and adults (SERNANP, 2014).

Manu NP and key stakeholders invest in the educational development of populations of the reserve as part of its public use programme included in the Master Plan. The main objective of the EE subprogramme is “to contribute to changing individual and collective attitudes of the populations of the Manu Biosphere Reserve in favour of the conservation of natural resources.” (SERNANP, 2014).

The EE in Manu BR has a participatory approach and is carried out by the cooperation of several national and international organizations, public and private. Through inter agency agreements and inter institutional cooperation agreements are strengthened with several sectors, articulating strategies and objectives. It works closely with schools, local education management units (LEMU Paucartambo, LEMU Manu), directorates and regional governments, radios and provincial and district municipalities in the Cusco and Madre de Dios regions.

Currently the EE strategy of Manu BR is being developed. Its main objective will be to develop environmental citizenship and will make a strategic guideline for the coming years and connect the efforts of partner organizations (SERNANP, 2015). Environmental citizenship is understood as the conjunction between knowing and acting on environmental issues, through which the sustainability of resources and ecosystems of the Manu BR will be possible.

II. Environmental education in Manu BR and Manu NP as a strategy

The EE work in the Manu BR dates back to 1987, with the initial participation of organizations like ProNaturaleza, APECO and the World Wildlife Fund (WWF) in specific activities such as lectures and informative workshops. Years later the Centre for Andean Regional Studies Bartolome de las Casas (CBC for its acronym in Spanish) joined in 2002, Frankfurt Zoological Society (FZS) in 2005, Think Foundation in 2007 and later San Diego Zoo Global and the Association for the Conservation of the Amazon Basin (ACCA for its acronym in Spanish).

The target audience of EE activities of Manu BR is the rural communities and settlers of

the Mapacho Valley in Cusco, as well as the native populations of different ethnicities (Matsigenka, Yine, Haramkbut) in Madre de Dios. While EE focuses predominantly on primary school children, there are also educational activities for secondary, higher and general public.

EE activities are carried out in the Amazon and Andean part of the Manu BR, and revolve around conservation projects and education by NGO partners, but in direct coordination with the Manu NP. In classes (in learning sessions) and outside classes (extracurricular activities), primary school students know about the ecosystem,



biodiversity, fauna and flora representative of the Manu BR and more environmentally friendly ways of life.

On the other hand, visits are made to different points of scientific, tourist and of interest in the Manu BR, in order to know part of the ecosystems that are in the rainforest, such as Path to Manu Learning Centre, excursion for primary school children through a tour of interpretive trails on the left riverbank of Alto Madre de Dios river. Biological Station Cocha Cashu (BSCC), positioned as one of the most important places in the Neotropics for generating information on tropical ecology (Pitman, et al. 2011; Flores, et al. 2013), opens its doors to students in primary and secondary schools of Maizal and Boca Manu for a research initiative and the monitoring of waters around the station. By actively participating in the data collection, analysis and interpretation of the results, students are identified with Manu BR and its conservation.

In addition, to bringing the work of EE to a wider audience and strengthening links with communities, public festivals for the general public for the anniversary of Manu NP are held in May. These events are organized in cooperation with the regional and municipal governments, the Ministry of the Environment, DIRCETUR, working groups on environmental education as the Council of Environmental Education Programmes of Madre de Dios (COPREDAM for its acronym in Spanish), the regional directorates of education, LEMU, tourism businesses and other private institutions aligned to the conservation of both regions.

The Ukumari Raymi or Feast of the Bear is celebrated since 2014 in the Andean part

of Manu BR (Mapacho Valley) and at the bottom, the Giant Otter Festival, since 2011. Both activities include sports championships, contests of artistic expression, parades with environmental issues led by the two emblematic species, the spectacled bear and the giant otter. It is important to mention that the last one is an ambassador of Manu, named as representative species of Madre de Dios by Regional Ordinance N°005-2011/GRMDD/CR.

On the other hand, training for primary school teachers of educational institutions of the low and high Andean area has been provided. The aim is to develop concepts and content related to conservation of species (conservation targets of natural protected areas) and sustainability concerning Manu BR and the use of educational materials provided. These workshops are given annually since 2007 and train an average of 55 teachers every year.

During 2015 assistance to primary school teachers was provided with a teaching companion who implemented a campaign of EE in the schools of this educational level of the native communities of Tayakome, Yomibato, Maizal and Cacaotal, inside Manu NP. Work was done with nine teachers and 159 students. Matsigenkas students were able to develop skills, abilities and language skills.

No less important is the valuable participation of park rangers of Manu NP, who have participated in activities of EE and have provided briefings in different localities and villages of Manu BR, revealing the importance of biodiversity conservation, ecosystems and environmental services offered by Manu BR.

On the other hand, the educational work is directly linked to the work of dissemination and communication, so the environmental education subprogramme considers the participation in radios, the most widely used media in the communities of Manu BR. The structure, content, production and radio broadcasts of the environmental programme have developed The green time, broadcasted in Challabamba, Paucartambo (Cusco) radio since 2013 with funding of the German Government (BMUB for its acronym in Spanish). The radio programme is a platform that makes known the work done in Manu BR and informs in favour of attitudes and sustainable practices and cultural knowledge and its immediate close surroundings and reaches a wider local audience. Regarding intercultural educational tools of work, games of dominoes and memory of

biodiversity, guides for teachers and colouring books of emblematic species have been developed. These materials are used in educational workshops for the Manu BR and they serve to strengthen cognitive skills of reading, comprehension, and memory and also to develop the creativity of the student while allowing him/her to know and identify the fundamental aspects of biodiversity.

Educational materials have been widely accepted and recognized by educational institutions, environmentalists and the general public. The concept of these materials connects two fundamental criteria for the management of biosphere reserves: science and education (FZS, 2015) for sustainable development and is the most outstanding experience to be developed in the next point.



Puppet shows and their elaboration are part of the workshops of EE.

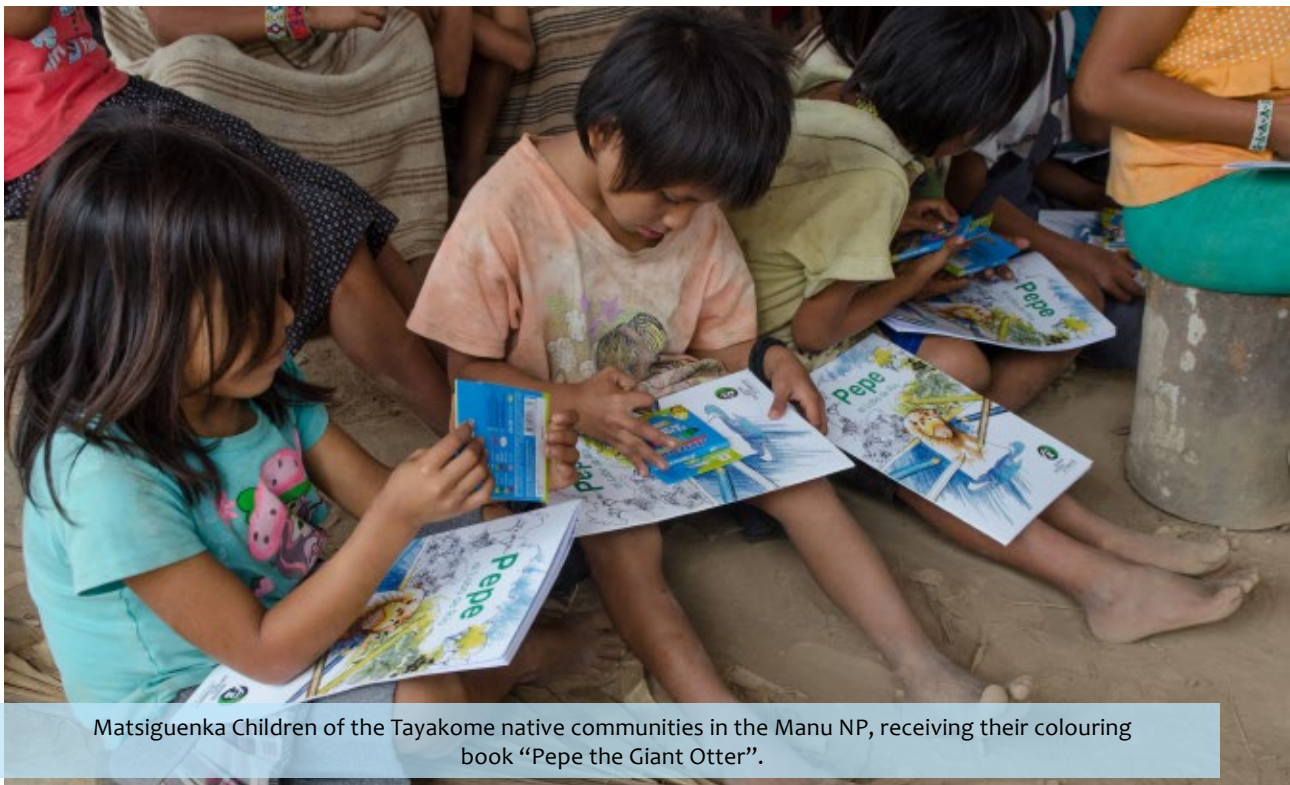
III. Outstanding experience of environmental education in Manu Biosphere Reserve

Educational materials presented below are born as a need to strengthen educational activities in the field and energize the contents on the importance of conservation of natural areas and its components. The materials have been edited and produced thanks to projects and national and international sources.

In recent years, a series of educational and instructional materials of representative species have been designed and produced. In this way the colouring books that FZS elaborated were born, in support of Manu BR and they give life to the characters:

- Pepe, the giant otter (created in 2003) in Spanish and Matsigenka; and Spanish and Yine.
- Pablo Ukumari, spectacled bear (2007) in Spanish and Quechua.
- Pedro, the blue-headed macaw (2008) in Spanish and Haramkbut.
- Paulina, the jaguar (2008) in Spanish.

Taking a representative and endangered species as the central character, these colouring books have an A4 format and contain between 16 and 18 inside pages with realistic illustrations that tell the history of the species: their habitat, life cycle and the



Matsigenka Children of the Tayakome native communities in the Manu NP, receiving their colouring book “Pepe the Giant Otter”.

threats they face. They include learning games (crosswords, labyrinths) that can be resolved from reading the colouring book, show the wildlife with which it interacts, and a distribution map of the main species. These colouring books are complemented by methodological guidelines for teachers that guide and suggest playful learning activities.

These tools have become a hallmark of the Manu BR and have a great value because they present the local environmental problems and promote the inclusion of remote populations, which in most cases have a lack

of access to quality education and relevant materials, adapted to their reality.

The work with these educational materials comes alive when used in workshops and are used to reinforce student cognitive skills while allowing knowledge and identification of fundamental aspects of conservation. By playing, children learn and identify with the Manu BR, generating values from an emotional level, which is essential to create links (Novo, 2009): to protect the Manu you first have to love it (**Table 6**).

Table 6. Colouring Notebooks of Manu BR

Materials	Quantity	Educational Institutions	Region	Quantity of school children	Quantity of teachers
Pepe	2 000	Tayakome, Yomibato, Maizal, Cacaotal, Atalaya, Gamitana, Villa Salvación, Águanós, Mansilla, Nueva Mansilla, Santa Cruz, Shintuya, Boca Manu, Palotoa Teparo	Madre de Dios, Manu	Approximately 2 500 Elementary school children	55 annual average
Paulina	2 000	Atalaya, Gamitana, Villa Salvación, Águanós, Mansilla, Nueva Mansilla, Santa Cruz, Shintuya, Boca Manu, Palotoa Teparo, Tayakome, Yomibato y Maizal	Madre de Dios, Manu	Approximately 1 000 Elementary school children	55 annual average
Pedro	2 000	Carbón, Gamitana, Águanós, Mansilla, Nueva Mansilla, Itahuanía, Mamajapa, Nuevo Eden, Palotoa, Santa Cruz, Llactapampa, Diamante, Boca Manu, Shintuya	Madre de Dios, Manu	Approximately 1 890 Elementary school children	25 annual average
Pablo	3 000	Pilco Grande, Accobamba, Huaccanca, Patanmarca, Lambranpata, Laly, Jesús María, Saway, Solan, Pillcopata, Patria, Santa Rosa de Huacaria	Cusco, Paucartambo	Approximately 1 500 Elementary school children	25 annual average

Memory games have been widely accepted to be a highly identifiable, educational and entertaining material. These come with an informative booklet with the common and scientific names of species. The first version was made in 2009 and since then there have been five versions of the memory game, edited and adapted to other areas with endemic species, in several formats and presentations. They have been reproduced in the Machiguenga Communal Reserve, Megantoni National Sanctuary and in 2016 there will be a version for Machu Picchu Historic Sanctuary.

A separate point is the Conserving board game for the general public and that aims to contribute to the knowledge about natural protected areas of Peru and ecosystem services they provide, including the Manu NP. One thousand games were made and distributed throughout the country. The Sarastro Foundation, PROFONANPE, ICAA and FZS financed this material.

Another notable tool is the recently published bilingual book *Matsigenka-Spanish Tito and the giant otter* (Groenendijk et al., 2014) produced by SDZG and supported by the Iris Darnton Foundation, via WildCRU, University of Oxford. The book points to the revaluation of indigenous practices in the use of nature and is being validated in terms of its effectiveness and relevance as a mean of reading that entertains and educates.

IV. Conclusions

The work experience in EE springs from the environmental problems that affect the integrity of the Manu BR: permanent socioeconomic pressure on the natural resources of the intangible area. EE activities in Manu BR are mainly implemented by partner organizations and their collaboration is essential for logistical, financial and staff support, supplying the deficiencies in the area. However, more coordination between these activities is still needed because in some cases they are isolated. For this reason, Manu NP propitiated in 2015 the development of the strategy on EE of Manu BR that is in a phase of review, and it is expected to articulate efforts.

Taking into account that the different communities that live in the reserve give it an intercultural character, the implementation of the strategy of EE in Manu BR will constitute an important management tool for the conservation of biological diversity, the revaluation of ancestral cultures and to strengthen the exercise of an environmental citizenship that assumes rights and duties in preserving the natural and cultural resources of their environment.

The participation of other public and private entities is essential, to concrete agreements, and interinstitutional commitments. This will allow the environmental education network to grow and be strengthened with joint actions. However, one of the biggest obstacles so far is the bureaucratic delay of some processes and the changes of the management or political course that

temporarily or permanently stop the work of EE in Manu BR.

Despite isolated efforts and challenges exposed, there is progress in the EE of Manu BR. Recreational or educational workshops for students and the general public seeking to create a link between people and their environment, for a better understanding and the management of resources. This component, also about the populations of Manu BR, reduces the idea that protected areas are restrictive in themselves. Budget and logistic issues are the biggest challenges at this point.

The Manu BR has educational materials in different dialects of the area with representative species as standard-bearers of conservation and development. These products reflect the cultural melting pot of the Manu BR and its greatest challenge: to unify a sustainable attitude with the environment and its resources.

It also seeks to strengthen the work with teachers through agreements with the LEMU, which may include training to develop their skills. It also seeks to include formally the educational materials in the educational curriculum ensuring the sustainability of work in time.

One of the most concrete results is that these materials have been widely recognized and replicated in other regions and protected areas (Machiguenga Comunal Reserve, Megantoni National Sanctuary, Machu Picchu Historical Sanctuary) and the agreements continue to be used officially in educational institutions. However, the work on EE is in the long term and among the most

significant challenges is the measuring of results due to seasonality and the indicators that have been designated to demonstrate them.

The cases presented are a samples of the work of public and private institutions in the intercultural EE in Manu BR, these cases are indispensable for an exchange factor in the people who live and thrive in these mega-diverse spaces. Even so, it will be necessary to implement more concrete environmental education policies at the national level and it is necessary that they are consistent with the cultural diversity existing in Peru. The work with Regional Directorates of Education in Cusco and Madre de Dios will be essential to carry out the inclusion of environmental issues, and this is one of the greatest long-term challenges for Manu BR. Thus, the EE not only will be inserted transversely in the national education system, but also in all sectors to assure the country's future regarding its natural resources and social development.

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The Biological Station Cocha Cashu opens its doors to students in from Maizal and Boca Manu primary and secondary schools.



Matsigenkas children from Tayakome in EE workshop.



Patanmarca schoolchildren, from the rural community of the Manu RE showing their memory games.



Biological Station Cocha Cashu opens its doors to students in the Maizal and Boca Manu primary and secondary schools.

4 ENVIRONMENTAL EDUCATION IN THE BR OF PERU: CONCLUSIONS AND CHALLENGES

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On the eve of the IV World Congress of Biosphere Reserves in March 2016, SERNANP, MINEDU, MINAM, the Biosphere Reserves (BR) of Peru and UNESCO have taken the opportunity to reflect on environmental education (EE) in BR, and from this milestone, think together about the next steps. The commitment of the BR of Peru with the promotion of EE has been demonstrated in the initiatives outlined throughout the previous chapters. As we have read, the EE is a practice that has developed in Peru since the eighties, taking various forms and institutionalized through various initiatives. In its chapters, the BR have put forward a brief summary of the rich history that each has in EE, choosing a meaningful experience that they have reflected on and drawn lessons.

Thanks to this effort, we have the first record that analyzes the course of the EE in the BE of Peru. With this we cannot only know its progress, but also study the challenges that BR has faced. In these exposures creativity and commitment of the BR are shown: addressing issues always contains a sensitivity to multiculturalism, traditional knowledge and ensuring inclusive participation.

In this sense, the Manu Biosphere Reserve does EE with an intercultural approach and the Oxapampa-Ashaninka-Yanesha Biosphere Reserve, through its Yanachaga Ecologic Brigadiers reflects on the importance of awareness of the adult population through youth participation. At the same time, a proactive attitude generating proposals for institutionalizing activities, promoting standards or involving state agencies with jurisdiction in the different themes. Thus, the Huascarán Biosphere Reserve raises the need to convert, in regional regulations, the EE on the BR in the curriculum of Basic Education. Meanwhile, the Northwest Biosphere Reserve coordinated with decentralized bodies of the MINEDU to promote conservation through proposals for productive projects.

All the BR have oriented their EE to solving problems through raising awareness, from which specific actions have been proposed. Threats to the conservation of BR in Peru are varied and highly complex, e.g. depredation of flora and fauna, pollution (population or industrial), agro-livestock activities or the loss of traditional practices. While awareness is the prerequisite for involving

people in conservation and sustainable management of resources, it is also important that the EE has an action component to implement the solutions to the problems identified. In this sense, it is seen that the BR are making great efforts to access as much of the population as possible and generate a common sense of belonging to the BR. This phase of public awareness is critical and requires the support of local, regional and national institutions to permeate throughout society. From there it is important to articulate the various actions and EE activities carried out, the concept of EE being the best umbrella for it.

Regarding the challenges that BR have ahead in terms of EE, the need for an EE that transcends the field of education and reaches the community is displayed. In this sense, inclusive education projects with all actors in the BR as target audience could be carried out. Moreover, the use of the BR itself as an educational resource involves the fact of achieving recognition of the territory and the population as a single socio-environmental system. Finally, EE has the great challenge of creating awakened people with knowledge about the environmental reality of their area and to actively participate in the management of the BR.



Of note, is the work of institutional and intersectoral coordination that MINEDU and MINAM have made to give Peru a regulatory framework in which to develop the EE: The National Environmental Education Plan. Thanks to this effort there are lines of action to articulate proposals arising in BR. Meanwhile, the BR is presented as the stage

for implementing these regulations through the involvement and commitment of its technicians, educators, authorities, scholars and population. In this sense, Peru has the necessary experience, enthusiasm, tools and resources to enhance its BR as sources of inspiration and educational laboratories ■





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