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Important advances in biodiversity conservation in Peruvian Amazonia

Avances importantes en conservación de la biodiversidad en la Amazonía Peruana

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Resumen

El ambiente está deteriorándose rápidamente en todo el mundo, incluyendo áreas que se pensaban eran remotas, como es la Amazonía peruana. La deterioración continua ha resultado en una serie de convenios internacionales, como el Convenio sobre la Diversidad Biológica, para disminuir y mitigar estos problemas ambientales, proteger derechos de las comunidades indígenas, y conservar flora y fauna, ecosistemas y genes. En este contexto, especialmente vulnerable es la Amazonía peruana que es un mosaico de ecosistemas asociados con los Andes y biológicamente muy diversa y que representa una gran variedad biológica y física que forma la base para una rica diversidad cultural. Esta megadiversidad está seriamente amenazada por la tala de bosques y uso de la tierra no sostenible que extiende ya áreas remotas. Para combatir estos problemas ambientales se inició el Proyecto Diversidad Biológica de la Amazonía Peruana, Perú-Finlandia (BIODAMAZ) que es un proyecto de cooperación entre los gobiernos del Perú y de Finlandia (Fase I 1999-2002, Fase II 2003-2005). El proyecto BIODAMAZ ha contribuido significativamente a la conservación y uso sostenible de la biodiversidad a través de los siguientes resultados: fortalecimiento de administración ambiental; mejoramiento de acceso a fuentes internacionales de financiamiento en conservación de la biodiversidad; fortalecimiento de capacidad de negociación de los actores ambientales peruanos; mejoramiento de sistematización, organización y acceso de información sobre biodiversidad; fortalecimiento de Zonificación Ecológica Económica; mejoramiento de conocimiento sobre patrones de distribución de biodiversidad amazónica para planificación de uso de la tierra; y fortalecimiento de capacidades regionales y colaboración institucional. Palabras clave: Conservación, Biodiversidad, Perú

Abstract

Environment is rapidly deteriorating everywhere, including even areas once thought to be remote, such as Peruvian Amazon. The ongoing deterioration has led to a series of international agreements and conventions, such as the Convention on Biological Diversity, in order to diminish and mitigate these environmental risks, protect indigenous communities rights, and conserve flora and fauna, ecosystems and genes. In this context, especially vulnerable is the biologically diverse Peruvian Amazonia which is a mosaic of ecosystems that are associated with the Andes, representing a wide range of biological and physical variations that also form the basis for a rich cultural diversity. This megadiversity is seriously threatened as logging and unsustainable land use practices reach ever remoter areas within the region. In order to deal with the pressing environmental problems the Project Biological Diversity of Peruvian Amazonia, Peru-Finland (BIODAMAZ) came into being. It is a cooperation project between the governments of Peru and Finland (Phase I 1999-2002, Phase II 2003-2005). The project BIODAMAZ has contributed significantly to biodiversity conservation and sustainable use in Peruvian Amazonia through the following results: strengthening of environmental administration and management; enhancement of possibility to access international biodiversity conservation funding sources; strengthening of negotiation capacities of Peruvian environmental actors; systematisation and organization of and improvement of access to biodiversity information; strengthening of the regional land use planning tool, the Ecological Economic Zoning; enhancement of knowledge on Amazonian biodiversity distribution patterns for land use planning; strengthening of regional capacities in biodiversity management and institutional collaboration. Key word: Conservation, Biodiversity, Perú

Introduction

Environment is rapidly deteriorating everywhere, including even areas once thought to be remote, such as Peruvian Amazonia. This ecological crisis is a global process that is generating much concern and discussion on environmental problems at a worldwide scale, especially on destruction of habitats and the resulting unavoidable loss of species (UNEP 1995). The Earth is suffering from irreversible deterioration which at some point ought to change attitudes towards conservation and sustainable use of biodiversity to more favourable for those. This should happen especially in countries that harbour vast richness of species, habitats and ecosystems and whose inhabitants are largely dependent on the resources provided by biological diversity in their daily lives. An example of such an area is Peruvian Amazonia where people's economies are still largely based on extractive activities that prey on biodiversity resources.

The ongoing deterioration have led to a series of international agreements and conventions, such as the Convention on Biological Diversity (United Nations Conference on Environment and Development, Rio de Janeiro, Brazil 1992), in order to diminish and mitigate these environmental risks, protect indigenous communities rights, and conserve flora and fauna, ecosystems and genes. These are to be achieved by the fulfilment of the three Convention objectives: 1) conservation of biological diversity, 2) sustainable utilization of its components, and 3) equitable sharing of benefits derived from genetic resources of biological diversity (Convention on Biological Diversity 1992).

In this context, especially vulnerable is the biologically diverse Peruvian Amazonia which is a mosaic of ecosystems that are associated with the Andes, representing a wide range of biological and physical variations that also form the basis for a rich cultural diversity. (Kalliola et al. 1993). Peruvian Amazonia is also megadiverse representing one of the richest environments on the Earth. This megadiversity is also seriously threatened as logging and unsustainable land use practices reach ever remoter areas within the region. Uncontrolled and informal logging also threatens the livelihoods and cultures of some native peoples, especially those peoples that are so called "not contacted" who have chosen to carry on their lives as they have done for thousands of years and who do not want to have any contacts with the modern society.

Although many areas of Peruvian Amazonia still remain remote the region faces some serious environmental problems, such as contamination of waters, especially of rivers close to large human settlements such as the city of Iquitos. An example of contamination endangering people's lives was the contamination of the Nanay River by mercury pollution which was used in gold mining upriver. Traces of mercury were found in the people's blood and the riverside people started to show signs of mercury poisoning. This lead to a large-scale questioning of the legality of the practice of gold mining in the river by the local people, and also by the city dwellers of Iquitos, largest city in Peruvian Amazonia with ca. 350 000 inhabitants that also get their daily drinking water from the Nanay River. After the problem was brought to the attention of the media and received much interest, the Government finally acted to prohibit gold mining in the river.

Peru has also showed interest in the protection and conservation of its vast natural and biological resources, this is evident in the legislation of the last ten years. The Peruvian Constitution calls for conservation of biodiversity as do a number of laws, such as, for example, the law on biodiversity and the law on protected areas. In 2001 Peru finalized its National Biodiversity Strategy (CONAM 2001) thus fulfilling one of the requirements of the Convention on Biological Diversity. This Strategy contains the Regional Biodiversity Strategy of Peruvian Amazonia (BIODAMAZ 2001a) which was finalized with the support of the Project Biological Diversity of Peruvian Amazonia (BIODAMAZ), a technical cooperation project between the governments of Peru and Finland. In 2002, Peruvian political leaders signed a National Agreement that explicitly calls for conservation of biodiversity and makes it one of the national priorities to promote its research.

In order to deal with the pressing environmental problems in the complex Amazonia the Project Biological Diversity of Peruvian Amazonia, Peru-Finland (BIODAMAZ) came into being. It is a cooperation project between the governments of Peru and Finland which in 1999-2002 was implemented through two agreements: first one for the Components 1 and 2 was signed on the 29th of September in 1999 and the second one for the Component 3 was signed on the 17th of January in 2001. The implementation phase for the Components 1 and 2 was until the 30th of September, 2002, and for the Component 3 until 31st of

December, 2002.

The Second Phase of the Project was deemed necessary in order to continue the work started in the first phase. The agreement regarding the second phase of the project was signed on the 21st of April in 2003 and the implementation period is from 2003 to 2005.

The national counterpart for the project is the Peruvian Amazonian Research Institute (Instituto de Investigaciones de la Amazonía Peruana, IIAP) and as the Finnish counterpart there is a consortium formed by the environmental consulting company, Biota BD Oy, and the University of Turku.

The project works in four Peruvian Amazonian provinces: Loreto, Ucayali, San Martín and Madre de Dios, focusing mainly on the lowland rain forest areas (below 500 meters above sea level). The project offices are located in the headquarters of the IIAP in Iquitos.

In this article the main results of this project are presented as important advances in biodiversity conservation in Peruvian Amazonia, including an assessment of the importance and impacts of these results.

Necessity of action in biodiversity conservation in Peruvian Amazonia

The necessity of this project rises from the compromise of the both countries to fulfil the requirements of the Convention of Biological Diversity. Also it was the first project to really tackle the complex biodiversity context of Peruvian Amazonia and to implement the requirements of the Convention at a regional level in Peru. One of these requirements is the development of biodiversity strategies and action plans for conservation and sustainable use of biological diversity. The presentation of strategies and action plans would allow access to different financing mechanisms of the Convention, such as the Global Environment Facility (GEF), for Peru. At the onset of the project, the Peruvian national and regional environmental authorities needed also strengthening of their capacities to implement the Convention of Biological Diversity at the national and regional level.

The information that exists on Peruvian Amazonian biodiversity is very scarce and scattered in different institutions and thus not easily available to the users, such as decision makers, planners and educators. Many areas in Peruvian Amazonia have not been exhaustively studied as to their biological diversity, for example due to their inaccessibility and remoteness, resulting in incipient biological collections only covering certain areas. Institutions working on issues related to biological diversity tend to guard their information from others, giving no room for a real development of an information culture: openness, accessibility and transparency.

In order to overcome these problems in the biodiversity sector in Peru the objective of the project BIODAMAZ was to contribute to conservation and sustainable use of Amazonian biological diversity by development of administrative and management tools and research methodologies for sustainable management of Amazonian biological diversity. The objective of the second phase of the project is to contribute to conservation and sustainable use of Amazonian biological diversity in order to promote sustainable development and poverty alleviation through strengthening of decentralized capacities and developing of administrative and managerial tools and research methodologies for sustainable management of biological diversity.

Advances in administrative and managerial tools for conservation and sustainable use of biodiversity
The project BIODAMAZ contributed to the finalization of the Regional Biodiversity Strategy of Peruvian Amazonia (ERDBA), which was compiled by biodiversity administrator, manager, planner and user organizations of Peruvian Amazonia. It is a planning tool whose objective is to set priorities and adopt actions and measures for adequate conservation and sustainable use of biodiversity. ERDBA is integrated to the National Biodiversity Strategy of Peru (ENDB) and it orients policies and practices of how to conserve and sustainably use the Amazonian biodiversity in the next 20 years, emphasising the management of the natural biological and cultural capital, promotion of investment and employment, and access for the local communities to the benefits derived from sustainable use of biodiversity. The Strategy and its action plans contribute to the decentralized environmental administration at the national and Amazonian level and facilitate the access to funding and national and international cooperation in prioritised projects and activities. ERDBA is published and it is now being disseminated and promoted in order to guarantee its sustainability.

As an integral part of the ERDBA are the biodiversity action plans (BIODAMAZ 2003f) which the project BIODAMAZ facilitated to develop in the process of the strategy formulation, and which specify the needed steps to implement the strategy, developing practical aspects. In order to take into account the

particular characteristics of the different administrative regions, action plans were also developed for the four regions separately: Loreto, Ucayali, Madre de Dios and San Martín.

The project BIODAMAZ together with specialists from institutions of the public and private sector proposed an action plan on *in situ* and *ex situ* conservation in Loreto (BIODAMAZ 2003e) as a part of the action plans of the ERDBA. It focuses on the region of Loreto that represents a third part of the national territory and which represents biodiversity that is the least altered in Peruvian Amazonia. Loreto is situated in the lowland Amazonian rain forest and harbours many areas of unique importance for *in situ* and *ex situ* conservation. It is considered fundamental to integrate *in situ* and *ex situ* conservation strategies to guarantee adequate conservation and sustainable use of biological diversity. The action plan contains a conceptual framework for conservation, strategic objectives and actions and projects.

Closely linked to the *in situ* and *ex situ* conservation action plan are the development plan of Botanical Garden-Arboretum El Huayo (JBAH) (BIODAMAZ 2003g), which is a conservation area that belongs to the National University of Peruvian Amazonia (UNAP), and the scientific and technical bases and proposals of guidelines for management practices and zoning of Allpahuayo-Mishana Reserved Zone (ZRAM) (BIODAMAZ 2003a) that have been developed by the project BIODAMAZ, as well as the proposal for development of tourism along the Iquitos-Nauta road (BIODAMAZ 2003h). The JBAH development plan includes actions to strengthen the JBAH in order to conserve economically and scientifically important plant species, especially tree species, of Peruvian Amazonia. The plan also includes sections on tourism and environmental education in order to strengthen the integration of the local communities to biodiversity conservation and sustainable use actions within the JBAH. The ZRAM is an important centre of biodiversity in the vicinity of Iquitos, as it is a mosaic of different ecosystems leading to high biodiversity and as it presents a largest concentration of white sand forests known in Peru, harbouring many endemic and unique species of fauna and flora. Its protection is of utmost importance as it is threatened by not sustainable utilization of its resources.

An essential part of biodiversity management is the management of information on biological diversity. An information system is seen as a system where information is located in different institutions that organize and maintain information on Amazonian biological diversity, institutions being linked to each other through different means of communication. It acts as a network that coordinates information, tries to systematize institutional and personal scientific research and information at regional, national and international level. It permits to coordinate standards for information management, including the immediate inclusion of this information to scientific and technical archives, avoiding thus dispersal of information on biodiversity. The Biodiversity and Environment Information System of Peruvian Amazonia – SIAMAZONIA – was designed by the project BIODAMAZ with these ideas in mind (BIODAMAZ 2001b). Now it is operating on the Internet giving services to different actors in conservation and sustainable use of biodiversity. It can be found at www.siamazonia.org.pe. Related information systems developed by the project are the Information System of the JBAH (SIHUAYO www.siamazonia.org.pe), Information System of the Allpahuayo-Mishana Reserved Zone (SIZRAM www.siamazonia.org.pe) and the Tourist Information System on Iquitos-Río Amazonas (SITURISMO www.siturismo.org.pe) that were designed in close collaboration with local sector actors and Faculty of System Engineering of the UNAP.

Advances in information on biodiversity patterns in Peruvian Amazonia

The project BIODAMAZ produced the first mosaic of satellite images with 42 images covering the whole of lowland Peruvian Amazonia which allows appreciate the great environmental variation within the area. The mosaic is an essential tool in biogeographical studies of biodiversity: the mosaic can help to locate areas that could have interesting biodiversity patterns and that could be important for conservation. For the first time at a simple glance it is possible to take in the whole of Peruvian Amazonia and the environmental variation within. The mosaic is very useful in basic studies; it is also essential in land use planning. IIAP has now a team of professionals that have capacity to develop satellite image mosaics, this capacity can be used for further development of satellite image based maps (BIODAMAZ 2003c). It serves also as basis for the map of vegetation diversity, showing the vast diversity of different vegetation types in Peruvian Amazonia, and map of environmental macro units, depicting areas relatively homogenous as to their physical and biological characters. The making of the environmental macro unit's map also required development of the methodology for the determination of these macro units (BIODAMAZ 2003d). To define these maps a series of ground-truthing studies were conducted in three

plant (ferns, family Melastomataceae and palms) and three animal (ants, anuran amphibians and birds) groups in thirteen localities in the lowland rain forest in the northern, central and southern parts of Peruvian Amazonia. These studies were done and the results analysed using standardized methods (BIODAMAZ 2003b). The results indicate that it is possible to use these groups of plants associated with certain environmental characteristics to explain patterns of other groups of plants, such as trees. Some light tendencies were observed in animals as well but the sampling was not extensive enough to provide concrete results on that. For that more studies are needed. One key result was that vegetation patterns can be observed in the satellite images which provide a remote sensing tool for assessment of biodiversity patterns.

The mosaic, the map of vegetation diversity and the map of environmental units are all freely available on the Internet through SIAMAZONIA.

Other field studies were also carried out by the project BIODAMAZ in the JBAH and in the ZRAM. In the JBAH an inventory of the Arboretum was carried out in order to identify the tree species in the area. In the ZRAM three research projects were conducted in order to provide information for the ZRAM management plan process: game fauna inventory, white sand forest classification and mapping of path network.

The game fauna inventory showed that there are certain areas within the ZRAM that are under intense hunting pressure by locals and outsiders. Within the area there are still certain areas that have good numbers of game animals present, even rarer ones (Oversluijs 2002). These studies are very important in the zoning of the area. In the white sand forest classification study it was possible for the first time tentatively classify the forests into five white sand forest type categories as the categorization was done using quantitative as well as qualitative methods (Garcia et al. 2002). The classification is essential to better understand how the white sand forest systems function and to show the existence of a mosaic of different forest types in the area in order to enhance the protection of different forest types and their characteristic and unique flora and fauna. The mapping exercise showed for the first time on a map the path network, this information is very useful for zoning and planning of ZRAM.

Capacity building in biodiversity issues in Peruvian Amazonia

The project BIODAMAZ emphasized the importance of capacity building during all of its activities. Capacity building in the following fields was considered very important: information systems with map servers, mosaic of satellite images, scientific research, environmental units and their integration to land use planning, scientific field work methodologies, conceptual framework for conservation and planning of conservation and sustainable use of biodiversity and biodiversity management.

Lessons learned in biodiversity conservation and sustainable use in Peruvian Amazonia

The implementation of the project has not only allowed the project to acknowledge the fruitful Peruvian-Finnish cooperation but also to identify lessons learned that will be of use for future research and development work in Peruvian Amazonia. Several of the lessons learned are presented here.

It is assessed that the conceptual framework for sustainable development requires that a fourth dimension is added, the political-institutional, to the three usual dimensions of environmental, social and economic, also in the Peruvian Amazonian region.

Information management through information systems accessible to decision-makers making decisions on policy questions and investment issues, is the key to an effective management of research and development.

Use of contemporary methodologies and technologies, such as remote sensing, facilitates substantially the increase in knowledge on biodiversity patterns, especially in spaces so complex and extensive as Peruvian Amazonia.

The Amazonian biodiversity issues are to be addressed in a multi-institutional and multidisciplinary manner in order to achieve sustainability through time and involvement of different actors in the biodiversity sector, including local communities.

There is a necessity in the region to strengthen capacity building and scientific rigor in order to increase the understanding of conservation, sustainable use and culture of valorisation of biodiversity for Amazonian development.

There is a need to look for solutions to the problems of conservation and sustainable use of biodiversity beyond mere means, to decide what is wanted and needed, develop attitudes for change; these are key issues in development.

Decentralization of capacities and opportunities is feasible and generate new and better opportunities for the country.

The wide integration and shared confidence between the Peruvian and Finnish teams has enriched visions and focuses, giving fruit to a productive cooperation.

Conclusions

The results of BIODAMAZ are an important support to conservation and sustainable use of biodiversity in Peruvian Amazonia. The advances in biodiversity conservation brought by these results are presented in the Table 1, along with an assessment of their importance and impacts. Nevertheless, it is important to learn from this experience and strengthen the sustainability of the results, by strengthening of the processes commenced and by implementing managerial and administrative tools developed. This is to be done during the second phase of the project BIODAMAZ.

Table 1. Main advances in conservation and sustainable use of biodiversity in Peruvian Amazonia by the project BIODAMAZ and their importance in conservation and sustainable use of biodiversity and long-term impacts.

Tabla 1. Avances en conservación y uso sostenible de biodiversidad en la Amazonía Peruana en el proyecto BIODAMAZ y su importancia en conservación y uso sostenible de biodiversidad y impacto de largo tiempo.

Advances	Importance of the advances	Impacts of the advances
Advances in administrative and managerial tools		
Methodology of concept, design and construction of information systems; Methodology for the design and consultation of managerial and administrative tools for conservation and sustainable use of biodiversity; Validation and enrichment of the methodology for design, monitoring and evaluation of research and cooperation projects; Plans for conservation and sustainable use of biodiversity.	Strengthening of environmental administration and management; Possibility to access financing sources of CDB; Strengthening of negotiation capacities; Biodiversity information more accessible, systematized and organized.	Raising of the level of the environmental consciousness amongst the people through training, more knowledge and functioning information system on biodiversity; Strengthening of decentralization; Situation of <i>in situ</i> and <i>ex situ</i> conservation made better as knowledge base, capacities and administrative and managerial environmental tools increase; Increase in the opportunities of financing and technical assistance for conservation and sustainable use of biodiversity for a better understanding of these processes, targeting of projects and actions needed and a fulfilment of the requirements of international conventions, typically the Convention of Biological Diversity; Enrichment of the conceptual framework of research of biodiversity, conservation and sustainable development in Peruvian Amazonia.
Advances in information on biodiversity		
Methodology for developing digitalized mosaic of satellite images; Methodology for evaluation of vegetation diversity and identification of environmental units as support to the land use planning process; Methodology to evaluate biodiversity, using indicator species of plants and animals.	Strengthening of Ecological Economic Zoning (<i>Zonificación Ecológica Económica</i> ; a regional land use planning tool); New knowledge on Amazonian biodiversity distribution patterns; New information for land use planning.	More baseline data on the Peruvian Amazonian lowland biodiversity, development of methodologies for analysis of biodiversity and support to land use planning; Enrichment of the environmental culture of different social actors of the care and valorisation of biodiversity based on new knowledge and information systems available and functioning.
Capacity building and institutional cooperation	Strengthening of regional capacities; Strengthening of institutional cooperation and collaboration.	Institutional strengthening and strengthening of relations between institutions and sectors as the information base augments for the decision-making on biodiversity, through administrative and managerial instruments such as plans, strategies and information network, and through capacity building.

The Peruvian government within the development priorities has oriented policies towards sustainable use of Amazonian forests, especially timber resources, sustainable tourism and other resources and services of Amazonian biodiversity. These decisions have to be supported by solid knowledge of technical and scientific base to guarantee favourable socioeconomic and environmental impacts.

The project BIODAMAZ, as a result of a significant cooperation between the governments of Peru and Finland, has started and strengthened some processes in order to increase knowledge and strengthen biodiversity conservation and sustainable use through sustainable management. The achievement of these results, in the framework of participative and integrated approach between conservation and development, would contribute to democratic practices and decentralization, as well as increase opportunities of investment and employment, with positive impacts in the alleviation of poverty, aspects that are priorities in the cooperation policy of Finland and renowned aspiration of the Peruvian society.

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