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THE NEED FOR INTEGRATING CONSERVATION AND DEVELOPMENT IN THE AMAZON: CHANGES, CHALLENGES AND OPPORTUNITIESIN THE OF GLOBALIZATION (DRAFT)

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THE NEED FOR INTEGRATING CONSERVATION AND DEVELOPMENT IN THE AMAZON: CHANGES, CHALLENGES AND OPPORTUNITIES IN THE AGE OF GLOBALIZATION[*] (DRAFT)

Luis E. Aragón[†]

Abstract:

This keynote discusses the most significant changes of the Amazon region in recent times, identifying the emergence of new issues that challenge the implementation of ICD oriented policies in the region. Among the issues discussed are the regulation of the markets of fresh water and biodiversity, the implementation of the market of credits of carbon dioxide through reforestation, and the importance of international cooperation. The note concludes by arguing that the Amazon should be seen within a new global context where the region plays a very important role because of its enormous stock of natural resources, demanding as a consequence strong cooperation among the Amazonian countries and of these with other countries and regional blocks; and new policies whose benefits reach local populations.

Key Words: Amazon. Water. Biodiversity. Carbon dioxide. Biosphere reserves. UNESCO chairs.

Necessidade de Integração do Desenvolvimento e a Conservação na Amazônia: Evolução, Desafios e Oportunidades na Era da Globalização

Resumo:

Esta apresentação aborda as mudanças mais significativas da região amazônica nos últimos tempos, identificando a emergência de novas questões que desafiam o desenvolvimento de políticas orientadas para a integração do desenvolvimento e a conservação na região. Entre os temas discutidos estão a regulação dos mercados da água doce, e da biodiversidade; a implementação do mercado de créditos de dióxido de carbono através do reflorestamento; e a importância da cooperação internacional. O texto conclui afirmando que a Amazônia deve ser vista dentro de um novo contexto global, onde a região desempenha um papel chave devido ao seu enorme estoque de recursos naturais, demandando como conseqüência uma forte cooperação entre os países amazônicos e destes com outros países e blocos regionais; e novas políticas cujos benefícios atinjam as populações locais.

Palavras-chaves: Amazônia. Água. Biodiversidade, Dióxido de carbono. Reservas da biosfera. Cátedras UNESCO.

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Introduction

An expert meeting jointly hosted by UNESCO-MAB, IUCN, WWF, GTZ and KfW, held in Frankfurt in December 2005 examined key issues related to Integrating Conservation and Development (ICD) schemes in developing countries and identified the most critical factors that imperil better results. It was concluded that initiatives to conserve natural ecosystems in developing countries tend to focus on the values of landscapes in ecological terms. Frequently, such concepts do neither originate from the affected local population, nor do they necessarily coincide with their often pressing livelihood needs (KfW, 2005). ICD schemes intend to reconcile the demand for preserving specific ecosystems with the need to sustain local livelihoods.

Conceiving conservation and development as interdependent processes represents an alternative for the implementation of ICD initiatives in areas of paramount importance in the world such as the Amazon. This immense area is characterized for being rich in natural resources but with low development standards, including important segments of society living in poverty. Experience and scientific research have demonstrated an unbalanced treatment of the environment and development equation, by putting more attention to the environment than to people, blunting the understanding of the socio-economic, demographic and cultural dynamics in the region, and the ability to use science in a socially relevant manner in such a way that real bridges can be constructed between science and its applications in solving simple and complex problems faced by society.

Within that framework, this keynote discusses the most significant changes of the Amazon region in recent times, identifying the emergence of new issues that challenge the implementation of ICD oriented policies in the region.

The note concludes by arguing that the Amazon should be seen within a new global context where the region plays a very important role because of its enormous stock of natural resources, demanding as a consequence strong cooperation among the Amazonian countries and of these with other countries and regional blocks; and new policies whose benefits reach local populations.

The Amazon region

The term Amazon or *Amazonia* means different things according to the criteria used and the purpose of the definition. It is best understood as an immense area containing several regions within the so called Greater Amazon Region, or *Amazonia sensu lattissimo,* which includes the areas covered by the Amazon river basin and also the tropical rainforest (figure 1) (EUROPEAN COMMISSION, 2005). Eight countries and a French Department share the region: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Surinam, Venezuela and French Guyana.

Although there is no consensus regarding the extent of the region, it is estimated to cover approximately 8 million square kilometers, of which some 6,878,000 belong to the Amazon river basin (DOMINGUEZ, 2004). Approximately 28 million people were estimated to be living in the Greater Amazon Region around the year 2000, including about 1 million Amerindians. More than 60

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percent of the current population lives in urban areas with two cities already over-passing one million people (Belém and Manaus) (ARAGÓN, 2005).

The Amazon region is one of the largest, most diverse, complex and rich natural domains of the planet. The area of the entire Amazon region corresponds to $1/20^{th}$ of the surface of the earth, $2/5^{th}$ of South America and $3/5^{th}$ of Brazil (BECKER, 1990) and contains 53 percent of the 9.2 million km^2 of tropical forests remaining in the world (WORLD RESOURCES INSTITUTE, 1994), about 15 percent of the fresh water of the world (SOUZA, et. al., 2004) and less than 0.5 percent of the 6 billion people living on earth. The relief includes valleys, plateaus (Brazil and Guyanas), high mountains (Andes), and the Atlantic coast.

Huge abundance of fresh water, thick humid tropical rainforest, and biological and cultural diversity are common features of this enormous region; and its functioning is intimately related and dependent of each one of those factors. The Amazon river is considered to be the longest in the world, with 6,671 kilometers, the whole basin is constituted by more than 1,000 rivers (CDEA, 1992) and the discharge of water in the Atlantic Ocean is estimated between 175,000 (MILLIMAN; MEADE, 1983) and 300,000 (SOUZA, et. al., 2004) cubic meters per second which would represent between $1/5^{th}$ and $1/6^{th}$ of the discharge of all rivers of the world (MILLIAM; MEADE, 1983). The discharge of the Amazon corresponds to four times the one of the Congo and ten times of the Mississippi; the Negro river alone, a tributary of the Amazon, contributes to 15 percent of the water that the Amazon discharges into the Atlantic and represents more than the discharge of all the rivers of Europe (FONSECA; SILVA, 2005). As the Amazon river approaches the Ocean, the sediments accumulate to an estimated quantity of 1 billion tons per year, which the river discharges into the Ocean (BOTTO, 1999). Such sediments are dispersed along the coast up to the Orinoco delta (Venezuela) (PROST; MENDES, 2001).

The Amazon in the age of globalization

Because of the enormous quantity of natural resources stocked in the region, the Amazon has become an issue in the world's highest scientific and political forums. Within this context the region should play an important role in the regulation of the market of key resources traditionally considered of free access, such as water and biodiversity; and more recently credits of carbon dioxide (CO_2) to control global warming (BECKER, 2004a). How the region should participate of such regulations is open to debate and has generated controversy at different levels.

Fresh water

Concerning regulation of the market of water, the polemic arises from the dual character of this resource: it is vital for life with an increasing economic value, because of its scarcity and unequal distribution on earth (BECKER, 2004b). While the Amazon region contains at least $1/5^{th}$ of the fresh water of the world, there exist extensive areas of the planet with severe scarcity of water. In fact more than 40 percent of river waters, rock-reservoir and lake waters, is found in six countries: Brazil,

Russia, Canada, the United States, China and India (UNESCO, 1999). And according to the United Nations (UN, 2003), the Amazonian countries (including French Guyana) are among the ones with highest availability of fresh water, ranging from 34,161 cubic meters per person per year in Ecuador to 812,121 in French Guyana, well above the limit considered of severe scarcity (1,000 cubic meters per person per year). UN also estimates that if measures are not taken, 2.7 billion people will encounter problems of water shortages by 2025, and for some, already 1.5 billion people do not have easy access to freshwater (SELBORNE, 2002).

In that scenario regions and countries with big water reserves present extraordinary advantages and are expected to play an important role in the geopolitics of water. In the final analysis, the critical issue resides on the property of water resources and the regulation of their market (CASTRO, 2003). The question that emerges, therefore, is whether or not, fresh water, this vital and progressively scarce natural resource, should be treated as a public good that belongs to humanity, or if, by the contrary, should it be submitted to the rules of the market (DIAS; ARAGON, 2004).

The possibility of commercializing fresh water from the Amazon has aroused a series of unresolved questions. The following three are crucial:

1) Is water really the "blue gold" (BECKER, 2004b) of our times, of strategic importance similar to oil in the 20th century, and can it be commercialized in similar way? The fragile ecosystems of the Amazon are regulated, among other factors, by the abundance of water and its hydrological cycle. Significant alterations of this cycle will affect the entire life in the region with serious implications in other parts of South America and other continents.

From the bio-geophysical point of view, the Amazon water cycle has been in balance for centuries. Fifty percent of the vapor existing in the Amazon is transported westward by the winds coming from the Atlantic Ocean and the other 50 percent comes from evaporation of the forest itself, producing a continuous circulation and reproducing the cycle permanently (SALATI, et. al., 1979). Precipitation varies in the region among other reasons because of the barrier of the Andean Mountains, and the location of the region in the Northern as well as in the Southern Hemisphere, which produces a difference of rainy and dry seasons.

Localized studies have demonstrated the occurrence of widespread convection in deforested areas with the formation of shallow cumulus clouds that usually do not evolve into nimbus clouds and thus may not produce rain. Comparing forest and pasture areas, for example, scholars found that forest areas absorbed 11 percent more solar radiation than pasture areas; average albedo in forest areas was 13.4 percent while in pastures areas was 18 percent; average temperature during the day on the soil of forest areas was around 24.1^{o}C, while in pastures areas was 33^{0}C; daily temperature of soil varies with depth: at 20cm depth, in forest areas such variation did not exceed 2,8^{0}C, but in the pasture areas the variation was of 8^{0}C; down to 4 meters depth, the forest roots and leaf systems are more effective in pumping water to supply the transpiration of vegetation, than pastures. Those results allowed the conclusion that by removing the forest, humidity in the air above surface will be reduced (estimated in 20 to 30 percent), and that the large-scale deforestation would reduce precipitation by 5 to 20 percent (SOUZA, et. al., 2004). The extent of the impacts on the climate and hydrological cycle is under study, but consensus already exists about the negative consequences of those changes.

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2) Who will be the beneficiaries of commercialization of water? There is no doubt about a tendency to privatize water supply services around the world; a market so far dominated by big enterprises: Vivendi, Suez-Lyonnaise, Biwater, Thames Water and Bouygues who are commercial water treatment companies, and other companies such as Nestle, Danone, Coca-Cola, Pepsi and others that commercialize bottle water (DIAS; ARAGON, 2004). Some estimates claim that over 1.6 billion people will have their water supply provided by the private sector in 2020, which would represent an increase of more than 500 percent compared to the current situation (PETRELLA, 2000).

With the increase of industrialization and costs of desalinization, the improvement of transportation systems and increase of the economic value of water, commercialization of fresh water in nature will tend to increase, and countries and regions with abundance will end sooner or later participating of this market. For Jerson Kelman, President of the Brazilian National Agency for Water (ANA), for example, the Amazon river has the capacity of supplying in just two seconds of discharge all bottle water consumed in the world during one day (360 million liters) (KELMAN, 2004).

Facing that challenge demands of governments of the Amazonian countries and the people of the Amazon region implementation of policies improving the management of water resources in such a way that attend the demand of local users and revert the benefits of an eventual commercialization for the well-being of the people and the sustainable development of the region.

3) Is availability of water related to accessibility of the resource? Abundance of water does not necessarily mean access of water for all (KING, et. al., 2007). Independently of the enormous availability of water in the Amazonian countries, according to UNDP (UNEP, 2004), access of population to potable water in these countries varies from 80 percent in Peru to 94 percent in Guyana and to sanitation services from 93 percent in Surinam to 70 percent in Bolivia. Those levels are similar or even lower than in some countries with severe scarcity of water (UN, 2003) including Saudi Arabia with availability of 118 cubic meters per person per year and access of 100 percent of the population to potable water and 95 percent to sanitation services; Jordan with availability of 179 cubic meters and access of 96 percent to potable water and 99 percent to sanitary services; and Egypt with availability of 859 cubic meters and access of 97 percent to potable water and 98 percent to sanitary services. Those figures refer to entire countries hiding important regional differences. In Brazil, for example, the Amazon region records some of the worst development indicators of the country: according to the 2000 population census, only 63.5 percent of the residences in urban areas had pipe-water and only 46.7 percent sanitary installations. In rural areas those services are much lower and even non-existent (ARAGON, 2007).

Those evidences permit to conclude that in the Amazon, issues related to use of water are related mainly to the paradox of abundance with little access. Therefore, special measures are needed to solve specific problems caused by abundance of water in humid areas, such as controlling tropical diseases and flooding, increasing and improving transportation and sanitation services, preventing occasional long dry periods and preparing emergency measures, and providing access of potable water for all.

Biodiversity

Tropical rainforests are the richest biomes of the world in biodiversity. According to Fonseca and Silva (FONSECA; SILVA, 2005), although covering roughly 5 percent (17 million km^2) of the surface of the planet, the tropical rainforests possess about 50 percent of all existing species in the world, and all agree that the Amazon is the region with the largest biodiversity in the world; even though the total number of species existing in the world is still unknown. Fonseca and Silva's study (FONSECA; SILVA, 2005) provides the following figures: the 1,750,000 species described in the world would represent a tiny part of the total number estimated between 3,635,000 and 111,655,000. Concerning the Amazon, the authors point out that estimates calculate between 365,000 and 11,165,000 species. Among the species known in the region are 40,000 species of superior plants (30,000 endemic) (10 percent of the world); 425 species of mammals (172 endemic) (9.1 percent of the world); 1,300 species of birds (263 endemic) (13.4 percent of the world); 37 species of reptiles (260 endemic) (5.7 percent of the world); 427 species of amphibians (366 endemic) (10.1 percent of the world), and between 3,000 and 9,000 species of fresh water fish (27-30 percent of the world). Two aquatic mammals are endemic of the region: *Trichechus inunguis* and *Inia geoffrensis*. The number of species of ants is estimated between 4,000 and 8,000, being already described about 1,000 species. In the Brazilian Amazon have been described 1,800 species of butterflies (24 percent of the world), and 2,500-3,000 species of bees (10 percent of the world). Another study (CDEA, 1992) mention that in the Peruvian Amazon have been found 300 species of trees per hectare; 630 species of vertebrates (353 birds) and 232 species of butterflies in 2 km^2; and 5,000 species of insects in just one tree.

With the actual tendency of commercialization of nature (BECKER, 2004a), sustainable use of biodiversity in the Amazon becomes a central challenge for the future of the region in the present context of globalization. How to regulate its market worldwide? How to deal with property rights of local communities who have developed social practices to preserve and even enrich biodiversity? (NEVES, 1995). How to incorporate traditional knowledge in scientific and technological development?

Those are questions without satisfactory responses while commercialization of natural products from the Amazon and the Humid Tropics progresses around the world. Products, processes, and even living organisms, from those regions are increasingly being patented in developed countries and bio-piracy is getting out of control. Bio-prospecting and other mechanisms facilitating the access of foreign companies to traditional knowledge and industrial processing of products derived from plants and animals from the Amazon are controversial and have produced so far limited results for the development of local communities (ENRIQUEZ; NASCIMENTO, 2007).

The challenge is to negotiate in better terms, reinforce environmental legislation, build scientific capacity in the region to develop biotechnology, aggregating value to the products obtained from the forest maintaining it standing, and above all involvement of local communities and indigenous people in the process and benefits. The list of products already existing extracted from natural products of the Amazon is long, and the list of those with real possibilities of being produced is even longer: cosmetics, medicines, foods and beverages, insecticides, fertilizers, paints and others. The

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question that remains, however, is how to revert the benefits of biotechnology and bio-commerce for the well-being of local people.

CO_2

Recognition of the impact of the increase of Carbon Dioxide (CO_2) in the atmosphere for the increase of global warming urges the implementation of Clean Development Mechanisms (CDM). The Kyoto Protocol determines that countries with excess of CO_2 emissions (industrialized countries) could compensate that excess by buying credits of CO_2 from countries that have not reached those limits (developing countries). This CDM has become an important market. During the first five months of 2004, 64 million tons of CO_2 were permuted in the world, amount similar to the one of the entire year of 2003 (SANTILLI; MOUTINHO, 2006).

One form of obtaining CO_2 credits is by buying the amount of CO_2 absorbed by growing vegetation through reforestation. In the Brazilian Amazon, for example, there exist some 200 thousand km^2 of degraded areas with possibility of implementing CDM projects through the market of credits of CO_2, which could generate some US$150 million per year (NOBRE; NOBRE, 2005). Such possibility, however, offers very limited contribution, if any, to control deforestation, since the CDM does not include the commercialization of CO_2 already retained in the forest by keeping the forest standing. But this is not the only limitation of this CDM. Reforestation can contribute to monoculture diminishing biodiversity, and depending of the species planted extensive areas have to be cultivated to sink significant amounts of Carbon Dioxide (NOBRE; NOBRE, 2005), reducing, therefore, the possibilities of involving poor communities and of generating significant social impacts because of the high costs required (SANTILLI; MOUTINHO, 2006). Furthermore, to have significant impact in reducing global warming, commercialization of CO_2 should be accompanied by measures to reduce emissions in developed countries, such as the implementation of new technologies for generating clean energy, and those innovations transferred quickly to be also used in developing countries.

In fact commercialization of credits of CO_2 through reforestation must be complemented with other measures to render significant results. One possibility is compensation for non-deforestation.

Brazil contributes with the emission of 80 to 90 million tons of CO_2 per year coming from burning fossil fuels and 200 to 250 million tons per year coming from alteration of uses of soil, principally deforestation ($3/4^{th}$ of the total) (NOBRE; NOBRE, 2005). The Brazilian Amazon covers about 5 million km^2 (59 percent of the country and 68 percent of the whole region), and approximately 20 million people (12 percent of the country and 72 percent of the whole region) are estimated to live in the region (ARAGON, 2005). About 680 thousand km^2 have been deforested in the Brazilian Amazon, at a rate of about 17 thousand km^2 per year, with picks in 1995 (29,059 km^2) and 2004 (27,429 km^2), representing the emission of about 200 million tons of CO_2 per year to the atmosphere (SANTILLI; MOUTINHO, 2006). The emission of that quantity of CO_2 to the atmosphere could be avoided if compensation measures for non-deforestation are implemented.

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Control of deforestation in the Brazilian Amazon

The cyclical pattern of deforestation of the Brazilian Amazon (figure 2) reflects inconsistent impacts of public policies to control deforestation: measures have not been strong enough to contain deforestation continuously. Among the causes are the expansion of soybeans cultivation, cattle breading, illegal logging, opening of highways, and fires.

One of the measures taken in Brazil to control deforestation in the Amazon has been the creation of conservation units and the delimitation of Amerindian Territories.

Law 9.985 of 18 July 2000, created the National System of Natural Conservation Units (SNUC), defining different practices of natural conservation in the country, public and private. SNUC defines two big categories of conservation units: (1) total protection units, where human settlement is not allowed; and (2) units for sustainable use, where several human uses are allowed. Each category includes several sub-categories. Amerindian Territories are not covered by SNUC; they are guaranteed by Article 231 of the National Constitution of 1988.

About 14 percent of the Brazilian Amazon is covered by some 290 conservation units of all types (5 percent in total protection units, and 9 percent in units for sustainable development) (BENSUSAN, 2005). Many of those units, however, have not been implemented; it is estimated that only 54.6 percent of the federal conservation units in the country has been implemented (FERREIRA, et. al., 2007).

Concerning Amerindian Territories, about 400 areas (29 with more than 1 million hectares each) have been legally recognized in the Brazilian Amazon, covering about 20 percent of the region and inhabited by about 250 thousand people (ZIMMERMAN; BERNARD, 2005). Putting together conservation units and Amerindian Territories some 34 percent of the region is under some type of environmental protection.

Scholars have demonstrated that deforestation in the Amazon is significantly minor within protected areas (conservation units and Amerindian Territories) than outside them. According to Ferreira, Venticinque and Almeida (FERREIRA, et. al., 2005) only 2.0 percent of the protected areas in the Amazon has been deforested until 2003, in comparison to 23.6 percent of deforested area outside those protected areas (12 times higher), and those differentials remain even in areas of intense occupation, indicating that protected areas are important instruments to contain deforestation. The question is until when?

There is no doubt that these instruments to be effective must be accompanied by other measures including the recuperation of degraded areas avoiding further deforestation, increasing involvement of local actors in the formulation and implementation of public policies, valorization of environmental services of the forest and use of non-forest products, reinforcement of environmental laws, and intensification of monitoring, among others. Without such measures deforestation of the Amazon will tend to continue with more or less intensity as governmental measures are more or less impacting.

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Biosphere Reserves

Biosphere Reserves have been established under UNESCO's Man and the Biosphere (MAB) Programme since 1976.

> Biosphere Reserves (BR) are areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognized within the framework of UNESCO's Programme on Man and the Biosphere. BR should: (i) contribute to the conservation of landscapes, ecosystems, species and genetic variation; (ii) foster economic and human development which is socio-culturally and ecologically sustainable; (iii) serve as a logistic support for demonstration projects and training, research and monitoring. To be qualified for designation as a BR, an area should: (i) encompass a mosaic of ecological systems representative of mayor biogeographic regions; (ii) be of significance for biological diversity conservation; (iii) provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale; (iv) have an appropriate size to serve the three functions [described above]; (v) include a legally constituted core area devoted to long term protection, a buffer zone where only activities compatible with the conservation objectives can take place, and a transition area where sustainable resources management practices are promoted; (vi) provide organizational arrangements for the involvement of a suitable range of *inter alia* public authorities, local communities and private interests; (vii) provide mechanisms (policy and authority) to manage human activities (UNESCO, 1996).

According to that concept, Biosphere Reserves represent ICD initiatives in specific settings that can include within the same BR different conservation units and protected areas, integrating management strategies with the participation of different stakeholders including the local people, the private sector, the government, NGOs, and the scientific community.

The change of focus of the conservationists' ideas in modern times towards a new paradigm where conservation and development are conceived as interdependent processes puts BR in a privilege position among ICD schemes. In that sense the experience of BR along the three decades of existence represents an important asset for the implementation of conservation and development projects in the Amazon.

There are 482 Biosphere Reserves in 102 countries of the world today (2005). Of those, eight are located in the Amazon or include parts of the region (JAEGER, 2005):

- Biosphere Reserve Manu, Peru, created in 1977
- Biosphere Reserve Pilón-Lajas, Bolivia, created in 1977
- Biosphere Reserve El Tuparro, Colombia, created in 1979
- Biosphere Reserve Beni, Bolivia, created in 1986
- Biosphere Reserve Yasuní, Ecuador, created in 1989
- Biosphere Reserve Orinoco-Casiquiare, Venezuela, created in 1993
- Biosphere Reserve Sumaco, Ecuador, created in 2000
- Biosphere Reserve Amazônia Central, Brazil, created in 2001

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There seems to be consensus today about the need to integrate people in the initiatives that involve environmental conservation. There will not be conservation without attending the livelihood needs of the population in and outside protected areas. People must be a partner and not an obstacle for conservation; in fact people should be the center of any ICD scheme. Biosphere Reserves intend to do so.

To enhance the work of Biosphere Reserves in the Amazon, the MAB programme in cooperation with the UNESCO Chair in South-South Cooperation for Sustainable Development (recently created at the Federal University of Pará), has initiated e series of activities to exchange experiences among the eight Biosphere Reserves existing in the region, including workshops, publications, research and training.

The International Workshop on Amazon Biosphere Reserves: An Integrative and Transboundary Initiative was held from 24-26 April 2006 in Georgetown (Guyana). The objectives of the workshop were: (1) to exchange experiences and methodologies for management and monitoring of Biosphere Reserves in the participating countries; (2) to establish mechanisms for the interchange of experience and expertise among people engaged in the management and monitoring of Biosphere Reserves in the Amazon region; (3) to include issues of sustainability, institutional framework, scientific and field methods, legislative issues and public support; (4) to discuss the development of programmes for the participation and inclusion of the affected communities.

A second international workshop on Amazon Biosphere Reserves will take place in Belém from 27-28 September 2007, as a follow-up of the first. The objectives are: (1) to discuss and compare successful experiences of sustainable products in the Amazon Biosphere Reserves; (2) to present and debate the themes of the III World Congress of Biosphere Reserves to be held in Madrid (Spain) in February 2008; (3) to discuss an agenda of cooperation among the Amazon Biosphere Reserves.

The UNESCO Chair in South-South Cooperation for Sustainable Development

In 1992 UNESCO launched an ambitious programme to reach its mission at the very local level: the UNESCO Chairs Programme. Around concrete environment and development issues, the UNESCO Chairs are aimed at successfully linking the different scientific disciplines to promote the knowledge base for policy formulation in the field of sustainable development. The Chairs are located in universities, research institutions or other relevant institutions of public or private character. The articulation between research, intensive training courses for policy makers and specialists, and documentation and information activities addressed to different clienteles are major concerns. UNESCO Chairs are designed according to local ecological, economic and socio-cultural conditions and should promote action-oriented research and specific priorities for decision-making concerning sustainable development, be it a question of educational strategies or scientific research, technological development strategies or negotiation processes concerning the environment, or information and communication strategies related to these issues. In developing countries, specific attention is given to social identification of the objectives of scientific and technical development crucial for sustainability. Special characteristics of the UNESCO Chairs are the outreach components of their programmes.

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Community servicing and assuming the function of a platform for fruitful dialogue between different societal stakeholder groups, are priority tasks taken up by these Chairs. The Chairs promote a pluridisciplinary vision, which is fundamental for removing obstacles on the way of knowledge progress. This especially applies to the interface areas where social sciences need an active dialogue with hard and natural sciences (UNESCO, 2007).

Within that concept, UNESCO created at the Federal University of Pará, Belém, Brazil, the UNESCO Chair in South-South Cooperation for Sustainable Development on 15 September 2006.

This Chair emerged from the experience of that University in the South-South Cooperation Programme on Environmentally Sound Socio-Economic Development in the Humid Tropics, a joint initiative of UNESCO/MAB, the United Nations University (UNU) and the Third World Academy of Sciences (TWAS). This programme that began in 1992 as a follow-up of the World Conference on Environment and Development held in Rio de Janeiro (1992) is coordinated through the MAB Programme at the Division of Ecological and Earth Science in Paris.

The Programme operates on two basic directions: on the one hand, helping to identify ways of strengthening local institutions undertaking research, training and management in relation to the sustainable use of renewable resources and on the other, by recommending possible actions. Furthermore, the programme has taken steps to improve the exchange of information and research results, particularly with respect to the preservation and sustainable use of biodiversity. It has also worked to disseminate knowledge of comparative research through publications and network data-bases. In addition it has tried to increase the exchange of scientists and experts. The progress made has been so promising that the UNESCO World Science Conference, held in Budapest in June 1999, included this programme as one of the priority follow-up activities that should be undertaken (CLÜSENER-GODT, 2004).

Following that programme and the purpose of the UNESCO Chairs which "should all be designed to complement the relevant UNESCO programmes and actions," (UNESCO, 2007) the purpose of the Chair in South-South Cooperation for Sustainable Development is to establish and implement a strong Programme of South-South Cooperation for Sustainable Development and thus helping to work out concrete results so as to improve synergy in the delivery of high-quality, scientific information on the current understanding of the interactions between humans and the environment, global environmental change, emerging environmental issues, and the consequences for human well-being in line with specific foci identified in concrete activities.

Conclusions

There is a need for a new vision for the development of the Amazon within the actual context of globalization and rapid change. Within the near future significant developments in the world in science and technology, as well as changes in social, economic, political and environmental conditions are expected, including the following: increased population in already highly populated coastal zones; increased urbanization; continued development of mega cities; rapid changes in technology, including rapid growth of global communication facilities; conflicts over access to resources and political

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conflicts; increased global warming leading to dramatic changes in sustainability in certain regions; lack of access to proper food resources; lack of access to safe drinking water; worsening of health conditions in many places; acceleration of land-use and other environmental changes, with subsequent erosion or loss of biodiversity and of ecosystem services; increased demand for scientific services; increased demand for information on the direction and magnitude of environmental change and on feasible adaptation measures; increased demand for training and capacity development in the scientific aspects of sustainable development.

There is, therefore, a need for establishing key partnerships so as to be able to properly assess those issues and provide different stakeholders with options for both policy-making and for implementing policies according to local demands leading to sustainable development. In that sense, ICD schemes in the Amazon, including Biosphere Reserves, will permit to identify key elements for improvement and cooperation. Moreover, in a time of global environmental, socio-economic, cultural, and institutional change, and of globalization, there is a need for international institutions that are active in these domains to join forces so as to maximize efforts in solving pressing problems.

Within that context, new bases should be incorporated in the formulation and implementation of pubic policies in the Amazon, including, among others: (1) to consider conservation and development as complementary processes: there will not be development without conservation or conservation without development, meaning to generate social inclusion with environmental conservation; (2) to have in mind that this challenge demands the generation and use of modern technologies adequate to the humid tropics, meaning significant scientific and technological innovations able to transform and valorize natural resources, aggregating value making them economically competitive at the local, national and international levels, without destroying the forest; and that the implementation of those alternatives demand a robust system of science and technology in the region; (3) to recognize that the Amazon is today a region of intense conflicts but also a land of many opportunities where communities and local actors are becoming more aware of their rights, demanding active participation on the formulation and implementation of policies, and more benefits generated by those policies; (4) to recognize that being the Amazon a region shared by nine countries, cooperation is indispensable to implement public policies.

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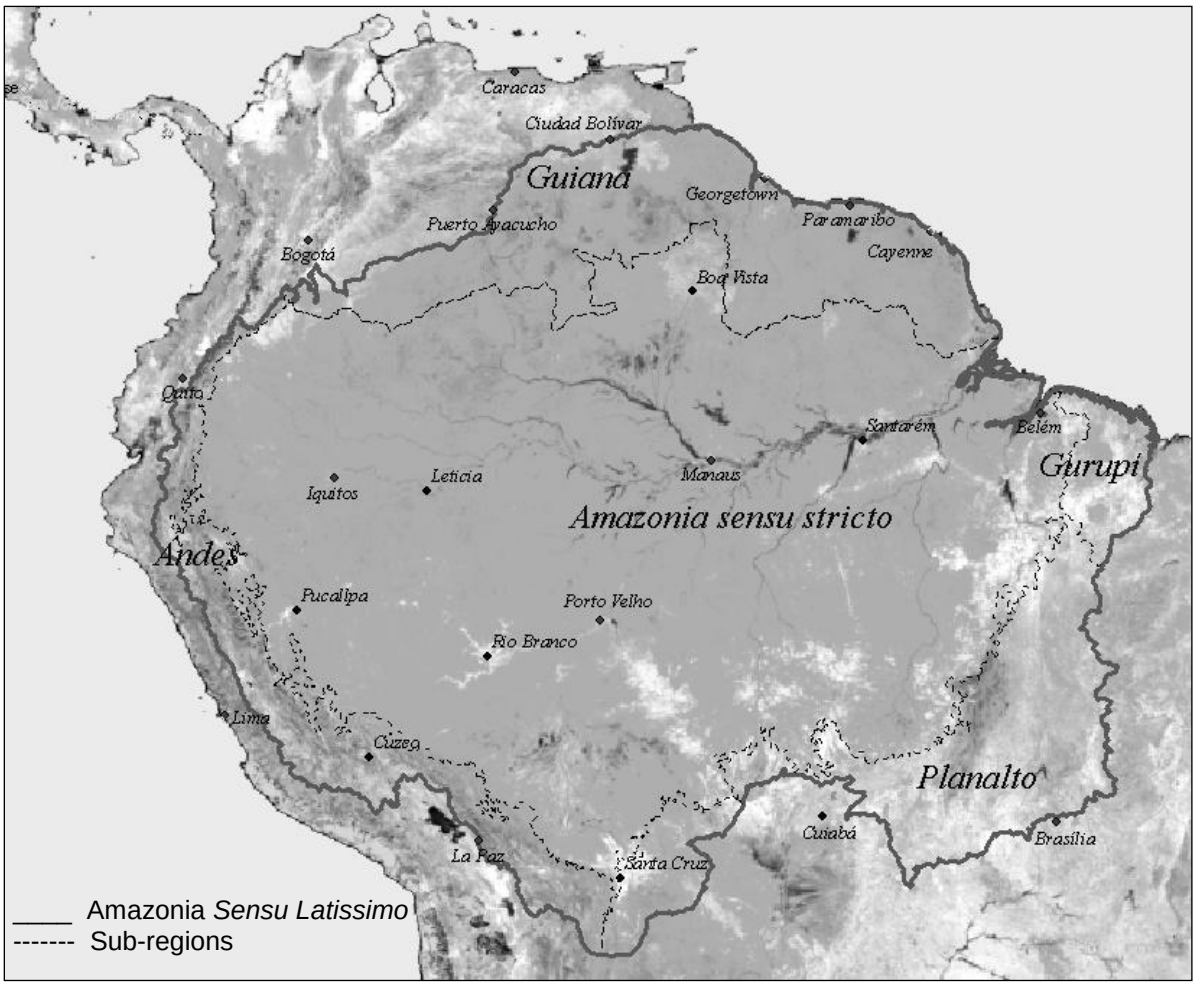

Source: European Commission/Joint Research Centre (2005), *Proposta para definição dos limites geográficos da Amazônia.* Serviço das publicações oficiais das Comunidades Européias, Luxembourg, p. ii

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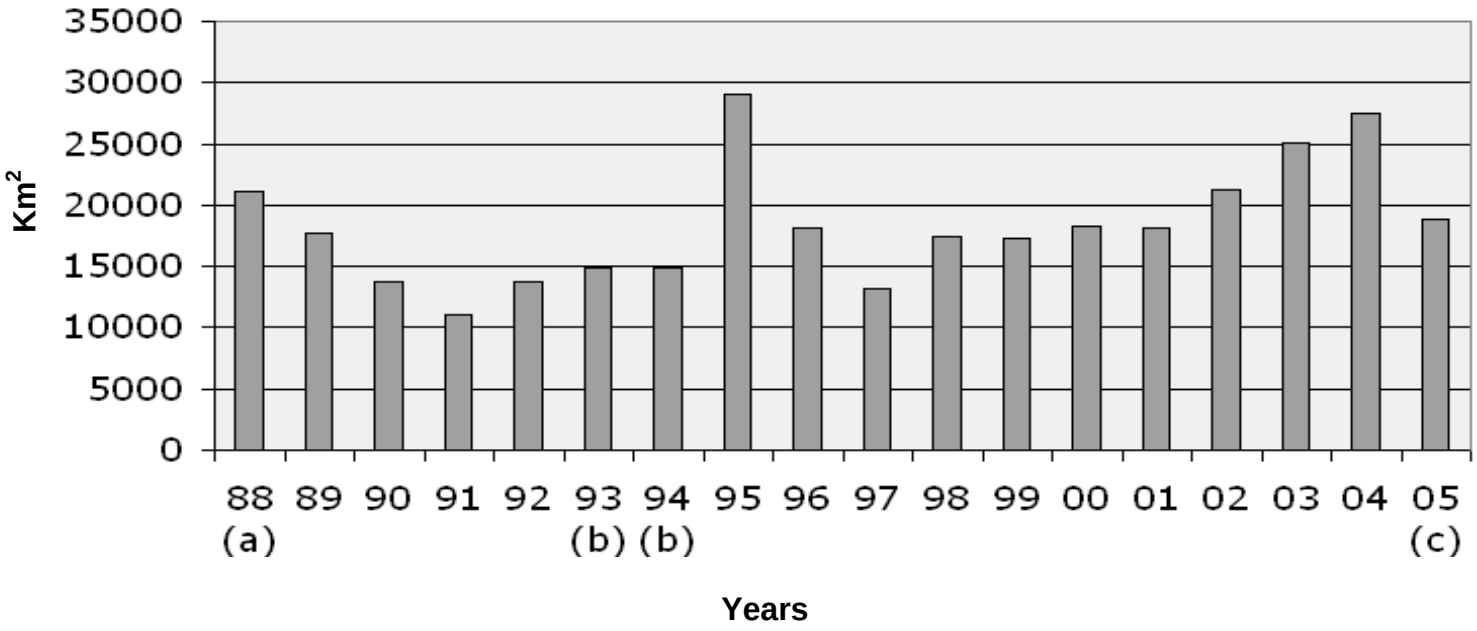
Figure 1
Amazonia *Sensu Latissimo* and sub-regions



Source: Instituto Nacional de Pesquisas Espaciais (2007). *Projeto PRODES: Monitoramento da floresta amazônica por satélite.* http://www.obt.inpe.br/prodes/index.html. Accessed, 5 June 2007

(a) Mean between 1977 and 1988
(b) Mean between 1993 and 1994
(c) Preliminary estimate in the basis of 211 images

Source: Instituto Nacional de Pesquisas Espaciais *Projeto PRODES: Monitoramento da floresta amazônica por satélite.* http://www.obt.inpe.br/prodes/index.html. Accessed 07 November 2006

(a) Mean between 1977 and 1988
(b) Mean between 1993 and 1994
(c) Preliminary estimate in the basis of 211 images

Figure 2
Deforestation of the Brazilian Amazon, 1988-2005

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