GEF/ACTO/UNEP Amazon Project- Water Resources and Climate Change

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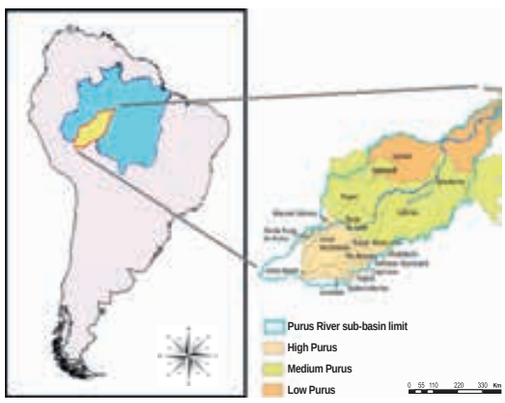
Water Resources Management and Adaptation to Climate Change in the Amazon Basin:

Regional Cooperation towards a Strategic Action Programme

Climate Change, Adaptation Capacity and Risk Governance in the Transboundary Purus River Sub-basin

Location of the Purus River sub-basin



INFORMATION BOX

Countries: Bolivia, Brazil and Peru.

Partners: Participating communities from seven (7) Municipalities in the State of Amazonas: Berurí, Tapauá, Canutama, Lábrea, Humaitá, Pauini and Boca do Acre; and from three (3) Municipalities in the State of Acre: Manoel Urbano, Santa Rosa do Purús and Sena Madureira. Other partners: UFPA and UNAMA.

Investment: US$ 400.000

Benefitted population (directly and indirectly): 295.000 people

Source: Diana Monroy

Tapauá, in the Purus River sub-basin, during the rainy season

CONTEXT

GEF Amazon Project – Water Resources and Climate Change's Component III – Strategic Action Programme (SAP) includes the pilot project "Climate Change, Adaptation Capacity and Risk Governance in the Transboundary Purus River Sub-basin". The Amazon region which harbours the Purus River sub-basin is one of the places in the world where natural resources are most diverse and available. However, the quality of these resources is threatened, since the region and its populations are facing the impacts of climate change. Although the sub-basin crosses Bolivia, Brazil and Peru, the pilot project focuses on the areas where it harbours more people, such as Brazil and Peru. Conditions resulting from environmental degradation – and the need to adapt to climate change – interfere with other, less urbanized areas, demanding institutional arrangements that consider the specificities of the region, its political culture and its biome. Risk Governance is an important factor for the stakeholders who occupy the sub-basin and an essential mechanism for adaptation.

ACTIVITIES

The goal of this pilot project is to assess the impacts of climate change on risk management and on the management of transboundary water resources in the Purus River sub-basin, and to provide the basis for coping strategies that allow for the sustainable use of the sub-basin's natural resources facing extreme weather. Stakeholders were interviewed during two field trips to the Purus River sub-basin, from Peru to Beruri, in the State of Amazonas. Two workshops were also held, one in Manaus (May 2014) and another in Rio Branco (August 2014), in order to validate the Risk Governance Model, a tool created to help the 43 participating communities or 295,000 people living in the Purus sub-basin during extreme weather events. With the Risk Governance Model at hand, decision makers and other sub-basin stakeholders may use strategies to adapt and respond in advance to extreme weather events. The model was developed from a regional perspective that can be operated at cross-border institutional level.

RESULTS

Semi-structured interviews with stakeholders were carried out during field research in the Purus River sub-basin. A total 367 interviews were used to establish perceived risks by local populations, as well as that of decision makers who deal with policies referring to these risks. These trips identified communities' ways of life and strategies used during past extreme events. Meanwhile, a database of variables listed in the Model was built, so as to address climate events.

FACTS BOX

Location: The Purus River sub-basin is located in southwestern Amazon, covering regions in Brazil, Peru and Bolivia. The Purus is its main river, and its head is at Arco de Fitzcarraldo, one of the most inaccessible parts of Peru. In Brazil, it crosses the States of Acre and Amazonas before flowing into the Solimões River.

Surface of the Purus River basin: 63.166 km2

Approximate length of the Purus River: 2.960 km

Purus River flow: 8.400 m3

Ecosystem: Dense forest and open forest.

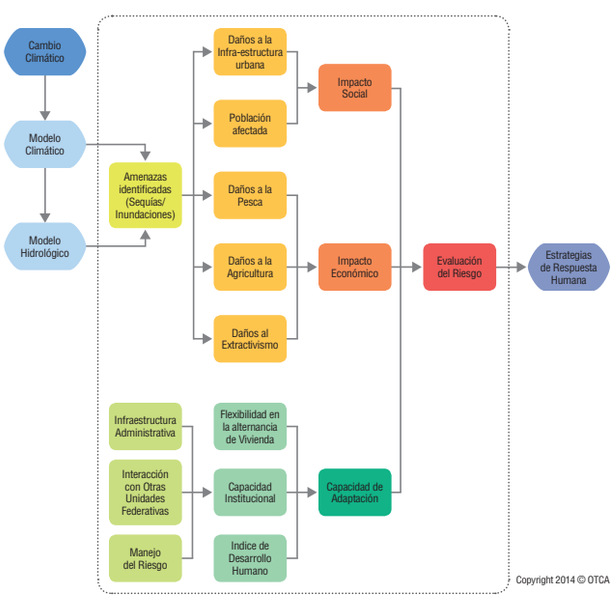
Economic activity: The population occupying the sub-basin lives mainly of subsistence agriculture, extraction of Brazil nuts and fish farming. The Purus is the river where there is most fishing in the Amazon basin, given its preserved biodiversity.

The Model is a prevention and decision making tool to address climate change for all countries involved. It was designed to operate in Amazon areas and, therefore, can be replicated in other Amazon countries. A result of this Activity, the Model provides the basis for measures to be implemented as pilot response and adaptation to climate change, in order to make better use of the sub-basin's natural resources. The Model has a 10-year predictive capacity, allowing it to be incorporated – in all countries participating in the GEF Amazon Project – into adaptation strategies and responses to extreme weather events. The use of the Model depends on the countries' concerns to take preventive measures concerning climate change.

Source: Raimundo Nonato Cunha Pinheiro

Canutama, in the Purus River sub-basin, during the rainy season

The Risk Governance Operational Model



Pilot project: Adapting to Climate Change in the Transboundary MAP Region: Madre de Dios-Peru, Acre-Brazil and Pando-Bolivia

INFORMATION BOX

Countries: Peru, Brazil, Bolivia

Partners: **In Bolivia:** Centro de Operaciones de Emergencia Departamental de Pando (COED-PANDO), Municipality of Cobija, Secretaría de Medio Ambiente del Gobierno Autónomo Departamental de Pando, Ministry of Foreign Affairs.
In Brazil: Instituto Nacional de Pesquisas Espaciais (INPE), Secretaria de Estado do Meio Ambiente do Acre (SEMA-AC).
In Peru: Autoridad Nacional del Agua (ANA)-Administración Local de Agua Maldonado (ALA-MALDONADO), Gobierno Regional de Madre de Dios (GOREMAD/Gerencia Regional de Recursos Naturales y Gestión del Medio Ambiente. Servicio Nacional de Meteorología e Hidrología (SENAMHI)-Iñapari and local governments.

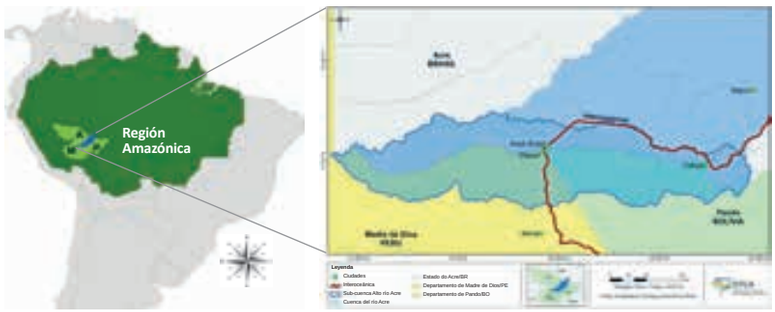
Investment: USD$ 270,000

Team: Installation of Terra MA2 Platform server and freeware in Peru and Bolivia for the Tri-national Early Warning System. Installation of radio communication system in Bolivia, Brazil and Peru.

Source: SEDP

Homes in risk area in Brasileia, Brazil.

Acre River basin: a part of the High Acre River sub-basin



Transboundary MAP región: Madre de Dios-Peru, Acre-Brazil and Pando-Bolivia

CONTEXT

GEF Amazon Project – Water Resources and Climate Change's Component III – Strategic Action Programme (SAP) includes Pilot Project "Adapting to Climate Change in the Transboundary MAP Region: Madre de Dios-Peru, Acre-Brazil and Pando-Bolivia".
In the Amazon region, the cross-border Acre River basin is at risk. Over the last decades, the local environment has faced extreme weather events such as floods and droughts, and suffered the impacts of intense anthropogenic pressure (fires, deforestation, agriculture), which have affected Acre River aquatic ecosystems, vegetation, soil, air and, consequently, the health and economies of local populations. Thus, the GEF Amazon Project carried out this pilot project – with the participation of local government authorities and communities in the three countries – in order to address the vulnerability of water resources and the local population to climate change, and to contribute to policies for social and environmental adaptation in this complex cross-border Amazon region. The project has enabled greater integration in the region and strengthened cooperation among the three countries. Moreover, the project can be replicated throughout the Amazon basin.

ACTIVITIES

Facing the challenges of climate change requires expertise and cooperation at regional level. It is essential for managing risks and protecting people and the environment, so that they can find ways to adapt. In this context, the main goal of the pilot project was to assess the vulnerability of water resources to climate change in the cross-border MAP region, and to develop and implement an early warning system for

the formulation and implementation of adaptation strategies to climate variability in this region, as a platform to increase the responsiveness of governments in Madre de Dios, Acre and Pando. With the support from the three countries' government representatives, from technicians belonging to national institutions and from the civil defense, as well as from social stakeholders (through the MAP Initiative), the pilot project collected the data needed to establish a geo-referenced tri-nation database, thus generating a statistical analysis on climate change and its effects on ecosystem functions in the MAP region. At the same time, a diagnosis of hydrological vulnerability areas- those affected by severe droughts, floods, landslides and erosion – was carried out. Methodology for developing a water resources climate change vulnerability Matrix for the MAP region was also consolidated. Similarly, explanatory maps were created to identify areas that are critical for local hydrological vulnerability.

RESULTS

The pilot project has provided the basis for formulating and implementing climate change adaptation strategies alongside government representatives from the three countries and local society. A tri-national team made up of 15 specialists carried out technical validation of the vulnerability and risk mapping, following an 185-kilometre expedition along Acre River (November-December 2013). Furthermore, the expedition mapped potentially hazardous activities, contaminated areas and fragile sites, emphasizing the extreme vulnerability of the Acre River basin and the need to establish adaptation strategies.

FACTS BOX

Location: The Acre river is born in Peru, in the basins of rivers Tahuamanu and Yaco, and first borders Brazil then Bolivia.

Length: 1,190 km. The Acre River flows into the Purus River in Boca do Acre, Brazil. Its basin covers around 35,967 km2 –87% in Brazilian territory, 7% in Peru and 5% in Bolivia.

Ecosystem: Tropical humid

Economic Activity: In Acre: Brazil nut extraction, livestock and agriculture: soy. In Madre de Dios: Logging, precious metals, oil. Agriculture: rice. Livestock. In Pando: Agriculture: corn, cocoa, coffee, rice. Livestock and fishing.

Population: Approximately 977.514 people

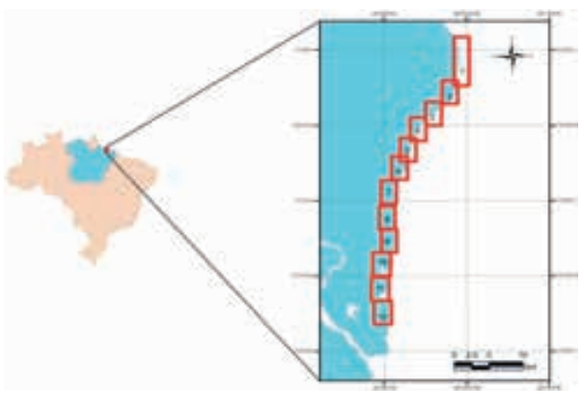
Tri-national maps and local responsibilities identified as to the MAP region Alert System were presented at the International Meeting of Acre River Early Warning System (December 2013). A tri-national Early Warning System was developed and implemented in the Department of Pando, Bolivia, with the Centro de Operaciones de Emergencia Departamental de Pando (COED-PANDO); in the Department of Madre de Dios, Peru, with the Autoridad Nacional del Agua (ANA), Puerto Maldonado; and in the state of Acre, Brazil, with SEMA. Responsible staff from relevant local institutions was trained to operate the Terra MA2 Platform. To support the warning system, a new Radio Communication System was installed. Joint work by national, regional and local governments allows for emphasis of the importance of this tri-national warning system in the region, and the need to expand it to neighbouring departments or states and other Amazon areas.

Source: GEF Amazon Project

A tri-national team of specialists carried out field work to gather data for a tri-national geo-referenced database.

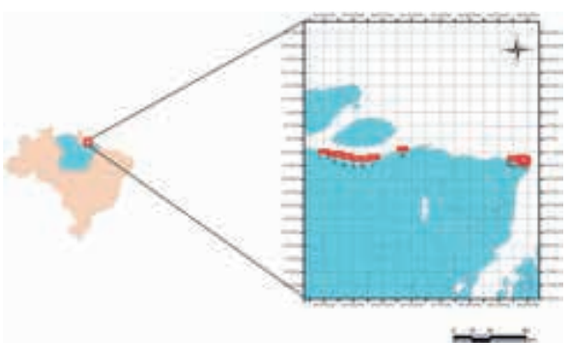
Adapting to rising sea levels in the Amazon river delta

Areas analyzed on the East coast of the island of Marajó



Source: GEF Amazon Project – Water Resources and Climate Change

Areas analyzed on the North coast of the island of Marajó



Source: GEF Amazon Project – Water Resources and Climate Change

INFORMATION BOX

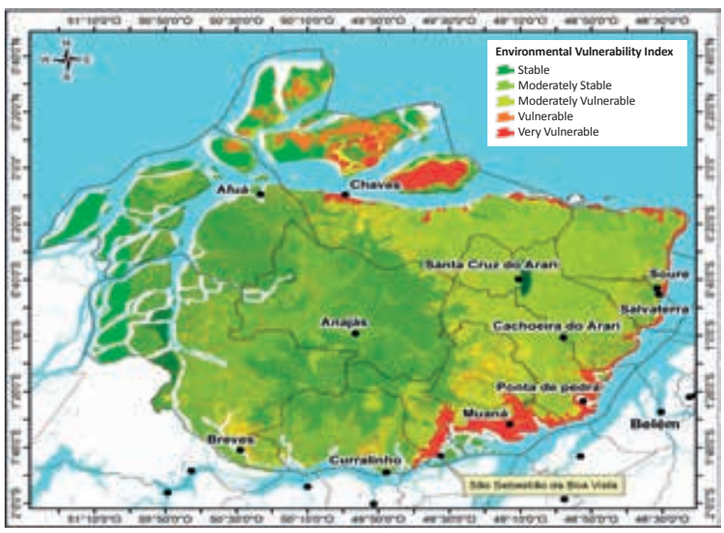
Country: Brazil

Partners: Municipalities on the North coast of the island: Chaves and Afuá; municipalities on the East coast: Soure and Salvaterra; others: UFPA

Investment: US$ 202.700

Benefited population: over 99,000 people

Island of Marajó coastal vulnerability map



Source: Adapted from IGBE/SIPAM, Brazil

CONTEXT

The activity "Adapting to rising sea levels in the Amazon River delta" is part of Component III – Strategic Action Program of the GEF Amazon Project – Water Resources and Climate Change. This geological, hydro-climatic and environmental study of the island of Marajó is focused on understanding the dynamics of the Atlantic Ocean at the mouth of the Amazon River – and aims to suggest measures for adapting to the rising sea levels which have been causing massive problems on the island. The Marajó archipelago is an estuarine complex made up of dozens of islands in the Marajoara Gulf; the island of Marajó is the largest of them all. The study assesses the consequences of the sea level rise in the Amazon delta – which was between 10 and 25 centimetres in the 20th century and will be possibly even greater over the 21st century, due to climate change. Erosion, transport and distribution of suspended sediments along the coast are leading to severe environmental and socioeconomic damage that demands adaptation measures to help cope with the impacts that have been occurring over the last 15 years.

ACTIVITIES

To establish how rising sea levels are affecting local populations and economic activities (agriculture, tourism, fisheries, transport and port movement), this geological, hydro-climatic and socio-environmental research of the island of Marajó limited the study area to municipalities of Chaves and Afuá, at the North of the island, and municipalities Soares and Salvaterra,

at the East. Similarly, research was carried out concerning erosion and coastline variations and the sandy Mangrove-Cordón interface of Soure Beach. Research also included studying the dynamics of the North coast of the island and local tidal behaviour, as well as an analysis of the estuary as a whole, allowing for the identification of dynamic changes in Amazon estuary limits.

Results revealed the need to review the historical evolution of the Amazon delta region. By means of a geomorphological study, of soil type analysis and of sediment distribution along the North and East coast of the island of Marajó, this research identified potential threats to local communities due to rising sea levels; possible scenarios were analyzed so as to better address them.

FACTS BOX

Location: The island of Marajó (0° and 2° S - 48° and 51° W) is located near the Equator, in the Northeast of the Brazilian State of Pará, 87 kilometres away from Belém, at the mouth of the Amazon River. It is the largest estuarine island in the world that is surrounded by both fresh and seawater. The island is washed by the waters of the Amazon River, to the Northwest; by the Pará River and the Tocantins River, to the South; and by the Atlantic Ocean, to the Southeast.

Area: 50,000 km2, larger than the territory of Belgium and Holland.

Ecosystem: An estuary, made up of continental and oceanic waters and ecosystems in the deltaic region. It is nursery for aquatic fauna. It facilitates transference of nutrients to the Atlantic Ocean and recovery of marine fish families.

Economic activity: Agriculture, tourism, fishing.

RESULTS

Facing rising sea levels in the Amazon River delta, the following threats were identified: 1. Socioeconomic impacts, such as loss of homes, destruction of urban and rural infrastructure, increased risks of flooding, water management problems, population migration, seawater intrusion, coastal protection costs, flood of archaeological sites, loss of agricultural land and fishing areas due to altered oceanic conditions. 2. Coastal erosion. The municipalities investigated are almost all located in flatlands close to the shore, less than 10 metres above sea level. Risks of flooding are particularly high on the North and East coasts of the island, where the coastline has undergone substantial changes as a result of spring tides, Amazonas and Pará rivers' rising water levels, and rising sea levels. These phenomena cause intense coastal erosion and migration of estuarine beaches towards mangroves, which eventually disappear.

Scenarios for adapting to rising sea levels in the Amazon River delta. The Amazon GEF Project is consolidating concrete proposals to support local governments in their adaptation to rising sea levels and coastal erosion. Educational materials are being produced and a strategy is being formulated for relocation of local people affected by loss of land.

GEF Amazon Project – Water Resources and Climate Change

Sea level rise in Soares

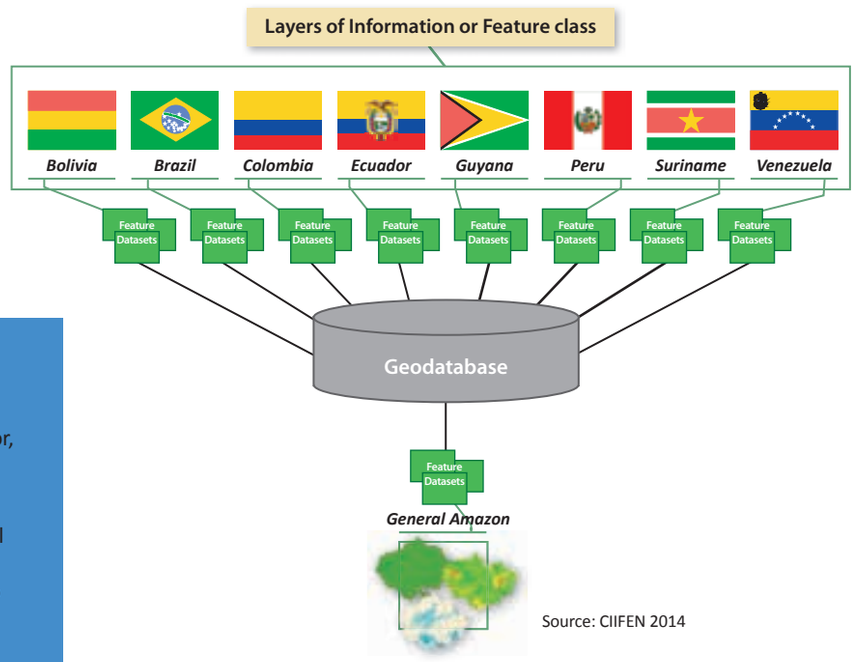
GEF Amazon Project – Water Resources and Climate Change

Coastal erosion in investigated municipalities

Amazon Basin Hydroclimatic Vulnerability Atlas

Periodical flooding of the Amazon River

Structure of Amazon basin regional geodatabase



Source: CIIFEN 2014

INFORMATION BOX

Countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Perú, Suriname and Venezuela.

Partners: National Focal Points: Ministerio de Relaciones Exteriores, Dirección General de Límites y Fronteras (Bolivia), Agência Nacional de Águas, ANA (Brasil), Ministerio de Ambiente y Desarrollo Sostenible (Colombia), Secretaría Nacional del Agua, SENAGUA (Ecuador), Ministry of Public Works and Communication (Guyana), Autoridad Nacional del Agua, ANA (Peru), Ministry of Labour, Technological Development and Environment (Suriname), Ministerio del Poder Popular para Ecosocialismo, Hábitat y Vivienda (Venezuela)

Investment: US$ 420,000

Team: Application of ArcGIS software for the design of a *regional geodatabase* structure for a Geographic Information System about the Amazon basin.

Source: OTCA

Floating market on the Amazon River

CONTEXT

Through its executing Agency – the Amazon Cooperation Treaty Organization (ACTO) – the GEF Amazon Project – Water Resources and Climate Change hired the Centro Internacional para la Investigación del Fenómeno de El Niño – CIIFEN to carry out activity *"Development of a Hydroclimatic Vulnerability Atlas of the Amazon Basin (scale 1: 1,000,000)".* The main objective of the Atlas is to collect and analyze available validated data on extreme climate variables and events and their impacts on Amazon basin water resources and society. To this end, CIIFEN contacted the Project's National Focal Points, so as to validate thematic, statistical and basic cartographic data needed for formulating the Atlas. Basic cartographic information was obtained in the websites of each country's official institutions, from map databases available to CIIFEN and with the support of Project Focal Points.

ACTIVITIES

Through the identification of national information sources, cartographic data concerning the Andean region and the Amazonian plains within the hydrographic, political and biogeographic boundaries of the Amazon basin was

gathered. To establish elements concerning the local population's vulnerability and response capacity, data on the physical infrastructure of the basin, on its natural resources and socio-economic statistical data from each of the Amazonian territories were taken into account. In this respect, meetings were held between CIIFEN, National Focal Points and relevant identified institutions. Once the cartographic base for each country was established, a file base (Geodatabase) was created within the ArcGIS environment for each country and for the Amazon basin in general. The information gathered was previously analyzed, filtered and processed before being stored in each file. For each Layer of Information, a graph showing the spatial distribution and graphic features of each file was created, as shown in Figure **Structure of Amazon basin regional geodatabase.**

FACTS BOX

Location: Amazon Region of the 8 ACTO Member Countries.

Surface: Approximately 7 million km^2, from the eastern side of the Andes to the Atlantic Ocean.

Length of the Amazon River: nearly 7,100 km

Flow: An average 240,000 m^3 of water pours into the Atlantic Ocean every second.

Ecosystems: Aquatic ecosystems, Amazon Rainforest. Warm and humid tropical climate.

Economic activity: Agriculture, Livestock, Fishing, Industry, Mining.

Population: 40 million people

RESULTS

CIIFEN presented a *Summary of data at regional basin level compiled in the form of metadata and geo-referenced to a scale of 1: 1,000,000*, developing a geodatabase which consists of a set of geographic data in an ArcGIS environment. Geodatabases have a large cartographic information storage capacity and are capable of integrating spatial data with other databases. With the Atlas, the goal is to gather validated geo-referenced information from the eight countries, to integrate different information levels, to cross data from heterogeneous data sources in a common geodatabase. CIIFEN has also made progress in identifying different policies for submission and publication of the technical and official information from each government in the region. Thus, the Amazon Basin Hydroclimatic Vulnerability Atlas collected national available data and information concerning a total 29 variables referring to socioeconomic, infrastructure, environmental, and climate components and their consequent risks.

Rui Faquini

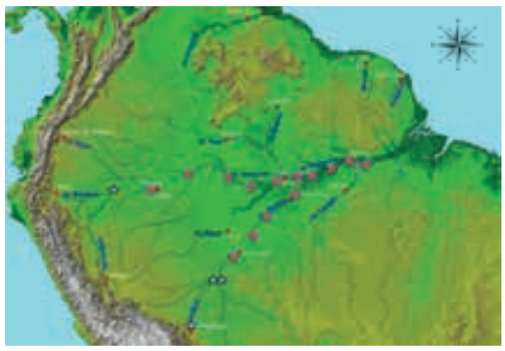
Cargo transportation in the Amazon River, Pará, Brazil.

MAPS

Biogeographical map of the Amazon basin, Hydrographic map of the Amazon basin, General Map of the Amazon Basin (Atlas) with Pfaffstetter Level 3 and 4 hydrographic division, a Digital Terrain Model (DTM), Thematic maps on Population growth (index calculated by CIIFEN), Protected Areas and Susceptibility to flooding.

Characterization of the Madeira and Amazonas-Solimões rivers' sediment load

Water and sediment sample colleting points (marked with stars)



Source: ORE/HYBAM, Brazil

INFORMATION BOX

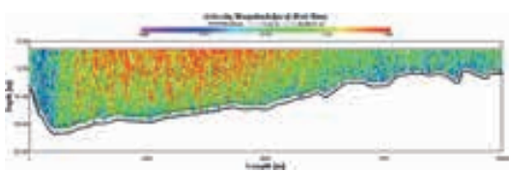
Country: Brazil

Partners: Agência Nacional de Agua (ANA, Brazil), Red del Observatorio Ambiental de Hidrología, Geoquímica y Geodinámica (OREHYBAM), Laboratorio de Potamología Amazónica del Departamento de Geografía de la Universidad Federal del Amazonas (LAPA/DGEOG/UFAM), Instituto Francés de Investigaciones para el Desarrollo (IRD)

Investment: US$ 101,160

Equipment used: Acoustic Doppler Current Profiler (ADCP). "Van Dorn" water sample type, "Van Veen" cylindrical sediment collection system. Local adapted boats with for working samples, and motor boats.

Doppler image of a cross section of the Madeira River in Humaitá, Amazonas



Source: GEF Amazon Project – Water Resources and Climate Change

André Zumak

Regional wooden boat where samples were gathered, on the Madeira River

CONTEXT

Activity II.1.3 – *Characterization of the Madeira and Amazonas-Solimões rivers' sediment load* is part of Subproject II.1 *Targeted Research*, from GEF Amazon Project – Water Resources and Climate Change's Component-II – *Understanding the basis of the Amazon River Basin's Natural Resources*. The goal of this activity is to carry out a geochemical characterization and to identify the main anthropogenic sources of suspended and river bottom sediment in the Madeira and Solimões rivers. Results will define mitigation actions, will reduce anthropogenic erosion and sedimentation process, as well as develop strategic interventions for the Strategic Action Programme (SAP). The campaign for water and sediment sampling was carried out in these rivers during the rainy season (October to April 2012-2013) and in the dry season (May to September 2013). The 16 sampling sites were selected according to the information on the regional geology of the Madeira and Solimões rivers.

ACTIVITIES

Two (2) sampling campaigns were carried out along 4,000 kilometres in the two main rivers of the Amazon Basin, based on a programme for sediment and water collecting and analysis. Samples of water, suspended sediment and sediment deposited on the bottom of rivers during the dry and rainy seasons were collected. Before collecting samples – and following the procedure for collecting hydrometric data recommended by ANA (Brazil) and the World Meteorological Organization (WMO) – it was necessary to measure the rivers' width, depth and speed of currents. An Acoustic Doppler Current Profiler (ADCP), offered by the Federal University of Amazonas' Department of Geography's Amazon Potamology Laboratory (LAPA / DGEOG / UFAM) and the Institute of Development Research (France), was used for making

these measurements. The sampling methodology and physico-chemical water and sediment analyzes followed the Standard Methods for Water and Wastewater Examination of the American Public Health Association (APHA, 2005) models. The samples were preserved according to standard methods of sediments analysis, for delivery to the laboratory. Laboratory analysis of samples included (i) sedimentological analysis, (ii) geochemical analysis of sediments, and (iii) water analysis.

RESULTS

A total of 3,600 physical and chemical analyzes were carried out on 57 samples of water and sediment from the Madeira and Solimões rivers. The data was used to build a database, using the HYDRACCESS Software (available for free at www.ore-hybam.org) and Quantum GIS Free Software, which uses satellite imagery to create a thematic map with pre-processed data from the period in which the samples were collected. The data on element concentration in water and in suspended sediments will be used for calculating flows in the period studied. The results will be used for the creating thematic maps, overlapping with specific topics (population, land use, etc.)

FACTS BOX

Location of sampling: On the Madeira River: Abuna, Porto Velho, Humaitá, Manicoré, Fazenda Vista, Alegre/Borba. On the Amazon River: Jatuarana, Itacoatiana, Parintins, Óbidos, Santarem (Prainha) and Tabatinga. On the Solimões River: Santo Antonio do Ica, Fonte Boa, Tefé, Itapéua and Manapuru.

Madeira River: Main tributary of the Amazon River, it is born at the confluence of the Beni and Mamore rivers (Bolivia). Length: 4.207 Km. Its basin covers 1.420.000 Km2. The basin includes parts of Brazil, Bolivia and Peru. Its flow is twice that of the the Mississippi River or the Ganges.

Solimões River: Along with the Madeira, it is one of the main tributaries of the Amazon River. It starts in Peru and, in Tabatinga (Brazil), is then called the Solimões. Length: 1,700 Km. Its basin covers 2.221.990 Km2.

Ecosystem: Rivers Madeira y Solimões aquatic ecosystem.

Economic activity: Fishing, River Transport, Agriculture.

Analytical results from the Madeira and Solimões rivers indicate a significant increase in the sediment load over the last decade. Measurements taken were important to estimate the flows of transported elements (sediment, particulate matter, dissolved material, etc). Similarly, one must note that a wealth of data and photographs of the study area were created, serving as a document of the entire process of research for future publications of scientific articles on the topic, essential for the understanding of the Amazon basin.

André Zumak

The Project team collecting samples in the Solimões River

Institutional coordination in the Amazon basin

To strengthen the institutional framework for the protection and sustainable management of water resources in the Amazon basin

INFORMATION BOX

Countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela.

Institutions consulted: National institutions related to Water Management.

Regional Organizations consulted: Bolivarian Alliance for the Peoples of Our America (ALBA-TCP), Union of South American Nations (UNASUR), Community of Latin American and Caribbean States (CELAC) and Andean Community of States (CAN)

Investment: US$ 440.000

National Focal Points of the GEF Amazon Project

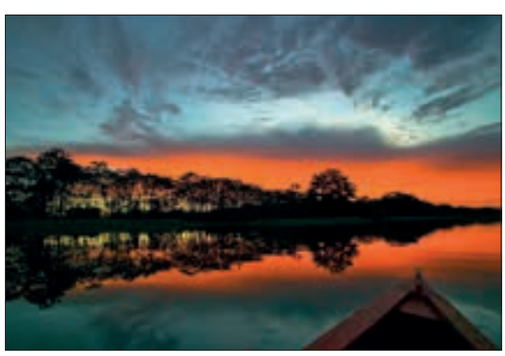
	Ministry of International Affairs, General Direction for Boundaries and Borders (Bolivia)
	National Water Agency, ANA (Brazil)
	Ministry of Environment and Sustainable Development (Colombia)
	National Water Secretary, SENAGUA (Equator)
	Ministry of Public Works and Communications (Guyana)
	Water National Authority, ANA (Peru)
	Ministry of Labor, Technological development and Environment (Suriname)
	Ministry of Popular Power for Ecosocialism, Habitat and Living (Venezuela)

CONTEXT

One of the goals of the GEF Amazon Project – Water Resources and Climate Change is to strengthen the local institutional framework to allow planning and implementation of activities for the protection and sustainable management of water resources in the Amazon basin, in a coordinated and coherent way. The activity "Institutional Coordination in the Amazon Basin" was carried out as part of Component I – *Understanding Amazon Societies*. The eight Amazon basin countries' current institutional framework was established by their respective national Constitutions, which define public policies to be implemented concerning natural and water resources and the environment, issues that were examined by this activity alongside plans and programmes by institutions responsible for local management of water resources, with emphasis on each country's Amazon region. In general, the Constitutions of the eight countries all identify water resources as a strategic resource owned by the State, which in turn must protect them, conserve them and guarantee their sustainable management for future generations.

ACTIVITIES

This research is based on consultation of primary and secondary sources of information. For primary sources – so as to get official information from national water resources institutions –, two questionnaires concerning Institutional Capacities and Needs were sent to each of the eight countries. Similarly, a regional



Source: http://3.bp.blogspot.com/-Dnr7GJTHQzY/UMzlfrB9RI/AAAAAAAAAIaU/6jKCZNGLGHs/s1600/AmazonasSunsetRTF.jpg

Amazon water resources are a State-owned strategic resource to be protected for future generations

consultation on the same subject was carried out with main Regional and Sub-regional integration Organizations. As for secondary sources, official texts, scientific studies and regulations – in which countries develop initiatives for the coordinated management of water resources – were consulted. The resulting products were presented at the *Strengthening Institutional and Legal Systems for the Integrated Management of Water Resources* Validation Workshop and at the III GEF Amazon Project Steering Committee Meeting, in Lima, in 2013. Participants' comments, ideas and recommendations were gathered and incorporated into the report's conclusions, which is essential input for the Strategic Action Programme (SAP).

RESULTS

The project yielded three main products:

- Institutional Analysis concerning ACTO member countries' Amazon basin water resources management organizations. A documented report on institutional arrangements and processes for Integrated Water Resources Management at national level. Thus, institutional development needs were identified concerning: organizational resources, human and financial resources, infrastructure, development and/or strengthening of mechanisms for protection of the basin, development and/or strengthening of coordination mechanisms.
- A report on inter-institutional connections, at national level, in the Amazon basin countries. Government representatives on water resources were identified. In this way, an inventory of responsible stakeholders was carried out, and inter-institutional mechanisms for water resources management in the eight countries were identified.
- An analysis of the role and potential of ACTO in coordinating regional actions for the management of transboundary water resources in the Amazon basin.

FACTS BOX

1. Representatives of national and regional institutions responsible for managing water resources in the countries that share the Amazon basin occupy the highest government level (Ministers or Deputy Ministers) at the Amazonia regional level (Governors, Secretaries) and have Secretariats as their water resources and environmental issues operational frameworks.
2. Some countries have established national institutions that are responsible for water resources management: Agência Nacional de Águas (ANA, Brazil), Autoridad Nacional del Agua (ANA, Peru), as well as the Secretaría Nacional del Agua (SENAGUA, Ecuador). In other countries, the ministries of Environment are also responsible for water resources.
3. In most of the countries national technical institutions that are responsible for Meteorology and Hydrology, for Mining (hydrogeology and groundwater), for Irrigation were identified among others involved in the management of water resources.

From the above products resulted the following main directions:
To strengthen: i) the institutional capacities of national institutions for water resources management in the eight countries, separately, according to their institutional contexts. ii) water resources management institutional coordination mechanisms in Amazon River basin countries at the three identified levels (national, regional and local).
To consider the establishment of a Permanent Executive Committee for the Coordination of Integrated Amazon Basin Water Resources, in order to articulate and coordinate water issues among Member Countries; its initial task would be the implementation of the Strategic Action Programme.

A common objective: to strengthen the institutional capacities of national institutions for water resources management in the eight countries

Pilot project: Sustainable Management of Transboundary Floodplain Forests in the Amazon Basin

Source: fomentinatura.wordpress.com

Pacaya Samiria National Reserve, in Peru

Source: Google, Maplink, 2013

Pilot project sites in Brazilian floodplain forests

Source: GEF Amazon Project

The Project produced a Botanical Atlas with 52 species from Amazon floodplain forests

INFORMATION BOX

Countries: Peru, Brazil

Partners: Tapará Grande, Urucurituba and Igarapé do Costa communities in the Santarém Municipality, in the State of Pará, Brazil, and San Jacinto and San Regis communities, in the Pacaya Samiria National Reserve, Nauta Province, Departament of Loreto, Peru.

Investment: US$ 370,750

Team: Installation of elevated vegetable gardens and tanks.

Directly or indirectly benefitted population: 22.044 people

CONTEXT

Sustainable Management of Transboundary Floodplain Forests in the Amazon Basin is one of the GEF Amazon Project – Water Resources and Climate Change's Component III – Strategic Action Programme's (SAP) three pilot projects. Floodplain forests are Amazon plain areas that are flooded during rainy seasons and are one of the most sensitive and threatened Amazon ecosystems. Historically, local populations have managed to survive through small-scale fishing and harvesting. Over the last decades, however, rainy seasons have led to public calamity situations because of rising water levels, affecting local communities' housing and their modes of production. This pilot project aims to ensure the economic livelihoods of communities during periods of rising water levels, through implementation of innovative agro-technologies – which can be replicated throughout other flooded basin areas – alongside local communities. The agro-technologies employed were vegetable gardens built on platforms for cultivation during extreme flooding, as well as innovative fishing systems.

ACTIVITIES

During the preliminary stage, socio-cultural, ethno-botanical and fishery resource diagnoses were carried out in selected areas, so as to promote the productive inclusion of coastal fishermen and farmers. A field reconnaissance trip was made during the rainy season, to search for a suitable site to install the platforms. Outreach work was carried out with communities to motivate people to create a favourable social environment for the project. Next, ecosystem resilience tests were carried out, and elevated platforms were built for the

vegetable gardens. During this process, training workshops were carried out for communities to better manage this new type of fish and vegetable production. An architect to build vegetable garden structures and a technical team of three Brazilian and three Peruvian consultants were hired to accompany communities during implementation of production systems.

RESULTS

Multidisciplinary systemic diagnosis of pilot sites in Peru and Brazil was carried out, with the following results:

1. A Botanical Atlas including 52 species referring to Amazon floodplain forests, based on communities' traditional knowledge.
2. Semi-hydroponic elevated vegetable gardens were installed in the communities of Tapará Grande and Urucurituba. The technological level of vegetable production was enhanced, and technological training of family horticulturists was carried out to allow for the inclusion of their products in local markets.
3. Three Fishing Units were installed, including 30 tanks (25 in Brazil and 5 in Peru) to increase fish production under the floodplain forest conditions, as well as generate income for communities. Five thousand fingerlings were placed in Igarapé do Costa; 2,500 in Tapará Grande; and 4,500 *Colossoma macropomun* or *Tambaqui* (an Amazon freshwater fish) fingerlings in San Jacinto. Expected production: 12 tonnes, following 8 months of culture.
4. Handicraft and wood fibre production was encouraged, as well as the creation of a gene bank with species used in Peruvian handicrafts.

FACTS BOX

Location: Lower Amazonas, Brazil: State of Pará, Santarém Municipality. Pilot sites: Tapará Grande, Urucurituba (AM). Peru: Departament of Loreto, Nauta Province. Pilot sites San Jacinto and San Regis communities, in Pacaya Samiria National Reserve.

Ecosystem: Amazon floodplain forests.

Economic activity: Fishing and agriculture-horticulture.

The project demonstrates that floodplain forests can also be cultivated during rainy seasons, taking advantage of the wealth of ecosystem biodiversity in a productive way, making use of innovative agro-technologies. These technologies allow for the inclusion of coastal communities in underexploited markets during extreme weather events. Thus, income generation is promoted with hydroponic elevated vegetable gardens and tanks, and human impact is reduced in the region with alternatives that can be replicated in other Amazon basin regions.

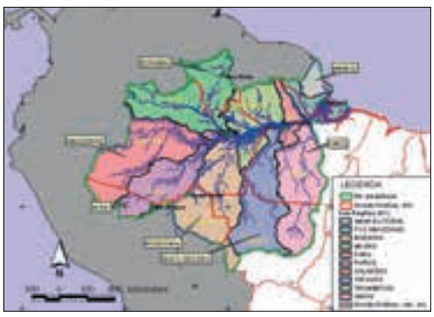
Source: GEF Amazon Project

Agro-technology: elevated vegetable gardens for the rainy season

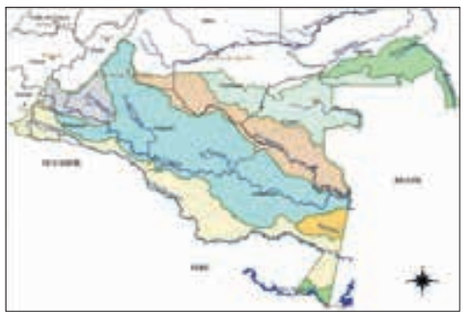
Source: GEF Amazon Project

Tanks, innovative fishing systems for flood periods

Water Pollution in the Amazon basin



Amazon River Sub-basins, Brazil
(ANA, Brazil)



Colombian Amazon basin
(MAVDT/IDEAM, Colombia)

Water quality measurement stations in Ecuador
(SENAGUA, Ecuador)

Peruvian Amazon basin
(ANA, Peru)

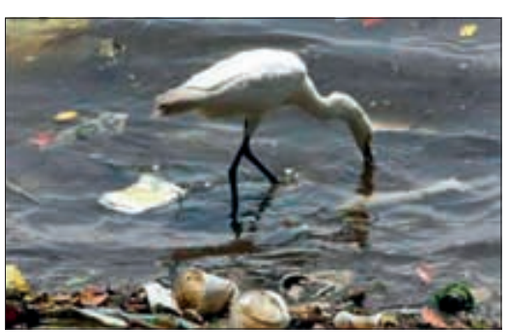
INFORMATION BOX

Countries: Brazil, Colombia, Ecuador, Peru

Partners: **In Brazil:** Agência Nacional de Águas (ANA), Ministério do Meio Ambiente (MMA). **In Colombia:** Instituto de Hidrología, Metereología y Estudios Ambientales (IDEAM), Instituto Amazónico de Investigación Científica (SINCHI), Corporación para el Desarrollo Sostenible del Sur de la Amazonía Colombiana (CORPOAMAZONÍA). **In Ecuador:** Secretaría Nacional del Agua (SENAGUA). **In Peru:** Autoridad Nacional del Agua (ANA), Instituto Nacional de Recursos Naturales (INRENA), Dirección General de Salud Ambiental (DIGESA), Ministerio del Ambiente (MINAM)

Investment: US$ 70,540

Government Institutions Responsible For Monitoring Water Quality:
In Brazil: ANA. **In Colombia:** IDEAM, SINCHI and CORPOAMAZONIA. **In Ecuador:** SENAGUA. **In Peru:** ANA, INRENA, DIGESA and MINAM.



Source: Media Correspondent in Today Leticia

Amazon River pollution, Leticia, Colombia

CONTEXT

Activity *"Water pollution in the Amazon basin"* is part of GEF Amazon Project – Water Resources and Climate Change's Component III – Strategic Action Programme (SAP). The Amazon basin spans around 7 million km^2, covering part of Peru, Ecuador, Bolivia, Colombia, Guyana, Suriname, Venezuela and over half of the Brazilian territory. Its average flow represents around 20% of global freshwater supply. Despite the vast availability of water, human consumption is restricted due to urban pollution, lack of basic sanitation and the various sources of pollution that result from socio-economic activities. The monitoring of water quality through standard parameters is vital for integrated water resources management, and is a common goal of Amazonian countries as part of their national basin management programs. However, monitoring of water quality of Amazonian rivers is a relatively recent activity, and faces problems due to the enormous size of the basin and the lack of infrastructure and logistics for the collection, transport and analysis of samples. In this context, an integrated system to control the water quality of Amazon rivers, based on coordinated actions, is crucial to Amazon countries, in order to prevent further degradation of water resources in the Amazon basin. The goal of this activity is to collect and systematize data regarding the monitoring of the water quality of some Amazonian rivers. In a first step, the project worked with four countries that provided early official data which served to propose a strategy for developing a common Amazon water quality monitoring System, as part of the GEF Amazon Project's Strategic Action Programme (SAP).

ACTIVITIES

An evaluation of existing data and information on water quality, pollution, sources of pollution of rivers in the Amazon basin of the four countries participating in this activity was carried out and consolidated in the product "Research of literature and projects on water pollution in the Amazon basin", which brings together a collection of publications on quality and water pollution in the Amazon, for public access and research and obtained from different virtual and physical sources of information.

This allowed the analysis of the quality and consistency of the data obtained in the countries. Similarly, there was a compilation of existing data on water quality and pollution sources, and in this way identification of the critical points of water pollution in the Amazon basin was carried out – generating an analysis of the extent and impacts of sources of contamination in the Amazonian ecosystems. An assessment of current development trends that cause water pollution was also carried out, so as to establish prevention measures and recommendations.

RESULTS

Data on water quality were collected through different parameters and strategies in this first stage of evaluation, held in four countries. In general, no systematic measurements are made, moreover, there are also differences between the methodologies used and the measured parameters and most of the data is not geo-referenced.

The collected data registered the following:

- Frequency of measurements, selected parameters analyzed and the location of the sample points.
- Total registered rivers
- Total measurement points recorded.

FACTS BOX

Location of water quality sampling stations: **In Brazil:** Amazonas-Xingu, Paru, Jari, Pará, Madeira, Guapore, Tapajós, Juruena, Trombetas, Rio Solimoes-Javari Itacuari, Ica, Jandiatuba, Juruá, Japurá, Negro, Branco, Purus and Coari rivers. **In Colombia:** Colombian Amazon basin, comprising the Amazon, Guamez, Putumayo, Lake Guamez, Vaupés and Axe rivers. **In Ecuador:** basins of the Napo, Pastaza and Santiago rivers. **In Peru:** in the Amazon basin, comprising the Purus, Yurua, Marañón, Ucayali and Madre de Dios basins.

Ecosystem: Aquatic Amazon.

Water quality parameters: Dissolved oxygen, thermo-tolerant coliforms, pH, biochemical demand of oxygen, temperature, total nitrogen, total phosphorus, turbidity, total residue.

Countries and measurement points recorded in the Amazon rivers: **Brazil:** 187 measurement points recorded. **Colombia:** 162 measurement points recorded. **Ecuador:** 150 measurement points recorded. **Peru:** 33 measurement points recorded.

Collected data were produced by government institutions and served to propose a strategy for the development of a System of unified monitoring of the quality of Amazon waters, as part of the GEF Amazon Project's Strategic Action Programme (SAP). With the information collected, a database on water quality, on monitored parameters, and systems for pollution monitoring and control is being prepared. Water quality data was analyzed in a total 236 rivers in 405 sampling points, allowing the creation of a regional map on the quality of water in the Amazon basin, essential for human health and as input for environmental impact mitigation policies.

Source: Armonicosdeconciencia.blogspot.com

Pollution in Iquitos, Peru

Improving knowledge of Amazon aquatic ecosystems and Management of aquatic ecosystems in critical areas

Source: Google Earth

Critical area in Lower Caquetá River, Colombia

INFORMATION BOX

Countries: Brazil, Colombia

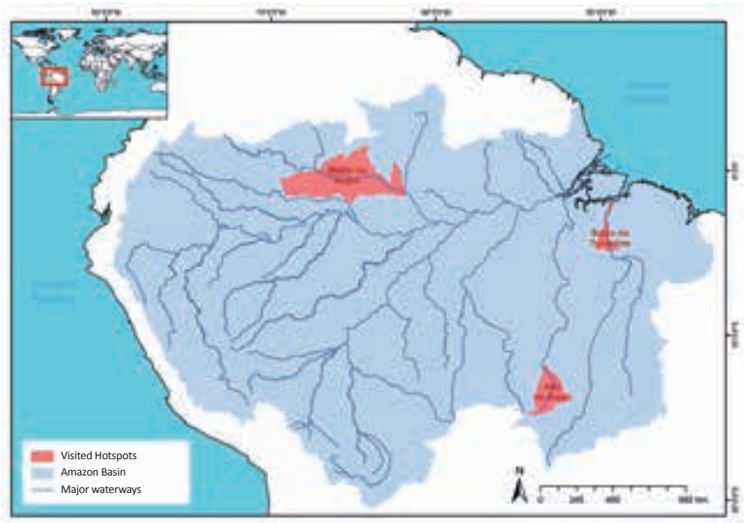
Investment: US$ 171.900

Source: GEF Amazon Project

A tucunaré fish (Cichla monoculus) from Lower Tocantins River

Source: GEF Amazon Project

Fish being sold in the market



Critical areas or hotspots in Brazil

CONTEXT

Activity "*Improving knowledge of Amazon aquatic ecosystems*" was carried out as part of the GEF Amazon Project – Water Resources and Climate Change's *Component II – Understanding the natural resource base*. This initiative is closely related to the Project's Component III – Strategic Action Programme's (SAP) Activity "*Management of aquatic ecosystems in critical areas – hotspots*". Thus, a study about the threats to these ecosystems in critical areas of Brazil and Colombia was carried out, based on two criteria: endemic species and degree of environmental threats. Using fisheries as a threat indicator, a set of strategic actions were formulated to mitigate impacts to these investigated aquatic ecosystems, that will serve as input for the SAP. Traditional socio-economic activities such as fishing and extraction of other natural products have been affected by increasing human migration, attracted by easy access to land, infrastructure, livestock, agriculture, mining and commercial fishing. Currently, three types of fishing occur in the Amazon basin: artisanal/subsistence, industrial and recreational fishing. As such, it is necessary to understand that the biogeographical distribution of Amazonian fish is determined by ecological and landscape features such as the geomorphology of basins, the weather, types of habitat and water chemistry.

ACTIVITIES

Activities began with a scientific and technical literature review about the situation of threats to Amazon aquatic

ecosystems. Next, field studies were carried out, with analysis of the diversity of fish and fishing in its different forms a priority, in the following critical areas of Brazil: at the head of the Xingu River, in the Negro River's Barcelos region, and in Lower Tocantins River; and in Lower Caquetá River, in Colombia. The study focused on Amazonian ictiofauna (groups of fish species) and on the degree of environmental threat to their ecosystems, considering that certain endemic species are more susceptible to extinction due to climate change than others. Fisherman dependence on aquatic ecosystem resources was analyzed, and interviews with local leaders and fishing cooperatives were carried out to identify environmental stress factors in critical areas. Once environmental threats to aquatic ecosystems and fishing conflicts – key for sustainable fisheries management – were identified and evaluated, a set of basic strategic actions which may be replicated over the Amazon basin were established.

RESULTS

A total 142 species of fish – of which 36 are endemic – were cataloged in the Xingu River basin. Seven threats to the environment and biodiversity were identified: 1. Alteration and loss of fish habitats due to deforestation of riparian vegetation. 2. Reduced river flows due to deforestation of forests at the head of the rivers, consequent erosion and increased sediment load. 3. Effect of environmental pollutants on water quality. 4. Effect of hydroelectric dams on fish movement and diversity. 5. Effect of infrastructure on fish and diversity. 6. Threats to turtles and aquatic mammals. 7. Effects of climate change on aquatic environments. Proposed actions include: Monitoring and control of deforestation; creating awareness in farmers; creating mechanisms for participatory monitoring; increasing surveillance and control of the indiscriminate use of fertilizers and pesticides; improving sanitation in urban centres; building systems for fish to pass through dams; develop environmental education programmes and increase countries' awareness as to the importance of conserving forests in order to regulate the climate.

FACTS BOX

Location: critical areas where threats to the environment and biodiversity were identified: Alto Xingu River, Lower Tocantins River and Middle Negro River, Brazil and Lower River Caquetá, Colombia.

Climatic factors in the Amazon basin: The climate of the Amazon basin, with its regime of flooding and droughts, is a decisive factor for aquatic ecosystems. The rainy season lasts about six months. Depending on the region, the average annual rainfall is between 1.5 and 2.5 mm in the basin, with over 4 meters in the northwest and in some regions of the Amazon estuary. The rains mark the seasonality of Amazonian rivers.

Biodiversity of Amazonian aquatic ecosystems: The fish fauna of the Amazon basin is the richest in the world and conservative estimates suggest that there are 2,200 known species. The diversity and complexity of Amazonian aquatic habitats are associated with high biodiversity; many of these environments change dramatically depending on the hydrologic flow of the river (water level rise, full flood, low water levels and drought).

The identification, characterization and evaluation of environmental threats to aquatic ecosystems are an important tool for planning strategic actions for conservation and also serve as potential tools for implementing public policies and environmental management, to be shared among ACTO Member Countries within the GEF Amazon Project.

Source: GEF Amazon Project

Fishing agreements are annually made in Puerto Caimán and in Quebrada de San Francisco, Caquetá, Colombia

Source: GEF Amazon Project

Pollution by liquid and solid waste threatens fishing in the Amazon

Sub-project: Transboundary Diagnostic Analysis (TDA)

Sources: http://www.elmundo.es y Viajejet

Seven priority transboundary problems affecting the Amazon society were identified in the basin

INFORMATION BOX

Participating countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela.

Priority transboundary problems:

1. Water pollution.
2. Deforestation.
3. Loss of biodiversity.
4. Extreme hydrological events.
5. Erosion and sediment transport.
6. Changes in land use and
7. Water governance.

Investment: US$ 350,000

Two national TDA workshops were held in Guyana with 60 national, regional and local stakeholders.

CONTEXT

The sub-project "Transboundary Diagnostic Analysis (TDA)" is part of the GEF Amazon Project – Water Resources and Climate Change's Component II - *Understanding the basis of natural resources*. The activity consists in formulating national TDAs, which allow preparation of the Regional Transboundary Diagnostic Analysis (TDA), which defines priority transboundary basin problems, their environmental and socio-economic impacts, causes and resulting strategies of adaptation and mitigation. Thus, the development of the Regional TDA for the Amazon basin was carried out based on national workshops held with over 380 representatives of ACTO Member Countries' institutions and contributions from the scientific and demonstration activities implemented in the context of GEF Amazon Project. The proposed Regional TDA is organized in three parts: (i) Identification of Amazon Basin Priority Transboundary Problems, (ii) Development of the Causal Chain Analysis of critical transboundary issues and (iii) Definition of Regional Strategic Actions.

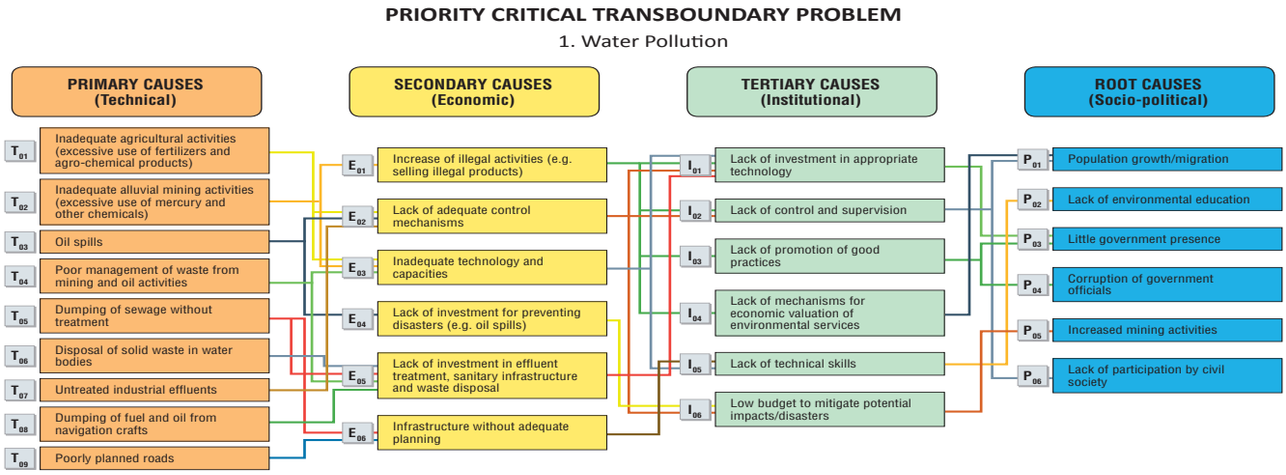
ACTIVITIES

The methodology of the Causal Chain Analysis used in TDA workshops was based on the collective recognition of the root causes of priority transboundary problems, which impact how transboundary waters and water related resources are used.

National consultants were hired to prepare national TDAs; next, nine National TDA Workshops were held in: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru and Suriname, considering that in Ecuador and Guyana two national workshops were held in two different regions. Venezuela is accompanying the process. From the identification of each country's transboundary problems, **seven priority issues were identified at the regional level** in the Amazon basin, consolidated by national TDA/SAP consultants in their work Meeting, held in Brasilia (13-14 October 2014). Based on the results of that meeting, **the analysis of the causal chain** of each transboundary problem identified was developed, and **strategies resulting from the causal chain** were established for each priority transboundary problem.

RESULTS

The Regional Transboundary Diagnostic Analysis (TDA) of the Amazon basin, carried out in Member Countries and at regional level identified, established priorities, and defined the causal chain of the seven trasnboundary problems referring to water resources: 1. Water pollution. 2. Deforestation. 3. Biodiversity loss. 4. Extreme hydrological events. 5. Erosion and transportation of sediments. 6. Changing land uses and 7. Water governance. These seven priority issues were discussed and agreed at the Regional Validation Workshop: Regional Proposal for the Transboundary Diagnostic Analysis (Brasilia, November 2014).



The methodology of the Causal Chain Analysis allows for the identification and understanding of the root causes of priority transboundary water problems. Here is an example.

Resulting strategic actions from priority issues at regional level and from the causal chain were consolidated into the following recommendations:

- To strengthen the institutional capacities of national institutions for the management of water resources in the eight countries and of key stakeholders in the basin, to mitigate water pollution and ensure effective participation in the management of water resources in the region.
- To promote a regional monitoring and vigilance System for water resources and to strengthen the Integrated Regional Water Information System.
- To strengthen communication, promotion and dissemination of public policies and strategies for water resources in transboundary basins.
- To strengthen technical and scientific cooperation on water resources.
- To establish guidelines at regional level under the ACT and to harmonize national criteria for the integrated management of water resources in transboundary basins.
- To promote the culture of water and environmental education, based on information and knowledge on the subject of water resources.
- To create early warning systems in transboundary basins and measures to adapt to climate change in transboundary basins.
- To consider the formation of a Permanent Executive Committee for Integrated Coordination of Water Resources in the Amazon Basin, so as to coordinate the water topic among Member Countries, having as initial task fundraising and implementation of the Strategic Action Programme.

Bolivia TDA Workshop

Brazil TDA Workshop

Colombia TDA Workshop

Peru TDA Workshop

The Project: Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River Basin considering Climate variability and Change

INFORMATION BOX

Agencies: ACTO/UNEP/GEF

Duration: August 2010-2015

GEF Funding: US$ 7.000.000

Cofinancing: US$ 45.2 million

Framework: Regional

Beneficiary countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela.

Project website: www.gefamazonas.otca.info

Source: GEF Amazon Project

PROJECT CONTEXT

The Project aims to strengthen the institutional framework for the planning and execution of strategic activities to protect and manage Amazon basin Water Resources in face of the climate variability and change, by formulating a *Strategic Action Programme (SAP)* and creating an enabling environment for its future implementation.

The Project is structured in three thematic components:

- **Component I: Understanding the Amazon Society**, by documenting the needs and goals of key regional stakeholders and national institutional and legal arrangements in this transboundary basin.
- **Component II: Understanding the natural resource base**, through scientific results and a Transboundary Diagnostic Analysis (TDA) of the Amazon basin.
- **Component III: Development of response strategies** to unsustainable management of water resources practices in the basin, and facing the need to adapt to climate change, through pilot projects and making use of Integrated Water Resources Management (IWRM) principles, so as to meet the needs of Amazon society.

The Project's main products are:

- **A shared vision of the Amazon basin**, designed for understanding common problems and defining future development scenarios for the region concerning Amazon basin IWRM.
- **A Transboundary Diagnostic Analysis (TDA)** based on the definition of priority transboundary problems referring to Amazon basin water resources and analysis of climate vulnerability.
- **A Strategic Action Programme (SAP)** agreed upon by ACTO Member Countries.

The Project's expected results are:

- Integrated management of Amazon basin Water Resources, considering the optimization of different uses of water, transboundary concerns, measures for adapting to climate change, formulation of policies and strengthening of legal and institutional frameworks, as well as investments necessary for the implementation of strategic actions agreed upon.
- Integration of a *groundwater* component into Amazon basin Water Resources management.
- Inclusion of the topics of climate variability and change into basin management practices and policies, so as to reduce the vulnerability of local populations and ecosystems facing extreme climate events.

FACTS BOX

Location: The Amazon River basin covers almost half of South America. Approximate size: 7 million km^2. Amazon River is around 6,900 km long. An average 240,000 m^3 per second of its waters flows into the Atlantic Ocean. It sends about 20% of the world's fresh water into the Atlantic Ocean, influencing global climate variability.

Ecosystem: Amazon tropical rainy forest

Economic activity: Agriculture, Fishing, Industry and Tourism.

Population: About 40 million people, mostly concentrated in urban areas, and approximately 385 indigenous groups and 71 confirmed references of isolated groups.

RESULTS ACHIEVED TO DATE

1. Institutional and legal mapping and analysis: The Project concluded the Analysis of the current institutional framework for the management of water resources in the Amazon basin, at national and regional levels. Similarly, based on common methodological protocol, a group of national legal specialists developed Inventories of national legislation on the management of water resources, biodiversity and climate change, identifying legal gaps and opportunities for regional cooperation.

2. Atlas of Hydroclimatic Vulnerability (1: 1,000,000): Once common methodology was established, Member Countries advanced in collecting data and information concerning 29 variables that refer to basic information and to social, economic-infrastructure, the environment, climate and risk components.

3. Production of Scientific Knowledge: Targeted research has produced scientific results for Transboundary Diagnosis Analysis: The Analysis of environmental threats and socioeconomic impacts associated to aquatic ecosystems in critical areas of the Xingu, Tocantins and Negro rivers in Brazil, and in Lower Caquetá river, in Colombia, were concluded. Also, the results of the sampling campaign in Madeira and Solimões rivers (4,000 km covered, 3,600 chemical analyzes carried out) indicate a significant increase in sediment load over the last decade.

4. Increased Knowledge of the Amazon Aquifer: During the First Regional Technical Meeting on the *Current scenario of knowledge on groundwater in sedimentary aquifers in the Amazon region,* preliminary data from the study "Evaluation of Aquifers in the Sedimentary Basins of the Amazonas Hydrological Province, in Brazil" was presented, and work defining baseline regional information on the subject advanced.

5. National TDA/SAP Workshops held in Member Countries with the participation of 380 stakeholders, representing over 250 institutions, identified priority transboundary problems, analyzed their causes and proposed strategic actions. The first regional TDA proposal was designed, for analysis and validation of the Project's IV Steering Committee.

Xingu. Rui Faquini, Bco de Imagens, ANA-Brasil

6. Measures to adapt to climate change: Significant results were achieved by demonstration activities and pilot projects in the selected areas. For the Purus River basin, a Risk Governance Model was created, enabling local communities to address local governments with their demands and needs of assistance in cases of extreme weather events, benefiting 295,000 people. In the border region of Madre de Dios-Acre-Pando, MAP (Bolivia, Brazil and Peru), the project is strengthening local governments' and communities' capacity to respond to extreme events, by implementing a tri-national Early Warning System that will benefit 800,000 people. Finally, concerning adaptation to rising sea levels in the Amazon Delta, a geological, hydro-climatic and socio-environmental study of Marajó Island was concluded, and proposals of adaptation measures that will support local governments in preparing adaptation policies and relocation of affected communities are being prepared.

7. Courses and technical meetings for specialists of the eight Member Countries: With the Agência Nacional de Água (ANA-Brazil), as part of South-South cooperation, eight technical training courses have been held for over 220 professionals from eight countries, concerning the fields of water management, hydro-sedimentology, data collection platforms, pedagogical basins, international law for waters and extreme events.

8. Strengthening of the regional dialogue on IWRM in the Amazon basin: ACTO Member Countries have established a regional dialogue concerning the management of transboundary water resources, highlighting issues such as the institutionality, sustainability and articulation of the region. The effort will generate a common strategy to address challenges and seize opportunities.