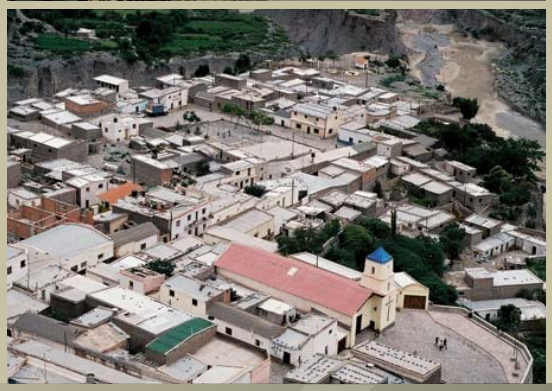
SAP BERMEJO
STRATEGIC ACTION PROGRAM
FOR THE BINATIONAL BASIN
OF THE BERMEJO RIVER




Strategic Action Program for The Binational Basin of The Bermejo River (SAP-Bermejo)

Implementation Phase

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FOR THE BINATIONAL BASIN
OF THE BERMEJO RIVER

Strategic Action Program for The Binational Basin of The Bermejo River (SAP-Bermejo)

Implementation Phase

ARGENTINA BOLIVIA

BINATIONAL COMMISSION FOR THE
DEVELOPMENT OF THE UPPER BERMEJO
AND GRANDE DE TARIJA RIVER BASINS
COBINABE

FMAM - GEF
GLOBAL
ENVIRONMENT
FACILITY

PNUMA - UNEP
UNITED NATIONS
ENVIRONMENT
PROGRAM

OEA - OAS
ORGANIZATION
OF AMERICAN
STATES

Index

Foreword

The Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija (COBINABE, *Comisión Binacional para el Desarrollo de la Alta Cuenca del Río Bermejo y el Río Grande de Tarija*), composed of Government representatives from the Argentine Republic and the Plurinational State of Bolivia, is pleased to present to the international community the final document of the **Implementation Phase** of the ¨*Strategic Action Program for the Binational Basin of the Bermejo River*¨ (SAP-Bermejo), an initiative of both countries executed during 2001-2009 with financial support from the Global Environment Facility (GEF).

The Binational Bermejo River Basin is located in southern Bolivia, in the Department of Tarija, and in the north of Argentina, covering part of the provinces of Chaco, Formosa, Jujuy and Salta. It is an important macro-region of the La Plata River Basin, characterized by a variety of topographical and climatic conditions offering significant development opportunities, but constrained by prevailing active and intense ecologic, geomorphologic and hydrological processes. Through an integrated vision of the Basin, a participatory management approach and respect for the customs and traditions of its inhabitants and of organized civil society, COBINABE aims to achieve the sustainable development of the Basin, fostering the sustainable and equitable use of water and other natural resources, and catalyzing and coordinating municipal, provincial, national and international efforts targeted at the development of the Basin, within the framework of a new development paradigm, centered around respect for mother earth, seeking to improve livelihoods in harmony with nature.

With this in mind, COBINABE, on behalf of the

beneficiaries and inhabitants of the Bermejo River Basin in Argentina and Bolivia, is grateful for the commitment and effort of all individuals and institutions who supported this Binational Program, and to the national, provincial, departmental and municipal governments of both countries who participated in its execution. In addition, COBINABE acknowledges the valuable cooperation and contribution of the United Nations Environment Program (UNEP), and to the Organization of American States (OAS), through its Department of Sustainable Development, which collaborated in the execution of the Project.

With the reassurance of being working in the present, but thinking on the future, and with the strong commitment to continue integration efforts, respecting the inhabitants of the Basin and their cultural diversity, we hope to achieve a better quality of life for the populations of the Binational Basin of the Bermejo River.

Eduardo Cavadini
Ambassador
First Argentine Delegate

Mónica Soriano López
Ambassador
First Bolivian Delegate

Preface

The Governments of Argentina and Bolivia, through the Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija (COBINABE), began in 1995 the formulation of a Strategic Action Program for the Binational Basin of the Bermejo River (SAP-Bermejo), seeking to reduce environmental degradation processes and to foster the development of the Bermejo River Basin. Since its inception, the Program had the support of the General Secretariat of the Organization of American States (GS/OAS), through its Department of Sustainable Development, which acted as regional executing agency, and the cooperation of the United Nations Environment Program (UNEP), as the Global Environment Facility (GEF) implementation agency, which provided the financial resources for the Program's execution.

A first stage for the formulation of the Program was conducted during 1997-2000, the results of which were presented in a Transboundary Diagnostic Analysis (TDA), and the subsequent Strategic Action Program for the Binational Basin of the Bermejo River. The TDA identified and outlined the main environmental issues and their direct basic causes, with the SAP-Bermejo determining the necessary actions for the solution of the issues identified. Both documents were published in May 2000.

The strategic actions of SAP-Bermejo were comprised of four areas: (I) Institutional development and strengthening for basin planning and integrated water resources management; (II) Environmental protection and rehabilitation; (III) Sustainable development of natural resources and (IV) Public participation, awareness, and replicability of actions. Actions in the four strategic areas were distributed in 21 components and 136 projects, with an estimated budget of USD $470

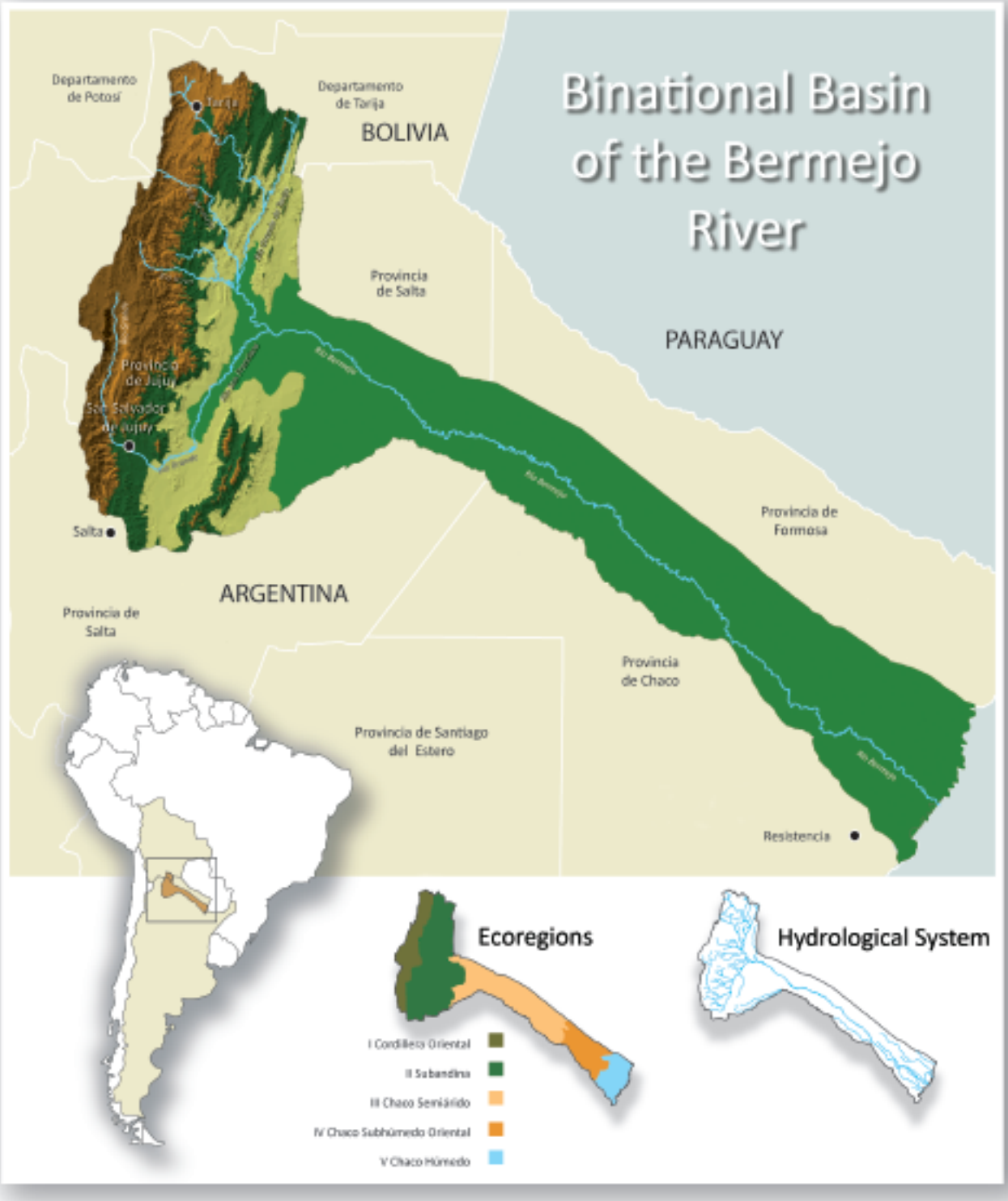
million, for a 20-year execution period. From the list of projects identified, a small number of priority projects were selected for execution in the short term, seeking to catalyze and stimulate the long term SAP-Bermejo. This set of actions was to address the more relevant elements identified in the TDA as basic causes of environmental issues, and to develop and consolidate the framework of cooperation, coordination and monitoring for all actions comprised in the SAP. The implementation of the Short Term SAP-Bermejo was conducted during 2001-2009, with a GEF contribution grant of USD $11.04 million.

The Bermejo River Regional Commission (COREBE, *Comisión Regional del Río Bermejo*) in Argentina and the National Technical Office of the Pilcomayo and Bermejo Rivers (OTNPB, *Oficina Técnica Nacional de los Ríos Pilcomayo y Bermejo*) in Bolivia, in their capacities as Secretaries of COBINABE in Argentina and Bolivia, respectively, are very pleased to have participated in the formulation and implementation of SAP-Bermejo, which has helped to establish practical tools to promote environmental management in the basin, and strengthened the capacities of local organizations to participate and positively influence in the development processes of the Basin.

We hope that this effort, and the lessons learned as a result of the experience, serve as a model for the design and execution of other environmental management and development plans in the region.

Edgardo Castellano
President
Regional Commission for the Bermejo River
SAP-Bermejo National Director, Argentina

Alejandro Romero Saravia
General Executive Director
National Technical Office of the Pilcomayo and
Bermejo Rivers SAP-Bermejo National Director, Bolivia


Binational Basin of the Bermejo River
Departamento de Potosí
Departamento de Tarija
BOLIVIA
Provincia de Salta
PARAGUAY
Provincia de Jujuy
San Salvador de Jujuy
Salta
Provincia de Formosa
ARGENTINA
Provincia de Salta
Provincia de Chaco
Provincia de Santiago del Estero
Resistencia
Ecoregions
I Cordillera Oriental
II Subandina
III Chaco Semiárido
IV Chaco Subhúmedo Oriental
V Chaco Húmedo
Hydrological System

Executive Summary

The Bermejo River Basin originates in the Andes mountains in northern Argentina and southern Bolivia. Its approximately 123,000 km^2 area covers territories in the Department of Tarija in Bolivia and in the Argentine provinces of Chaco, Formosa, Jujuy and Salta. The Bermejo River, which flows 1,300 km from its source to confluence with the La Plata River system, connects two geographical areas of vital geopolitical and economic relevance - the Andes Mountain Range and the Paraná-Paraguay-La Plata River system. It is the only river that entirely crosses the large Chaco plain forming a corridor that connects the Andes' ecosystem with that of the Chaco. Meteorological and topographic conditions differ significantly along the Basin, varying from tropical forests, humid valleys and desert mountains in the Upper Basin, to dry and humid forests in the Lower Basin. There is an exceptional diversity of habitats along the river's course.

The Basin's erosion rates and the Bermejo River sediment transport rates are among the highest in the world, with more than 100 million tons of sediments annually being deposited in the Paraguay-Paraná-La Plata River system (accounting for 80% of the total). Most of these sediments are generated in the Upper Basin and are carried downstream in freshets and floods, regularly modifying the River course and hampering the rational use of water and other natural resources. This natural behavior determines the Basin's high vulnerability to the development of productive activities and the presence of human settlements, in some cases with high hydrological risk to humans and their activities. The increase in erosion and sediment deposition processes has a significant transboundary impact on aquatic ecosystems and the wetland corridors of the hydrological system, affecting economic activities, which are vital for the region's development, such as transportation and

water-borne commerce through the Paraná River and La Plata River waterways and harbors.

The population of the Bermejo River Basin amounts to 1.3 million individuals, most of whom are rural workers, small farmers and members of indigenous communities. Important urban centers concentrate higher relative densities of development in the Basin.

The natural resources in the Basin are plentiful but they show a high social and environmental vulnerability due to the serious limitations imposed by water availability in the Upper and Middle Basins (which limit and condition the population's quality of life), and a natural environment which is undergoing a process of degradation because of the accelerated loss of soils through misuse and destruction of native forests.

Studies of local weather highlight a high vulnerability to the local effects of the climatic change occurring in the Chaco region in which the Basin is located; such change is due to the worsening of recurrent droughts which accentuate the preexisting limitations on access to water in the semi-arid areas of the Basin, and exposure to devastating floods throughout the Basin.

In June 1995, the governments of Argentina and Bolivia agreed to set up the Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija (COBINABE), as a permanent legal and technical mechanism for fostering sustainable development in the Basin and its area of influence, optimizing the exploitation of its natural resources, attracting investments and facilitating the rational and equitable management of its water resources. The Commission is comprised of two Delegates from each Member State. The First Delegate represents each country's Chancery, holds the title of Ambassador, and is the president of the respective Delegation. The Second Delegate is, in the case of Bolivia, the General Executive Director of the National Technical Office for the Pilcomayo and Bermejo Rivers (OTNPB) and, in the case of Argentina, the Chairman of the Board of Directors of the Regional Commission for the Bermejo River (COREBE). COREBE andthe OTNPB act as the Commission's Secretariat.

In September 1995, COBINABE applied for assistance from the Global Environment Facility (GEF) in order to prepare a Strategic Action Program (SAP) to address the main transboundary environmental issues and promote sustainable development in the Basin. The resulting strategic actions were developed jointly with the General Secretariat of the Organization of American States (OAS/GS), as the regional executing agency, within the framework of an agreement entered into with the United Nations Environment Program (UNEP), as the GEF implementing agency.

The SAP-Bermejo formulation was carried out between 1997 and 2000. It covered the identification of the main environmental problems and their root causes, the implementation of pilot demonstration projects for assessing the technical, economic and social feasibility of corrective or

rehabilitation measures, and the implementation of a public participation and consultation process for development and environmental management project planning and execution within the Basin. The consolidation and analysis of the studies and consultation processes resulted in the preparation of a Transboundary Diagnostic Analysis (TDA), identifying and characterizing the main environmental problems which affect the Basin, and the SAP-Bermejo, which identified actions for solving the root causes of priority problems and promoting sustainable development in the Basin.

The TDA process identified six major environmental issues considered endemic throughout the Basin:

1. *Soil Degradation, Severe Erosion and Desertification Processes*. The studies determined that over 50% of the Basin was undergoing significant to quite severe erosion, and that 60% of the pasturelands were being overexploited or inappropriately managed. Small-scale sediment control measures proved to be cost-effective in reducing the sediment loads in the River and simultaneously produced local benefits by providing irrigation to small farmers and protecting local reservoirs.

2. *Water Quality Degradation.* Water quality protection and restoration was recognized as an important subject to take into account as the Basin develops. In the Bolivian area of the Upper Basin, 68% of the sampling sites showed restrictions on human consumption due to bacteriologic pollution.

3. *Water Shortages and Restrictions.* Water supply was recognized as the main problem in the Basin. Almost one-third of the Basin is affected by extreme water shortages during the dry season – April to November - worsening the conditions of communities already affected by a depressed standard of living and limiting the development potential in areas which are good for farming.

4. *Habitat Destruction, Biodiversity Loss and Deterioration of Biotic Resources.* It was determined that severe or extremely severe deforestation was affecting 26% of the natural forests and that 15% of the total area runs the risk of losing significant elements of biodiversity. Twenty-four flora and fauna species were categorized as vulnerable, eighteen of which were endangered. The studies and pilot projects showed that it is feasible to implement community extension programs for training and fostering the use of sustainable production methods.

5. *Floods and Other Natural Hazards.* Floods and freshets during the rainy season – December to March - severely affect 7% of the Basin, including the City of Tarija in Bolivia. In the Chaco Province alone, over 390,000 ha of land were flooded during 1983-1984.

6. *Deterioration of the Population's Standard of Living and Loss of Cultural Resources.* Moderate to extreme poverty is evidenced throughout the Basin, mainly affecting small farmers, indigenous

communities and marginal urban centers. Data gathered during the SAP-Bermejo formulation showed that 40% of the population has unsatisfied basic needs. There is a high percentage of illiteracy and most of the population does not have access to health care. Temporary as well as permanent seasonal worker migration constitutes an important transboundary symptom of poverty and unemployment.

The analysis of the root causes of these problems was the result of a long public consultation process, during which the SAP-Bermejo strategic actions were defined. At the same time, a long list of *sustainable development*-related and *environmental* plans and projects under way or scheduled for the Basin was compiled. Through the consultation process, the most relevant projects were selected in order to tackle the identified problems and they were subsequently incorporated into the final SAP-Bermejo.

The resulting SAP-Bermejo was a long term action program designed not only to address the root causes of the environmental degradation processes in the Basin but also to promote the sustainable development of the communities and settlements located there. The Program covered a total of 136 projects with a 20-year execution period, and required a total investment amounting to approximately USD$ 470 million. Over 70% of this total corresponded to hydrological development projects, mainly irrigation works and drinking water supply works, reflecting the need and the priority assigned to this issue by stakeholders.

The actions were grouped into four strategic areas, according to the characteristics of the problems to be tackled, the interrelations between them and their local and transboundary manifestations, seeking to establish a *basin vision* and the *integrated management* of its natural resources. The strategic areas were:

- Institutional development and strengthening for the planning and integrated management of water resources
- Environmental prevention, protection and rehabilitation
- Sustainable development of natural resources
- Awareness-building, public participation and replication of Project activities

From each of these four strategic areas, a small number of actions were selected. They were oriented toward establishing a legal and institutional framework for executing the entire program, consolidating and expanding awareness-building and public participation mechanisms, and executing some environmental rehabilitation/remediation and sustainable production actions. This group of actions, called the *Short Term SAP-Bermejo*, was considered an immediate priority, necessary for catalyzing the SAP-Bermejo execution, initiating a process directed at solving the main transboundary environmental problems, and promoting the Basin's sustainable development.

The *Short Term SAP-Bermejo* implementation started in June 2001 and ended in December 2009. The project was supported by an USD$11.04 million grant from the GEF. A total of 29 projects were

executed, 11 of which were implemented jointly by the two countries, and 18 projects were executed at national levels (9 in Argentina and 9 in Bolivia), based on the location and characteristics of the problems to be solved and the corresponding strategic actions.

The SAP-Bermejo implementation consisted of studies, demonstration projects, and institutional actions conducted in both countries, which addressed the most relevant issues identified in the TDA as root causes of environmental problems, and which, overall, were the "catalyzing" activities for the implementation of a long-term Integrated Water Resource Management Program. The activities performed and the results achieved in each of the strategic areas were:

- **Institutional Development and Strengthening for Planning and Integrated Management of Water Resources.**

Based on the TDA, the SAP defined a set of actions oriented to strengthening the policy, legal and institutional framework for promoting the sustainable development of the region and fostering the integrated management of water resources at the Basin level. Special attention was given to the establishment, through the adaptation and consolidation of existing binational and regional entities, of forms of organization and inter-jurisdictional capacities that would facilitate the development of Basin agency functions, strengthening the different aspects involved in the integrated planning and management of the Basin's natural resources, such as the regional regulatory framework, jurisdictional and sectoral coordination mechanisms and organizations, access to environmental information, and the development of environmental and land use zoning plans.

The development and strengthening of COBINABE as the binational entity for the management and sustainable development of the Bermejo River Basin was one of the main pillars of SAP implementation. Thus, several technical and institutional strengthening activities were conducted, positioning COBINABE as the Basin's water resource planning and integrated management agency, at the binational, national and local levels in Argentina and Bolivia. For instance, in order to facilitate an integrated cross-functional and coordinated approach to water resource management in the Basin, COBINABE entered into more than forty (40) Mutual Understanding and Collaboration Agreements with different organizations, institutions, associations and other stakeholders in the Basin, including national, provincial and regional governmental organizations; international entities; public and private universities; academic and scientific institutions; as well as civil society intermediate institutions (professional associations and NGOs).

Likewise, COBINABE's actions were strengthened through the establishment of the Regional Coordination Committee (RCC) and the Regional Advisory Committee (RAC) within COBINABE. The RCC is comprised of representatives from the governments of the four provinces in Argentina and Tarija Prefecture and the Bolivian municipalities

having jurisdiction in the Basin. The RAC consists of representatives of the universities in the basin, academic institutions, scientific and technical organizations and other social stakeholders interested in the management of Basin's water resources and the environment. These Committees constituted the coordination, scheduling, control and advisory mechanisms for the SAP-Bermejo implementation. Subsequently, the Binational Coordination Committee was created and implemented, building upon the aforementioned RCC and RAC, as a basis for its operation and organization.

Moreover, a communications action plan was developed and implemented as a strategy to promote local stakeholders' commitment, foster public participation through information dissemination and contribute to building awareness about the benefits of the integrated management of water and other natural resources.

Furthermore, with the aim of consolidating COBINABE as a binational entity for the integrated management of the Bermejo River Basin and ensuring its institutional sustainability, its Internal Regulations and the Seat Agreement were prepared and approved, creating the position of Binational Coordinator with technical and administrative functions. As for its financial sustainability, an annual operating budget for COBINABEs operation was drafted, and subsequently approved by the competent authorities.

The national agencies in charge of the Bermejo River Basin management in Argentina and Bolivia, COREBE and the OTNPB respectively, were institutionally strengthened in terms of their human resources, and technical, organizational and operating capacities, for the purpose of performing the activities they are responsible for, both as national basin agencies and in their capacity as COBINABE's Secretariat.

At the level of the Argentine provinces and the Department of Tarija in Bolivia, the capacities of governmental and/or civil society organizations with jurisdiction or interests in the sustainable development of the water resources and other natural resources within the Bermejo River Basin were strengthened. The activities performed included training of technicians and managers, strengthening of organizational and equipment capacities and supporting the successful performance of actions related to the fulfillment of the missions and functions of the organizations responsible for managing water resources and the environment.

As for the harmonization of the legal frameworks relating to environmental legislation, water codes and environmental impact assessment regulations, comparative analyses and recommendations were made in order to establish common objectives and policies for the use and protection of shared water resources.

Moreover, environmental and land use zoning processes were fostered, not only as vital planning instruments for basin management but

also for the integrated development of large areas of the watershed. The 2006-2025 Departmental Land Use Zoning Plan for the Department of Tarija was completed in Bolivia and approved by the Departmental Council as a medium- and long-term regulatory and guidance instrument for optimizing land use and occupation based upon a sustainable development approach. Pilot land use zoning plans for the Municipalities of Toldos, Iruya and Tilcara in the Upper Basin in Argentina and for the Lower Basin in the provinces of Chaco and Formosa were also prepared, based on hydrological risk zoning, as instruments for planning sustainable development and natural resource exploitation.

- **Environmental Protection and Rehabilitation**

The environmental protection and rehabilitation actions sought to address important problems related to the degradation of natural resources and their transboundary aspects as identified in the TDA. The activities performed were oriented toward strengthening prevention and control mechanisms to tackle the main environmental degradation phenomena affecting habitat availability and biodiversity, the availability of natural resources and good water quality, as well as the conflicts resulting from floods and other natural disasters.

Given the particular characteristics of the Bermejo River Basin in terms of sediment production, transport and deposition, an important set of actions was directed at reducing sediment production and controlling sediment transport in critical areas in the Basin. At the sub-basin/local level, successful structural and non-structural demonstrations of erosion control and sediment transport reduction were performed jointly with the Upper Basin communities, with small multiple-purpose works being verified as economically and socially feasible and financeable. Successful practices which simultaneously contributed to the reduction of environmental degradation and the expansion of availability of water for exploitation were: structural flood control measures, sediment retention dams, bank protection works, rainwater drainage systems, and river bed cleaning and consolidation activities, among others.

Additionally, a set of non-structural erosion control and natural ecosystem conservation measures were implemented, mainly cattle-raising management actions to reduce grazing pressure, communal practices affecting grazing land use, implementation of forest nurseries, and introduction of waste management in small communities. It is worth mentioning the demonstration projects on integrated microbasin management carried out in Bolivia jointly with farming communities, which had multiple results showing the possible simultaneous benefits to be achieved in terms of improvement in quality of life, access to water and productive development of lands using micro irrigation systems, as well as the sustainable management of natural resources, control of erosion and water body sedimentation and protection of infrastructure at the larger scale.

The consolidation of protected areas recognized

by national and provincial conservation systems was a high priority. The SAP-Bermejo proposed to reestablish continuity between nearby protected areas, implementing the Binational Biological Corridor, connecting Tariquía National Flora and Fauna Reserve in Bolivia with the Baritú and Calilegua National Parks in Argentina. This action permitted the expansion of the area protecting biodiversity and natural resources, preventing habitat fragmentation in the Yungas.

Moreover, in order to contribute to the sustainability and the reduction of vulnerability of these fragile ecosystems, management plans for several protected areas were prepared, ecotourism practices in protected areas and in their surroundings were implemented, afforestation actions to expand carbon fixation in the Yungas were executed, and biodiversity studies were conducted.

In terms of water quality management, projects were implemented for solving the pollution problems of the Guadalquivir River through small water treatment plants. In the case of the Bermejo Triangle watercourses, a diagnostic analysis of the sanitary situation was conducted, the Sanitation and Water Quality Sustainability Plan prepared, waste water collection and treatment carried out, and a sewer system built. Moreover, the Water Quality Monitoring Network was implemented, consisting of over 40 sampling points, four of which are in binational sections of the river.

- **Sustainable Development of Natural Resources**
  The TDA developed in the framework of the SAP-Bermejo, pinpointed a wide sector of the population affected by poverty, identifying the indigenous community, the Creole community, native settlements, rural areas and marginal sectors of urban areas as the most vulnerable groups. Moreover, it was pointed out that poverty was the conspicuous manifestation of the Basin's environmental problems, as low income levels had been inducing the use of unsustainable management practices, worsening the pressure on natural resources and eventually resulting in impacts on the soil, water, biota, etc.

One of the factors identified as the root cause of this problem was the inadequate access to, and application of, sustainable technologies; mainly in terms of the use of primary production systems and farming practices, the application of inappropriate technological models and the underutilization of available materials and technologies.

In this sense, the SAP-Bermejo identified the need to foster concrete actions oriented toward improving the prevailing low levels of human development through integrated basin planning and management, development of sustainable technologies and rational application and exploitation of water and other natural resources. For this purpose, appropriate management technologies and practices were consolidated and disseminated. These technologies and practices had been developed and experimentally verified in many regions of the Basin by research and development agencies, producers associations and production and social development programs, but

had not been sufficiently disseminated due to the expansiveness and diversity of regions in the Basin and to institutional fragmentation.

The actions implemented included practices for grazing and livestock management, farming, forestry and pastoral system management, workshops and training programs on production activities, small optimization works for irrigation infrastructure, and soil management plans, among others. Actions in localized areas of the Upper Basin in Argentina and Bolivia were also incorporated, including a large number of proposals brought forward by the different jurisdictions, aimed at improving the quality of life of the poorest communities, through the validation and application of sustainable management practices and the appreciation of traditional cultural manifestations of natural resource management techniques.

Highly successful elements were the pilot demonstration experiences and projects on pastureland and goat and cattle management, the development of small-scale traditional crops, sustainable exploitation at experimental scales, water resource management improvements through the systematization of irrigated areas, farming and pastoral system management, and the awareness building of sustainable management of natural resources in the Wichi and Creole communities.

- **Awareness-Building, Public Participation and Replication of Project Activities**

A common element identified in the diagnostic stage as a root cause of environmental problems in the Basin was the insufficient knowledge, commitment and participation of the community in the management of natural resources, as well as the lack of mechanisms, which were not part of the regulatory framework, to promote and facilitate the community's involvement in the management of natural resources. In addition, the low level of public participation was marked by the community's insufficient access to necessary information and the limited capacity of the communities and their organizations to participate in decision-making processes.

In order to address this issue, SAP-Bermejo sought to stimulate informed and participatory decision-making processes, strengthening (I) society's awareness at all levels through environmental education and training; (II) the community's active participation in planning, implementing development actions and natural resource management; and (III) public access to information.

Social awareness was built through the development and implementation of an Environmental Education Program, by means of which sustainable development and environmental concepts were incorporated into the public education system, both in the Argentine provinces and the Bolivian education districts of the Basin. In Argentina, the Program was implemented through Framework Agreements and Protocols signed with the Ministries of Education of participating provinces, by which content related to the Bermejo

River Basin and the environment in general was incorporated into formal education programs. School experiences were also carried out in several locations, contributing to building environmental awareness and commitment for the Basin's conservation. In Bolivia, activities were conducted within the framework of the Educational Reform Program, implemented through an Inter-institutional Agreement between the Departmental Education Service and the corresponding Ministry. In both cases, capacity programs were conducted for trainers and teachers, and local school initiatives were implemented throughout the Basin, using for this purpose training manuals specially designed and prepared by professionals and technicians from within the Basin. Actions were also carried out in the informal education system, seeking to incorporate civil society as a key player in actions and tasks related to environment conservation and sustainable development.

Public participation activities also sought to guide and validate the actions of SAP-Bermejo, promoting a common vision among the governmental sector, the academic sector, non-governmental organizations, the private sector, farming communities and native settlements, project beneficiaries and the population in general. Varied participatory tools and processes were used, including inter-sectoral technical meetings, communications and consultations with civil society, implementation of community-based information exchange networks for production and commercialization of agricultural products, training workshops for teachers and students on environmental issues affecting the Basin, development of productive experiences in educational and communal settings, participatory preparation of work plans, etc.

In order to improve the access to information, an Integrated Environmental Information System was developed and implemented in a participatory manner. The system gave a regional Basin context to the information generated within the different jurisdictions, making it accessible to different users. Some of the essential elements of the System were the Hydrometeorological Network and the Early Warning System, both based on real-time meteoric data transmissions from 14 remote stations located in Bolivia and Argentina. The system has facilitated access to information for a more thorough knowledge of the hydraulic behavior of the Basin´s rivers, not only for preventing floods along riverine communities, but also for promoting agricultural development of the region. The System, which has operation centers both in Tarija, Bolivia, and in Salta, Argentina, has been made available to the provincial Civil Defense agencies as well as university and research institutions by means of different collaboration agreements.

A second element of the System is the Water Quality Monitoring Network, which is comprised of more than 40 sampling points, four of which are located in binational sections of the river. Physical, chemical and biological parameters are systematically measured at these sampling points twice a year by the water laboratories of the four Argentine provinces and the Department of Tarija,

Bolivia, comprising the Basin. The functioning of this network is based on the operationalization of the inter-institutional agreements between national and local entities, and on the strengthening of local capacities as a result of monitoring campaigns launched within the SAP.

As part of the dissemination activities, communication actions were executed through workshops and informational meetings, periodic publications and brochures on project activities and results, institutional and sectoral brochures, documentaries, radio programs, and participation in national, regional and international events. Moreover, COBINABE's webpage was developed and launched, serving as a key tool to disseminate and provide access to project-related information.

Finally, a set of replicability actions were carried out, seeking to expand and disseminate SAP-Bermejo methodological approaches, conclusions and results into the broader context of the La Plata Basin.

- **Conclusions**

The finalization of SAP-Bermejo´s implementation phase reveals a Basin with a stronger institutionality at the binational level in COBINABE, under an exemplary understanding between the Argentine and the Bolivian Governments after more than a decade of joint work. The experience gained in the implementation of this initiative leaves the Basin with capacity to organize and coordinate actions in the region, taking the basin as a planning and management unit for the sustainable use of water resources, with valuable experiences for addressing problems related to soil loss and water and ecosystem degradation; for ecological and hydrological risk zoning; the valorization of traditional practices and incorporation of sustainable production techniques; and a formal education program properly addressing local aspects of global environmental management.

The experience also leaves established a binational information system, with wide access to information, fed by hydrometeorological and water quality monitoring and alert networks, including georeferenced information within a thematic map system. SAP-Bermejo opened opportunities for the protection and conservation of valuable ecosystems, focusing on their biological values, as well as for the protection of water quantity and quality and sustainable water use, seeking its rationalization and efficiency to help improve the quality of life of poor farming and indigenous communities.

The set of actions implemented within the framework of the SAP-Bermejo offers a series of lessons which are invaluable and useful, and which provide a reference framework for continuing the activities oriented toward the integrated management of water resources. In particular, it is worth mentioning the progress made in terms of the institutionalization of the Basin's agencies at the binational level as well as in the national spheres in Argentina and Bolivia; the results of environmental prevention, conservation and rehabilitation actions; the high degree of acceptance and response to participatory processes; the multiplying effect of environmental education for building awareness in

the community; the safety and benefits provided by access to information; and the implementation of sustainable development projects, which provided numerous and concrete local benefits in both countries.

From the quantitative point of view, these local benefits show an increase in the communities' ***Physical Capital*** through investment in machinery, tools, the regularization of land titling and productive infrastructure; ***Financial Capital***, through the generation of savings, increased production and productivity, the increase of labor required and the reduction of risks due to improvements in marketing channels; ***Natural Capital***, through valuation, improved conservation and use of natural resources; and, finally, ***Social Capital***, reflected in the strengthening of institutional capacities, the communities' improved ability to relate and connect with one another, improvements in social and gender equity, and the empowerement of women and minority groups in decision-making.

Moreover, these activities diminished the vulnerability of the communities facing environmental degradation and risks of floods and landslides, and improved the integrated management of water quality, the integrated management of water and soils, all through information, communication and institutional coordination.

Sustainable management of water resources essentially consists of slow and complex processes where it is essential to work on the societal causes of environmental problems, such as social organization, institutionalization, participation and education, in order to make progress in terms of a basin's sustainable development. In this sense, the SAP-Bermejo as a whole, regardless of the individual success or failure of each of its components, projects or activities, has effectively started the process of incorporating the environmental dimension into the binational actions within the Basin, under a sustainable development approach.

The SAP-Bermejo, executed as an initial catalytic program for the sustainable development of the Basin, has generated not only important progress in terms of consolidation of the institutional framework and the implementation of practices and experiences related to ecosystem rehabilitation and protection, production diversification and development, and public participation, but also has led to a proposal for an Integrated Management Program for the Binational Bermejo River Basin, which expands the short-, medium- and long-term vision started with the Project, identifying additional priority actions and projects for strengthening the backbone of the Basin's sustainable development, and focussing on those actions which, given their transboundary relevance, are to be coordinated by both countries and the jurisdictions competent in each issue, on the basis of public participation and empowerment of local stakeholders.

1. The Bermejo River Basin

1.1. Biophysical and social aspects

The Bermejo River Basin is part of the La Plata River Basin. It drains one-fifth of the South American continent through the La Plata River into the Patagonian Shelf Large Marine Ecosystem (LME). The Basin extends from the Andes Mountains of northwestern Argentina and southern Bolivia to the plains of the Great American Chaco, which extends from southwestern Brazil to the east of Bolivia and from western Paraguay to northeastern Argentina. With approximately 123,000 km^2 in surface area, the Basin covers parts of the Department of Tarija in Bolivia, and the Argentine provinces of Chaco, Formosa, Jujuy and Salta. Roughly 90% of the Basin area is located in Argentina (including portions of both the Upper and Lower Basins) and 10% of the Upper Basin is found in Bolivia. The Bermejo River flows about 1,300 km to it's confluence with the Paraguay River where it contributes an annual average discharge of 320 m^3/s. The Bermejo River connects two geographical areas of vital geopolitical and economic importance: the Andes and the system of the Paraguay-Parana Rivers. It is the only river that completely crosses the large expanse of the Chaco plains, acting as a corridor that connects the biotic elements of the Andean Region with the Chaco Plains, and the wetlands corridor and the river ecosystems of major rivers in the La Plata Basin. Radically different meteorological and topographical conditions along the basin create a diversity of tropical forests, humid and semi-arid valleys and desert mountains in the Upper Basin as well as dry and humid forests in the Lower Basin. An exceptional diversity of habitats exists along the course of the river and its tributaries.

Basin erosion rates and sediment transport of the Bermejo River are among the highest in the

world, with over 100 million tons annually (representing 80% of the total) being deposited in the Paraguay-Parana-La Plata River system. Along with these sediments, the Bermejo River brings an enormous amount of nutrients which influence the life and richness of the rivers, coastal and marine ecosystems of the La Plata Estuary that create the hydrological system into which the Bermejo River discharges. Most of the sediment is generated in the Upper Basin and is carried downstream in times of freshets or flood flows. As a river of mountain origin, the high energy of the water creates a wandering course as it reaches the Chaco plains, generating a complex phenomena of migratory channels, shifting river bends, coastal erosion and sediment deposits. The flow regime exhibits a high annual variability, concentrating up to 75% of the annual runoff during the summer months. Large rises in the river occur throughout this period, reaching peak flows that surpass 12,000 m^3/s. Flows decrease in the early autumn and in winter the dry season begins with very low flows , which hardly exceed 50 m^3/s.

The highly dynamic behavior in the Upper Basin, the erratic behavior in the Lower Basin, and the high volume of transported sediments are in essence natural processes that should be protected. This however, hinders the rational use of water, soils and other related natural resources, limiting opportunities for community development in the region. The harmonization of these factors and conditions constitutes a great challenge for the sustainable development of the Basin.

The Basin population is estimated at 1.3 million

Upper Bermejo River Basin

Lower Bermejo River Basin

Sediments generated in the Upper Bermejo River Basin. Mud torrent in Iruya River Basin, Province of Salta, Argentina

Bermejo River mouth section on the right side of the Paraguay River, where an important sediments concentration can be appreciated.

Erosion processes in Tarija Central Valley, Bolivia

people, the majority rural workers, small farmers and indigenous communities, but with important urban centers such as the provincial capitals of Salta, Jujuy, Resistencia (Chaco), and Formosa in Argentina and Tarija in Bolivia, which concentrate the majority of the development of the region. Poverty rates in the Basin population are extremely high and particularly affect indigenous communities throughout the area.

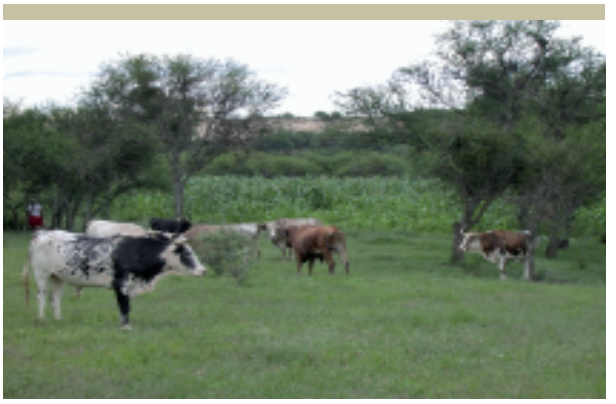
Natural resources are abundant in the Basin; however, there is a high rate of social and environmental vulnerability due to severe limitations on water availability, which affects the western area for the most part of the year, and its high annual variability with recurrent droughts and floods that affect the Basin as a whole. Rainfall concentration during the summer months creates severe flooding with catastrophic social and economic effects, particularly in coastal and socially vulnerable communities. These strong variations limit and condition the quality of life of the population living in this environment, which is undergoing an increasing degradation process, due mainly to overgrazing, poor land use, loss of native forests, surface water and groundwater pollution and rapid encroachment of the agricultural frontier from the east. All of these elements accelerate the natural processes of soil loss that characterize the Basin.

In both countries, the Basin's economy is heavily dependent on agriculture and livestock; however, both of these predominant activities are constrained by climatic and geographic

characteristics, social and cultural realities, and production business development. In various parts of the Basin, rural, family-based and indigenous subsistence agriculture can be found along with extensive and intensive market-based farming operations (with high technology and large investments). There is also presence of major agro-industries, including sugar mills in Argentina and Bolivia, tobacco companies in Argentina and wine producers in the Department of Tarija. In the lower and middle basin in Argentina, a strong land-use change process can be observed. Similarly in Bolivia, the existence of rich oil and gas fields in the Department of Tarija has enabled the national government, the Prefecture of Tarija and the municipal governments to inject new financial resources into the local economy, generate changes in migration patterns, and increase investment capacity to rehabilitate lands in valleys of the Upper Basin for agricultural production and irrigation, albeit in an environment characterized by a strong presence of small farmers, subsistence-based agricultural production and a migrant livestock activity based on annual cycles.

One of the emerging challenges in the Basin is the uncontrolled use of aquifers of good water quality, for human use but, predominantly, to increase the areas under irrigation. Aquifers like the SAYTT[1], co-exist in geological areas characterized by

Local population – Quebrada de Humauaca, Province of Jujuy - Argentina



Livestock farming. Tarija, Bolivia

Intensive agricultural activities. Province of Salta - Argentina

[1] SAYTT: Name defined by the institutional representatives of Argentina, Bolivia and Paraguay, present at the Bermejo River Basin ground waters Workshop organized by SAP-Bermejo in Tarija (2006). This aquifer was previously known as Toba in Argentina, Tarijeño in Bolivia and Yerendá in Paraguay (Yerendá, Toba Tarija Aquifer System – SAYTT).

the intercalation of marine origin sedimentary formations with layers of salt water. These groundwater resources are strategic for development given the water deficits that characterize the region, exacerbated by the effects of climate variability and change, and the growing demand for water with the expansion of intensive agriculture.

Due to the structure and physiography of the Bermejo River Basin, the population which inhabits the Basin does not perceive it as a planning and management unit. The mountainous Upper Basin, with soils on steep slopes, intermountain valleys and the Yungas forests in its foothills, has a very different social and productive reality compared to the Lower Basin, with its extensive flood plains, once covered with forests of the semi-arid and wet Chaco ecosystems, but now under great pressure from agricultural expansion. The natural link of the Bermejo River has not been strong enough for communities to perceive the Basin as a unit. While the Upper Basin is shaped by people of Argentina and Bolivia with a strong historical interaction, the Lower Basin is characterized by economic and social conditions more strongly connected to the Paraná and Paraguay Rivers: in the north by the communities of the Lower Pilcomayo River Basin and neighboring Paraguay, and in the south by the Argentine provinces of the Paraná River coast. In addition, infrastructure and communications have not favored socio-economic interactions within the Basin. Roads connecting communities and East-West trade have been paved only in recent decades as regional trade in MERCOSUR became stronger and cross-South American transport corridors took shape. These corridors now cover the major cities of the Basin, both in Bolivia (Tarija) and Argentina (Resistencia-Chaco, Salta, Jujuy) and the Paso de Jama.

Climate research and projection models carried out in recent decades indicate that the average temperature in the Chaco region has increased and is projected to continue increasing with a consequent increase in evapotranspiration and soil dryness, favored by the slow water runoff in the vast Chaco plains of the Lower Basin. The average rainfall however, has been increasing in the east, with a progression of soil moisture from the humid Chaco in the west toward the drier central portions of the semi-arid Chaco. These weather patterns, observed during the last recent decades, have favored the expansion of the agricultural frontier, thus soils that were previously covered by the native forests of the Chaco ecosystem, are currently allocated for agricultural production. Weather patterns also show that drought periods in the Upper Basin and semi-arid foothills are becoming more acute, with rainfall distribution concentrated in a shorter period of time, more intense, and with more erosive power. Meanwhile, greater soil moisture in the humid Chaco and semi-arid Chaco inter-phase areas have been a factor in the deforestation of native forests and expansion of intensive agriculture with a greater demand for water and irrigation.

1.2. Legal and Institutional Framework

Political and administrative structures differ in

both countries. Argentina is constituted as a federal government system, based on a confederation of states known as Provinces. Provinces are made up of departments, which are comprised of Municipalities. The municipality is placed at a decentralized and autonomous level and is situated at the base of the national institutional pyramid.

Bolivia, from the political administrative standpoint, is a country with a unitary government system that is divided into Departments, comprised of Provinces, which are divided into Provincial Sections, also known as Municipalities, and these are sub-divided into Cantons.

The binational nature of the Basin alongside the federal organization of the Argentine government, lends the Bermejo River Basin an inter-jurisdictional character making the institutional structure, under which the project has been developed, particularly complex.

The following governmental levels have been identified:

Binational:

Binational Commission for the Development of the Upper Basin of the Bermejo River and the Rio Grande de Tarija (COBINABE)

Regional:

Argentina - Regional Commission for the Bermejo River[1] (COREBE)

Bolivia - National Technical Office for the Pilcomayo and Bermejo Rivers[2] (OTNPB)

Provincial:

Argentina - Chaco, Formosa, Jujuy and Salta Provinces

Departmental:

Bolivia - Tarija Department

- **Binational Level**

The Oran Agreement, signed by the governments of the Republic of Argentina and the Republic of Bolivia in 1995, reflects the principles of collaboration and cooperation among both States regarding the rational and equitable use of transboundary[3] natural resources. According to Article I, the Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija aims to "establish a permanent legal-technical mechanism responsible for the management of the Upper Bermejo River Basin and the Rio Grande de Tarija, that will foster sustainable development in the area of influence, optimize natural resources use, create jobs, attract investment and allow for rational and equitable management of water resources (cf. inc. a)." Paragraph b) of Article I of the Agreement

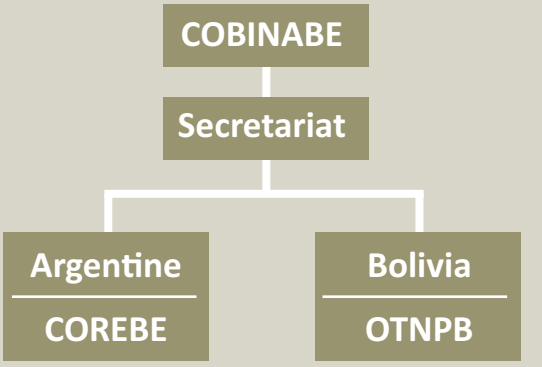


Diagram of the Binational Commission for the Development of the Upper Basin of the Bermejo River and the Rio Grande de Tarija.

emphasizes that, within the generally described subject area, the parties will seek the best water usage to meet household, power generation, irrigation, flood control and fishery needs, industrial and recreational uses, among others.

The operational capacity of the Binational Commission is based on its Secretariat, comprised of COREBE in Argentina and the OTNPB in Bolivia.

In practice and within its legal framework, the Binational Commission as such had not formally incorporated into its decision-making processes the principle institutional actors in the Basin (the provinces in Argentina and Prefecture and Municipalities of Tarija in Bolivia), nor provided for formalized participation mechanisms involving social stakeholders.

Similarly, COREBE had not achieved, through its actions, to develop, institutionally, the functions of a *basin organization* needed to ensure the integrated management of shared water resources or, through its functional relationship with the Argentine Delegation of the Binational Commission, to properly channel provincial involvement in the decision-making processes related to issues within the scope of the Commission.

Given the political organization of Bolivia, decisions on natural resources use are under the responsibility of the national government, channeled to the Bolivian Delegation of the Binational Commission through the OTNPB.

- **National and Regional Level**

In Argentina, the **Regional Commission for the Bermejo River** (COREBE), a body created by Law No. 22697 passed on December 17, 1982, has as its main purpose the rational and equitable use of this shared resource for regional development. This body was established as a forum for coordination of policy and management strategies among the provinces involved. All developed actions arise from decisions by its Governing Council, composed of the governors of the provinces of Chaco, Formosa, Jujuy, Salta, Santa Fe and Santiago del Estero, and the appropriate national body, and are implemented by its Board of Directors (consisting of Governing Council member representatives). The COREBE is composed of six provinces, four of them with territory in the Bermejo River Basin. The provincial governments in Argentina have original control over their natural resources and are therefore necessary stakeholders and contributors in national decision-making processes that affect these resources.

In Bolivia, in February 1989, Executive Order 205842 established the **National Commission for the Pilcomayo and Bermejo Rivers**, located in La

[2] Federal agency in Argentina comprised of representatives of the National government and governments from the provinces of Chaco, Formosa, Jujuy and Salta, riparians of the Basin and the provinces of Santa Fe and Santiago el Estero.

[3] During the SAP preparation phase, the National Commission for the Pilcomayo and Bermejo Rivers (CONAPIBE) was the regional level agency in Bolivia.

[4] United Nations Economic and Social Council Committee on Natural Resources, Second Session, 22 February - 4 March 1994, "Review of Progress on Water Related Issues: Consideration of New Instruments for Global Action" (E/C.7/1994/5).

Paz, as the "technical body responsible for formulating policies and strategies for the management of these rivers; as well as policies and strategies to be implemented by Foreign Affairs after negotiations with the Republics of Argentina and Paraguay." In turn, laws N° 1324 and 1325 passed on April 23, 1992, established the **National Technical Office for the Pilcomayo and Bermejo Rivers (OTNPB)** based in Tarija, as being "responsible for coordinating activities in Bolivia and act as the national counterpart in the studies conducted for multilateral use of the stated rivers."

By Executive Order Nº 24544, the President of the Republic, along with the responsible Ministers, bestowed on the OTNPB, "decentralized public entity legal status, with autonomous technical, administrative and financial management, as the operating body of the National Commission for the Pilcomayo and Bermejo Rivers, under the Ministries of Foreign Affairs and Sustainable Development and Environment" with an "Executive Director" appointed by the then Minister for Sustainable Development and Environment.

2. Formulation of The Strategic Action Program for The Binational Basin of The Bermejo River

2.1. Background

Based on previous efforts undertaken by the governments of Argentina and Bolivia and the General Secretariat of the Organization of American States (GS/OAS) in the La Plata River Basin, and particularly in the Bermejo River Basin, authorities of the Binational Commission contacted the then Office of Sustainable Development and Environment of GS/OAS in September 1995, to report on the progress in the institutionalization of the binational interests for the development of the Bermejo River Basin, and to learn about technical cooperation and funding options for further integrated management and sustainable development actions in the Basin. This interest was also an opportunity to establish contact with the newly created Global Environment Facility (GEF) and with United Nations Environment Program (UNEP) as the implementing agency for regional projects in the GEF International Waters focal area. Between 1995 and 1997, meetings and joint missions of GEF, UNEP and GS/OAS were held in Argentina and Bolivia in the Bermejo and Pilcomayo region, seeking to learn about the Basin, its background and local realities, and to identify environmental issues of global importance that merited GEF financial attention.

It is important to point out that the problems and potentials identified in the Bermejo River Basin, coupled with the strong interest of both countries to advance sustainable development efforts at a time when the GEF was defining its global programs, provided an opportunity to influence the design of the International Waters focal area operational Program #9, oriented toward the *Integrated Management of Land and Water Resources* in transboundary basins. The Bermejo River Basin project was the first global funding

experience under this program, and the first to be carried out in the Americas. Thus, since its creation, the SAP-Bermejo was considered a GEF flagship project, whose results would be seen as a demonstration at the global level.

A second aspect worth mentioning is GEF's interest in an inland transboundary basin, justified because of the high environmental vulnerability of the Basin, the intense natural erosion processes, and the sediment transport and deposition levels that were determining factors in the biology, the ecosystems and, and the development of the water resources of the La Plata River Basin, subject to increased degradation due to unplanned human use. This was coupled with prevailing rural poverty and the presence of a significant indigenous population living at subsistence levels. The fact that the Basin had a newly created binational institution, still weak, but with broad sustainable development objectives, contributed to GEF's selection and financing of the Bermejo River Basin. As a result, the SAP-Bermejo was conceived as a facilitating project, an initiative that would address the root causes of environmental degradation and issues related to the sustainable development of the La Plata River Basin.

2.2. Social, Political, and Institutional Context

The formulation of SAP-Bermejo was undertaken from 1997 to 2000, a period of intense activity for the newly created Binational Commission. Its preparation should be understood as the pursuit by the two governments, jurisdictions and institutions involved, for a broader Basin development vision, which, before SAP, was focused on harnessing hydropower and regulation of the River.

Guadalquivir River, Tarija – Bolivia

The preparation of SAP-Bermejo emerges as a breakthrough that, from Agenda 21 and the Earth Summit of 1992, paved the way changing economic and social development paradigms to include the environmental dimension and development limits under the new concept of sustainable development. The incorporation of this new paradigm into the SAP-Bermejo preparation process was not exempt of adjustments and resolution of conflicts addressed through open dialogues between stakeholders prior to GEF project approval. The consideration of the objections of local stakeholders to some of the actions proposed by the Binational Commission eventually led to the

modification of the Program´s execution. As mentioned, the Binational Commission had made progress in project preparation activities under a binational agreement that considered a Bermejo River regulated by the presence of three dams, mainly for hydropower generation.

The benefits of regulated water were negotiated at two levels: internationally between Argentina and Bolivia through the Binational Commission, and nationally, in Argentina, within the framework of COREBE. Under these circumstances, the SAP-Bermejo considered the Bermejo River a *regulated river* and did not, addressing the possibility that this scenario would not materialize immediately. On the other hand, the involvement of local stakeholders in the preparation of the SAP-Bermejo demonstrated the impacts on the environment by the construction of dams and their corresponding reservoirs, which had not been included in the program, resulting in complaints taken before GEF with the objective of slowing down the approval process and funding for the SAP-Bermejo formulation phase. Both Governments, through their Binational Commission representatives, stated before GEF, UNEP and GS/OAS that the process followed for the design and eventual construction of the dams had been done according to the environmental impact laws of each country, and that the specific studies undertaken for this purpose proposed compensation schemes for the foreseen damages to local populations, ecosystems and the environment. In this context, the SAP-Bermejo, in turn, reaffirmed and expanded its protection and conservation goals with regards to the territories to be affected, identifying and planning, for subsequent implementation, a binational biological corridor, linking Tariquía National Park in Bolivia with Baritú and Calilegua National Parks in Argentina, expanding the scale of protection of biodiversity, ecosystems and natural resources in the Basin.

With the agreements reached regarding the actions proposed in the Project Document, the SAP-Bermejo financing was approved by the GEF. Notwithstanding, the financial crisis unleashed in Argentina during late 2001, which coincided with the final approval of the SAP-Bermejo in the GEF, slowed momentum for the construction of the three proposed dams, leaving unaddressed by the SAP-Bermejo the problems generated by an unregulated, complex and highly changeable river such as the Bermejo River.

The financial factor, and the recognition of the gas reserves in Bolivia, particularly in the Department of Tarija, combined with a sharp increase in international natural gas prices, changed, in the early years of the new century, the previous scenario and the justification for strong and structural interventions that involved the construction of three dams on the Bermejo River, shifting their value to uses other than energy. The issue of river regulation was still pending due to the benefits linked with disaster prevention and mitigation and increased accessilibity to water in the framework of a basin that has not been able to overcome prevailing poverty, particularly in rural and indigenous communities. After a few years of impasse, in April 2004, a Declaration of the

Presidents of Argentina and Bolivia took up again the initiative of the now called COBINABE, instructing the prioritization and selection of the first hydraulic project in the Basin, which was the Cambarí Dam in Bolivian territory, with multiple benefits for both countries and considered key to initiate the process for regulating the Bermejo River within the realm of interventions of binational interest.

Finally, and with new administrations (Bolivia 2006 and Argentina 2007), COBINABE agreed to undertake the necessary actions to solidify the construction of the water regulation works, within the framework of an Integrated Basin Vision, as a priority goal for binational integration. In this regard, COREBE and the OTNPB were instructed to update existing research and studies and to carry out actions to achieve this goal.

2.3. SAP-Bermejo Formulation

The SAP-Bermejo was prepared following the guidelines of the Argentine and Bolivian Governments, through the Binational Commission, using the methodology proposed by GEF through UNEP, as its Implementing Agency, under the management of the OAS Department of Sustainable Development (DSD/OAS), as regional Executing Agency, in support of the Binational Commission. The GEF programming framework was defined by Operational Program # 9: *multiple focal land and water program in transboundary basins* in force during the First, Second and Third GEF project cycles. The overall objective of Operational Program # 9 was: *"... to achieve global environmental benefits through implementation of IW [International Waters] projects which integrate the use of sound strategies for land and water resources..."* and its scope was *"... mainly interventions that extend over more than one activity sphere and typically involve integrated management of land and water resources."*

At country level, the preparation of SAP-Bermejo was handled by two technical teams, one from Argentina and one from Bolivia. Each team was headed by a Technical Coordinator (TC) appointed by OAS/GS, working closely under the guidance of a National Director (ND) in each country, named by their respective governments. The National Director position in Bolivia was always the OTNPB Director General. In Argentina, it varied, but the criteria mostly used were that the ND position was to be filled by the COREBE President.

The preparation of SAP-Bermejo included a set of working elements organized in six major areas:

- **Mapping:** Digital thematic mapping at 1:250000 scale of the whole Basin in a GIS environment, including data on geology, geomorphology, soils, land use, vegetation, infrastructure, climate, human settlements, socioeconomic indicators, drainage network and susceptibility to production and transport of sediments in the Upper Basin by surface erosion and mass removal phenomena, allowing zoning of the Basin area in large environmental units.
- **Public participation processes:** Establishment of consultative and communications mechanisms with civil society organizations and regional

experts; implementation of a website with regularly updated project information. In Argentina, creation and operation of the Governmental Working Group for SAP Formulation (GWGSAPF)[5], establishing the main participation and consultation mechanism with provincial governments.

- **Demonstration projects:** Demonstration projects were an important element of the preparation process to assess the technical, economic and social feasibility of remediation or rehabilitation measures. Particularly relevant were those made in relation to erosion control and sediment transport in the Tarija Valley, sustainable management practices in mountain and piedmont Yungas areas, forage handling and weed control in the Humid Chaco, removal of barriers to sustainable development in the Dry and Humid Chaco and environmental education in Formosa.
- **Projects and programs survey:** An inventory of regional plans, programs, projects and initiatives related to socio-economic development and natural resources management was completed, identifying for each case their execution status.
- **Transboundary Diagnostic Analysis (TDA):** Consolidation of sectoral, local and regional studies to identify and characterize the main environmental problems affecting the Basin, their transboundary manifestations and causes.
- **Strategic Action Program (SAP) Formulation:** Identification and selection of strategic actions to address the root causes of priority environmental problems and to promote the sustainable development of the Binational Basin.

Transboundary Diagnostic Analysis

The TDA process resulted in the identification of six major transboundary environmental problems, considered endemic throughout the Basin, corresponding to:

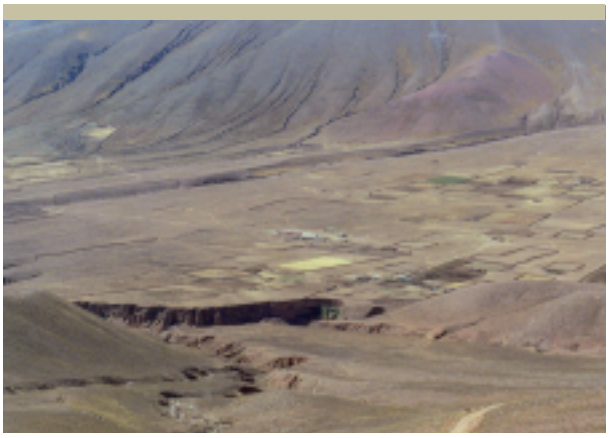
- *Soil Degradation.* Intense processes of erosion and desertification. Research found that more than 50% of the Binational Basin was subject to significant or severe erosion, and that 60% of grassland areas were being overexploited or poorly managed. Small scale sediment control methods proved to be cost-effective in reducing erosion and sediment loads while achieving local benefits by providing irrigation for small farmers and protecting local reservoirs.
- *Degradation of Water Quality.* Protection and restoration of water quality was recognized as an important issue to be considered, as anthropogenic processes and land use in the Basin continue to advance. In the Upper Basin in Bolivia, 68% of sampling sites showed restrictions on human use due to organic water pollution.
- *Water shortages and restrictions on water availability.* Access to water and water supply was recognized as the main problem in the Basin. Almost a third of the Basin is affected by extreme shortages during the dry season, exacerbating the living conditions of already

[5] Composed of representatives from government agencies with jurisdiction over Water, Natural Resources and the Environment from Chaco, Formosa, Jujuy and Salta, and the Argentine Delegation to the Binational Commission for the Upper Bermejo River Basin and the Regional Commission for the Bermejo River.

deprived communities, and limiting development potential in areas otherwise favorable to agricultural production.

- *Habitat destruction, biodiversity loss and biotic resources degradation.* It was determined that severe or highly severe deforestation affected 26% of natural forests, and that 15% of the total area was under risk of biodiversity loss. There were 24 species of flora and fauna categorized as vulnerable, 18 of them at risk. Research and pilot projects proved the feasibility of community outreach programs in providing training and promoting sustainable production methods.
- *Floods and other natural hazards.* Flooding during rainy seasons severely affects 7% of the Basin, including the City of Tarija in Bolivia. In the Province of Chaco alone, more than 390,000 ha of land were flooded during 1983-84.
- *Deterioration of living conditions of the population and loss of cultural resources.* Moderate and extreme poverty was evident throughout the Basin, mainly among small farmers, indigenous groups, and marginal urban populations. Data collected during the SAP-Bermejo formulation phase showed that 40% of the population had unsatisfied basic needs. The illiteracy rate was high and most of the population had no health care. Temporary and permanent migration of seasonal workers was a significant transboundary symptom of poverty and unemployment.

As part of the TDA process, the following were identified as determining factors of the problems



Stream and ditch bank erosion in the Upper Bermejo River Basin. Colanzulí, Province of Salta - Argentina

Las Yungas forest contains approximately 50% of the Argentine biodiversity

Floodings in the Lower Bermejo River Basin. Embarcación, Province of Salta – Argentina

identified: I) **Direct Causes,** defined as the immediate causes of the problem, as a result of a complex system of underlying elements, both of natural and anthropogenic origin; II) **Basic Causes**, defined as the root or original cause of the problems identfied; these generate the direct causes of anthropogenic nature, consequently can be subject to interventions. Considering the characteristics of the Bermejo River Basin, the basic causes were divided into:

- **Specific Basic Causes,** defined in relation to each problem. Interventions on this type of cause contribute to solving the specific problem.

- **Common Basic Causes:** These are structural causes originating from the socio-political, economic and institutional framework of the Basin that determine to a greater or lesser degree the existence of all environmental problems and, therefore, are located at the beginning of the causal chain. Interventions for this type of causes contribute to the solution of all environmental problems. The main common basic causes of the environmental problems identified were related to:
- **Institutional Aspects**

The analysis and consultations held with regional stakeholders during project formulation resulted in the identification of weaknesses in the legal and institutional framework governing the use and conservation of natural resources and environmental protection in different Basin jurisdictions. These weaknesses were recognized as the fragmentation of functions and spheres of action, functional gaps and overlaps, lack of both hierarchization and the independence of regulatory functions.

It was also determined that the principles of integrated water resources management and policies for integrated management of the Basin's natural resources were not sufficiently adopted at decision-making levels, nor explicitly incorporated into policy and regulatory frameworks and in natural resource planning and management practices. There were also weaknesses in the coordination and cooperation processes between local stakeholders and different jurisdictions.

At a regional level, along with the asymmetries arising from the different development levels of legal frameworks and their lack of harmonization, a basic cause identified was the lack of common regulatory and control criteria for the use and protection of shared natural resources between the different jurisdictions involved.

Organizational capacity shortcomings in fulfilling assessment, planning, management and control of natural resources functions were also identified as a common basic cause of most of the identified problems in the Basin. Inadequate quantity and capacity of human resources, insufficient equipment and limited access to appropriate technologies at the level of government agencies and civil society were the main weaknesses identified. Contributing factors were the limited availability of basic information and a low commitment level of those responsible for application of the norms.

CAUSAL CHAIN RELATIONSHIP FOR PRIORITY ENVIRONMENTAL PROBLEMS

Direct Causes (natural origin)	Environmental Problems	Direct Causes (human origin)	Specific Basic Causeses	Common Basic Causes
• Adverse natural conditions (soil, topography, geology, climate)	Soil Degradation	• Destruction of vegetative cover by deforestation and overgrazing • Clearing of land for agricultural activities	• Improper soil use • Unsustainable agroforestry practices • Insufficient use of water resources	• Deficient political, legal, and institutional framework
• Rainfall seasonality • Reduced water availability in the dry season • High sediment load and fluviomorphologic dynamics • High groundwater salinity contents	Water Scarcity and Availability Restrictions	• Inadequate water infrastructure • Low utilization of the current water potential • Depletion of groundwater supplies	• Insufficient infrastructure for water regulation • Limited knowledge of the potentially usable nat. resources	
	Water Resource Degradation	• Contamination by industrial and urban wastes • Water misuse and contamination by agricultural and livestock activities • Soil degradation and erosion	• Inadequate sanitation infrastructure • Deficient information on monitoring of water quality	• Poor interjurisdictional planning and coordination
	Loss of Biodiversity and Biotic Resources	• Over-exploitation of forest resources • Uncontrolled fishing and hunting activities • Clearing of land for agriculture • Inadequate agricultural practices • Overgrazing • Pollution of water sources	• Lack of land-use regulation plan • Lack of biodiversity management plans • Unsustainable agricultural, forestry and animal husbandry practices • Insufficient knowledge of the native flora and fauna	• Inadequate community awareness, knowledge, and participation in sustainable resource management
• Extreme river highflows • Extreme climatic events	Floods and Other Natural Hazard Events	• Urban expansion in flood-susceptible areas • Agricultural activities in areas prone to flooding events • Destruction of vegetation along river banks and waterheads	• Unplanned urban and rural development • Limited infrastructure for hazard reduction, control and protection • Lack and inadequate application of emergency plans	• Deficient financial and support mechanisms
	Diminished Quality of Life and Endangered Cultural Resources	• Unemployment and seasonal subemployment • Deficient health, sanitation and education services. • Low income	• Inadequate infrastructure to support production • Insufficient utilization of the natural resources potentialities • Limitations and deterioration of natural resources • Insufficient sanitation and watersupply infrastructure	• Inadequate access to and application of sustainable technologies

- **Social and Economic Aspects**

The TDA identified a large, poverty-ridden population sector, with indigenous, creole, native and rural groups, and marginal sectors of urban settlements, as the most vulnerable. In addition, poverty was pointed out as an evident manifestation of the Basin's environmental problems, given that low income levels led to unsustainable management practices, heightening pressures on natural resources and eventually impacting the soil, water, biota, etc. At the same time, unsustainable harvesting practices led to deterioration of the productive base and increased production costs, reducing farming profitability and accentuating the deterioration of living conditions, triggering seasonal or permanent migration, especially among the rural population. One of the factors identified as a root cause of this problem was inadequate access to and application of sustainable technologies, particularly in primary production systems, and the use of unsustainable agricultural practices, application of inadequate technological models, and underutilization of appropriate and available materials and technologies.

Another common basic cause of most identified environmental problems was the lack of available financing sources for sustainable development projects, as well as the existence of subsidies or incentives, which encouraged unsustainable practices and activities. This was combined with the low value given to the environment in economic policies and lack of internalization of environmental and social costs in project evaluations.

There was a continuous and increasing loss of ancestral cultural values, through changes in indigenous practices and customs, with a marked underutilization of available human potential complementing this process.

- **Public Participation and Awareness**

A common element found during the diagnostic phase as a root cause of environmental problems in the Basin was the lack of knowledge, commitment and participation by community organizations in managing natural resources and a lack of mechanisms that could promote or facilitate community involvement in natural resources management because they were not backed by the jurisdictional regulatory framework. Low public participation was also shaped by insufficient community access to needed information and limited community and organizational capacity to take part in the decision-making process.

The analysis of basic and direct causes of these problems was the topic of a comprehensive public consultation process, where the outcome defined strategic actions to be included in the SAP-Bermejo. Simultaneously, an extensive list of existing or future plans and projects related to sustainable development or the environment for the Basin was complied. Those most relevant to solving the problems identified were chosen and included in the final SAP-Bermejo proposal.

Strategic Action Program

The SAP-Bermejo was a long-term action plan designed not only to address the root causes of environmental degradation in the Basin, but also to

promote the sustainable development of the settled populations and communities. The program included a total of 136 projects to be implemented during a 20-year execution period with a total required investment of approximately USD $470 million. More than 70% of this amount was allocated to water development projects, mainly structures for irrigation and fresh-water supply, reflecting the needs and priorities defined by stakeholders.

SAP-Bermejo Objectives

The overall SAP-Bermejo objective was: "to promote environmentally sustainable development within the Bermejo River inter-jurisdictional Binational Basin (I) including environmental concerns in policies, plans and programs of the various jurisdictions, (II) by creating a natural resources integrated management and Basin vision, (III) promoting the establishment of regional coordination and organization mechanisms, public participation and consultation organization, by (IV) implementing programs, projects and actions that (V) prevent and solve unsustainable use and environmental degradation of natural resources and (VI) encourage the adoption of natural resources sustainable management practices."

The **specific objectives** of the SAP-Bermejo were defined as:

- To establish a framework for regional coordination and harmonization of transboundary measures to be implemented by the various jurisdictions in the Basin and, at the same time, help guide actions developed within each jurisdiction, contributing to the harmonious and sustainable management of natural resources.
- To extend and update the environmental analysis of the Basin to identify, quantify and georeference priority transboundary environmental problems and related sectoral issues.
- To strengthen water resources and natural resources management, and protect the environment within different Basin jurisdictions.
- To promote the creation of a suitable planning system and cooperation and coordination mechanisms between the different jurisdictions within each country and within the Basin.
- To promote incorporation of transboundary environmental issues in policies, plans and development programs for the Basin.
- To systematically develop pilot demonstration activities to obtain the necessary information for SAP-Bermejo implementation and updating purposes.
- To help establish, strengthen, and use public participation and consultation instruments in planning, decision-making and implementation of general interest projects in the Basin, so that they are environmentally sustainable and socially appropriate.
- To implement preventive and remedial actions and projects to solve priority transboundary environmental problems such as soil degradation and erosion, water quality degradation, habitat destruction and biodiversity loss, flooding and other natural hazards and deterioration of living conditions of the population.

- To implement actions and projects for the sustainable use of water resources within the context of integrated natural resources management at the basin level.
- To promote public awareness.

The SAP-Bermejo actions were grouped into four strategic areas, according to the characteristics of the problems to be addressed and the interrelations between them and their local and transboundary effects, seeking to establish a Basin vision, promote sustainable development, and mitigate identified environmental problems, addressing fundamentally the basic causes of anthropogenic origin. The four strategic areas proposed were:

I. *Institutional Strengthening and Development for Integrated Planning and Management of the Basin* oriented to resolve the identified weaknesses in the institutional, policy, and legal framework, and the inadequate capacity of organizations to guide the development of the Basin under conditions of sustainability, developing an appropriate framework for the integrated management of water resources at the basin level. Special importance was given to the establishment of organizational and inter-jurisdictional capacities to facilitate the proper development of Basin agency functions, both regionally and in each country, adaptating and strengthening existing regional and binational institutions.

II. *Environmental Prevention, Protection, and Rehabilitation*, designed to promote and disseminate natural resource management practices identified during SAP-Bermejo formulation. In particular, actions focused on soil management and sediment transport control through specific prevention and control measures, protecting natural landscapes in critical erosion areas through the strengthening of protected areas.

III. *Sustainable Development of Natural Resources*, to strengthen implementation of sustainable production practices to reduce environmental degradation, especially in terms of soil degradation and erosion, while providing greater economic opportunities for the local population in a context of integrated water resources management and sustainable development planning for the Basin as a whole.

IV. *Public Participation, Awareness, and Replication of Project Activities,* to identify and coordinate the interests of people and organizations with economic and/or institutional responsibilities in the Basin, including the agricultural and industrial sectors. For this purpose, information and training was provided to Basin citizens through an integrated program of environmental education and information exchange among communities, civil organizations and government agencies.

From the long-term SAP-Bermejo, a limited group of priority actions were selected, covering areas related to coordination, planning, consolidation of consultation and participation mechanisms and pilot or specific environmental remediation and prevention activities in identified sub-regions with highly critical environmental

conditions. Areas related to ***soil degradation, biodiversity protection and ecosystem conservation*** were also selected to ensure an inter- and trans-sectoral approach for integrated water resources management. These activities were chosen because of their catalytic and dynamic nature in the implementation of SAP-Bermejo as a whole, asthey addressed the most relevant issues identified in the TDA as basic common causes of the environmental problems in the Basin.

The selected core group actions were considered of immediate priority, and were to be executed in a period of five years (Short-term SAP-Bermejo). Upon this basis, a Project Document was prepared by the Binational Commission and submitted to the GEF for consideration of new funding, which was approved in the amount USD$11.04 million, with a USD$8.53 million counterpart contribution from Argentina and Bolivia. The financing of the Short-Term SAP-Bermejo permitted the initiation of a process oriented towards the implementation of the long-term, comprehensive program. The actions included in the short-term SAP-Bermejo, either as catalytic elements or for demonstration purposes, sought to achieve the framework of cooperation, coordination and monitoring for the remaining preselected strategic actions, in their different stages (idea/profile, prefeasibility, feasibility, under preparation or implementation) and under the responsibility of many public institutions.

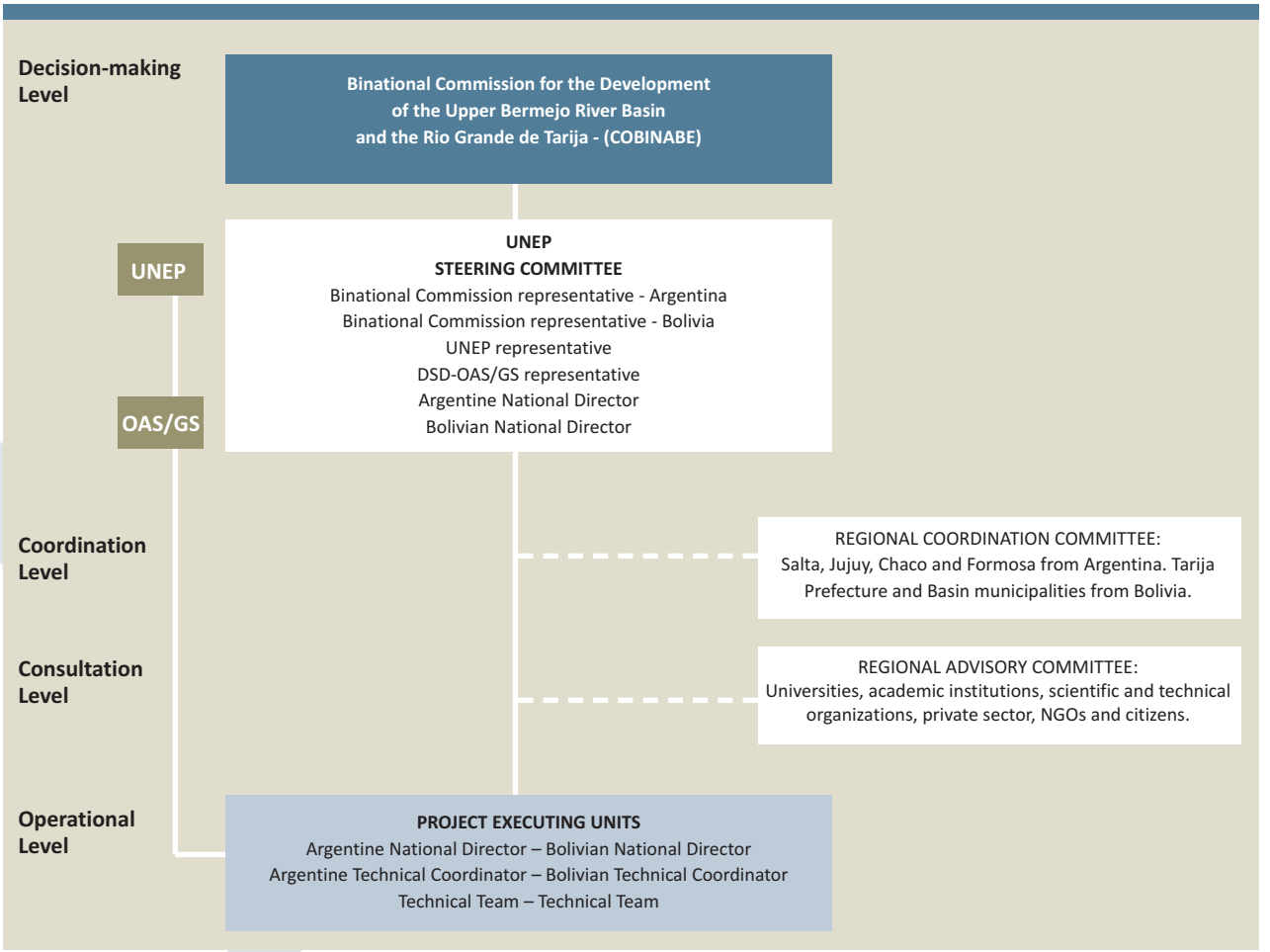
3. Framework for the Implementation of the Short-Term SAP-Bermejo

3.1. Implementation Arrangements

The implementation of the Short-term SAP-Bermejo began in March 2001 with a proposed 5-year duration within the framework of agreements signed between COBINABE and OAS/GS, and between the OAS/GS and UNEP.

Following approval of the Project Document by the parties (Annex I of the Agreement), two new technical units were created, one in each country. In Argentina, this unit was based in Buenos Aires, and in Bolivia based in the City of Tarija. OAS/GS, in consultation with the Binational Commission, assigned a Technical Coordinator responsible for each technical unit. Each country provided a National Director nominated by the Governments and approved by the Binational Commission. Their role was to guide the implementation process in accordance with the policies and priorities of each country, and to approve project disbursements, based on a previously agreed-upon Annual Operations Plan, as established by the Project´s Steering Committee (SC). The SC was the highest authority of the Project, and was composed of: I) the First Delegates from each country to the Binational Commission; II) the SAP-Bermejo National Directors of each country; (III) UNEP´s project manager, as GEF Implementing Agency and IV) DSD/OAS Director or representative of the Executing Agency.

Administration of the GEF funds was to be handled by OAS/GS. Based on the Operations Plan approved by the Steering Committee, the execution of activities and disbursement of funds required prior authorization from the National Directors of Argentina and Bolivia, based on the location of the activity and following a specific request from the respective Technical Coordinator.



The DSD/OAS set up a direct monitoring unit for the program based in Buenos Aires, Argentina, and administered the funds from its headquarters in Washington, DC, USA, with corresponding disbursements through the OAS National Office in Bolivia, based in La Paz, and the OAS Technical Project Unit based in Buenos Aires, Argentina.

The position of SAP-Bermejo National Director in Bolivia always corresponded with the OTNPB Director General, and thus changed each time the Directorship changed. In Argentina, the National Director was appointed by the First Delegate to the Binational Commission (who held the rank of Ambassador) thus within the realm of the Ministry of Foreign Affairs of that country. With few exceptions, although for the most part the program the position of National Director in Argentina corresponded with the President of COREBE.

3.2. External Constraints

The project began with an intrinsic binational institutional weakness, recognized in the TDA;

namely, that the Binational Commission did not have its own staff and the two technical teams that participated in SAP-Bermejo formulation had been dismantled. Consequently, all background information related to the SAP-Bermejo formulation process was either in documents prepared and segmented among the various national institutions from Argentina and Bolivia that had participated, or with the various stakeholders that were involved in the public participation and consultation process. Upon funding approval of the Short-term SAP-Bermejo in 2001, the re-installation of the technical units along with the technical professionals who had taken part in the SAP-Bermejo formulation was explored. This was fully achieved in Bolivia and partially in Argentina, where only one expert from the previous phase returned to the project. This created an asymmetry in the executing capacities of the two countries, with advantages for Bolivia and difficulties for Argentina, where new administrations at the national level and in the Basin provinces had taken office in 1999 as a result of general elections, with significant institutional and hierarchy changes in the Binational Commission and COREBE.

The implementation of SAP-Bermejo by a Binational Commission with no technical or administrative personnel, within an institutional framework that preceded the Project and that was dependent upon the various original jurisdictional owners of the natural resources, generated a a strong dependence on the political events and situations that occured during project implementation of the different action areas of the Program.

Although the Binational Commission resorted to OAS/GS for the management of the project and the administration of GEF funds provided by UNEP (as the Regional Executing Agency), the orientation of OAS/UNEP technical cooperation and of the GEF program, favored the appropriation of activities by the institutions involved as a condition for the sustainability of project activities, which was done according to competence and responsibilities of each of the institutions involved.

Changes in government and major political events in both countries defined in different ways the implementation of the SAP-Bermejo. The main impacts of these political changes on the SAP-Bermejo were determining factors in project implementation, particularly with respect to strategic activities related to institutional issues. Additionally, this period coincided with deep political/institutional reforms in both countries with regard to water management, with considerable advances that positively interacted with the SAP-Bermejo and required specific adjustments, in particular with regards to strategies of the Program related to institutional strengthening.

In Argentina, the first year of implementation of the SAP-Bermejo (2001) was defined by the difficulties encountered in stabilizing the Project Technical Unit, given the replacement of most of the members who had participated in the preparation phase and the appointment of new national and provincial authorities, particularly in the Binational Commission and COREBE. In addition, there were successive changes in the SAP National Directorate

in a relatively short period of time, which, given the key role of that office, conditioned integration of the new technical unit and hindered program insertion at the provincial level.

During this first period in Bolivia, the continuity of the National Director, the OTNPB team, the SAP-Bermejo Technical Coordinator and Technical Unit were a stabilizing factor for the joint implementation of the Project, with the Unit acting as a "trustworthy" institutional memory of the previous SAP-Bermejo formulation process and as an active element for its implementation.

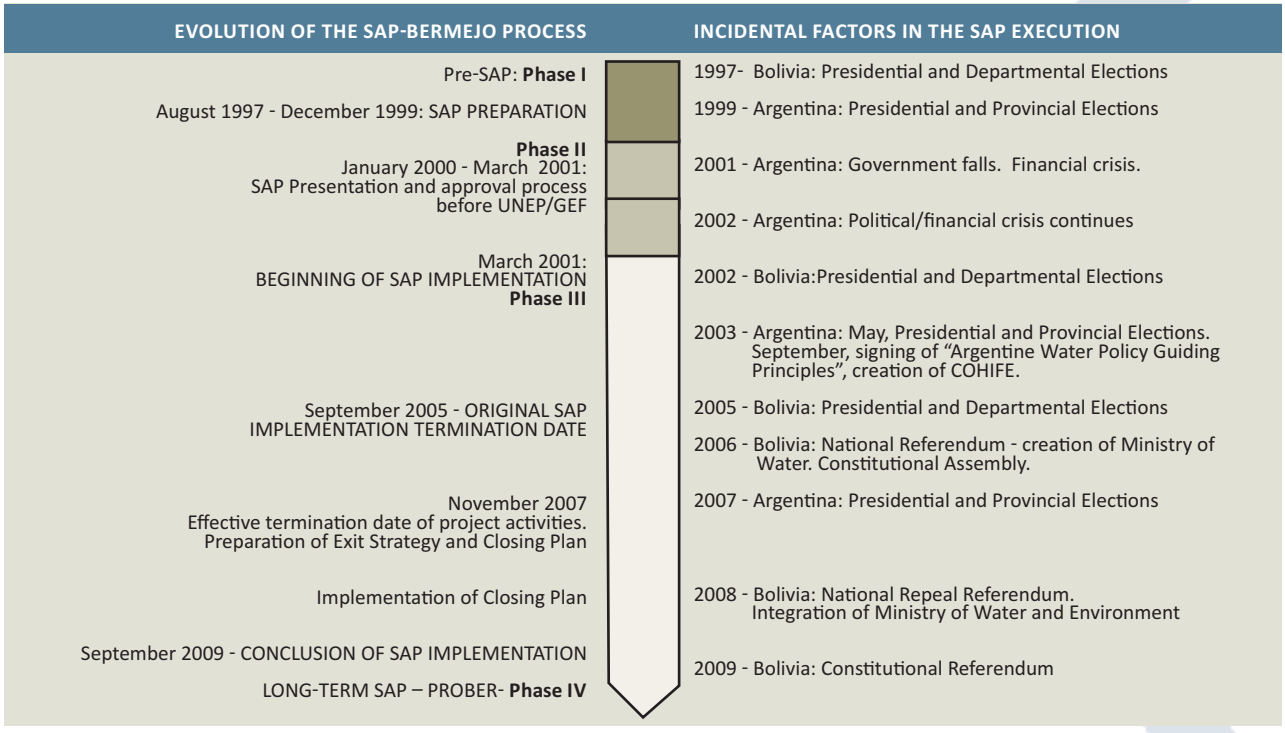
The severe Argentine financial crisis of 2001 led to the fall of the National Government elected in 1999, amid a difficult financial, political and social scenario that affected the normal progress in the implementation of the SAP-Bermejo, already impaired by the lack of stability of management and technical authorities. Under these circumstances, there where no conditions to move forward with the *institutional strengthening and development* strategic activities, neither in Argentina nor at the binational level. Nevertheless, a set of activities in other areas began as planned in Bolivia, and to the degree possible in Argentina, with extraordinary efforts from institutional counterparts with the support of technical teams. A factor for the continuity of actions given the lack of access to bank deposits in Argentina (bank freeze), was the operational arrangements with OAS/GS, as Program funds were not deposited in national accounts but managed from OAS headquarters. SAP-Bermejo implementation was one of the few examples of international cooperation that went uninterrupted, as highlighted at the GEF Project meeting convened by the Argentine Foreign Ministry in early 2002.

A positive and very important factor in Argentina during this period was the *"First National Water Policy Meeting"* in December 2002, with representatives from the 23 provinces and the then *National Bureau of Water Policy*, *Development and Coordination*[6] which created the ***"Federal Water Resources Council (COHIFE)***[7]. The meeting outlined the "*Argentine Water Policy Guiding Principles",*[8] in a document that was signed on 17 September 2003, *to facilitate and improve relations among provinces, and between these and the national government in regards to water management*. The implementation of a national policy based on the aforementioned Guiding Principles implied the construction of a new institutional reality, requiring

[6] The *"National Bureau of Water Policy, Development, and Coordination"* is now the *"Water Resources Conservation and Protection National Council"* in charge of generating and implementing Water Policy related initiatives (Decree No. 1142, November 26, 2003).

[7] **COHIFE** had a long development and recognition process; nevertheless, it has influenced development of Argentine national water resources policy since its inception. Its creation was proposed in December 2002 during the "First National Water Policy Meeting" and COHIFE was established by agreement of all 23 provinces and the National Government on March 27, 2003, as per the Agreement Act. The final version of the Charter was approved by Special Meeting on April 15, 2004 and had official recognition by the National Congress in 2008.

[8] The task, carried out through a highly participatory approach, gave way to a federal framework agreement, including policy guidelines that integrated socioeconomic and environmental issues by setting water resources management goals. Such integration is reflected in the national goal of achieving a rational, equitable, and sustainable management of water resources.



time for its consolidation and not exempt of difficulties. Gradually these agreements influenced changes in the atomized setting of provincial actions related to water issues, in line with the objectives of SAP-Bermejo.

Coinciding with the Guiding Principles, it should be noted that the SAP-Bermejo had opportunely defined a set of principles and policies that expressed the vision and demands of the region and gave context to the proposal of prioritized actions. These principles reflect and expand the basic fundamental consensus of the need of an integrated water resources management at the basin level, achieved through various international meetings at the global and Latin American level, based on the recognition of water as an integral part of an ecosystem, a finite and vulnerable natural resource and an economic and social good.

While COHIFE emerged during the implementation of SAP-Bermejo, as a mechanism not envisaged by the Program, the underlying themes of the Guiding Principles responded, as evidenced above, to what was originally proposed by both the TDA and the SAP-Bermejo, and its scope contributed as a framework for the participation of the institution responsible for national water policies in the implementation of the SAP-Bermejo, facilitating dialogue at all levels: binational, national and interprovincial.

The implementation of the SAP-Bermejo in Argentina and the binational level will have a highly

dynamic period as a result of the stability generated by the new government, which came into office in 2002. During the period 2002-2005, virtually all program activities started implementation, but with an initial one-year lag.

Some unplanned activities, but consistent with the SAP-Bermejo Project Document, were introduced in the institutional strengthening strategic area. Among these, one of the most important was the creation of the COBINABE Sub-headquarters in the City of Salta, seeking a more active presence in the geographic area of the Basin, a stronger relation with local social and institutional stakeholders involved in the execution of the program, and facilitating monitoring of implementation activities in the Upper Bermejo River Basin in Argentina. The creation of the sub-headquarters was partially funded by SAP-Bermejo with COREBE support; subsequently, operating costs were allocated to the office by the Salta provincial government as their contribution to the program.

SAP-Bermejo progress and events during this period were recognized in a Declaration by the Presidents of Argentina and Bolivia on 24 April, 2004, in which they acknowledged *"the results achieved, to date, by the **Binational Commission** through the **Strategic Action Program for the Binational Bermejo River Basin** and in particular, they noted the progress in the installation of the environmental monitoring and hydrometeorological alert system; the development of the Environmental Education Program; and the institutional strengthening in the development of the Transboundary Biosphere Yungas Reserve."*

Another important external constraint that demanded attention and where different approaches converged was the legal and institutional standing of COREBE, partly due to the advances made by SAP-Bermejo to consolidate COBINABE as the Binational Basin entity, and COREBE as the inter-jurisdictional Basin entity in Argentina. The different visions and roles began in mid-2006 with the designation of a non-Basin-province representative as the new COREBE President by the Ministry of the Interior. The situation continued throughout 2006 and culminated with the resignations of the First Delegate of Argentina to the Binational Commission and SAP National Director of Argentina.

Between December 2006 and late May 2007, when the Argentine Foreign Affairs Ministry announced the appointment of a new First Delegate to the Binational Commission (by now called COBINABE), the SAP-Bermejo project in Argentina had no national leadership, and therefore no authorization for the allocation of funds with which to begin activities. OAS/GS informed the Argentine Foreign Affairs Ministry and UNEP/GEF of the suspension of new activities in Argentina due to this situation. Meanwhile, national SAP-Bermejo activities continued in Bolivia as did activities with previous contractual commitments in Argentina.

The crisis in Argentina was resolved with the affirmation of a Basin vision, and the transfer of COREBE and its budget from the **Ministry of the Interior** to the **MIPFE's Water Resources Sub-Secretariat**. This particularly dynamic period in

developing Argentine water policy required a period of consolidation and implementation, which affected the development of strategic *institutional strengthening and development activities* in particular, and the SAP-Bermejo in general.

As the situation in Argentina was developing, by the end of 2005 national and departmental elections took place in Bolivia, where, for the first time, departmental prefects were elected by popular vote, resulting in significant policy and administration changes in the National Government. The new government took office in early 2006, and created a **Ministry of Water**, but did not nominate, immediately, the representatives to COBINABE and the OTNPB. Later that year, the Second Delegate of Bolivia to COBINABE and the Bolivian SAP-Bermejo National Director resigned, and a new OTNPB Director took office, who was charged with implementing the SAP-Bermejo program, providing continuity to the work carried out by the Project Technical Unit based in Tarija. Up until that date, national SAP-Bermejo activities in Bolivia had been virtually completed, except for the binational activities, which had been affected by the delays in Argentina, particularly those relating to national and binational institutional strengthening in each country.

The creation of the **Ministry of Water** in Bolivia, as previously mentioned, was the result of major changes in the policies of the country, expressed in various ways. Water management was prioritized under a *development vision* which states: *"Bolivia practices an equitable, participatory, sustainable and recreational management of water resources and associated services, thus effectively contributing to the social and economic development of a multicultural, multiethnic, multilingual society and environmental conservation."* In turn, the Ministry of Water was tasked with the mission to*: meet quantity and quality water needs of the population, both for consumption and productive activities, while respecting the environment, biodiversity, natural population organization and indigenous and farmer communities.* The strategic goal was *to ensure full water access to meet the needs of the population as a human right, with equity, participation, social justice, diversity and sustainability; strengthening the water resources legal system to ensure a water rights system implementation that prioritizes human consumption.* With the Executive Order Nº 26559, April 2002, the **Interagency Water Council (CONIAG)** was created *to define a water resources regulation and policy system within a coordination, dialogue and consultation framework, among all stakeholders involved.* It is clear that the changes in the basic guidelines regarding roles, rights, water access and use were to have an impact on the SAP-Bermejo institutional strengthening activities, at both national and binational levels.

On 29 June 2006, in the Town of Hurlingham, Buenos Aires province, Argentina, the Presidents of Argentina and Bolivia signed a Declaration, which highlighted the main elements of a new bilateral relationship generated from the major political, social and economic changes in both countries. Within this framework, on 17 October 2006, the Ministers of

Foreign Affairs of both countries met and discussed issues of common interest, reiterating the terms and principles of the Presidents´ Declaration, and agreeing on the need to reactivate the Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija (COBINABE). The Ministers instructed their delegations to hold a regular meeting to foster implementation of the final phase of the SAP-Bermejo, and agreed on the importance of building a model for social participation, in line with the agreements reached at the first meetings of representatives held in June and August 2006, seeking its political, technical and economic sustainability, topics to be developed in Delegate Council meetings of the Tri-National and Binational Commissions of the Pilcomayo and Bermejo Rivers. These meetings were held on 27 and 28 November 2006.

At the XXIV COBINABE Meeting, held in July 2007, delegations from the Bolivian and Argentine governments, with newly designated First Delegates, agreed to consolidate COBINABE as a binational integration entity. The sustainable economic development of the Basin, founded on an ***"Integrated Basin Vision"*** was reaffirmed, taking into consideration all natural resources in their relation to water resources.

Almost one year after the new government took office in Bolivia, during the first quarter of 2007, differences arose within the SAP-Bermejo Technical Unit, resulting in the resignation of its members and the hiring of a new team. This new team, without prior knowledge of the activities that had been carried out, led the project through a highly complex[9] political period, but was unable to achieve substantive progress. After several months of work, members of the unit were again replaced. In 2008, the Ministries of Water and the Environment were unified under a single Ministry, of which the OTNPB became a part. At this point, a new OTNPB General Director and Second Delegate of Bolivia to COBINABE was appointed, and also named SAP-Bermejo National Director in Bolivia, under increased national institutionalization.

These situations illustrate the profound changes in policy and working conditions that generated external constraints on the implementation of the SAP-Bermejo, affecting not only original timelines, but also the specific objetives and activities defined to consolidate the substantive long-term goals.

3.3. Short Term SAP Bermejo Implementation

The implementation of the Short-term SAP-Bermejo was comprised of studies, demonstration projects and institutional activities carried out in both countries that, as a whole, represent the catalyzing instrument for the Long-term SAP-Bermejo. The actions were grouped into four Strategic Areas and their corresponding activities, as shown in the tables that follow, according to the central themes

[9]In 2006, a Binding National Referendum for Department autonomies was held, calling for a Constituent Assembly, which worked during 2007 under great stress generated by the different country visions held by the delegates to refine the Constitution of Bolivia. The Constituent Assembly finally adopted the new constitution that defined Bolivia as a Plurinational state and incorporated concepts of indigenous, regional, cantonal and communal autonomies, in addition to the departments.

of coordination and planning, baseline studies and specific activities related to environmental protection and remediation, natural resource use, and consolidation of consultation and participation mechanisms. Chapters 4 to 7 describe the activities, results and accomplishments in each Strategic Area, including lessons learned, good practices and their replicability.

Strategic Area I: Institutional Development and Strengthening for the Integrated Water Resources Management and Planning	
Institutional development and strengthening	Development and strengthening of the Binational Commission (COBINABE)
	Institutional development and strengthening of the national Basin agencies (COREBE and the OTNPB)
	Strengthening of provincial and local governmental organizations
Development of a comprehensive legal, economic and environmental framework for the Basin region	Development and harmonization of legal frameworks at the regional and jurisdictional levels
	Environmental zoning and land use regulation
	Development and strengthening of economic instruments to promote sustainable use of water
	Development of strategies for incorporating social and environmental costs into project management

Strategic Area II: Environmental Prevention, Protection and Rehabilitation	
Soil management and erosion control in critical areas Sediment control in the Tolomosa River Basin	Sediment control in the Tolomosa River Basin
	Integrated management of the Santa Ana River Basin's natural resources
	Integrated management of the Iruya River Basin
	Management of the Grande River basin – mapping of the Huasamayo River sub-Basin
Consolidation of protected areas and biodiversity protection	Ecotourism alternatives in the piedmont forest
	Carbon fixation in the Sub-Andean region
	Biodiversity study
	Implementation of the Calilegua-Baritú-Tariquía biological corridor
	Administration and management plan for Sama and Tariquía reserves
	Evaluation of pastures in the Sub-Andean region
	Zoning for the future Teuco National Park(*)
Water quality protection and restoration	Environmental clean-up of the Guadalquivir River
	Bermejo Triangle environmental clean-up study

Strategic Area III: Sustainable Development of Natural Resources	
Sustainable practices for the rehabilitation of degraded areas	Sustainable natural resources management alternatives in the humid and sub-humid region of the Rio Bermejo Basin
	Production diversification under sustainability conditions in the Upper Bermejo River Basin
Community extension programs for sustainable production and natural resource management	Valuation and implementation of traditional natural and water resources management practices in the Basin
	Rural development of indigenous and native communities
Sustainable agriculture and soil conservation practices in the San Jacinto project area	Systematization of irrigated areas of the San Jacinto project area
Search for financial resources for the Bermejo River Basin	Securing of financial resources for the Bermejo River Basin
Implementation of a planning framework for integrated water resource management and sustainable development of the Bermejo River Basin	Integrated Management Program for the Binational Basin of the Bermejo River

Strategic Area IV: Awareness-Building, Public Participation and and Replication of Project Activities	
Environmental education program	Promotion of environmental education activities in the basin
Public participation program	Public participation program
Bermejo River Basin Information System	Access to information in support of public participation
	Developing networks and mechanisms of articulation among the various economic sectors and jurisdictional authorities in the basin
	Developing and implementing an environmental information and monitoring system for the Bermejo River Basin
	Definition and adoption of international waters indicators
Project activities replication	Dissemination and replication of Bermejo project into the broader context of the La Plata Basin

(*) This project was not implemented, by decision of the National Director of the SAP-Bermejo in Argentina because support of the competent authorities both at the provincial and national level could not be counted on.

4. Strategic Area I: Institutional Development and Strengthening

The Short-term SAP-Bermejo defined a set of actions oriented at the strengthening of the policy, legal and institutional framework for promoting the sustainable development of the region and for fostering integrated water resources management at the basin level. The efforts were specifically directed at: I) the institutional development of the entities responsible for integrated management of water and other natural resources management at different levels and jurisdictions; II) the incorporation of regional planning and coordination instruments; III) the strengthening of the functions of existing regional institutions (COREBE and the OTNPB); iv) capacity building to ensure the active participation of the Argentine Provincial Governments and Tarija Prefecture; and, V) strengthening COBINABE as a basin agency at the binational level, with broad public participation.

The purpose of these actions was to build an appropriate framework for the integrated water resources management, particularly taking into account the following aspects:

a) The preparation of a regional legal framework and harmonization among the different competent jurisdictions. At the regional level, the establishment of common criteria for the quantity- and quality-related management of transboundary water resources, and, within each jurisdiction, the harmonization of those aspects of mutual interest stipulated in their own legal frameworks for the use and protection of natural resources and the environment. Environmental legislation, water quality standards, public participation and access to information were among the priorities established.

b) The coordination among the Basin's different sectoral and jurisdictional stakeholders.

c) The strengthening of the planning system, with a view to drawing up integrated water resource management plans, controlling erosion and pollution, and environmental and land use zoning within each jurisdiction.

d) The strengthening and/or development of economic instruments and financial mechanisms, and the incorporation of the economic, social and environmental values of water and other natural resources into appropriate regulatory and cost structures, with the objective of having valuation mechanisms which will ensure sustainability and social equity in development efforts.

Based on the priority actions proposed for the execution of Strategic Area I "Institutional Development and Strengthening for Integrated Water Resources Planning and Management", the Project Document established two sets of activities:

4.1. Institutional development and strengthening, including:

4.1.1. Development and strengthening of the Binational Commission (COBINABE);

4.1.2. Institutional development and strengthening of the national Basin agencies (COREBE and the OTNPB); and

4.1.3. Strengthening of provincial and local government and civil society organizations related to natural resources management in the Bermejo Basin.

4.2. Development of a comprehensive legal, economic and environmental framework for the Basin region, including:

4.2.1. Harmonization of legal framework at the regional level and for the various jurisdictions;

4.2.2. Environmental zoning and land use regulation;

4.2.3. Development and strengthening of economic instruments for promoting the sustainable water use; and

4.2.4. Development of strategies for incorporating social and environmental costs into projects.

The foreseen actions were structured in the form of projects, in accordance with the approved Project Document (ProDoc) of the SAP-Bermejo. The seven projects of Strategic Area I were adjusted in their scope and contents, in light of the changing political and institutional scenarios that developed during SAP-Bermejo implementation, but maintaining the strategic vision of consolidating a basin institutional framework at the binational level, as a critical path to the success of the entire SAP-Bermejo.

Special attention was given to the establishment, through the adaptation and consolidation of the existing binational and regional entities, of forms of organization and inter-jurisdictional capacities, that would allow the development of basin agency functions, strengthening the different aspects involved in integrated planning and management of the Basin's natural resources, such as a regional regulatory

framework, coordination of jurisdictional and sectoral objectives, access to environmental information, and the development of environmental and land use zoning plans.

The implementation of this set of actions through the SAP-Bermejo has contributed to the strenghthening of institutions and the establishment of effective coordination mechanisms for the integrated water resources planning and management and the sustainable development of the region. Under the new institutional scheme developed for the management of the Basin, COBINABE has evolved as the basin agency with the review and approval of its bylaws and regulations, improving its functions and capabilities as a binational coordinating entity. A communications action plan was prepared and implemented as a strategy for establishing its identity and for creating a communications mechanism between the Commission and its stakeholders. Its actions were strengthened by the implementation of a Binational Regional Coordination Committee (RCC) comprised of representatives of the four Argentine Provinces and the Tarija Prefecture and one representative per Municipality in the Bolivian portion of the Bermejo River Basin. Moreover, a Regional Advisory Committee (RAC) was established, with representatives of governmental organizations, academic and scientific institutions, nongovernmental organizations (NGOs), private entities and other groups interested in the management of natural resources and the environment. Although the operation of RAC did not reach its intended scope, it constituted an important inter-sectoral and trans-jurisdictional organizating and coordinating mechanism.

Similarly, important successes were achieved in terms of strengthening the organizational, human resources-related and operational capabilities of the provincial governmental organizations in Argentina responsible for managing water resources and the environment, including Jujuy's Secretariat of Production and Environment, Chaco's Provincial Water Administration, Formosa's Undersecretariat of Natural Resources and Ecology and Salta's Secretariat of Environment and Sustainable Development. For this purpose, training courses in issues relevant to the Basin were organized and implemented, such as environmental legislation and management, land use zoning, hydrographic basin management, information system operations, and institutional development actions of governmental bodies involved in the management of natural resources and the environment. Moreover, water quality laboratories operating in the Basin, both in Argentina and Bolivia, were strenghthened and consolidated, and more than 40 contracts and mutual cooperation agreements were entered into with public, academic, private and civil society institutions, with a view toward incorporating and achieving participation of these institutions under a shared basin vision.

As for the legal framework, a survey and analysis of the institutional legal framework related to water resources and the environment was conducted,

identifying priority actions regarding the needs for harmonization of jurisdictional legal frameworks, particularly those related to environmental laws, water laws or codes and environmental impact assessment regulations, public participation and access to information. Moreover, SAP-Bermejo fostered environmental zoning and land use regulation processes, not only as vital planning instruments for basin management but also for the integrated development of large tracts of land. In this manner, the 2006-2025 Departmental Land Use Zoning Plan for the Department of Tarija was completed in Bolivia and approved by the Departmental Council as a medium-term and long-term regulatory and guidance instrument for optimizing land use and occupation under a sustainable development approach. Land use zoning plans for the Municipalities of Toldos, Iruya and Tilcara in Argentina and for the Lower Basin in the Provinces of Chaco and Formosa were also prepared as instruments for planning for sustainable development and utilization of natural resources.

Dissemination message used by COBINABE within its Communications Plan

COBINABE publications

4.1. Institutional development and strengthening

The activities, results and achievements at the level of projects were the following:

4.1.1. Institutional Development and Strengthening of the Binational Commission (COBINABE)

The development and strengthening of COBINABE as a binational entity for the management and sustainable development of the Bermejo River Basin was one of the main pillars of SAP-Bermejo implementation. Accordingly, several

COBINABE booth at Argentina's Northeastern International Trade Fair, FERINOA 2005, City of Salta – Argentina

technical and institutional activities were carried and contributed to position COBINABE as the planning and integrated water resources management entity for the Basin, not only at the binational level but also at national and regional levels in Argentina and Bolivia.

Prior to SAP-Bermejo implementation, the Binational Commission was mainly identified through the activities performed by its Secretariats, COREBE in Argentina and the OTNPB in Bolivia, due to a lack of public identity and corporate image as well as a lack of physical presence in the Basin. Moreover, its scope had ambiguous territorial limits, not considering the transboundary nature of the Bermejo River, or the interests of the different jurisdictions involved in the Basin.

The SAP-Bermejo actions implemented within the framework of the institutional strengthening activities of the Binational Commission were the following:

I. **Collaboration Agreements.** With the aim of encouraging and incorporating the participation of institutions in the process of integrated water resources management of Basin, COBINABE signed more than forty (40) mutual collaboration Agreements and Memorandums of Understanding with different national, provincial and regional governmental organizations, international entities, public and private universities, academic and scientific institutions and intermediate civil society institutions (professional associations and NGOs).

II. **Communications Action Plan for COBINABE**. With the objective of developing a corporate identity for the Binational Commission, disseminating its functions and actions, and seeking the commitment of local stakeholders in the activities and strategies for social inclusion and public participation in the sustainable development of the Bermejo River Basin, the preparation and subsequent implementation of a Communications Action Plan became a priority.

As a first step, an institutional analysis of COBINABE was carried out, including the identification of the different population targets. Based on this analysis, a corporate identity and a communications strategy was developed, including a series of actions designed for effective dissemination of information As an integral part of this strategy, the name "COBINABE" and a logo were adopted, using

those elements in all of the Commission's communiqués and stationery.

Moreover, with the aim of disseminating COBINABE's vision, mission, functions and objectives, informational material was prepared and distributed through different media, seeking to build greater public awareness on the benefits of joint and organized management of water and other natural resources. A web page for the Binational Commission was designed and put on on-line, including information on the Commission as well as material produced by the SAP-Bermejo project, including an atlas with thematic maps.

In terms of promotional materials, pamphlets, leaflets, brochures, posters and institutional and thematic videos were prepared with a view to disseminating information on COBINABE's activities in the Basin, particularly those related to the SAP-Bermejo implementation.

During a four-month period, 25 articles on COBINABE and its projects were published and disseminated through the press and digital media, constituting a significant increase when compared with the publication of only eight articles about COBINABE and its actions during 2003.

One of the most important successes achieved through this activity was the creation and positioning of the "COBINABE trademark", which helped differentiate the binational entity from other national institutions related to the management of the Basin, and the dissemination

First meeting of the Regional Coordination Committee. Orán, Province of Salta – Argentina

of information related to SAP-Bermejo, as an activity of COBINABE, of interest to both countries and to the jurisdictions of the Binational Basin. The acronym COBINABE started to be used in all COBINABE-related communiqués officially issued by both countries' governments.

As part of the Communications Action Plan for the institutional strengthening of COBINABE, it is worth highlighting COBINABE's presence at Argentina's Northeastern International Trade Fair, FERINOA 2005, with a booth promoting the values of the Bermejo River as a unifying component of development, fostering the participation of different publics through various educational and communications tools. This triggered a whole array of activities aimed at promoting an active commitment of the local population to Basin-related issues.

III. Regional Basin Committees. In order to address the inadequate coordination and participation of jurisdictional and institutional stakeholders,

and as demonstration activity to help execute its priority actions, the SAP-Bermejo proposed the creation of three coordinating bodies, each with different roles: I) the Regional Coordinating Comittee-RCC; II) the Regional Advisory Comittee-RAC; and III) the Inter-ministerial Committee-IC.

- **Regional Coordination Committee (RCC).** The RCC was created on 18 June 2002 through COBINABE Resolution 05/02, based on Article 40 of the Agreement signed between COBINABE and OAS/GS for the execution of the SAP-Bermejo, assigning to COBINABE the role of *"… coordination, support to the program and general supervision of the activities within its jurisdictions, ensuring coordination among the governmental entities in charge of managing the Basin at the sub-regional level".*[10] RCC was comprised of representatives of the Argentine Provincial administrations and the Prefecture and Municipalities of the Bermejo River Basin in Tarija, Bolivia, appointed by their highest authorities. It sought to facilitate the flow of information from the jurisdictions governing the management of the basin's natural resources to COBINABE, and, at the same time, allow for the assimilation of the strategic actions related to the environment, natural resources (in general) and water (in particular) within the communities, stimulating their sustainable development based on public participation. Another function was to provide support to, and coordination of, institutional legal mechanisms for harmonizing and approving proposals made within COBINABE. For this purpose, it was stipulated that the RCC would meet regularly and on special occasions, expressly establishing that one member of COBINABE would attend its meetings. The meetings would be held three times a year.

The first RCC meeting was held on 26 June 2003, in San Ramón de la Nueva Orán, in the Province of Salta, Argentina, where the RCC's mission, structure, functions and objectives were agreed upon, the scheduled SAP-Bermejo activities reviewed and its Internal Regulations approved. The SAP-Bermejo project, after tackling the initial legal and institutional difficulties, obtained through the RCC an institutional framework that facilitated dialogue and technical coordination among the entities directly related to the management of water resources, as well as among other sectoral organizations related to, or directly affected by, the program. Additionally, the RCC met on different occasions to review proposals for adjusting the SAP-Bermejo's Operational Plan. The RCC was an essential instrument for coordinating the Program's activities within the Basin, because, for the first time, it was possible, organizationally, to gather the main stakeholders involved in the management of water resources within the jurisdictions from which the representatives to

[10] Agreement between the Binational Commission for the Development of the Upper Basin of the Bermejo River and the Grande de Tarija River and the General Secretariat of the Organization of American States for the Execution of the Project "Implementation of the Strategic Action Program for the Bermejo River Binational Basin".

the RCC came from, in a forum dedicated to coordination and agreement.

From the operational point of view, a meeting among national delegates was held prior to each binational meeting of the RCC with the purpose of reviewing, adjusting and validating the provincial and institutional proposals in the case of Argentina and those made by the territorial entities in the Department of Tarija in the case of Bolivia. Thus, national issues were dealt with among the organizations involved in each country and binational matters were addressed in the RCC's binational meetings. In this respect, the creation of work teams, subcommittees or commissions, grouping different sectors and stakeholders, facilitated the necessary scheduling and coordination of actions, not only for the implementation of SAP-Bermejo activities, but also for water resources management in general.

The RCC was an essential tool for the implementation and success of the SAP-Bermejo, which facilitated the joint organization and coordination of a group of key technical and governmental stakeholders during periods in which the national agencies in Argentina and Bolivia (COREBE and the OTNPB) underwent transformations and adjustments to new political realities. During these periods, the RCC contributed to the performance and monitoring of SAP-Bermejo implementation activities.

- **Regional Advisory Committee (RAC).** Body proposed by SAP-Bermejo to fill the existing void in consultation and participation and to establish a pilot institutional framework, seeking to verify its viability and replicability in basins like the Bermejo, highly unstructured and where both public and private stakeholders lacked an integrated and comprehensive vision of the basin in which they operated.

Through Resolution Nº 01/03 dated 21 May 2003, the Binational Commission created the **Regional Advisory Committee** *consisting of representatives of NGOs, academic institutions, scientific and technical organizations, the private sector, the public and corporations having an interest in the zoning of the Binational Bermejo River Basin's natural resources*. On 18 March 2004, the Internal Regulations of the RAC were approved through COBINABE Joint Resolution Nº 01/04, defining the Committee's composition, operations and main functions.

Despite the analysis of the TDA, the original proposal on this Committee was based on the perception of a Bermejo River Basin that was socially integrated, with organizational capacity, a sense of belonging to the Basin and the possibility of aligning with a comprehensive binational and inter-jurisdictional Strategic Action Program. However, while the final goal focused on the sustainable development of the Basin as a planning and management unit, with the Bermejo River itself serving as a potential integrative axis, the Basin was a set of differing realities.

On one hand the Upper Basin, and within it, the differing conditions in Argentina and Bolivia; and on the other hand, the Lower Basin, with social, production and environmental conditions very different from those in the Upper Basin. Its largest cities, the political decision-making centers, and the centers of technical capacity are far apart from each other, and, in the case of Argentina, are highly dependant on Buenos Aires´s centralism. The sense of belonging to a single and integrated basin was not the starting point, but was, and still is, a challenge for achieving sustainable development based on its water resource potential, its systemic interrelationship with land, climate and other natural resources. This challenge, which was identified in the TDA, was not wholly resolved through the SAP-Bermejo, largely because of the political and institutional instabilities that characterized the period of its implementation, and/or because proposals at the basin scale of the dimensions and complexity of the Bermejo River Basin, were not considered viable.

Again in this case, COBINABE sought to establish RAC as a consultative body and a forum for the participation of private and academic stakeholders, as well as for civil society organizations and entities interested in the Basin's development. The main functions of the RAC define it as an advisory body to the Binational Commission, a mechanism for communication between the government and civil society at the jurisdictional level, for facilitating the active participation of the community and for integrating the interests of academic institutions, scientific organizations and various national, provincial and departmental NGOs.

Even though this Committee was created by COBINABE, it did not operate with the foreseen schedule of three annual meetings and, consequently, it did not fully achieve the status of a consultative body for the implementation of the SAP-Bermejo. The active participation of stakeholders interested in the sustainable development of the Basin was achieved through their incorporation into the individual activities associated with the implementation of the SAP-Bermejo, by means of the different jurisdictions and a variety of formal mechanisms. This approach, respectful of jurisdictional priorities, permitted a fluid dialogue across a very wide spectrum of stakeholders. While it did not replace the lack of an institutionalized advisory instrument for the Basin, it was an important step forward in providing COBINABE and jurisdictional stakeholders information about the interests, approaches, capacities and forms of operation of various actors, key for the sustainable development of the Basin.

- **Inter-ministerial Committee (IC).** This Committee was conceived based on the integrated and holistic vision established during SAP-Bermejo formulation phase, to foster the sustainable development of the Bermejo River Basin, besides addressing GEF´s specific recommendation to include this type of

mechanisms in multifocal programs, as #9, related to land and water. The implementation of the SAP-Bermejo involved the participation of different sectoral and thematic institutions having a variety of roles within the framework of the Program, requiring coordinated, agreed and focused actions to be effective and efficient in meeting its objectives. Nevertheless, the application of this concept in an inter-jurisdictional basin such as the Bermejo River Basin, shared not only by Argentina and Bolivia, but also by four provincial jurisdictions in Argentina all with their own institutions, required special care in its implementation and had to be adjusted to the Basin's large scale, so as to deal with its complexities and imperfect institutional development in each jurisdiction as well as the enormous differences and asymmetries between the parties.

Within the framework of strengthening of the Basin's institutions, the IC's mission was defined as *recipient of the issues and realities of the different institutions in the Basin's jurisdictions and promoter of actions aimed at developing and exploiting all of its resources, seeking to optimize human and economic resources, avoid the overlapping of each country's basin-related tasks, and support the movilization of investments identified for the region.*

It was proposed that this Committee would meet on an annual basis and, when needed, as required by its members. Delegates were to be appointed by each jurisdiction's sectoral minister for each strategic action area, in both countries.

It was soon noted that the proposed Committee would imply a very high cost if it was to operate effectively at the scale of the Bermejo River Basin, with large distances to be travelled by delegates whose offices were sometimes located in the capital cities of the various jurisdictions. In practice, inter-ministerial meetings were promoted by SAP-Bermejo under the coordination of the provincial governments in the case of Argentina and of the Department of Tarija in cooperation with the OTNPB in the case of Bolivia. In fact, five inter-institutional meetings were held within the framework of the SAP-Bermejo, which, in each case, went ahead in different ways, depending on the activities being implemented by the SAP-Bermejo in each jurisdiction. The agreement and coordination function was performed on the basis of each strategic activity and, although it was not possible to advance toward a different formalization of the proposal, the IC was an important mechanism for inter-institutional coordination, incorporating public representatives of the hydrological, environmental, production–particularly, the farming sector, education, health-care and utility sectors. These meetings made progress in the harmonization of interests and in improving the possibilities of joint coordination and management in matters of strategic interest in the Basin.

After some time of operation, the RCC and the RAC were established as permanent bodies by COBINABE for the purpose of institutionalizing and strengthening planning, control and consultation mechanisms, in accordance with the resolution of its XX Meeting, held on 5-6 October 2004.

- **Binational Coordination Committee (BCC).** In 2008, COBINABE, supported by the SAP-Bermejo, prepared an institutional proposal for the creation and operationalization of a Binational Coordination Committee (BCC), which was based on the operation and organization of the RCC and RAC. The first BCC Meeting was scheduled and held in the City of Palpalá, in the Province of Jujuy, Argentina, on 25 July 2008. Over 85 people from both countries attended this event. In the case of Bolivia, representatives of the municipalities of Bermejo, Méndez, Tarija, Arce and Cercado, among others, attended the meeting. Argentina was represented by delegates from Chaco, Jujuy, Salta and Formosa, with a large number of mayors attending.

IV. **COBINABE's Ad Hoc Group.** The creation of this specific group, which had not been envisioned during the formulation of the SAP-Bermejo, arose as a response to the need for strengthening COBINABE. It was created in the XXIV COBINABE Meeting, held in the City of Santa Cruz de la Sierra, Bolivia, on 18 July 2007. It was conceptualized within the SAP-Bermejo framework for supporting COBINABE's institutional strengthening needs. It was made up of a maximum of four officially appointed delegates, two per country, for a defined period of operation. Its functions were defined as:

- Gathering all the existing legal documentation within the COBINABE framework, as well as conducting an analysis thereof in order to submit an updated legal report to COBINABE before September 2007;
- Proposing mechanisms to COBINABE with the aim of strengthening the Commission and implementing Article IV of its Constituting Agreement, relating to administrative structure, Basin master plan, decision-making mechanisms, Seat Agreement, regulations, etc.; and
- Working on the SAP-Bermejo dissemination mechanisms.

The group was made up of one representative from each chancery and one technical representative assigned by each country's first delegate to COBINABE. The contribution of staff time was compensation from the governments to the SAP-Bermejo and included support to its operation in pre-programmed meetings. . The Ad Hoc Group issued reports on each required aspect and was an important factor in COBINABE's institutional affirmation process. For this reason, the duration of its mandate was extended, as COBINABE assigned new responsibilities to the Group during the evolution of the SAP-Bermejo activities. Its existence was further evidence of COBINABE's need for a group of advisors who could assist with legal and institutional issues, with a broad

vision regarding the Binational Commission's mission for the sustainable development of the Basin, within a complex institutional framework involving two countries and several different jurisdictions and institutions.

An additional activity required from COBINABE's Ad Hoc Group was the review of COBINABE's Bylaws and Internal Regulations, and the preparation of proposals for adjustments to, and new versions of, both documents. This was carried out within the framework of Strategic Area I of the SAP-Bermejo implementation project, based on contributions from the Argentine and Bolivian national technical agencies.

The Ad Hoc Group submitted successive reports to the Binational Commission proposing the adjustments deemed necessary for strengthening its actions as a binational, inter-jurisdictional body for the sustainable development of the Basin, reaching consensus on a proposed set of revised Bylaws and Internal Regulations. This proposal was approved in the COBINABE meeting held in April 2008 and then sent for review by the national governments. The proposal for new Bylaws and Internal Regulations was considered for a long time by the delegations of both countries, deciding, at the XXIX COBINABE Meeting, not to modify the current Bylaws, which had been approved by means of exchange of diplomatic notes in 1996. Instead, it was agreed to continue to operate based on the existing Bylaws, avoiding a long consultation process for its approval by both countries' legislative branches, complementing them with operating protocols adopted under the Internal Regulations, imbuing them with contents and interpretations more consistent with the Basin's needs. This approach was consistent with the Commission's mandate under the integrated "basin vision" and ensured COBINABE's permanent operational capacity, based on the functions assigned in the Orán Treaty.

For this purpose, the need for a permanent binational coordination was estalished, to which criteria for selecting suitable professional staff were defined and staff functions were agreed upon. Such functions were focused on supporting the Commission and the national delegations, and were oriented toward programming activities in the Basin based on binational coordination, and linked with the different jurisdictions and institutions with responsibilities in the Basin.

Furthermore, the criterion of a rotating seat per country was established, and an annual budget specific to the Commission was prepared for the first time. Each delegation ensured the institutionalization and inclusion of an annual USD $100,000 appropriation for COBINABE in the respective national budgets, which were approved in both countries. With the support of the SAP-Bermejo, and after a selection process defined within COBINABE, the first COBINABE's binational coordinator was hired. Finally, the

Ad Hoc Group came to the conclusion that the SAP-Bermejo made a paramount contribution to COBINABE's growth, development and strengthening, keeping and sustaining the vision of a binational hydrological basin.

V. **Sub-office of COBINABE in the Province of Salta, Argentina.** The establishment of a SAP-Bermejo/COBINABE Sub-office in the City of Salta in Argentina, complied with Binational Commission Resolution Nº 04/02, adopted on 23 May 2002 with the sponsorship of the Argentine delegation, as a way to take the SAP-Bermejo into the geographical area occupied by the Basin. This new Sub-office was staffed with COREBE's personnel and local employees hired with SAP-Bermejo resources. They were assigned the functions of monitoring and following up on activities carried out in the provinces of Salta and Jujuy. The Sub-office was equipped with furniture, a car, computers and other elements needed for its operation and technical support, which were provided by COREBE and the Government of the Province of Salta with the support of the SAP-Bermejo. The Sub-office was key to installing and putting into operation the Hydrometeorological Network, as it included the Office for Technical Support in Salta (OTAS). Subsequently, the Government of the Province of Salta offered on gratuitous loan a physical space for the Office at the Secretariat of Water Resources and bore the operating costs associated with its operation.

The creation of this Sub-office was beneficial for the execution of local SAP-Bermejo actions, adjusting activities to local realities and the demands of the communities, provincial institutions and companies involved. The Sub-office was also able to disseminate a greater knowledge of the processes and results of the activities and their local impacts on the Upper Basin of the Bermejo River in Argentina. Moreover, it favored the working relationship with the Bolivian Technical Unit, based in the relatively close City of Tarija. However, the hierarchy established by the Sub-office, and its physical separation from the Argentine Technical Unit, unbalanced project activities favoring the Upper Basin. This provided, without a doubt, experience in decentralization, which, if it had been evolved organically with political will during project preparation, would have been resolved more efficiently.

4.1.2. Institutional Development and Strengthening of the National Basin Agencies (COREBE and the OTNPB)

The SAP-Bermejo developed actions aimed at the coordination of actions of jurisdictional bodies involved in the management of natural resources and the sustainable development of the Basin. This included the strenghthening of the binational basin functions, focused on the strengthening of COBINABE, and simultaneously, of COREBE and the OTNPB, as national basin agencies and as secretariats of COBINABE.

I. Strengthening of the Regional Commission for the Bermejo River (COREBE) in Argentina

One of the issues evidenced in the TDA and included in the SAP-Bermejo implementation proposal was that, with the waters belonging to the provinces, there was a lack of harmonization among provincial policies and between existing regional and federal institutional authorities. The lack of definitions or voids in the legal framework supporting actions at the binational level implicitly left the two provinces of the Lower Basin outside of the actions directed toward transboundary issues. In addition, the Argentine regional development agency (COREBE) involves six provinces, two of which are outside the basin: Santa Fe and Santiago del Estero.

The SAP-Bermejo set forth the need for strengthening COREBE in its capacity as technical support body in Argentina, contributing with specialists' time and funding for many scheduled activities. In this manner, COREBE would enter into the integrated basin management planning and implementation process and would be strengthened through its interaction with SAP-Bermejo, as the main coordinating activities in Argentina would be performed from COREBE's headquarters.

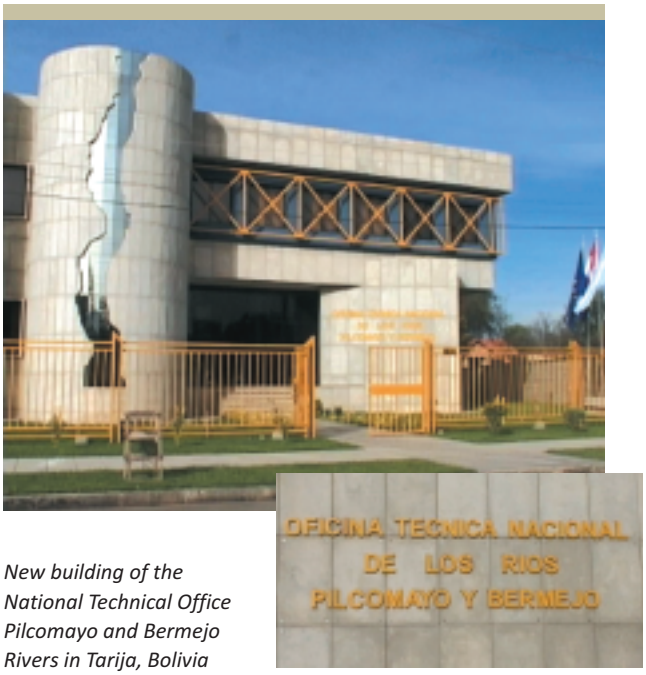
Starting in 2008, COREBE, already under the Undersecretariat of Water Resources of the Federal Ministry of Planning, Public Investment and Services (MIPFE), started a reorganization process seeking to become the Bermejo River Basin agency in Argentina. For this purpose, it adjusted its objectives and goals and started a fast track process of establishing local presence in the provinces involved, becoming decentralized and geographically less concentrated, in agreement and with the technical and financial support of the provincial governments. COREBE moved its headquarters to the district of Presidencia Roque Saenz Peña, in the Province of Chaco, and opened up provincial offices in Formosa and Jujuy.

During 2009, within the framework of SAP-Bermejo´s institutional strengthening activities, a consultancy was conducted to strengthen COREBE's institutional capacities—technical, administrative and organizational, providing technical assistance for developing an organizational configuration consistent with its operational decentralization and geographic objectives. This allowed COREBE to make progress in the analysis, evaluation, funding and implementation of projects to be identified for the Integrated Management Program for the Binational Basin of the Bermejo River (PROBER), seeking to optimize the fulfillment of its mission and performance as Basin Agency at the national level, and in its role as COBINABE's Secretariat.

II. Strengthening of the National Technical Office for the Pilcomayo and Bermejo Rivers (OTNPB) in Bolivia

The strengthening of the OTNPB was carried out in two stages, defined by corresponding political and institutional context. The first stage was directed toward strengthening the OTNPB for the planning and integrated/participatory management of the Basin's water resources, fulfilling the mandates established at its creation, and for its

COREBE logotype and ilustration of the Argentine Provinces whic compose the mentioned Commission.



New building of the National Technical Office Pilcomayo and Bermejo Rivers in Tarija, Bolivia

coordinated and agreed upon work in the Binational Bermejo River Basin, as the Bolivian agency responsible for providing advice and technical support to the country's delegation at COBINABE.

In particular, the activities performed were directed at providing the OTNPB with capabilities to: I) actively take part in all the strategic actions, activities and projects to be executed by SAP-Bermejo within the Upper Basin in Bolivia and II) design and implement a planning, coordinating, scheduling and control system for the integral development of the entire Bermejo River Basin, in support of the Bolivian delegation at COBINABE. With these objectives, an analysis of the legislation supporting the creation and operation of the Office, and the prevailing institutional situation, was conducted. Based on this analysis, adjustments to the OTNPB's objectives, mission and functions were proposed, ensuring the role of the Office as the responsible body for the sustainable development of the Basin in Bolivia.

The technical, operational and financial requirements for fulfilling this objective were also identified. On the basis of the analysis, an implementation strategy was created, executing those institutional strengthening activities considered a priority.

It is worth highlighting that, simultaneously, the OTNPB was working on the preparation of the Pilcomayo River Basin Master Plan, thus becoming an instrument in Bolivia for replicating the

experience of SAP-Bermejo in the Pilcomayo River Basin, facilitating the replication of its most successful results, such as those associated with sediment management, which were included in the above-mentioned Plan for this neighboring trinational basin.

The SAP-Bermejo was a determining factor in the OTNPB achieving an identity and visible presence in the Upper Basin of the Bermejo River and in the City of Tarija. The support provided for building the OTNPB's headquarters, largely financed by the Departmental Prefecture with assistance from SAP-Bermejo, ensured its presence during periods of uncertainty, and demonstrated that, in certain situations, it is important to have an independent, well equipped and well built office. The OTNPB currently has a two-story building with a basement, with a total built area of 1,045m^2.

In a second stage, during 2009, and within a political, economic and social context characterized by extensive state transformations in Bolivia, SAP-Bermejo supported the OTNPB in the preparation of its 2010-2012 Triennial Plan and the corresponding Strategic Plan.

The central strategy of the OTNPB's 2010-2012 Triennial Plan is the development of capacities and the social, political and economic empowerment of the organizations representing the population whose quality of life depends most directly on the Basin's management.

The Strategic Plan, considered as a guideline for the fulfillment of its mission, provides a frame of reference for formulating and implementing development actions within its sphere of operation. In particular, attention was paid to providing the OTNPB with better capabilities for the analysis, evaluation and implementation of the Integrated Management Program for the Binational Basin of the Bermejo River (PROBER), and for its role as COBINABE's Secretariat.

4.1.3. Strengthening of provincial and local government and civil society organizations related to natural resources management in the Bermejo Basin

This Project had the objective of strengthening the capabilities of the governmental organizations within the Bermejo River Basin having jurisdiction or interests in the sustainable management of natural resources.

With this aim, work was done in different areas and themes, which make progress toward the sustainable and integrated management of the Basin, identifying the available knowledge and the capacities of the governmental organizations with technical responsibilities in the Basin, and of academic institutions in Argentina and Bolivia.

In addition, a new concept of institutional strengthening was addressed by supporting institutions in the execution of key projects, recognizing the importance of the implementation of sustainable management models in the region that ensure coordination and adequate public participation.

In the case of Argentina, SAP-Bermejo efforts were focused on actions to support and institutionally strengthen organizations in jurisdictions with control over the natural resources; namely, the provinces. Therefore, activities were directed toward the agencies of the provincial governments of Salta and Jujuy in the Upper Basin and of Formosa and Chaco in the Lower Basin.

In the case of Bolivia, actions were directed at strengthening OTNPB's coordination with the Department of Tarija's Prefecture, which became especially important during the dynamic period of change from a highly centralized unitary administrative system, which characterized the situation during preparation of the SAP-Bermejo, to a more decentralized and participatory system. It is important to highlight that, in this context, the departmental government was critical in supporting OTNPB's existence and operation and, technical and financial structure. Thus, the institutional strengthening proposed in SAP-Bermejo, at the governmental level, was oriented toward consolidating coordination and consensus building mechanisms necessary for working together at the OTNPB with a binational basin approach, structuring and developing efforts so that each organization would progress based on its own competencies and capabilities, but within an agreed planning and management framework.

The following is a summary of the activities carried out by the SAP-Bermejo in support of, and in collaboration with, institutions of the provincial governments in Argentina and Tarija's Departmental Prefecture in Bolivia.

Province of Salta

- **Secretariat of Environment and Sustainable Development[11] (SEMADES)**

The strengthening of SEMADES was within the approach of supporting institutions in the execution of key projects. Within this framework, efforts were made to strengthen the Secretariat's institutional leadership in the coordination of governmental and civil society organizations having jurisdiction or interests in the management of natural resources and the environment, in order to consolidate the Yungas Biosphere Reserve (YunBR).

The YunBR project was structured around three components or programs: Institutional Strengthening, Public Participation and Environmental Zoning. The execution of these components was carried out in a wholly participatory manner, mainly based on technical and informational meetings, as well as training workshops. In the performance of these activities, SEMADES played a vital role as coordinator and moderator of the institutional process, permitting the execution of the agreements signed among societal stakeholders concerning the Reserve's land use planning and management.

- **Water Resources Agency[11]**

In order to fulfill its mission and perform its

[11] As the result of the modification of Salta's Ministry Act, SEMADES became the Ministry of Environment and Sustainable Development in 2007.

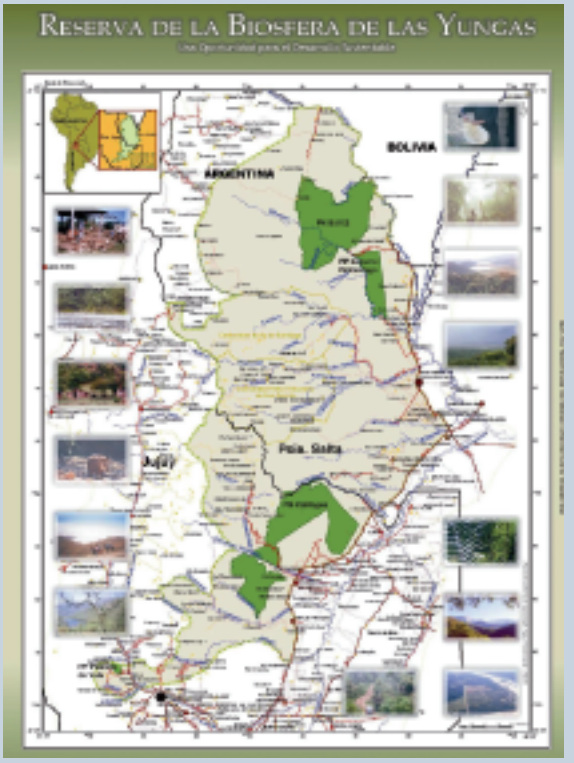
Strengthening of the SEMADES:
The Yungas Biosphere Reserve (YUNBR)

The institutional strengthening of the Secretariat of Sustainable Development and Environment (SEMADES) of the Province of Salta was specifically focused on addressing the organizational and institutional weaknesses identified during the preparation of the SAP-Bermejo. The activities performed within this project promoted SEMADES's leadership as the agency responsible to UNESCO for the implementation of the Yungas Biosphere Reserve (YUNBR), and for the coordination of governmental and civil society organizations having jurisdiction or interests in the management of natural resources and the environment. The objective was to transform a 1,340,000-hectare territory into a management model. This territory accounts for 50% of Argentina's biodiversity and includes a great variety of economic and production systems supporting over 30,000 people who live within the Reserve and its area of influence.

The project focused on organization and participation, training and planning-related aspects.

The General Coordination Committee was established, having the participation of different stakeholders (governmental, provincial and municipal organizations, NGOs, the private sector, the academic sector, etc.). Furthermore, sub-committees (based in the North, Center and South of the area) were organized at the sub-regional level.

Functionally, the communication among stakeholders was promoted and activities and information about the Yungas were broadly disseminated through the preparation of different informational materials and conducting of training programs. An important element of the public participation process was directed at governmental, business, academic, technical and community stakeholders with the objective of sensitizing, informing and promoting public awareness of environmental conflicts in the Upper Basin of the Bermejo River.



Implementation of a new Land Use Zoning framework for the planning, promotion and execution of sustainable development policies and actions was promoted, and the Strategic Management Plan for implementing the YUNBR was drawn up in a participatory manner.

The implementation of this SAP-Bermejo Project permitted the improvement of the initial agreements signed among the Natural Resources-related governmental organizations of the provinces of Salta and Jujuy, and between them and the above-mentioned societal stakeholders, facilitating a sustainable framework for the development of the Basin. The Committees (General and Zoning Committees) remain operational and active in the implementation of the defined workplan, more than a year after finalizing GEF's financial support through SAP-Bermejo.

Water Resources Geographical Information System, Province of Salta, developed as part of the Decision Making Support System for Planning and Management

Web site of the First Workshop related to the Toba aquifer, carried out by INASLA in the Province of Salta-Argentina

Sample taking for water quality analysis

functions, the Water Resources Agency performed a set of actions, with the support of the SAP-Bermejo, aimed at adjusting its organization through the evaluation of structural and functional alternatives with a view towards positioning the organization within the provincial institutional framework and in its relation with other provinces and the Nation.

A central pillar of the strengthening of the Water Resources Agency was the preparation of the 2008-2012 Water Resources Management Plan, including components covering the evaluation, planning, management and control of water resources and its utilization. For this purpose, the report *Planning and Management of Water Resources* was prepared, identifying the main issues to be addressed based on the Water Resources Agency's needs and visions.

The implementation of the Management Plan, which has an integral and modern vision, requires the participation of human capital that is skilled and committed to the established goals and objectives. In this sense, and considering the training needs of the technicians and professionals who will confer sustainability to the Plan, internship agreements were entered into with students who were about to graduate or had just graduated in majors related to water and natural resources management, as well as students majoring in institutional-development related careers, such as social communications, law, information technology (IT), engineering and others.

Finally, within the framework of the Agency's communications and institutional positioning strategy, a plan was devised for implementing regional workshops for information dissemination and joint work with the different social stakeholders, particularly irrigation groups, as primary users of water resources. It is worth mentioning the publication and distribution of the Province's Water Code as a way of raising awareness of the importance of water resources management.

- **Groundwater Institute for Latin America (INASLA), National University of Salta**

  Aiming to respond to what the TDA identified as the lack of information on groundwater, and to incorporate the existing knowledge on groundwater to strenghthen the Basin´s integrated management, an agreement was entered into between COBINABE and the National University of Salta (UNSA), through its Groundwater Institute for Latin America (INASLA).

  Within this framework, SAP-Bermejo supported the implementation of two workshops. The first one was aimed at gathering information available in Argentina and Bolivia on the subject and level of knowledge of the groundwater system. Specialists from different universities in the country took part, resulting in the dissemination and promotion of information on groundwater in different academic environments.

  The second workshop was an international event gathering more than 60 institutional representatives of technical organizations from Argentina, Bolivia and Paraguay and international organizations. This workshop was sponsored by the ISARM/Americas Project and executed by UNESCO and OAS/DSD.

  As a result of these actions, INASLA-UNSA's capabilities as coordinator of the Technical Group of Specialists for the integral study of the Yrendá-Toba-Tarijeño Transboundary Aquifer System were strengthened.

- **Environmental Laboratory**

  The Laboratory, dependent on the Ministry of Environment and Sustainable Development of Salta, was strengthened in its capacity as a member of the Bermejo River Water Quality Monitoring System.

  Based on the diagnostic analysis carried out during SAP-Bermejo´s formulation phase, the following needs were identified: I) acquisition of equipment and monitoring systems and II) training of personnel.

  In this sense, the laboratory was provided with field equipment for measuring parameters *in situ*, as well as the necessary materials for preparing sampling campaigns and determining the physical, chemical and biological characteristics, in its capacity as the laboratory in charge of the sampling points located in the Province of Salta and of the three sampling points located in the binational sections of the Bermejo River and the Grande de Tarija River.

Furthermore, training activities were conducted, particularly in field sampling techniques, application of new technologies and implementation of acquired analytical instruments.

Province of Jujuy

- **Ministry of Production and Environment**

  The institutional strengthening effort was directed at the **Provincial Department of Environment and Natural Resources** and the **Unit for Integrated Basin Management**, both under the Ministry of Production and Environment.

  The strengthening of the Provincial Department of Environment and Natural Resources was mainly focused on the following aspects: legal framework, management tools, technical training of human resources, equipment and promotion and dissemination of the available information on environment and natural resources of the Bermejo River Basin in the Province of Jujuy.

  Specifically, actions were directed at strengthening the existing Provincial Environmental Information System, promoting the dissemination of information to the governmental sector and civil society as a whole; at identifying institutional strengthening needs, including the development and implementation of regulatory instruments, technical capacities of its human resources and its equipment, selecting priority strengthening actions to be developed in the short term and fostering the participation of different sectors and governmental levels related to the management of natural resources and the environment. This latter activitity extended to the different communities living in the Yungas and its area of influence.

  The broad participation of both the institution's authorities and technical and professional staff, as well as of many key organizations, NGO representatives and users (e.g., the Yungas Biosphere Reserve's staff, the province's production leaders and local conservation leaders, etc.) was a common factor in all the activities performed.

  At first, the potential benefits, restrictions, risks and conflicts in terms of the environment and the natural resources in the portion of the Bermejo River Basin in the province were identified. This allowed prioritization of critical subjects and sites, and represented an important input for the design of public policies directed at the conservation and management of high anthropogenically-impacted ecosystems.

Among the critical subjects addressed, the following ones are worth mentioning:

- *Provincial Environmental Information System.* The node of the Provincial Environmental Information System was designed, complementing actions initiated prior to SAP-Bermejo activities. The node will solve the inefficiencies in the generation and management of information caused by

overlapping functions and fragmented work environments, providing the province with a modern management instrument, which will allow the integrated management of natural resources and the design of public policies related to this issue.

- *Registry of environmental civil society organizations.* As prerequisite for information dissemination to facilitate stakeholder participation and maximize the utilization of resources, it was essential to enable horizontal communication channels among the organizations involved in environmental conservation and sustainable development. In this respect, the organizations engaged in these activities were identified, systematized and entered into the Environmental Information System.

- *System of Protected Natural Areas.* The establishment of a system of protected areas that harmonizes management categories and legal instruments for their creation was identified as a prority for the conservation and protection of the province's natural heritage, in general, and of the Bermejo River Basin, in particular. In this manner, a proposal for a Regulatory Decree related to the Protected Natural Area System within the General Environmental Act was prepared for consideration.

- *Environmental Impact Assessment (EIA).* EIA was another key aspect of the General Environmental Act that required regulation, due to the strategic importance of this management tool in public policy-making, and in the environmental impact monitoring and control systems used by the provincial administration. For this reason, an analysis of the current system of EIA and environmental aptitude certificate was conducted, and the regulatory process initiated by the Provincial Department of Environment and Natural Resources was strengthened through a comparative analysis with other legislation on this subject at both the national and international levels, and through consultations with legal technical experts and stakeholders from the business sector.

Potrero de Yala Provincial Reserve, core area of the Yungas Biosphere Reserve, Province of Salta - Argentina

- *Yungas Biosphere Reserve.* As in the case of Salta, the strengthening of the Provincial Department of Environment in the Province of Jujuy was within SAP-Bermejo´s approach of supporting governmental institutions in the execution of key projects. Within this framework, efforts were made to strengthen the

Department in its environmental enforcement capacity, consolidate its institutional leadership and enhance the coordination between government and civil society organizations having jurisdiction or interests in the management of natural resources and the environment in order to implement the Yungas Biosphere Reserve (YunBR).

Finally, a new organizational chart and work distribution chart (functional organization chart) defining the Department's mission and general functions were prepared with the help of all the Department's staff, leading to an institution which could respond to the current environmental problems, but, at the same time, maintain a vision of sustainability and integrated planning for the future. The responsibilities, chains of command and scope of each of the four Core Areas into which the organizational structure was divided were also established. The four Core Areas were: 1) Environmental Policy and Pollution Control; 2) Natural Resources: 3) Supervision and Control and 4) Accounting.

The institutional strengthening of the Integrated River Basin Management Unit (UGICH) was initiated through an internal process of self-diagnosis and inter-sectoral debate on the weaknesses in the practical implementation of the integrated basin management concept. Based on this process, it was concluded that the main limitations to the application of this concept in the province were:

- Lack of information for conducting basin analyses;
- Poor dissemination of experiences;
- Scarcity of skilled personnel for making informed diagnoses; and
- Methodological problems affecting the appropriate coordination of the different decision-making levels and, consequently, difficulties in correctly implementing recommendations.

The first aspect was addressed and strengthened through the implementation of the province's Environmental Information System, supported by the SAP-Bermejo program at the Department of Environment and Natural Resources.

For coordinating different decision-making levels, both the Department of Environment, through the adaptation and rearrangement of its organizational structure, and the UGICH, through the redefinition of its institutional map and the organization of workshops, meetings and multi-sector meetings among the different public administration bodies addressing this issue, facilitated the integration and distribution of responsibilities for managing resources more efficiently.

In this sense, SAP-Bermejo supported UGICH particularly in terms of strengthening its technical and professional capabilities, as it was deemed necessary to have human resources permanently promoting adequate levels of efficiency and professionalism, which would translate directly into enhanced performance of the personnel working in the different organizational units involved.

Within this framework, UGICH was provided with the necessary computers and multimedia equipment for giving training courses, as well as with assistance in designing and implementing communications tools and dissemination mechanisms. Training for professionals and technicians mainly involved the participation of UGICH personnel in specific courses.

Finally, the institutional strengthening process was completed with the design, preparation and distribution of informational and awareness-raising materials on the value of water and the need to protect it. In that sense, the compact disc (CD) entitled *A jugar con agua (Let's Play with Water)* was updated with the incorporation of new activities using the AulaClic freeware; institutional brochures and posters were designed and educational materials were developed for youth at the EGB1 and EGB2 (Elementary School) levels, attending schools located in the Basin.

- **Provincial Food Science Unit (SUNIBRON)**

The strengthening of this laboratory, as member of the Bermejo River Water Quality Monitoring System, was based on the results of the TDA conducted during the formulation of the SAP-Bermejo, which identified the following needs: I) the acquisition of equipment and materials for preparing sampling campaigns and II) training activities for its personnel.

In this sense, the laboratory was provided with field equipment for measuring parameters *in situ* and a spectrophotometer, as well as the necessary inputs and materials for conducting campaigns for determining physical, chemical and biological parameters, in its capacity of laboratory in charge of the sampling points located in the Province of Jujuy.

Furthermore, training activities were performed, particularly in field sampling techniques, the application of new technologies and the implementation of acquired analytical instruments.

Province of Chaco

- **Provincial Water Administration - APA**

This organization's Laboratory was designated by the representatives of the four provinces at COREBE in charge of leading the environmental monitoring process of the Bermejo River Basin in Argentina, given that the corresponding laboratories in the other three provinces were relatively less developed at the time of SAP-Bermejo preparation. Consequentely, APA´s Laboratory was strenghthened, receiving the necessary equipment for performing its tasks, including inputs and materials for the analytical studies of the First Basin Monitoring Campaign.

In a second stage, and once the other laboratories had been strengthened, APA's Laboratory jointly conducted monitoring campaign activities and water quality analyses, receiving support for these campaigns from the SAP-Bermejo.

Finally, it is worth mentioning that this

Chaco's APA Laboratory, Argentina

Bolivia Laboratory

laboratory and the Provincial Drinking Water Service's Laboratory of the Province of Formosa are in charge of the sampling points located in the Lower Basin of the Bermejo River.

Province of Formosa

- **Provincial Water Coordinating Unit (UPCA)**

The strengthening of this Unit was conducted considering its role as provincial enforcement authority for issues related to water resources, including different activities related to the planning and management of water resources and the use of water, and for the updating of the provincial legal and regulatory base.

It is worth mentioning that, as a result of this process, a number of Regulatory Bills relating to Law Nº 1060, Law Nº 1335 and Law Nº 305 were introduced, and the Project for Modifying Formosa's Current Water Code and associated regulations was prepared. With these legal tools in place, the Province has the elements needed for updating its water management regulatory framework, and incorporating environmental factors and sustainability aspects into its regulatory framework for the sustainable management of water and other natural resources.

- **Provincial Drinking Water Service's Laboratory - SPAP**

This laboratory was strengthened in its capacity as member of the Bermejo River Water Quality Monitoring System. Based on the initial diagnostic analysis of its technical, operational and human capacities, a strengthening program was prepared, including the provision of equipment for *in situ* analysis, the rehabilitation of equipment out of operation due to a lack of spare parts, and the operation of new equipment which had not been used due to the lack of appropriate training. Moreover, the laboratory was provided with equipment, materials and reactants for organizing water quality sampling campaigns.

The result of this strengthening process produced a qualitative leap in the Laboratory´s capacity to operate as member of the Bermejo River Basin Water Quality Monitoring System, sharing with Chaco's APA Laboratory the responsibility for water quality monitoring in the Lower Basin.

Department of Tarija

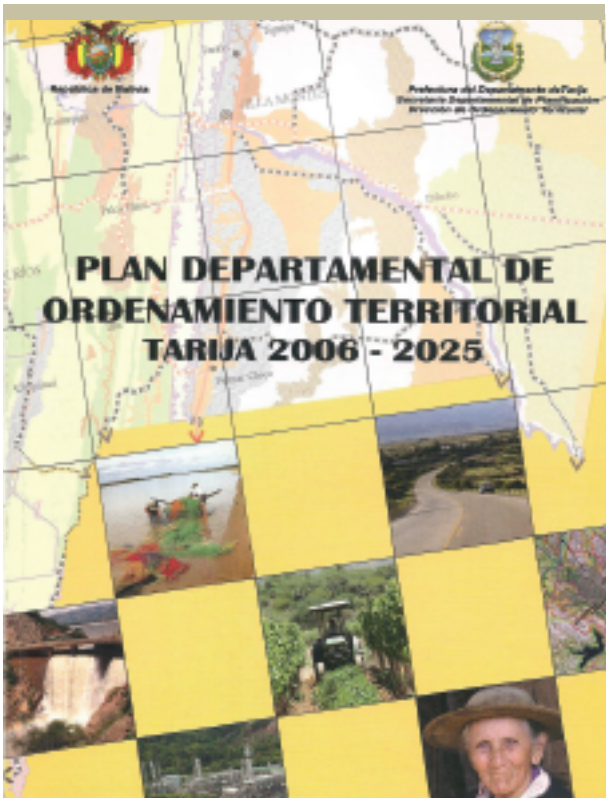
The strengthening of institutions dealing with binational and environmental basin management

issues, for the Department of Tarija, basically referred to: I) promoting actions for establishing common environmental quality objectives and policies and II) formulating and implementing, in a participatory manner, a regional regulatory framework covering the basic aspects of managing the water resources shared with Argentina and enabling the integrated management of water and other natural resources.

As for the first aspect, the establishment of common environmental quality objectives, the following activities were performed:

- Identification, quantification and harmonization of institutional requirements at the regional level;
- Recommendation of instrumentation strategies for establishing common environmental quality objectives and policies; and
- Implementation of actions to strengthen technical capabilities and equipment capacities of governmental and civil society organizations.

In terms of the formulation and implementation of a regional regulatory framework, it was deemed necessary to create a water quality laboratory with sufficient technical capacity and competence to enable the Departmental Environment Secretariat of Tarija Prefecture and the municipalities comprising the Upper Basin of the Bermejo River in Bolivia to determine the classification and control of water bodies in accordance with Bolivia's Environmental Act. Moreover, this laboratory, together with OTNPB's technical staff, integrate the Bermejo River Water Quality Monitoring System.



Publication of the Land Use Zoning Plan for the Department of Tarija

Additionally, the laboratories of the Agricultural Sciences and Forestry School of the Juan Misael Saracho Autonomous University (UAJMS) were strengthened for processing flora and fauna samples. This Laboratory conducted the analysis of the samples obtained from the Biodiversity Study field activities carried out within SAP-Bermejo. Additionally, support was provided for the training of technicians and the preparation of texts and training courses.

4.2. Development of a comprehensive legal, economic and environmental framework for the Basin region

4.2.1. Harmonization of legal framework at the regional level and for the various jurisdictions

The objective of this project was to have a strengthened regulatory framework for the utilization and conservation of the Basin's natural resources, within a harmonized binational and inter-jurisdictional legal framework.

Although the SAP-Bermejo interacted closely with the various jurisdictional bodies in order to improve and adjust the legal and institutional framework for integrated basin management, it was clear that the legislative branches of the national/federal and provincial/departmental governments were outside of the scope of the Program at this stage. Nevertheless, SAP-Bermejo, through its activities, promoted the dialogue concerning necessary adjustments to the legal frameworks, drafting specific regulatory proposals in particular cases (e.g., Regulation of Salta and Jujuy's Protected Natural Areas Act, Formosa's Water Code, Regulation of Formosa's Laws Nº 1060, 1335 and 305, etc.).

While in both countries SAP-Bermejo´s strategic actions helped advance policy frameworks for Integrated Water Resource Management (IWRM) in general, where it had direct incidence was in the adjustment of the regulatory frameworks of COREBE and the OTNPB, and especially of COBINABE, through the proposals for Bylaws, Internal Regulations and Seat Agreement. Similarly, the updating of the Bermejo River Basin Environmental and Legal Diagnostic Analysis permitted: I) to update the survey and analysis of the current institutional and legal framework regarding the environment, in general, and water, in particular, in the Argentine jurisdictions and II) verify the degree of progress in the enforcement of current environmental regulations, the implementation of activities and field work.

An issue addressed early in project implementation was the diversity of legal frameworks within the inner Basin in Argentina, as with Bolivia this is not the case, because national legislation governs the Department of Tarija. An analysis of the environmental legislation in each jurisdiction verified that the existing diversity, while attending each jurisdiction's characteristics and peculiarities, was compatible with the concept of a basin as a regional unit, both in its conception and application.

The comparison and analysis of the provincial

legislations showed many differences and were asymmetric in terms of their coverage, though they did have important common elements regarding environmental principles and hydrological policies. It is worth noting that the adherence to COHIFE was a step forward in common by the Argentine provinces, which coincided with the finalization of SAP-Bermejo´s formulation phase and initiation of its implementation. The adherence to these principles, which recognize the *hydrographic basin* as the unit for planning and managing water resources, was an incentivating factor for the support of SAP-Bermejo within the political sphere.

It is also worth highlighting that SAP-Bermejo, through its actions and presence, was an important instrument for operationally incorporating these principles into the context of the provinces of the Bermejo River Basin.

4.2.2. Environmental Zoning and Land-Use Regulation

The purpose of SAP-Bermejo in this project was to promote and stimulate the application of environmental zoning and land use regulation processes as a basic instrument for regional planning and, therefore, to contribute to the Basin's sustainable development. For meeting this objective, SAP-Bermejo proposed the identificacion and evaluation of the necessary technical, legal, institutional and political aspects for the establishment of basic instruments to help guide land occupation processes and the development of economic activities based on the sustainable use of natural resources.

Due to the large extent of the Bermejo River Basin in Argentina and the diversity of jurisdictions involved, a set of pilot demonstration actions were programmed, seeking to obtain experiences, technical guidance, and common methodologies, which could be expanded and replicated in the future. In the case of Bolivia, the goal was to prepare a Land Use Zoning Plan for the Department of Tarija, covering the entire Bolivian portion of the Upper Basin of the Bermejo River, and having it submitted for approval by Tarija's Prefecture, and to work under an integrated approach in critical microbasins with specific actions oriented toward the conservation and maintenance of the San Jacinto Reservoir.

The activities carried out were:

a) **Land Use Zoning Plan.** In order to prepare Tarija's Departmental Land Use Zoning Plan, a three-party inter-institutional agreement was signed between the Ministry of Sustainable Development and Planning, Tarija's Departmental Prefecture and the OTNPB. SAP-Bermejo contributed by contracting a specialized consulting company, which was selected through an open bid process. The Zoning Plan was intended to facilitate the development of the Department of Tarija during the 2006-2025 period, taking into consideration environmental factors, as well as social and economic development elements.

Work was structured in two components: I) the *Land Use Plan* and II) the *Land Occupation Plan.*

On the basis of the agroecological and socio-economic zoning carried out by ZONISIG, the implementation of the land use and natural resource management plan was proposed. The Plan was prepared incorporating satellite and geographically referenced cartographic information, as well as data and information generated by SAP-Bermejo for the Upper Basin and for the Department of Tarija, particularly the studies and experiences related to erosion and sediment transportation, integrated microbasin management, and the TDA.

With this information, it was possible to identify physical ecosystem drivers and localized production activities, which were integrated and evaluated in terms of their location and characterization; land use categories and subcategories were assigned to land units based on this knowledge. In accordance with the current legislation and proposed amendments in certain cases, rules for land use and interventions were defined and recommendations made regarding the management of the defined land units.

The final product, a comprehensive document outlining the resulting Plan, included: I) an Integral Diagnostic Analysis of the Area; II) a set of thematic maps and land use zoning map; III) the Department of Tarija's 2006-2025 Land Use Zoning Plan, including the Land Occupation Plan and the specific proposals for each Land Unit; IV) the Hydrographic Basin Plan; V) the Urban Land Use Plan and VI) cartographic guidelines for the formulation of the Departmental Land Use Zoning Plan.

The Departmental Land Use Zoning Plan, Tarija 2006-2025, as it was officially named, was approved through Resolution Nº 263/2006, dated 30 July 2006, issued by the Departmental Council, which is the highest authority in Tarija's Departmental Prefecture. The main stakeholders in the Department validated the Plan.

The Plan is currently in force and is a vital element in the project preparation and approval process of the Prefecture and other Department-related bodies. Its approval shows that the Plan was considered important and that it was a successful element of the SAP-Bermejo project, which promoted its necessity and supported its preparation and implementation. Apart from the success of the process, it is worth noting the importance of this type of inter-institutional working tool, recognizing the need it addresses, thus, effectively strengthening institutional development regarding this topic.

The development of this Plan in Bolivia, within SAP-Bermejo´s framework, was not exempt of discussions about its orientation and working methodology, on the basis of the dilemma as to whether to take as the territorial base for the Plan the Bermejo River Basin unit in Bolivia or the entire Department of Tarija, which corresponded to the administrative management unit of the Departmental Prefecture. The decision to work with the

administrative unit but considering the territorial physical support structure provided by the Basin seems to have been correct based on the result.

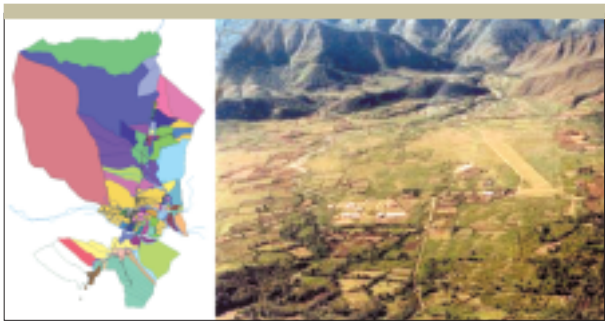
It is worth highlighting also that, concomitantly with this plan, a territorial hydrological strategy, aimed at the protection of the critical microbasins of San Jacinto Reservoir, was applied. This strategy employed an integrated approach and considered the need for development and improvement of the population's quality of life. It, too, was successful in terms of its results.

b) **Pilot Demonstration Land Use Zoning Actions in the Argentine Provinces.** As mentioned above, in Argentina the incorporation of land use zoning tools was carried out, in contrast to the case of Bolivia, on the basis of pilot demonstration projects localized in areas with critical problems. Some of these projects had already been identified as necessary by local or provincial stakeholders and were taken and strategically adjusted in SAP-Bermejo with a view to promoting ideas and obtaining experiences which, if successful, could demonstrate the benefits achieved, thus strengthening the institutions involved. This meant a step forward in expanding the use of the tool to every province and, therefore, to the entire basin in Argentina.

It is important to highlight that the territorial zoning concepts were relatively new in the Bermejo River Basin area, although elements of the process had been used for many years. Thus, an important amount of secondary information arising from specific studies and natural resource planning initiatives was already available, but generally sectoral in nature.

An important characteristic of this work at the local level was the direct involvement of the population, unlike the work at broader regional scales, as in the case of Bolivia, where participation occurred within the existing legal and institutional framework.

- **Environmental Zoning and Land Use Regulation – Municipality of Los Toldos, Province of Salta.** The objectives were: I) to prepare and institutionalize the Environmental Zoning Plan in the Municipality of Los Toldos and II) to create and incorporate an executing unit within the sphere of this municipality, formalizing the Project´s institutionalization. Specific additional objectives were to elaborate and register the Municipal Zoning and Municipal Land Registry Cartography, and carry out land formalization and titling of lands, legally regularizing land titles and formally registering them in the Municipal Land Registry, with the consent of the Province of Salta's Cadastral Office. For this purpose, a multi-disciplinary technical team was created, the Land Use Zoning Unit was established, within the Municipality of Los Toldos, and studies of natural resources, land use and land



Land Use Regulation – Municipality of Los Toldos, Province of Salta - Argentina.

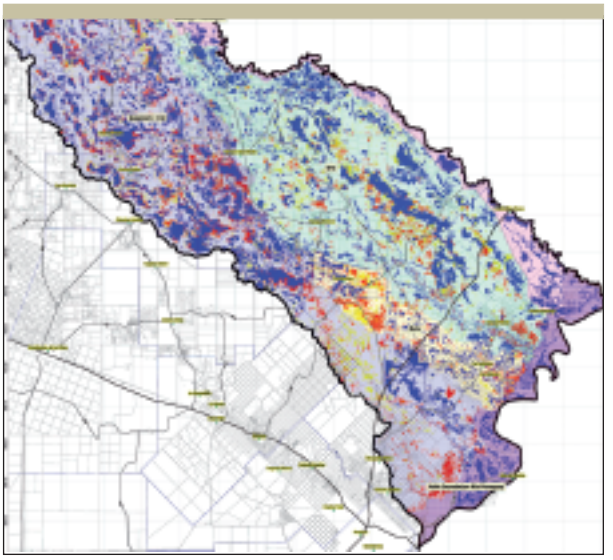
ownership were carried out. A historical problem related to multiple titling and the overlapping of titles was identified. This problem stemmed from the prevailing historical uncertainty in the Municipality of Los Toldos, whose territory, previously within Bolivia, was incorporated into Argentina by common consent in the 1940's as a result of border adjustments completed without due consideration of land ownership. The problem was affecting not only individual ownership rights but also the management of natural resources, which are particularly valuable due to the presence of important protected areas, such as Baritú and El Nogalar National Parks.

The project prepared a cadastral plan for the Municipality of Los Toldos, identifying the localation of houses, infrastructure and private and communal facilities, as well as a general land use and occupation map, including protected areas, production areas, urban areas, etc. Thematic maps were also produced, such as those detailing human settlements, economic activities, provision of utility services, education and health networks, facilities and infrastructure, as well as road access and infrastructure. Cartography of the main aptitudes and restrictions of the physical medium was prepared, as well as maps of the hydrographic network, flood exposure, landslide risks and fire danger. A basic zoning scheme and its relation with the conservation areas of the Baritú National Park and the El Nogalar National Reserve, in the area within the Municipality of

Los Toldos, was proposed. The technical and legal analysis of overlapping of land use rights was initiated and work was done to resolve these conflicts by means of informal mediation. Cartography for regularizing land ownership and an individual land registry using magnetic media and graphic support tools was prepared, which gained wide acceptance by the Municipality's population and authorities. Finally, the Municipality submitted the files with the land-titling proposal to the competent authorities in the Province of Salta, with the agreed solutions identified in each conflictive case.

Although the experience demanded significant efforts from SAP-Bermejo, seeking to resolve a structural problem utilizing a pilot project with successful results, some uncertainties remained and difficulties became evident. At the end of the Project however, the local population was very satisfied, as they had assured land ownership, which implied a more permanent and responsible link on behalf of the producers in the management of their land and natural resources.

- **Environmental Risk Management-Oriented Land Use Zoning.** Pilot demonstration projects were undertaken in the Argentine provinces of Chaco and Formosa. In both cases, the projects had the objective of assessing the risk of flooding and demarcating the riverbank line, as required by the regulations governing riverine areas. The preparation process of the projects had broad participation by the institutions



Map of the Bermejo River floodplain, Province of Chaco - Argentina

Land Use Regulation – Municipality of Tilcara, Province of Jujuy - Argentina.

involved and their professional staff, which permitted, on the one hand, meeting the established objectives and, on the other hand, documenting the process in operational instruments.

The work was strengthened by the transfer of knowledge among the institutions involved in these tasks. Initially, critical zones were selected, beginning in the Province of Chaco, coordinating the work with the Province of Formosa.

- *Project on Environmental Zoning and Land Use Regulation in the Province of Chaco.* In this case, a geographical information system (GIS) was utilized with extensive use of Landsat-TM satellite imagery of the study area defined as the Provincial portion of the Bermejo River Basin between Puerto Lavalle (National Road Nº 95) and its confluence with the Paraguay River. Based on this information, maps of the Bermejo River floodplain were produced. The floodplain is located along the Bermejo-Bermejito Rivers, in the section extending from Presidente Roca to Lavalle Bridge. Such maps show the iso-risk line, according to the water levels of the Bermejo River, which permitted an estimate of the lateral movement of the river bed and its area, which requires particular attention in terms of land use, given the frequency and magnitude of possible floods. On the other hand, the information on farming activities in terms of localized yields, crops and surfaces planted within the study area was systematized. As for cartography, maps identifying flooded surfaces within the study area, for the period between May 1988 and May 2002 were generated. Cartography with 2, 5 and 25-year iso-risk lines were also prepared, complemented with the water volume (413 m^3/s) at the El Colorado hydrometric station.

- *Project on Environmental Zoning and Land Use Regulation in the Province of Formosa.* A second pilot demonstration project on land use zoning for provincial hydrological risk management, similar to that carried out in the Province of Chaco, was executed jointly with the Government of the Province of Formosa and the Provincial Water Coordination Unit (UPCA). Three types of results and products were obtained: I) training of technical personnel in the form of workshops organized jointly by Chaco's government officials and technicians involved in the project, focusing on the use of the Spring© software developed by Brazil's National Institute for Space Research, for farming hydrological risk zoning; II) the creation of the Geographical Information System for the Bermejo River Basin in the Province of Formosa and III) the generation of hydrological flood risk maps for the entire Bermejo River Basin in the Province of Formosa, and a farming and ranching risk map prepared for the southern area of the Department of Pirané; these two products were developed at semi-detailed scale levels (1:100.000 and 1:50.000, respectively), and are considered to be pioneering risk management, as well as natural resources management tools for the Province.

- *Other Land Use and Environmental Zoning Experiences* Additional environmental zoning experiences, not originally planned as institutional strengthening actions, were included in SAP-Bermejo. These actions took into account aspects related to integrated water and natural resources management or hydrological risk. Nevertheless, they left installed capacities in the institutions and organizations involved in their execution.

  In the case of Argentina, the actions undertaken jointly with the institutions in charge of water resources management in the Provinces of Salta and Jujuy for the Grande and Huasamayo River Basins (Jujuy) and the Iruya and Colanzulí River Basins (Salta) were particularly important. These activities were known as the *Grande River Basin Zoning Project – Huasamayo River Sub-Basin Systematization* and the *Integrated Iruya River Basin Management Program*, for which the *Social and Territorial Environmental Risk Diagnostic Analysis of the Town of Iruya* was carried out, given that this town has a high heritage value and runs the risk of collapse due to erosion on the banks of the Colanzulí and Milmahuasi Rivers, tributaries of the Iruya River.

4.2.3. Development and Strengthening of Economic Instruments for Promoting Sustainable Water Use

During the SAP-Bermejo implementation process, this issue did not achieve the importance given to it during the preparation stage, because of the debate on the human right to water that sparked off in the region during the Program execution period, which regressed all actions oriented towards strengthening the idea of water as an economic good. On the contrary, governments, at different levels and under different circumstances, sought to strengthen concepts such as the populations' ancestral right to water, a process that was particularly strong in Bolivia. While this did not imply a negation of the costs incurred in the management of the resource and its related services, it politically reduced the opportunity to develop economic instruments to support such management during the Project period and within the framework of the binational program[13].

Consequently, it was not possible to draw conclusions, design instrumental strategies or obtain agreed upon recommendations at the binational level, for the incorporation of economic instruments into the Basin's water policies as a means to value water. Nevertheless, SAP-Bermejo was able to address the issue in Argentina in the national area of the Basin, providing training to professionals working with governmental water resources and environmental organizations, and promoting its incorporation into a proposal for a pilot demonstration project on integrated basin management.

[13] In Argentina, during 2002, the Water Policy Governing Principles established that as water becomes a scarce resource as a result of the existing competition for its utilization, it acquires an economic value only after its social and environmental functions have been fulfilled. Based on this, it is an accepted principle that economics can introduce rationality and efficiency into water distribution and resource management in certain situations.

Course on the Economic Value of Water

The course had the objective of designing strategies agreed to at a regional level, so that it would be possible to incorporate financial and economic instruments reflecting the economic value of water into legislation to supplement other regulatory instruments for managing natural resources in the Basin, and, thereby, constitute a genuine financing source for the integrated management of water and other natural resources.

The course tried to confront the theoretical framework of the ideal economy where market mechanisms ensure an efficient allocation of resources, maximizing social welfare, with real world economies where the free play of supply and demand does not always lead to socially efficient situations, due, in part, to exceptions to the general theory known as "market failures".

One of these inefficient allocation situations is manifested by the presence of "public goods", preventing the development of a market where goods are bought and sold according to their actual price and value.

Given that water, as the rest of the environmental goods, is considered to be a "public good", the problems associated with the absence of incentives for a willingness to pay prevents the value of these resources from being known. Within this framework, the failure to quickly identify the value does not imply that it does not exist. To estimate it, it is recommended that some methodology for "revealing" the preferences that the consumers strategically hide (whether knowingly or unknowingly) be applied.

By organizing this activity, performed jointly with the Association for Supporting the School of Engineering (AFIN) of the National University of the Northeast, Chaco, SAP-Bermejo contributed to strengthening the capacities of government officials and professionals working with water resources and environmental management organizations, as well as in the governmental planning and economic development areas of the Argentine provinces.

The Ministry of Production and Environment of the Province of Jujuy identified the need to advance the practical application and dissemination of the concepts addressed in the course. For this purpose, a proposal was prepared within the framework of the SAP-Bermejo for broadening the knowledge of international experiences in terms of technical and financial instruments reflecting the economic value of water in production processes and starting an awareness-building process related to this issue among producers and other users in the Los Pericos-Manatiales Rivers sub-Basin.

The proposal was prepared by Jujuy's Department of Water Resources, Jujuy's Tobacco Grower Cooperative, the Perico Manantiales' Irrigation Consortium, the Jujuy 3000 Foundation and the Yavi Group of Scientific Research.

4.2.4. Development of Strategies for Incorporating Social and Environmental Costs into Projects

This activity was aimed at designing, validating and formulating regional criteria, strategies and recommendations to incorporate environmental and social costs into the evaluation of development project, by means of methodologies valuing natural resources and ecosystem services.

For this purpose, an environmental training workshop was designed and organized for farm production projects. The course was given in different localities across the Bermejo River Basin by the Association for Supporting the School of Engineering (AFIN) of the National University of the Northeast, Chaco.

The objectives of this course were to: strengthen the environmental management capacities of individuals in charge of formulating, executing and evaluating production processes, and disseminate the necessary and appropriate methodological tools for environmental impact assessment relating to production processes, ensuring their sustainability.

Training was directed at individuals responsible for formulating, executing and evaluating production processes both in the public sphere, such as officials from COREBE and other institutions dealing with water resources, natural resources, the environment and public works in the Argentine provinces, and in the private sector, such as production-related businessmen and professionals, environmental managers, NGO representatives as well as the Bermejo River Basin's stakeholders and inhabitants.

4.3. Lessons Learned and Best Practices Regarding Institutional Development and Strengthening

The *lessons learned* derive not only from the analysis of the successful strategic actions executed in terms of the *Institutional Development and Strengthening* Strategic Area of the SAP-Bermejo, but also from those actions which failed or had limited success in achieving the desired results. Based on this premise, the main lessons learned from the project are detailed below.

- Integrated and **sustainable basin management** over time requires a sound institutional framework, that includes not only agencies of the governments involved, but also by the social stakeholders interested and conditioned by the actions to be implemented.

- Institutional strengthening at the **competent jurisdictional levels** (binational, national, provincial/departmental and local) supported by in-house technical capacity are essential factors for the sustainable and integrated management of a transboundary hydrographic basin.

- The behavior modification process required to reverse unsustainable uses of natural resources is slow and complex; it requires institutionalized formal education actions and informal education mechanisms, institutionalized communications and training programs, as well as sustained improvements in legal foundations.

Las Yungas poster, Province of Salta – Argentina

SAP Bermejo banner

- Projects must explore compatibilities among, and with, the institutions benefiting from their execution.

- Consulting services must be carefully selected jointly with the institutional beneficiaries of such work, so that they can contribute to strengthening the institutions by providing the recipient entities with knowledge and relevant experiences.

- The development of the legal and institutional framework must pursue the promotion of dialogue, joint organization and coordination among the entities directly related to the use and management of natural resources and other sectoral organizations related to, or directly affected by, the program, at their various action scales and considering their individual competencies.

- For the inclusion of stakeholders directly committed to the basin's sustainable management, it is important that agencies be locally present in the geographical area of project execution, so that they are accessible and can work closely with executing institutions.

- Transboundary projects are vulnerable to political changes in participating countries.

- The complexities posed by the institutional realities of a transboundary binational project, which include a country with a federal structure and jurisdictions having independent ownership

of natural resources, demands the establishment of realistic deadlines, taking into consideration the time required for decision-making processes and intergovernmental and inter-institutional coordination.

- In order to move forward towards the integrated and sound management of a transboundary basin, it is necessary to generate a compatible basin database and incorporate an information system appropriate to the demand for information, equally accessible to and considered to be reliable by the different parties involved.

- For actions to be effective, it is necessary to determine the perceptions of the stakeholders involved and foster their understanding of the importance of the environment to their economic and social development in the basin.

- The institutional weaknesses in the binational management of the Bermejo River Basin were one of the determining factors in the failure of the Project to meet SAP-Bermejo's proposed deadlines and schedules.

As for best practices, following is the list of those practices used in the performance of strategic legal and institutional activities which showed potential for continued effort over time, with an approach and methodology that lead to concrete and measurable results and, therefore, have been effective and sustainable as well as consistent with the environmental objectives of integrated water resources management and the Basin's sustainable development. These practices include:

- Respect for and attention to the existence and role of the Binational Commission, as the highest authority in the Binational Basin of the Bermejo River.

- Compliance with the legal frameworks existing in each country.

- Efforts to share knowledge between both countries and standardized methods and parameter sets for addressing transboundary issues.

- Efforts having bidirectional communications between technical and political stakeholders, including communities.

- Ongoing work aimed at achieving good coordination and communication among the agencies and institutions within the jurisdictions involved.

- Flexibility and the ability to adjust the program to changing political scenarios.

- Participation of the regional executing organization and national, provincial /departmental and local executing bodies from the very beginning, with well defined roles, acting in concert with subsidiary organization ethics.

- Participation of the social stakeholders involved

in all stages of the Program, from the identification of the strategic actions to their implementation.

- Identification of institutional strengthening needs according to the objectives and concrete activities to be performed under the auspices of the Program and their financial implications.

- Efforts to provide a sound scientific and technical basis to the defined strategic actions, with coordination among the executing institutions and the involvement of specialized departments from local universities, educational institutions and/or research centers.

- Appreciation of the specific knowledge of local communities and cultural knowledge and understandings of community rights, systematizing and integrating them with those of the technical and academic sector.

- Work combining strategic structural institutional actions with pilot demonstration project actions.

Search for consistency, agreement and coordination, at the different scales of strategic action, among the different local, provincial/departmental, national, regional and international institutional bodies legally involved.

- Generation and/or analytical collection of missing basic information, needed to fill gaps in knowledge required for the sustainable management of natural resources.

- Execution based on an open communications policy and strategy.

- Introduction of land use zoning actions on the basis of ecological zoning, and the participation of stakeholders from the different jurisdictional institutions involved.

4.4. General Conclusions – Institutional Aspects Addressed by SAP-Bermejo

In general terms, the products and results envisioned in the SAP-Bermejo for the *Institutional Development and Strengthening* Strategic Area were achieved, despite some important problems that needed to be resolved and the additional time spent in order to achieve their resolution. The Strategic Area activities were the base upon which the execution of the entire SAP-Bermejo was structured and was made possible.

From the beginning of the process, SAP-Bermejo faced a complex institutional situation, with inter-jurisdictional conflicts posing a serious obstacle to be surmounted for the project´s normal execution, and thus, to achieve the sustainable and integrated management of water resources as a catalyzing factor for the sustainable development of the Binational Basin of the Bermejo River. A successful aspect of the Program was that it able to insert itself into this intricate institutional context, adjusting its organizational structure and the performance of its initial actions until the reality upon which it was based could be modified. The Program and the management which drove and accompanied it contributed to providing an intelligent approach for

adapting to the realities of the Basin, which prevented a waste of efforts and goods and the frustration of initiatives in a context of changing realities, simultaneously permitting, or at least influencing, most of the activities in the Basin to proceed toward the fulfillment of the sustainable development objectives. Along this line, it was essential to consolidate the Program within an appropriate organizational structure, according to the objectives, mission and functions of an appropriate binational basin organization; namely, COBINABE. Further, it was equally essential to coordinate the structure of the Program with the different structures of the various jurisdictional institutions involved in the management of the Basin in each country. For this purpose, the Program supported the definition of roles and the adaptation of their legal bases, taking into account their political dynamics, in seeking to fulfill these objectives in each country.

On top of the weak institutional situation prevailing in the Basin at the beginning of SAP-Bermejo implementation, came the complex institutional context created by a country with a federal structure, such as Argentina, where the provinces had the historic right to manage and utilize the natural resources, and where a national institution, COREBE, already existed as an organization for promoting regional development, with the participation of two provinces which were not part of the hydrological basin. This situation made it particularly difficult to harmonize regional interests with binational interests, and the Argentine provincial interests with those of the other provinces, thereby generating uncertainties and conflicts that persisted during a large part of the process. In this sense, the creation of the Regional Coordination Committee, made up of representatives of provincial organizations with jurisdiction over water resources and the environment, permitted, in times of disagreements, the execution the actions proposed by the SAP-Bermejo with the direct participation of provincial entities.

The consolidation of the COBINABE as the Binational Basin agency, fulfilling the requirements of the hypothesis upon which the SAP-Bermejo was based, under adverse institutional and legal circumstances, required a process of flexibility and adaptation by the Program actions for strengthening the organization and its national and regional agencies. The SAP-Bermejo made an essential contribution to the growth, development and strengthening of COBINABE, generating a shared, binational view of the hydrological basin during its execution.

Integrated water resources management at the Basin level, as an objective which guided the execution of the SAP-Bermejo, implied not only the construction of works and the performance of actions for the physical and economic development (structural actions) of the Basin communities, but also the execution of actions for protecting and managing natural resources, resulting in public and private benefits. The land use zoning, which was specifically carried out in the Department of Tarija and in the area of the Yungas Biosphere Reserve in

COBINABE web site www.cobinabe.org

View of the Lower Bermejo River Basin

Argentina, affected the way in which the development of the Basin and its microbasins was oriented, thus constituting a non-structural measure with significant impact.

The institutionality and legislation prevailing at the initial stage of the Program, related to the weak policy, legal and institutional framework of COBINABE and the national basin organizations, were put into question and faced a crisis, making room for a new *basin institutionalism,* which was further favored by the changes taking place at national levels in both countries during the period of Program implementation.

The SAP-Bermejo projects, which were most accepted were those whose objectives were consistent with the interests and public policies of the country, province or department or community in which they were applied, and where the issue was on the public agenda. In the case of Argentina, COBINABE's institutional strengthening, as set forth in the PRODOC, was not initially in harmony with that of COREBE, generating a conflict which was overcome, in part, through the creation of the RCC. Both Bolivia and Argentina faced acute social and economic crises, as well as political and institutional transformations during the SAP-Bermejo implementation period. This situation required flexibility to refine SAP-Bermejo according to the level of organization and political and economic stability of the benefiting countries, adapting the activities being implemented under potentially unfavorable conditions.

The orientations and work methodologies employed were relevant for the promotion and maintenance of the appropriations by the beneficiaries and the institutional stakeholders involved in the Program´s preparation and execution. SAP-Bermejo achieved an institutional framework which stimulated dialogue and coordination among the entities directly related to the management of water resources, as well as among other sectoral entities related to, or directly affected by, the execution of the Program. In this sense, the creation of the Basin committees or commissions, and the grouping of different sectors and stakeholders, facilitated the scheduling and coordination of actions needed not only for the

performance of the Program's activities, but also for the management of water resources in general. The institutional coordination provided through the Regional Coordination Committee was important, incorporating public representatives from the hydrological and environment sectors, which meant some progress in terms of the harmonization of the interests of water resources and environmental managers, and the improvement of management possibilities.

The coordination of institutions from different governmental levels (national, provincial, municipal and departmental), as well as from academic sectors, required great efforts to conform the needs and interests of the parties with those of the local population. The difficulty faced in the initial stages of the SAP-Bermejo implementation process showed that it was important to have an overarching legal and institutional base for managing water resources, mainly taking into account the inseparable relation between water and land, the interrelationships between water quantity and quality, the consideration of the multiple uses of water in sectoral activities and its harmonization with environmental management in general. The Communications Action Plan was beneficial, although its late formulation as a result of the slow internalization process arising from COBINABE strengthening reduced the timeliness of the impact of its implementation.

In short, the different *Institutional Development and Strengthening* actions performed had an adequate basis and were, in general, appropriate and convenient, although insufficient, for tackling the transboundary problems and their causes, which were correctly identified in the TDA. The achievements of the project refer to the priority strategic actions included in the Short-term SAP-Bermejo, in order to introduce the concept of integrated management, allowing for the implementation of actions in that direction and, therefore, move toward the integrated development of the Basin, with particular focus to the relationship between water and land.

Two relevant conclusions are drawn from the SAP-Bermejo implementation. The first conclusion is that the problems and their root causes still exist and require the continuity of the efforts initiated during this Program. The second conclusion, which leads to a similar finding, is that, given the efficient results of the priority actions implemented by SAP-Bermejo, it is a tool, which must be continued, updated and improved. Both countries benefiting from the SAP-Bermejo drew these conclusions. They have agreed, within the framework of COBINABE, to address the sustainability of the SAP-Bermejo through a new Integrated Management Program for the Binational Basin of the Bermejo River (PROBER), which stems from the positive evaluation of the actions performed to date and the analysis of the lessons learned, consolidating the institutional development achieved by SAP-Bermejo during this implementation stage.

5. Strategic Area II: Environmental Protection and Rehabilitation

The prominent role of active and intense hydrological and geomorphologic processes in the Bermejo River Basin, with substantial impacts in terms of natural resources, ecosystems and biodiversity, was one of the main pillars of action within the SAP-Bermejo. Given the important amount of sediment discharge into the Paraguay-Paraná-La Plata River system (over 100 million tons per year), the Bermejo River Basin is considered a "*natural laboratory in terms of erosion and sedimentation*".

The general strategy defined in the TDA and executed in SAP-Bermejo focused on strengthening the mechanisms for the prevention, control and remediation of the principal forms of environmental degradation in the Basin that were affecting the vulnerability and quality of life of wide social sectors, the availability of habitats and biodiversity, the condition of natural resources and the quality of water, as well as the conflicts resulting from floods and other natural disasters. Thus, nature conservation, and the prevention and control of erosion, sediment transportation, and water contamination, were the strategic pillars of this Strategic Area, also incorporating specific actions related to the consolidation of the Basin's protected areas for the protection of biodiversity, springs and bodies of water, mitigation of the effects of floods, droughts and other natural disasters and the environmental clean-up of water bodies.

Specifically, the strategic concepts formulated from the TDA were:

- Establishing erosion control measures to reduce sediment generation and develop proposals for reducing sediment transportation impacts.
- Strengthening nature conservation mechanisms and the prevention and control of environmental degradation phenomena

affecting habitat availability and biodiversity, the condition of natural resources and the quality of water, as well as conflicts resulting from floods and other natural disasters.

- Strengthening and consolidating the system of protected areas, the management of buffer zone areas, the implementation of mitigation plans for floods and other natural disasters, the control of water pollution and environmental clean-up of water bodies.

The strategy was developed through a set of actions localized in specific areas which were a priority for nature conservation, for habitat, biodiversity, water and soil quality (erosion and desertification) protection and/or restoration; and for the implementation of protection and preventive measures against floods and other natural disasters. In this context, the priority actions, grouped into three main activities, and their corresponding projects, were the following:

5.1. Soil management and erosion control in critical areas.

5.1.1. Sediment control in the Tolomosa River Basin, Bolivia

5.1.2. Integrated management of the Santa Ana River Basin's natural resources;

5.1.3. Integrated management of the Iruya River Basin; and

5.1.4. Management of the Grande River Basin – Huasamayo River Sub-Basin.

5.2. Consolidation of protected areas and biodiversity protection.

5.2.1. Ecotourism alternatives in the piedmont forest;

5.2.2. Carbon fixation in the Sub-Andean region;

5.2.3. Biodiversity study;

5.2.4. Implementation of the Calilegua-Baritú-Tariquía biological corridor;

5.2.5. Management plan for Sama and Tariquía Reserves;

5.2.6. Evaluation of pastures in the Sub-Andean region;

5.3. Water quality protection and restoration.

5.3.1. Environmental clean-up of the Guadalquivir River;

5.3.2. Bermejo Triangle environmental clean-up study.

In the particular case of erosion and sediment transportation problems, an updated diagnostic analysis was carried out on sediment production, transportation and deposition in the Basin area. The analysis included multiple mathematical modeling studies covering a regional erosion susceptibility assessment, making significant progress in terms of defining the zoning of erosion risk and knowledge about fluvial morphological evolution. These experiences are detailed in the document *"Sediment Generation and Transportation in the Binational Basin of the Bermejo River – Characterization and Analysis of the Processes Involved"*, published by SAP-Bermejo.

At the sub-basin/local level, pilot structural and non-structural erosion control and sediment

transportation activities were succesfully carried out in collaboration with the communities of the Upper Basin, including small multiple-purpose works verified as economically and socially feasible and financeable. Structural measures for flood control, sediment retention dams, riverbank protection, rainwater drainage systems and river bed cleaning and consolidation, were some of the successful practices implemented that contributed to the reduction of environmental degradation and, at the same time, increased the lifespan of local dams.

These actions were supplemented with a set of non-structural erosion control and natural ecosystem conservation measures, including livestock management actions to reduce grazing pressure, communal practices regarding grazing land use and the implementation of forest nurseries and waste management in small communities. In this respect, it is worth mentioning the demonstration projects on integrated microbasin management carried out in Bolivia jointly with farming communities, with multiple results, showing the simultaneous benefits of sustainable natural resource management practices, with improvements in quality of life, access to water and production development in lands with micro irrigation systems, while controlling erosion and water body sedimentation and protecting infrastructure at larger scales.

In order to ensure the continuity of hydrological basin ecosystems as the foundation for biodiversity, initiatives were developed for the protection of the aquifer recharge areas and springs, and the strengthening of the ecological connectivity between nearby protected areas. In this respect, it was a high priority the consolidation of protected areas recognized by the national and provincial systems, constituting the core areas of the Yungas Biosphere Reserve (UNESCO-MAB) in Argentina, and the promotion of the Binational Biological Corridor, seeking to establish the connectivity between Tariquía National Flora and Fauna Reserve in Bolivia and Baritú and Calilegua National Parks in Argentina. These actions permitted the expansion of the biodiversity and natural resource (water and land) protection area, preventing habitat fragmentation in the Yungas. Furthermore, management plans for many protected areas were designed and prepared. These plans, together with the implementation of ecotourism practices in these areas and their surroundings, concrete actions for expanding carbon fixation in the Yungas, and biodiversity studies, contributed to the sustainability and the reduction of the vulnerability of these fragile ecosystems in the Andean piedmont.

Projects were also implemented in order to tackle pollution problems in the Guadalquivir River, in the Department of Tarija, Bolivia, through the implementation of small clean-up systems with their respective treatment plants. In the case of the Bermejo Triangle watercourses, activities included a sanitary diagnostic analysis, the preparation of the Sanitation and Water Quality Sustainability Plan and the implementation of waste water collection and treatment works.

5.1. Soil management and erosion control in critical areas.

The projects developed under this Strategic Area were the following:

5.1.1. Sediment Control in the Tolomosa River Basin, Bolivia

The Sediment Control Project was implemented in the Tolomosa River Basin. Its objectives were oriented to the control of basin soil erosion and the sediments transported through river courses, aimed at reducing progressive silting processes in the San Jacinto Reservoir, which is used for multiple purposes: irrigation, power generation and drinking water for the City of Tarija.

It was an action made up of three components: (1) control of sediments in transit by building earth and gabion dams, (2) construction of enclosures to allow natural regeneration and forest plantations and (3) farmland management and protection.

The Project was developed in the Mena River Sub-Basin and consisted of interventions in two areas: Pampa Redonda (12.8 km^2) and Churquis (10.2 km^2), which were selected because they were representative of the region's erosion processes. The works carried out included the construction of one dam of earth and gabions and 11 earth dams (5 to 10 meter-high and with a total retention capacity of 378,000 m^3).

The sediment retention dams were located in such a way as to generate direct benefits to farmers, providing them with water for irrigation, fish

View of the Lower Bermejo River Basin
Sediments control/retention dams, Tolomosa River Basin, Tarija - Bolivia

Earth-fill dam for sediments retention, Churquis area, Mena River Sub-Basin, Bolivia

breeding and cattle watering. Each of the microbasins defined by the dams constituted a work unit for erosion control, having the participation of the beneficiaries and their commitment to maintain the works, in order to extend the lifespan of the small reservoirs.

The dams control an 8.8 km^2 area, which accounts for 40% of the total intervention area, obtaining a high sediment retention efficiency. The results show that the construction of a group of dams covering a significant controlled area will translate into a substantial extension of the lifespan of the reservoirs located downstream.

The construction of sediment retention dams and implementation of erosion control works and practices in each microbasin demonstrated to be not only efficient for sediment control but also economically feasible. The interventions showed that they had a favorable cost-benefit ratio, with a retained sediment cost of USD $0.80 /$m^3$, which is lower than the estimated benefit of USD $0.95 per m^3 of reservoir in the San Jacinto project.

Regarding the "Enclosures for natural regeneration and forest plantations" component, the project carried out enclosures totaling 15 km for natural regeneration (61 hectares), forest plantations (30 hectares) and farming land management and protection (60 hectares).

Similarly, in the "Farmland Management and Protection" component, infrastructure related to irrigation water collection (2 dams), channeling (6,400 meters of aqueducts, including both enclosed systems–pipelines-and open systems–lined canals) and storage (4 storages and night compensation tanks, with capacities between 20 m^3 and 60 m^3 and a total volume of 174 m^3) were carried out.

These works made it possible to implement I) six microirrigation systems, II) enclosures for natural regeneration (61 hectares), III) forest plantations (30 hectares) and iv) farmland management and protection measures (60 hectares).

5.1.2. Integrated Management of Natural Resources of the Santa Ana River Basin, Calderas River Sub-Basin, Bolivia

The Project consisted of the execution of a set of works and activities which made it possible to regulate water levels in the microbasins and in the main river course, seeking to improve the management, conservation and restoration of soils, reduce sediments in transit, habilitate areas under irrigation, restore vegetative cover, livestock management, and consolidate local institutions through public participation.

The Project originally considered the performance of actions in the Gamoneda River Sub-Basin. Nevertheless, as a result of participatory processes at the beginning of the implementation, the community members expressed their interest in giving priority to works in the Calderas River Sub-Basin. The Project execution in the Calderas River Sub-Basin, within the framework of the Integrated Santa Ana River Basin Management Plan, consisted

of the construction of 21 gabion dams and 700 m^3 of low stone walls for erosion control. These works were complemented with works destined to store and channel water for irrigation, and the implementation of measures for water and soil management in the Basin.

Similarly, soil management and conservation actions were performed, including the construction of slow-forming terraces, planting living fences, forest and fruit plantations and the management of degraded areas through the construction of "low stone walls" and enclosures. Technical assistance in traditional practices was also provided for one year.

As a non-structural erosion control measure, 6,500 forest trees and 2,000 fruit trees were planted in different critical sectors of the Basin.

Complementary to the erosion control measures, the Project included the construction of 3 water level regulation dams (11 and 13 meter-high) and their respective microirrigation systems (9.7 km of piping); 12 water storage and night compensation tanks (474 m^3); the enclosure of a 3,000-meter perimeter field and enrichment plantations covering 20 hectares.

Finally, within the framework of this Integrated Santa Ana River Basin Management Plan, and complementary to the structural water collection, storage and distribution measures carried out, more than 40 training courses were given in the localities of Caldera Grande and Caldera Chica, aimed at providing technical assistance in

Gabion dam with the goal of curtailing sediment erosion, San Jacinto area, Bolivia

Water reservoir for irrigation purpose, Tolomosa River Basin – Bolivia

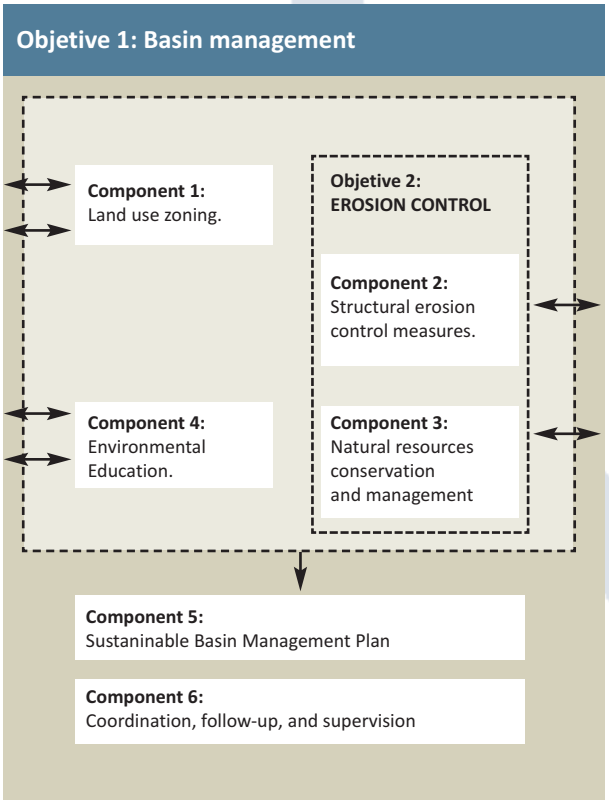
Fence and collector channel for irrigation purpose, Mena River Sub-Basin, Bolivia

traditional practices related to irrigation system management, operation and maintenance.

In terms of sustainability and replicability of the actions performed, the Project developed a plan for the entire Calderas River Sub-Basin, upstream of the Calderas Dam, for the irrigation of a 1,200 hectare area of fruit crops based on the planning and design carried out during the formulation of the SAP-Bermejo as a pilot demonstration project. The Department of Tarija's Prefecture committed itself to finance this endeavor. This pilot demonstration project was of great importance as a natural resources management experience, and it also constituted the first stage of the Santa Ana River Basin Management Program.

5.1.3. Integrated Management Program for the Iruya River Basin, Province of Salta, Argentina.

The Integrated Iruya River Basin Management Program, consisting of structural and non-structural measures, had the objective of defining action policies in the Basin with a view to optimizing the sustainable development of resources, promoting economic development and protecting the land and the natural ecosystems in it. The actions were grouped into 6 components, according to the following diagram:



Among the structural measures directed at erosion control, water level consolidation and riverbank protection, the most important were:

- Construction of sidewalls for protection against erosion and undercutting produced by mud and water torrents on the gradient control works in the Milmahuasi River.

- Construction of rainwater drainages in the Town of Iruya. The drainage system was designed and implemented with due consideration of the steep slopes and torrential rains typical of the town. The objective of the works was to collect and channel runoff in order to avoid erosion of the town's hillsides and, therefore, prevent undercutting and landslides.

- Construction of gabion defenses with a view to controlling hillside destabilization processes in Iruya, thus reducing the town's vulnerability in the event of floods.

- Gradient control in the Colanzulí River (wall nº 1 – first fixed point located downstream from the town). The works consisted of the construction of a cyclopean concrete wall as reinforcement of the existing wall. The purpose of the wall is to control the level of the riverbed bottom upstream.

- Gradient control in the Milmahuasi River. This consisted of the reconstruction and covering of the waterfall with stone masonry and the construction of three cyclopean concrete walls, one upstream and two downstream, for the purpose of creating an energy-dissipating hollow; it also included the placement of metal profiles on the upper edge, with an eye to mitigating wall erosion and making it possible for the waters to discharge into the hollow located downstream.

- Construction of two transverse cyclopean

Construction of fluvial drainages in Iruya, Province of Salta, Argentina

Riverside gabion defense, Iruya, Province of Salta - Argentina

Colanzaulí River bottom control and rehabilitation, Iruya, Province of Salta, Argentina

Side wall for the protection of the Milmahuasi bottom control Benchmark , Iruya, Province of Salta - Argentina

concrete walls for gradient control and the consolidation of the Colanzulí River bed, with the aim of stopping Iruya's hillside erosion process.

These last three works, directed at stopping the drop in the riverbed level and, therefore, reducing riverbank erosion risks, had a high impact on fulfilling the Program's objectives, and also retaining an important volume of sediments, estimated at approximately 232,000 m^3.

The set of riverbed consolidation (fixed points) and bank defense works carried out in the Colanzulí River in Iruya proved to be very successful, as shown by the behavior of the fixed points following the floods that occurred between 2003 and 2006, as they controlled the headcutting, maintained the riverbed level, and avoided bank erosion, retaining sediments.

As for the non-structural measures taken to complement the structural measures, afforestation activities were performed to contribute to riverbank stabilization over the courses of the Colanzulí and Milmahuasi Rivers, thus reducing the erosion processes which might affect the Town of Iruya. The trees used for this activity were produced by nurseries of the Municipality of Tilcara (Jujuy) and Iruya High School.

In the area of Colanzulí and San Isidro, a project on sustainable pastures and traditional livestock management was implemented with the participation of the communities, defining actions

for reducing grazing pressure on natural pastures, considering animal loads and vegetation coverage. This activity set forth the following lines of action:

- Animal load management: health management and maintenance of a communal first-aid kit.
- Vegetation coverage management: afforestation, division into pasture plots and sowing pastures, inter-sowing, watering hole management and natural pasture rest period management.

Among the project results, it is worth mentioning the development of new livestock management practices, through the construction of enclosures for pasturing animals or for natural pasture regeneration, and the creation of communal first-aid kits for animal health-care, the strengthening of local organizations and human resources training.

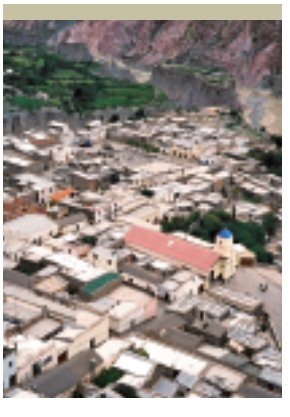
Furthermore, a social and territorial diagnostic analysis of Iruya's environmental risk was conducted, consisting of four basic dimensions: hazards, vulnerability, exposure and uncertainty, seeking to anticipate the potential causes of natural disasters and perform preventive actions to reduce the impacts and negative consequences of events, in this case geohydrologic events.

Information was collected and generated using participatory planning methodologies, including interviews, mental maps and the preparation of thematic cartography, through workshops conducted under this and other components. Based on these actions, the perceived hazards, the vulnerability of Iruya's inhabitants, as well as the

Pasture planting for livestock management, San Isidro, Iruya, Province of Salta – Argentina

Riverside afforestation aimed to bank stabilization, Colanzulí River, Iruya, Province of Salta – Argentina

Implementation of the veterinary sanitary first-aid kit, Colanzulí, Iruya, Province of Salta - Argentina



View of Iruya Town, Province of Salta – Argentina

Forest nursery – Iruya High School, Province of Salta - Argentina

goods and people exposed to the geohydrologic risk and their distribution, were characterized, obtaining a very accurate diagnosis of the conditions of social vulnerability.

Scientific and technical aspects related to territorial zoning guidelines were also analyzed, aimed at reducing possible impacts and stopping the activities, which increased risk. Cultural and identity-related aspects associated with this issue were identified, and exchange and participation activities were established, permitting the gathering of information and explicitly raising awareness of the issue among the population and authorities.

In this sense, the basis for an Early Alert Participatory System (EAPS) was established and the BAGER Plan (Administrative Basis for Risk Management) was designed, prepared and implemented, taking into account experiences generated by the population and strengthening their experiences with its own proposals and with the participation of the Civil Defense Department, municipal authorities and the Municipal Board for Civil Protection (JMPC).

The Project "Educating by Afforesting" had the objective of generating a higher degree of environmental and forestry awareness, seeking to set the basis for improving the quality of life and environmental preservation in the community.

As for the specific issue of afforestation, the Nursery of the Farm and Vegetable Garden Section of High School Nº 5058 "*Senador Eduardo E. Correa*" in Iruya was restored and reopened. Such a nursery was used for the production of plants, including Tamarix, Willow and Pepper Tree, among other species, due to their fodder properties pioneered in the area.

In the Colanzulí River Sub-Basin, irrigation works were carried out within the framework of the "Sustainable Management of Natural Resources for Sustainable Productive Development with Indigenous Communities in the Iruya (San Isidro and Colanzulí) Basin" and "Campo Tapial" components. It is worth mentioning the execution of eight pilot irrigation infrastructure projects, which included the construction of five water collection works and the associated channels (1,492 meters of irrigation ditches) and storage systems. The impact was highly positive in terms of providing substantial improvements in irrigation efficiency in the test plots, representing an estimated increase of 50%.

Within the "Environmental Education" component, the activity called "Waste Management in the Town of Iruya" is noteworthy. The general objective was to formulate and develop a sustainable project on urban solid waste (USW) management, and implementing its first stage. The impact factor was deemed relevant due to the importance of tourism in the area, with attractive landscapes and a great cultural tradition.

As a result of this activity, the diagnostic analysis of Iruya's waste management was conducted, with the participation of the community, and an Integrated USW Management was designed,

proposing improvements and/or solutions for the problems detected in the collection, transportation, treatment and final disposal stages, including regulatory adjustments within the current legal and institutional framework.

Furthermore, community and municipal personnel were trained in waste use alternatives (plastic basketwork workshops, compost production, dissemination and implementation of USW differentiated collection) and the manual landfill and compost field work was enabled, with its location chosen based on technical studies and corresponding public consultation and environmental impact assessments, in accordance with Law Nº 7070 on Environmental Protection (Province of Salta, Argentina).

It is important to highlight that this project "Waste Management in the Town of Iruya" was presented in the first national edition of the *"Escobas de Plata®, Oro® y Platino®"* Contest, organized and carried out in 2003 by the Solid Waste Study Association (ARS)–National Member of the International Solid Waste Association (ISWA) in Argentina-in cooperation with the ISALUD Foundation University Institute, and with the support of Argentina's Secretariat of Environment and Sustainable Development. The project was awarded the Escoba de Plata (Silver Broom).

5.1.4. Grande River Basin Management: Huasamayo River Basin Systematization, Province of Jujuy, Argentina

The general objective of this Project was to implement structural measures for mitigating the effects of erosion associated with torrential flows typical of the Grande River Basin, with a view to reducing the hydrological risks in the City of Tilcara, and, thereby, protecting its archeological and architectural values and the overall population.

Placement of water pipes with local community, Campo Tapial, Province of Salta - Argentina

Training activities with local community in separation at source, and recycling of urban solid waste.

The erosion control works were installed using small gabion dams along a series of waterways. The works were made up of the following: five gabion walls built in Quebrada de Cementerio, nine gabion walls built in Quebrada del Valle, seven gabion walls built in different sectors of Tilcara's piedmont and a 52-meter gabion wall built in Quebrada Seca.

Wall for stream control. Quebrada del Valle, Tilcara, Province of Jujuy - Argentina

Cleaning of the Huasamayo River bank, Province of Jujuy – Argentina

Activities for cleaning the Huasamayo River bed in the area where it flows into the Grande River were also performed. The tasks consisted of:

- Cleaning the river by removing debris from the riverbed with a bulldozer (channeling) and reducing its bottom elevation by 2 meters in order to increase the passage section below the bridge.

- Cleaning of the area where the Huasamayo River flows into the Grande River, in Jujuy, including the Huichaira River mouth section, by removing approximately 120,000 m^3 of material.

Construction of a defense embankment on the right bank near the bridge using the material obtained from the channeling.

As for the non-structural measures regarding the Huasamayo River Basin management, and particularly for the area of Tilcara, a proposal for land use zoning focused on social vulnerability and environmental risk was prepared. For this, the following activities were performed:

- Systematization of spatial information, including the collection, review and selection of cartography, aerial photos and satellite images of the study area.
- Implementation of a Geographical Information System (GIS) as a management tool for the Municipality.
- Identification and solution of information gaps, according to the subject areas classified into physical, social and economic, legal and institutional, cultural and educational components.
- Preparation of thematic cartography, including that referring to vulnerability and environmental risks, for the purpose of carrying out an integrated diagnostic analysis of the City of San Francisco de Tilcara and its environs.
- Analysis of soil use conflicts, which impair land use management and zoning. Implementation of participatory SWOT analysis (Strengths, Weaknesses, Opportunities and Threats).
- Promotion of the community's participation in public hearings and citizen representation through existing organizations or other forms of participatory management.
- Creation and operation of a center for disseminating the scope, results, commitments

and benefits of the Land Use Zoning Plan Project.

These activities resulted in the production of a set of thematic maps, the implementation of a Geographical Information System, the preparation of a diagnostic risk situation analysis, and a population trained in, and aware of, environmental risks.

The "Forest Nursery" project, implemented by the Municipality of San Francisco de Tilcara (Province of Jujuy, Argentina) had the purpose of producing native plants for the Basin's environmental restoration through the development of standards, technology, trained personnel and the preparation of the required documentation for the operation of a plant production system with the necessary quality and costs for future bioengineering activities in the Sub-Basin.

The activities performed included, among others, the organization of workshops for personnel training, the purchase of equipment, instruments and other inputs essential for the nursery operation, soil preparation and planting of selected species, the design and launch of educational campaigns in schools and neighborhood centers, the creation of a center for disseminating bulletins and brochures, and the development of transfer and extension activities.

The products and results obtained were, among others, the development of production standards and related technologies, with corresponding technical documentation, the training of human resources for carrying out the different nursery tasks, the implementation of a Germplasm Bank, the development of 20,000 seedlings in planting-ready condition, the launch of ten educational campaigns, the preparation and distribution of informative material and the opening of three afforested public spaces.

Forest nursery, Municipality of Tilcara, Province of Jujuy - Argentina

Brochure El Rey National Park, Province of Jujuy – Argentina

Guarani Symbolic Interpretation Path, Calilegua National Park, Province of Jujuy - Argentina

Visitors Center and signs, El Rey National Park, Province of Salta – Argentina

5.2. Consolidation of protected areas and biodiversity protection

5.2.1. Implementation of Ecotourism Alternatives

Within the framework of the ecotourism promotion activities carried out in the area of the piedmont forest (Yungas), those implemented in Calilegua National Park, in the Province of Jujuy, and El Rey National Park, in the Province of Salta, both in Argentina, were particularly noteworthy.

The implementation of *ecotourism* projects was oriented to evaluating land uses in the areas surrounding the National Parks, in order to identify, design and implement alternatives based on environmentally sensitive tourism for the sustainable use of the buffer zone around these protected areas.

Although many actions included in this component were planned to be carried out in the parks' surroundings, most of them were carried out inside the parks given the existence of a governmental institutional framework for protected area management and the population's acknowledgement of the values and services provided by the National Park Administration through the park ranger service. Nevertheless, progress was made regarding the identification and formulation of an ecotourism circuit in the Calilegua National Park's buffer zone, describing its implementation potential and restrictions in three sectors: i) San Francisco – Alto Calilegua; ii) Valle Grande – Valle Colorado and iii) Valle Colorado – Santa Ana. These circuits include walks, horseback riding and trekking opportunities.

The activities carried out led to the creation of a Guarani Symbolic Interpretation Path, located in Calilegua National Park, from the Aguas Negras campsite to Provincial Road Nº 83. For this purpose, an inter-cultural workshop was organized and 70

people actively participated. Moreover, training courses for tourist guides were given and training material, informative billboards, posters and educational brochures on the region's protected areas, particularly the parks, were prepared and distributed.

In El Rey National Park, interpretative and informative material for visitors and neighboring communities was designed and prepared, the entrance of El Rey National Park was built and the Visitor's Center was restored and put into operation.

5.2.2. Carbon Fixation in the Sub-Andean Region

The Project on Carbon Fixation in the Sub-Andean region in Bolivia had the objective of managing and preserving renewable natural resources and the environment by applying sustainability criteria through integrated carbon fixation actions, with the active participation of beneficiaries and the institutions of the Municipality of Entre Ríos, in order to improve the quality of life of the local population in the selected area (San Antonio community, O'Connor Province, Department of Tarija) of the Salinas River Basin.

This first experience was implemented in an area of the Sub-Andean region considered representative, not only of the biophysical complex, but also due to the presence of inappropriate land use practices, with the resulting degradation of the Salinas River Basin's natural resources.

The project was executed through three components:

I) Agroforestry Practices;
II) Forest Plantation Production;
III) Natural Productive Forest Management.

Among the Agroforestry Practices, the activities performed included the rehabilitation, management and conservation of resources by establishing forest plantations in marginal areas using native and exotic species and the use of timber-yielding products of the natural productive forest.

Within the framework of Component II: Forest Plantation Production, selected forest species were planted on 63 hectares. An essential instrument was awareness-building and training activities directed at 50 families regarding forest preservation practices. Such activities were the result of an appropriate and timely strategic planning process.

In Component III: Natural Productive Forest Management, a General Forest Management Plan (GFMP) was prepared in accordance with Technical Regulation 132/97 of Bolivia's Forest Act. It covers a net area of 75.61 hectare of forest surface to be managed, which has 1,803 trees/hectare, representing a yield of 3.46 m^3/hectare. The management unit, or administrative GFMP exploitation unit, includes 58.52 hectares. The cutting cycle is from 1-20 years. The cutting intensity accounts for 64.8% of the exploitable trees, primarily cedar trees (*Cedrela balansae*) and walnut trees (*Junglas australis*).

For its execution, the Plan includes and systematizes the following information:

1. *Ownership information:* Includes legal ownership framework, surface, adjoining land, geographic coordinates and a description from the census.
2. *Biophysical aspects of the forest*: Describes generally the types of soil, current uses of the forest, interventions or disturbances to which the forest has been subjected, climate and life zone, hydrographic aspects, as well as a very brief description of social, economic and demographic characteristics.
3. *Objectives of the management plan:* Describes the management plan objective.
4. *Vegetation description:* Describes the vegetation per stratum of the most important species.
5. *Census results:* Survey results of the number of trees, basal area and volume for cutting and remaining trees per species and total, with the description of the potential number of trees, basal area and volume per species, and total.
6. *Forest zoning/division strategy:* Specifies the zoning strategy and administrative forest management unit, including a forest management and treatment proposal with the type of management, cutting intensity, cutting cycle and justification.
7. *Use planning:* Describes pre-use, use and post-use activities and methods.
8. *Industrialization and commercialization:* Documents the type of transformation and timber sales processes.
9. *Other goods and services:* Describes the use of other forest goods and protection measures derived from forest use.
10. *General forestry provisions*: Describes forestry measures for forest enrichment.
11. *Activity schedule:* Generates a schedule of activities.
12. *Maps:* Includes spatial information on the distribution of usable commercial and remaining trees.

5.2.3. Biodiversity Study

The "Biodiversity Study" Project had the objective of improving the current knowledge on the biodiversity in the Bolivian sector of the Upper Basin of the Bermejo River, determining the state of conservation of the ecoregions, identifying problems affecting the biota and conducting a diagnostic analysis of information voids, proposing lines of action for improving conservation and management activities.

The activities performed included the environmental, social and economic assessment of the area, paying particular attention to productive activities and use of biological diversity, the evaluation of existing threats to the values of biodiversity conservation in the study area, the definition of environmental and sustainability indicators for assessing biodiversity knowledge, conservation and management efficiency, and the formulation of an action plan for the sustainable management of biodiversity products and services.

The products obtained include: I) Biodiversity Study; II) Report on Ecological and Socio-economic Landscape Systems; III) Report on Conservation Status and Sustainable Biodiversity Utilization

Opportunities and IV) Diagnostic Analysis and Action Plan, including the Biodiversity Conservation and Management Plan with its economic evaluation, proposal and social and environmental monitoring guidelines. Other products include the fauna and flora diversity database and the flora and fauna collections, and thematic maps at 1:500000 and 1:250000 scales regarding bioclimate, plant units, forest coverage, ecological landscape systems and critical conservation areas, among others.

This work generated important baseline information for the study area, which has substantial, but poorly known, biodiversity. An evaluation and a diagnosis of the conservation status and threats were carried out for species and ecosystems, as well as the identification of critical areas and their categorization.

The study considered local uses of the different biodiversity components, integrating academic with traditional knowledge. Moreover, an economic evaluation was conducted within the framework of a biodiversity conservation and management plan, selected biodiversity indicators were identified and a monitoring program was established.

Species in danger of extinction

Calilegua-Baritú-Tariquía Ecological Corridor area

5.2.4. Implementation of the Calilegua-Baritú-Tariquía Biological Corridor.

The original proposal prepared during SAP-Bermejo formulation phase considered the connectivity between the protected areas of Tariquía National Flora and Fauna Reserve in Bolivia and Baritú National Park in Argentina. Then, during SAP-Bermejo implementation, the corridor area

was expanded to include Calilegua National Park in Argentina. This decision was made based on the proposal for the creation of the Yungas Biosphere Reserve, as part of the UNESCO World Network of Biosphere Reserves.

In this context, and within a broad process of public participation of social and institutional stakeholders from both countries, SAP-Bermejo prepared a Short-term Action Plan for the Calilegua-Baritú-Tariquía Biological Corridor, directed at improving the biological connectivity, the sustainable exploitation of natural resources, and the quality of life of its inhabitants.

For the formulation of the short-term plan for the biological corridor, the diagnostic study of the area was updated and management programs and projects were formulated at the level of final design. Similarly, land use zoning plans were formulated at communal and farm levels, seeking to organize and optimize the use of natural resources (pilot level), and identifying critical connectivity sites for the implementation of a fauna monitoring system. As part of the activities carried out, binational workshops were organized for the preparation of the terms of reference and the presentation and validation of the management plan.

The objectives of the Biological Corridor Management Plan were to maintain acceptable biological connectivity levels and ensure the continuity of natural processes, improve the population's quality of life through sustainable activities and consolidate public participation.

The Plan was structured around three components:

Institutional Component: Directed at generating capabilities for strengthening the social stakeholder participation process, starting the process of creating a binational management body, strengthening the existing organizational structures and/or creating necessary new structures, and generating mechanisms for making social stakeholder participation feasible.

Economic and Social Component: Aimed at strengthening on-going sustainable production activities; promoting sustainable and innovative practices; supporting the search for financing to provide and/or improve basic utility services; promoting incentives for the implementation of sustainable activities, fostering the appreciation of environmental services and the sustainable management of livestock and native forests; identifying critical public health issues and supporting prevention campaigns.

Environmental Component: including actions for the implementation of fauna and farming monitoring systems; identifying critical situations for sustainability of the fauna, flora, ecosystems and natural resources at the regional and local levels, as well as critical situations (from a species-specific perspective) in terms of biological connectivity, the continuity of natural processes and biodiversity conservation; managing resources for implementing mechanisms for the prevention, mitigation, restoration and correction of potential/current critical situations (including

connectivity, the continuity of natural processes and the operation and representativeness of conservation units); and promoting the implementation of monitoring systems for production activities, to help assess their sustainability.

In the Bolivian sector of the Corridor, progress was made in the implementation of short-term management plan actions. For this purpose, an agreement between SAP-Bermejo and Bolivia's National Service for Protected Areas was established, which defined and consolidated the institutional framework. Moreover, the Technical and Humanistic Farming Center of Emboruzú (CTHA) was hired for the execution of production demonstration projects, including training for community leaders and authorities.

In particular, the *training and production* actions had the objective of strengthening community organizations in the Corridor area, seeking increased access to information by community leaders and authorities, an appreciation of their knowledge, and the availability of basic requirements for the identification and formulation of projects to ensure the Corridor's sustainability.

Additionally, *"Production Demonstration Projects"* were implemented with an eye to identifying and promoting innovative production activities, oriented to the rational and sustainable use of natural resources and the direct benefit (through higher earnings) of the communities involved. The production demonstration projects were related to: I) community ecotourism; II) sustainable ranching; III) sustainable forest management; IV) production of strategic alternative crops and v) beekeeping. In each case, the activities included the organization of training workshops and the generation of production manuals, informational materials, management and production plans and strategies for the execution of projects, including organizational, institutional and funding aspects. Similarly, specific actions were conducted in the execution or implementation of projects, such as the construction of beehives, storage centers, establishment of pastures, etc.

Finally, it is worth noting the legal and institutional aspects related to the formulation of a long-term management plan for the creation of the Yungas Transboundary Biosphere Reserve (YUNBR), as a mechanism for achieving biological connectivity, the functioning of natural systems and the sustainability of conservation activities. This Transboundary Reserve was the result of a binational agreement formalized in COBINABE Joint Resolution 03/04, which states: *"It is declared that the development of the project on the Transboundary Biosphere Reserve in the Upper Basin of the Bermejo River is of binational interest".*

Based on the actions taken by the UNESCO-MAB Program focal points, with the aim of establishing an institutional framework for the creation of the Transboundary Biosphere Reserve, it was concluded that the appropriate way to obtain the Reserve declaration would be to create a Biosphere Reserve

in Bolivia, and then apply for recognition of the Transboundary Reserve.

For this purpose, a proposal for the creation of the Yungas Biosphere Reserve in Bolivia was prepared. This document was disseminated through presentations to the communities and authorities involved, and a consensus was reached regarding a zoning proposal.

In the Argentine sector of the Yungas Biosphere Reserve, the management plans for Potrero de Yala Provincial Reserve in Jujuy and Laguna Pintascayo Provincial Reserve in Salta were prepared jointly with the respective provincial authorities and local communities. The two above-mentioned protected areas are core zones of the YUNBR.

- *Potrero de Yala Provincial Park Management Plan*

The Potrero de Yala Provincial Park Management Plan was prepared for guiding Park management over the short term (1-2 years) and medium term (5 years), considering both the environmental functions of the area and the expectations of the local and regional communities in terms of recreation, education and sustainable development.

The work was organized in three stages: a) diagnosis, b) agreement of the technical basis for the management plan and c) proposal of management programs.

The Management Plan is made up of the following programs: I) research and environmental and socio-cultural monitoring; II) management of natural resources and production activities; III) public use and tourism, including impact assessment and correction; information, environmental education, education and training and iv) Park management, including administration, control, surveillance, infrastructure, legal and financial issues.

The Management Plan is the planning instrument for meeting the Yala Park management and conservation objectives, which are:

- To maintain in perpetuity the natural and cultural values of the Yungas ecoregion represented in the Yala Park, from a sample altitudinal floor of the Montane Forest and Foggy Grasslands, as well as the natural and traditional production processes supporting them.
- To improve the quality of life of the local communities, integrating them and making them co-participants of the benefits resulting from the management of the protected area.
- To strengthen and organize the Park's administrative structure, and consolidate its perceived value by the inhabitants of Jujuy and the region.
- To arrive at a zoning system for the Park, based on its potential and limitations through a consensus among the scientific, technical, production, societal and cultural points of view.
- To formalize a permanent relationship between the public and private sectors, in order to adjust actions according to changes in land use and new paradigms, both in terms of conservation and regional development.

- *Integrated Management and Development Plan for Laguna de Pintascayo Provincial Park*

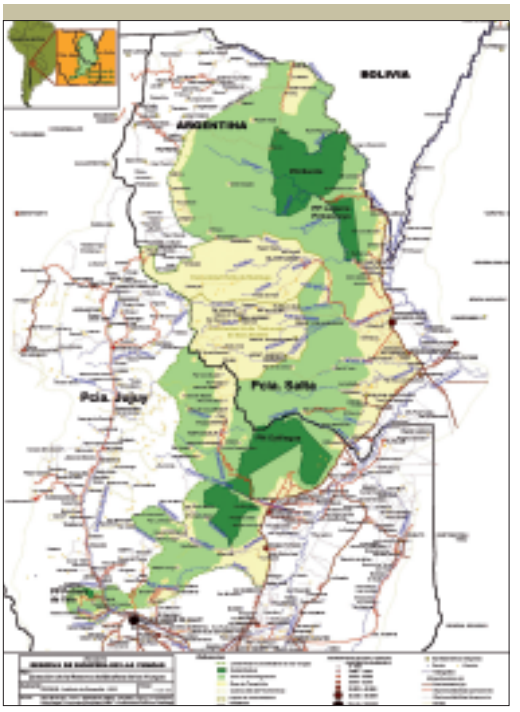
The preparation of the Integrated Management and Development Plan for the Laguna de Pintascayo Provincial Park made possible to orient the proposals for the conservation of this Protected Area within framework of the environmental policies of the Province of Salta. For this purpose, a multidisciplinary team was created, and charged with preparing the Integrated Management and Development Plan (IMDP) in a participatory manner. Activities carried out include research, field trips, as well as workshops and interviews with stakeholders involved in the Protected Area.

The IMDP document consists of three sections: Environmental Diagnosis, Legal Framework and Strategic Action Plan.

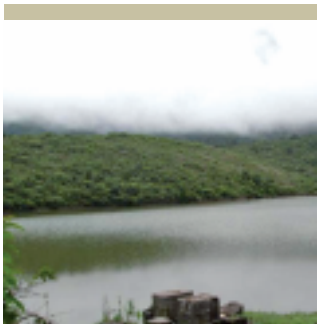
The *Environmental Diagnosis* provides a description of the area, assessing the current state of conservation of its values, the activities being carried out, their potential and their role in the regional context as a core zone in the Biosphere Reserve and in the Tariquía-Calilegua Corridor.

The *Legal Framework* is a compilation of the laws governing the Park's operation and the implementation of the Plan.

Finally, the *Strategic Action Plan* defines the Park's objectives and vision, the IMDP objectives, the Protected Area zoning, the actions to be carried out and their order of priority, the implementation schedule, the IMDP follow-up and evaluation



Biosphere Reserve of the Yungas



Potrero de Yala Provincial Park, Province of Jujuy – Argentina

Laguna Pintascayo Provincial Park, Province of Salta – Argentina

parameters and an estimated budget for its execution.

Other products generated by this project include: A Mutual Cooperation Agreement between the Ministry of Environment and Sustainable Development of the Province of Salta and the Municipality of Orán, a list of potential funding sources for the implementation of the IMDP, the Constitutive Act of the Park´s Management Committee and the proposed regulations for its operation, reports on the three workshops conducted, press releases on the process and a review of the Park boundaries.

5.2.5. Zoning and Management Plans for the Sama and Tariquía Biological Reserves, Bolivia

This Project involved the most important protected areas in the Bolivian sector of the Basin: Tariquía National Flora and Fauna Reserve and Sama Mountain Range Biological Reserve. The formulation of management plans in these areas was proposed under the existing regulatory framework in Bolivia, with the following objectives:

- To provide a technical and regulatory management instrument, contributing to the planning and execution of activities aimed at meeting protected area conservation objectives and satisfying the communities' development needs.
- To characterize the conservation values and the environmental problems present in the protected areas, and determine the strategies and activities to be implemented in the short term to address the concerns.
- To integrate the management of protected areas with municipal and department planning in order to ensure the combination of human and economic efforts.
- To institutionally strengthen the management of protected areas.

The activities carried out within the framework of the "Management Plan for Sama Mountain Range Biological Reserve" (SMRBR) Project were: Preparation, Collection, Generation and Systematization of Information; Diagnosis and Analysis; Zoning; Definition of the Strategic Framework and Preparation of the Management Plan.

For carrying out the Comprehensive Diagnosis for the SMRBR, in addition to providing a biophysical, social and economic description of the area and the buffer zones, existing problems, limitations and potentials were identified, taking into account the presence of settlements, the objectives of natural resource conservation, the beauty of the landscape and its archeological attractions.

Based on the analysis of the land use, the zoning proposal was prepared, defining different management zones and sub-zones and special use sites, including a proposal for the SMRBR redelineation and recategorization.

The Management Plan was proposed with a basic structure consisting of the following management programs:

- Integrated Participatory Land Management
- Conservation of Natural Resources
- Support for Local Economic Development.

The results produced were the following:

- SMRBR Management Plan
- Comprehensive Diagnosis of the SMRBR
- SMRBR Ranching and Pasture Diagnosis
- Diagnosis of the Use of SMRBR Natural Resources
- Protected Area Zoning
- Legal Study on Land Ownership
- Regulations for the Use of Natural Resources
- Survey of Mammals
- Survey of the Cardonal area
- Livestock and Pasture Management
- Surface Water Study
- SMRBR Livestock and Pasture Management Plan
- SMRBR Cartography Guide
- Educational and Informational Materials: 9 leaflets and 3 booklets

Management Plan for the Sama Mountain Range Biological Reserve

This Plan was widely disseminated and validated by all community and administrative bodies corresponding to the farming communities, the association of farming substations and the Management Committee. Finally, the Plan was approved by the National Service for Protected Areas through Administrative Resolution 27/2005 and by the Ministry of Sustainable Development, through Ministerial Resolution 21/2006, granting it full legal and institutional validity for the Reserve's management.

The process of preparation of the Action Plan for Tariquía National Flora and Fauna Reserve (TNFFR) was developed in three stages: (I) Review of existing information; (II) formulation of the Action Plan, and (III) presentation and validation of the proposal. Communities, farmers' trade unions and the representatives of the municipal governments having jurisdiction in the TNFFR participated in each of these stages.

Important guidelines resulting from the information analysis and evaluation were incorporated. They included: improving the production systems of the communities inside the Reserve, under environmental efficiency and sustainability criteria; addressing the institutional weakness of the TNFFR management; facilitating

local participation and generating social commitment for the management of the Reserve, seeking coordination with other levels of government planning, such as municipal and departmental.

The Action Plan fosters investment in the sustainable management of natural resources, livestock, farming, beekeeping, fish breeding and ecotourism. Moreover, it proposes the implementation of norms that allow for the rational use of natural resources, and stipulates investment in scientific research.

The specific results produced through the execution of this activity were:

- Tariquía Reserve Action Plan
- Action Plan project profiles
- Livestock Management Plan
- Monitoring and Regulation of Fisheries
- Environmental and Socio-economic Monitoring Program for the Reserve

5.2.6. Evaluation of Pastures in the Sub-Andean Region

The study of pastures in the Sub-Andean region had the objective of evaluating the characteristics and situation of natural grazing lands located in the Upper Basin of the Bermejo River in Bolivia, and to propose management strategies for sustainable development, including a database and an action plan for the conservation and management of these systems.

The study area geographically covered five provinces and six municipal sections of the Department of Tarija, Bolivia: Province of Arce (44.9%), Province of O'Connor (26.8%), and Province of Gran Chaco (18.9%); the remaining 9.5% corresponded to lands in the Province of Avilés and the Province of Cercado.

In particular, the project was aimed at:

- Identifying and characterizing the types of vegetation used for grazing in the Sub-Andean region.
- Identifying representative administrative units where grazing is an important economic activity.
- Identifying and characterizing ecological management units (sites) of natural grazing land in the representative administrative units (grazing zones).
- Determining the seasonal animal load for the representative administrative units.
- Determining the grazing value and estimating the seasonal animal load capacity of representative ecological units.
- Determining fodder balances per season and per year for the representative administrative units (load capacity versus actual animal load).
- Preparing an action plan for the conservation and management of pastures in the Sub-Andean region, including strategies and actions related to sustainable natural grazing land management.
- Preparing a manual on sustainable management of pastures in the Sub-Andean region.

The evaluation of pastures in the Sub-Andean region was carried out by gathering physical and biological information at two levels: a) at the general level, with low intensity for all grazing lands, based on secondary information, which was

complemented with information from satellite images; and, b) at the specific level, for which four representative areas were selected and high resolution satellite images (icons) were compared and then interpreted in order to define the sampling units (grazing sites).

The works were carried out in four natural grazing lands (CANAPAS), located in Iñiguazu (Province of Gran Chaco), Salinas (Province of O'Connor), Salado Conchas (Province of Arce) and Papachacras (Province of Aviles) during two different seasons: the dry season (May-August) and the rainy season (December-March), according to the use of pastures by livestock.

The evaluation was aimed at establishing the land use potential for sustainable production, taking into account the qualities and characteristics of the different land units and the types of production intended to be implemented. Basic biophysical information and cartography with qualitative information was prepared, providing a general overview for planning land resources in the study area, and making it possible to generate a Livestock Development Action Plan for the Sub-Andean region of the Bermejo River Basin.

The main products are the reports on the assessments of land quality for cattle-raising purposes and the Livestock Development Action Plan. This Plan includes the following programs: I) food and nutrition; II) genetic improvement and reproduction; III) preventive environmental sanitation and IV) installation of regional veterinary emergency centers and pharmacies.

Training Workshops in Tariquia, Bolivia

5.3 Water quality protection and restoration

5.3.1. Environmental Clean-up of the Guadalquivir River, Bolivia

During the SAP-Bermejo Formulation Phase, the study of the Guadalquivir River Clean-up was started. The Guadalquivir River crosses Tarija's central valley and the City of Tarija (providing significant value from an environmental point of view, as it is the main source of water for the region) and has been affected by the dumping of domestic and industrial effluents, jeopardizing the quality of water for different uses.

The general objective of the study was to assess the pollution level of the Guadalquivir River, determine its impact and propose solutions for cleaning up the river and maintaining the sustainability of the river's water quality. The study included the following:

- Assessment of the pollution level of the Guadalquivir River based on monitoring carried out by different institutions and by the study itself.
- Location of the main effluent discharge points and characterization of their quality by means of laboratory tests.
- Evaluation of the efficiency of the existing waste water treatment systems.
- Evaluation of the existing solid waste disposal system in the city and proposals for its improvement.
- Assessment of the sanitary conditions in the surrounding rural area, determining its influence on the river's pollution and recommending solutions for the problems identified.
- Assessment of aquifer pollution levels.
- Analysis of the legal framework regarding clean-up and the environment.

Based on the analysis conducted on the Guadalquivir River's water quality, it was found that, in general, the river had Class C water (requiring complete physical and chemical treatment: coagulation, flocculation, filtration and disinfection for human consumption) in all sections, except for the San Lorenzo – Tomatitas section and from Torrecillas al Agosto, where it had Class D water (requiring long storage or pre-sedimentation, followed by complete treatment, like Class C, for human consumption). The presence of fecal coliforms is more common in this latter class.

For designing different clean-up solutions, the basic premise was that the sections with Class C water should be upgraded to Class B (requiring only physical treatment and disinfection for human consumption) and the sections with Class D water should be upgraded to Class C. For this purpose, the following measures were proposed:

- Compliance with environmental legislation and its application at the regional level.
- Expansion of the City of Tarija's sewage system.
- Upgrading of the City of Tarija's wastewater treatment systems.
- Implementation of wastewater treatment systems in small rural communities.
- Improvement of solid waste management.
- Prevention of aquifer pollution.

As for environmental sanitation in the surrounding rural area, proposals were set forth for the construction of a streamlined sewer system, treatment with septic tanks and lagoons with horizontal surface flow as well as providing sanitation solutions for communities with isolated houses using sanitary latrines.

The study proposed and identified a series of works and activities related to the elimination of polluting effluents dumped into the Upper Guadalquivir River Basin, differentiating two intervention sectors: the first sector upstream of Tomatitas and the second sector covering the entire area of influence of the City of Tarija.

During SAP-Bermejo Implementation Phase, the activities carried out were focused on the first sector and consisted of the construction, commissioning and operation of a pilot effluent and

waste water treatment plant. This included the construction of the following works:

- Collector sewers in Tomatitas, consisting of 1,840 meters of piping, 29 inspection chambers and 34 home connections.
- Maturation lagoon in San Lorenzo, with 2,433 meters of piping and 493 meters of perforated piping.
- Sewer system connection in the Town of Canasmoro.
- 63 septic chambers and 20 latrines for isolated houses.

This work was very significant at the regional level, due to its high impact on improving the population's quality of life. For their operation and maintenance, the works were given to the competent entities: COSAALT in the case of Tomatitas, and the Municipality of San Lorenzo in the case of San Lorenzo and Canasmoro.

Maturation pond, San Lorenzo, Bolivia

Bermejo Triangle (Alto Bermejo and Grande de Tarija Rivers)

5.3.2. Environmental Clean-up of the Bermejo Triangle Watercourses

The main objective of the Project was to assess the degree of contamination and its main causes, and to propose solutions for the environmental clean-up and sustainability of the waters of the El Nueve and El Cinco streams and the Grande de Tarija and Bermejo Rivers, affected by industrial and organic pollution.

The study included:

- A diagnostic analysis of the sanitation status of the Bermejo Triangle rivers and streams, which showed that the Bermejo River had Class B

water in the Condado–Juntas de San Antonio section due to the presence of fecal coliforms. According to the level of fecal coliforms, the Grande de Tarija River had Class B water from El Cajón to its confluence with the Stream 9, and Class C water from its confluence with the Stream 9 to Juntas de San Antonio.

- The Bermejo Triangle Environmental Clean-up Plan, consisting of:
- Proposal for municipal regulations for water quality management.
- Environmental education program.
- Basic sanitation projects for both the Bermejo Triangle rural and urban areas, as well as environmental sanitation projects for the sugar industry.
- Project proposals at the level of engineering design for environmental sanitation in areas surrounding the City of Bermejo, in the communities of Campo Grande, Colonia Linares and Barredero, and environmental sanitation projects for the sugar industry.

This Plan was submitted to the Municipality of Bermejo and the Bermejo Farming Industry Administration (IABSA), who expressed their intentions to seek funding for the corresponding works.

5.4. Lessons Learned and Best Practices in the "Environmental Protection and Rehabilitation" Strategic Area

What follows is a description of the principal lessons learned and best practices arising from the experience of the implementation of prevention, protection and rehabilitation activities carried out in the framework of the SAP-Bermejo.

The subsequent list details the main lessons learned, dividing them into those related to (I) erosion and sediment transportation processes; (II) the protection of protected areas and management plans; (III) biodiversity studies and ecotourism development and (IV) waste management and pollution control.

(I) Erosion and sediment transportation processes:

- Given the special hydrosedimentological nature of the Bermejo River, particularly in the lower basin, the design and project of erosion control works in the basin must necessarily include a geomorphologic study of the area, apart from the regular classical studies performed in these cases (hydrology, hydraulics, etc.).

- The sediments produced by surface erosion are mainly associated with the mobilization of soil by direct impact of raindrops and its subsequent transport by surface runoff. It is a process which has certain continuity over time associated with the ordinary hydrological events typical of the Basin. In contrast, the sediments produced by mass removal such as landslides, riverbank collapses, mud flows, detritus flows, etc. are related to the Basin's hydrogeological instability and are linked to extreme hydrological events; therefore, they do not

show the same continuity over time as the mobilization of soils by rainfall events.

- The complexity of the physical processes involved in mass removal makes it very difficult to quantify them, both for determining the volume of sediments produced by this means and for setting design variables in the case of works required to manage these types of processes.

- The numerical models for representing and resolving the different water and sediment flows present in the Bermejo River Basin were validated and can be used for solving problems in the Bermejo River and its tributaries. The ANDES model, developed within the framework of SAP-Bermejo, turned out to be a very useful tool in the Upper Basin and its use has been successfully replicated in many montane rivers in South America.

- The use of the FLO2D model for mudflows permitted a description and quantification of the processes related to highly concentrated sediment flows, although the results do not have a high level of accuracy. In contrast, the MIKE 11 model from the Danish Hydraulic Institute, used for analyzing the fluviomorphological behavior of the Lower Bermejo River, proved, through comparisons between measured and estimated situations, to be a model which, under the hydrosedimentological conditions of the Lower Bermejo River, yields reliable highly accurate results. The two-dimension RVMeander model, developed at the University of Illinois, Urbana, USA, and used in the Lower Bermejo River, also gave satisfactory results.

- Erosion control works require systematic maintenance. Due to their characteristics and location, works are exposed to different degrees of deterioration during their lifespan, even if the design parameters are not exceeded. Well planned and well built works should meet its objectives, despite some acceptable degree of deterioration. The possibility of including a maintenance period in the construction agreement (for example, one or two years) must be analyzed. Under these conditions, it will also be good practice to monitor works that are already built and in operation.

- Coordination among institutions such as municipalities, universities and the government requires great effort in order to balance their priorities with the needs and interests of the local community.

- In order to strengthen the local community's ownership of projects, it is necessary to reinforce the participation of the population and the value of their local knowledge, systematizing and integrating their contributions with those of the technical and academic sectors.

- Works and practices for erosion control in the headwaters must be carried out in combination with works for sediment-in-transit control,

optimizing these types of works from an economic point of view.

- It is fundamental that sediment control projects ensure benefits for the population settled in the area of intervention. In order to achieve farmers' participation, works must offer direct local benefits, which have immediate impacts through microirrigation, water for cattle watering, water for fish breeding, etc.

- The interventions regarding the conservation and management of irrigated and unirrigated farmlands are an efficient way to mitigate erosion, promote sustainable use of these soils and improve the social and economic conditions of the beneficiaries.

- Implemented structural and non-structural sediment control measures are successful at a local level, and their replication in larger areas can have significant influences downstream.

- The solution to water deficits, flora restoration, erosion control and the improvement of farming and ranching production systems are better addressed simultaneously, applying an integrated basin management approach.

- Working with the local community on aspects such as organization and awareness-building regarding the importance of the conservation of soils and natural resources is definitely a key aspect for successful integrated basin management.

- The magnitude and complexity of sediment transport processes in the Bermejo Basin require that this problem be analyzed and addressed in a multidisciplinary manner.

(II) Protected areas and the preparation of management plans:

- The promotion of inter-cultural values in protected areas is an appropriate way to integrate the cultures of the inhabitants of the buffer zones or the protected areas into the conservation and sustainable management activities in these areas.

- The protected areas have great educational potential, which can be best exploited through brochures, interpretive signs and educational tours.

- Management plans are a vital tool for protected areas, permitting planning in the medium term of tasks to be carried out in order to meet objectives, whether resource conservation or management, set when creating these areas.

- The definition, demarcation and zoning of protected areas must be supported by scientific studies, based on which management plans must be prepared, according to biophysical, environmental, social and economic realities.

- In order to facilitate adequate planning and management of reserves, it is necessary to improve the level of knowledge about biodiversity in terms of existing species and ecosystems in the reserves' ecoregions,

contributing to the conservation of local, regional and global biodiversity.

- The lack of awareness of visitors and the communities settled in reserves regarding the protection of natural resources and conservation values results in inadequate and unsustainable uses of such resources. In this respect, it is necessary to disseminate economic and ecological functions of the ecosystems present in the reserves (e.g., higher vegetation coverage and plant biomass results in higher carbon fixation capacity, improves soil protection, reduces runoff, improves the water infiltration and management capacity, etc.), encouraging a positive perception of natural resources by the reserves' inhabitants and visitors.

- The preparation of management plans for protected areas in collaboration with all stakeholders is a difficult but promising way of integrating the actors on a voluntary basis into the conservation and sustainable management of natural resources.

- The preparation of management plans for protected areas must take into account that conservation has a social function which must be shared by everyone and in which all the social and institutional stakeholders must be acknowledged and valued.

- Management plans must be approached as adaptable tools, which are evaluated as they are executed, being open to improvements or new, originally unforeseen scenarios. The self-evaluation and monitoring systems stipulated in the plans are a vital element for keeping them updated and closely linked to the realities of the area in question.

- It is necessary to strengthen the institutions in charge of implementing management and action plans for achieving expected results.

- The follow-up of management plan formulation processes by competent authorities, located in administrative centers near the region where the activities are carried out, facilitates the fulfillment of the planned goals by the stipulated deadlines.

- Conservation is not *per se* easily assimilated by the local communities; therefore, management plans and projects for the exploitation of natural resources in protected areas or special protection areas must reflect the demands and development projections identified by the local communities, incorporating productive activities which will ensure the economic basis for the improvement of household incomes.

(III) Biodiversity studies and ecotourism development:

- The study of biodiversity in areas being analyzed must be conducted in a participatory manner, taking and integrating the information provided by the different social stakeholders in order to capture their different visions and knowledge of the studied elements.

- The research and monitoring of biodiversity in protected areas and their peripheral areas must be closely linked to their management by provincial and national authorities, so that the results are useful for guiding protection and management objectives.

- Studies and research on biodiversity can be conducted through universities, where there is a whole array of specialists in different fields.

- Coordination among institutions such as the National Park Administration, the provincial governments, local governments and the business sector is vital for the efficient development of ecotourism initiatives.

- In order to implement ecotourism projects, it is necessary to work in the medium term with local associations (or other types of organizations), which can effectively manage the different sectors involved in tourism (e.g., promotion, hospitality services, insurance, loans, etc.).

- Ecotourism actions around protected areas or other attractive sites require training, as well as technical and financial assistance.

(IV) Waste management and pollution control:

- Every waste management plan needs popular consensus for its successful application. In the special case of urban solid waste, any urban solid waste management proposal must be accompanied by participatory activities to encourage an informed and motivated community to get involved and support the sanitation process.

- The use of research-participatory action processes and participatory rural diagnostic analyses as work methodologies strengthens communal organizations and ensures that all participants can express their opinions.

- Workshops and meetings organized according to existing criteria and methods in the communities and among native people facilitate participatory planning and implementation, reaching a consensus on the project's timeline, ensuring that actions can be effectively implemented.

- Actions should be accompanied by human resources training to recover communal technical, social and cultural values and knowledge, in an attempt to revalue their skills and reaffirm their culture.

- The reutilization of wastewater for crop irrigation is not easily accepted by communities; instead, the use of aqueducts for treated waste water transportation to isolated parts of the river, which are appropriate for building infiltration fields, must be promoted.

The best practices identified include:

- Evaluation of works and implemented practices to determine the technical and economic feasibility of structural and non-structural measures aimed at tackling the sediment transportation problem.

- Use of the microbasins defined by reservoirs as work units for erosion control works and activities.

- Use of measures complementary to farming and/or silvopastoral practices and protection measures implemented in feeder microbasins extend the lifespan of the small reservoirs.

- Construction of water transfer and/or collection channels in microbasins while building reservoirs in suitable areas but with limitations for water storage according to the topography to enhance availability of water for human uses.

- Implementation of small works for the exploitation of water resources as a means for improving farming production and productivity, fostering adequate land use and favoring the increase of vegetation coverage and biodiversity in the Basin.

- Incorporation of the need for reducing risk to people and their assets, training for the local population, land use zoning and promotion of sustainable development, as part of the objectives and stipulated activities to prevent or reduce erosive torrential phenomena based on structural and non-structural measures.

- Integration and incorporation of special cultural features into SAP-Bermejo´s objectives, considering the needs and visions of the local population.

- Formulation and implementation of an environmental education and awareness-b program for bringing about behavioral changes in the population and showing gestures of solidarity towards the environment, within the framework of a participatory environmental policy.

- Development and implementation of a community work plan as a mechanism for ensuring higher participation and appreciation of the communities' production in urban markets.

- Adoption of measures for maintaining and operating sanitation systems in order to keep water quality within permissible levels.

- Provision of basic utility services in small rural areas, making the population aware of the importance of the environmental clean-up of the Bermejo River and the significance of international waters, as a shared natural resource.

- Socialization of information and strengthening of capacities to raise levels of awareness of governmental, private and social stakeholders through their intervention in the project.

- Incorporation of ecotourism activities in montane forests, taking into account the visions of different social and governmental sectors, as a mechanism for the protection of natural heritage and a way to improve the quality of life of local population.

- Broad participation of the Guarani living in the

region, who selected and prepared the themes of interest on cultural tours for their inclusion in national park guides.

- Inter-cultural participation in the design of paths or cultural tours covering the history, spirituality, cosmovision and respect for nature of native communities living in and around protected areas.

- Preparation of management plans agreed to by consensus with local stakeholders and consistent with natural resource conservation objectives based on multidisciplinary studies.

- The zoning of protected areas as a result of the harmonization of uses defined on technical grounds, according to soil capacity, and existing uses, which the communities living in protected areas have traditionally employed.

- Increase people's awareness of the fact that respect for natural resources is a priority measure for ensuring their conservation and use in a sustainable manner.

- Acknowledgement of preexisting organizations in the preparation of action plans and management plans, seeking to strengthen government institutions while acknowledging the validity of local communities, private and non-governmental organizations as well as civil society.

- Preparation of short-term management plans agreed by consensus by the Corridor's institutional and communal stakeholders and consistent with the objectives of conservation and connectivity of the protected areas involved, as an essential aspect for the conservation of natural resources and their environmental attributes.

- Improvement of productivity and production, through support to production and economic sustainability, based on the use and dissemination of sustainable technologies and the sustainable diversification of economic alternatives for the local population.

- Support for actions directed at achieving governmental commitment to the fulfillment of planned objectives, such as the Binational Declaration of Interest about the development of the "Transboundary Biosphere Reserve in the Upper Bermejo River Basin" and the "Statement of the Argentine and Bolivian Presidents about institutional strengthening for the development of the Yungas Transboundary Biosphere Reserve".

5.5. Main Conclusions – Environmental Protection and Rehabilitation Actions Performed by SAP-Bermejo

The structural and non-structural erosion control and sediment transport management actions performed jointly with the Upper Basin's communities through small multi-purpose works proved to be economically and socially feasible and financeable. The integrated and participatory

nature of the actions performed was particularly important, combining physical works for flood control, sediment retention and bank protection with non-structural measures through livestock management projects or components for reducing grazing pressure, communal practices regarding land use and grazing land management, among others. These integrated management experiences, applied in this case at the level of demonstration microbasins, showed that it is possible to obtain simultaneous benefits in terms of improvement of the quality of life and sustainable management of natural resources, by controlling erosion and water body sedimentation.

Moreover, the sediment study conducted showed that feasible management measures at the regional level were not identified to substantially affect the amount of sediments discharged into the Paraná-Paraguay-La Plata River system. This does not imply that specific problems, of local scope, related to sediment production processes at any point in the Basin cannot be solved by means of structural and/or non-structural measures feasible from any point of view, meeting their local specific objective, as mentioned in the paragraph above.

A relevant aspect in terms of environmental problems of the Bermejo River and Grande de Tarija River Basins is that the problems related to water resources are associated with extreme situations; i.e., large deficits in some sectors of the Basin and during some periods of the year versus severe surpluses causing floods in other sub-regions of the Basin or during the rainy season. For this reason, many projects executed by SAP-Bermejo were directed at mitigating and/or minimizing the problems associated with water deficits, particularly through water utilization schemes or systems for farming irrigation purposes, as a productive means for the support of local communities.

In general terms, the projects developed were demonstration projects and were implemented in a small sector, whether a sub-basin or a microbasin. From these examples, the most successful experiences or the ones having better results, can be gradually replicated in other areas, applying methodologies with integrated and sustainable approaches. The great geographical extent of the Basin, with its diversity of environments and landscapes and complex hydrological dynamics, required a gradual approach through pilot actions. Certainly, an approach to the sustainable management of water resources at the basin level seeking to improve its inhabitants' quality of life and simultaneously preserve its biodiversity makes it necessary to develop and implement both structural and non-structural solutions of greater magnitude than those carried out thus far, implying high investment costs.

In this sense, it is necessary to plan comprehensive actions and projects at the basin or sub-basin level, appropriating the necessary resources for performing them and setting long enough deadlines to meet the established goals, considering the lessons learned and the best

practices arising from the implementation of SAP-Bermejo.

Another noteworthy aspect about the environmental protection and rehabilitation actions executed under the SAP-Bermejo is that *protected areas* can be used as privileged spaces for the integration of environmental and cultural values. All in all, these areas are reserved as representative samples of the systems included in them, and society bears the costs and benefits of this strategy. In this respect, the activities linking protected areas with local communities must aim at distributing these costs and benefits fairly.

Likewise, *ecotourism* activities seem to be a novel approach to involve local stakeholders, who often do not see the benefits of protected areas but have borne some of the costs. It is assumed that the incorporation of ecotourism into the buffer zones is a sustainable alternative to traditional productive practices. For this purpose, SAP-Bermejo proposed the implementation of conservation-oriented "model management schemes" supporting the consolidation of buffer zones through the organization of sustainable schemes for ecotourism with the participation of, and/or management by, the local communities. Undoubtedly, the implemented initiatives are positive and, given the particular characteristics of the activity, the initial objectives of the project must be met in the medium and long term.

Management plans for protected areas are valuable instruments for managing and executing action plans projected for the medium term. These plans must be tools which can be adapted without losing sight of the fulfillment of its main goals. The four management plans developed by SAP-Bermajo in the Upper Basin of the Bermejo River are very important contributions to the management and consolidation of the protected areas in the Basin. Moreover, the projects for connecting and integrating large wild spaces, such as the *Tariquía-Baritú-Calilegua Biological Corridor*, show great potential for preventing the fragmentation of habitats and ecosystems for different animal species, protecting headwaters and introducing sustainable farming, ranching and forestry practices. In this regard, the promotion of the implementation of the Corridor and the subsequent actions for obtaining the declaration of *Yungas Biosphere Reserve* were very important efforts for the region, representing challenges and lessons to be learned in the long term.

The *training* activities performed within the different projects implemented by SAP-Bermejo are perhaps the most important and, at the same time, most intangible contributions to the region. Training often requires continuing education efforts, which are beyond the scope of particular projects. Nevertheless, they shape a path of commitment and independence of the stakeholders involved. SAP-Bermejo training efforts have been numerous and they have reached a wide array of stakeholders who have benefitted from them.

All the activities performed by SAP-Bermejo have had multiple levels of *public participation.*

These processes, although they are essential for planning and implementing many work phases, do not always yield satisfactory results. Undoubtedly, reconciling different and sometimes conflicting interests is a difficult endeavor. The project experiences show that it is possible to generate transparent and constructive participatory processes. Nevertheless, it is also clear that there is still much to learn from these processes, which seem to require long periods to achieve the necessary levels of institutional and civic maturity. Knowing the community from a social and cultural point of view seems to be vital for facilitating the design and implementation of public participation mechanisms.

6. Strategic Area III: Sustainable Development of Natural Resources

The TDA showed that the poverty prevailing in important social sectors of the Basin led to the existence of non-sustainable extractive management practices, increasing the deterioration of the population's standard of living and producing seasonal or permanent migratory movements, especially in rural areas. Some of the factors identified as a basic cause of the problem were the inadequate access and application of appropriate technologies, the use of primary production systems, and the use of non-sustainable agricultural practices.

In this respect, SAP-Bermejo fostered initiatives oriented toward improving the existing low levels of human development through the development and application of sustainable technologies, and the appropriate use of water and other natural resources. To this end, appropriate management practices and technologies were consolidated and disseminated through the SAP-Bermejo, developed and experimented with in many areas of the Basin by research and development agencies, producer organizations and social and production development programs, but were not properly disseminated due to the extent and diversity of the Basin and because of institutional fragmentation.

Sustainable production practices oriented at contributing to the improvement in the communities' quality of life were promoted, developing and implementing production alternatives sustainable from an environmental, economic and social perspective, in conjunction with the strengthening and fostering of the participation of local and indigenous community organizations located in the Basin. Activities carried out included the development of pasture and livestock management practices, the

implementation of silvopastoral and agroforestry systems, the organization of workshops and programs on production activities, preparation of land use plans, implementation of small construction works to optimize irrigation infrastructure, the validation and application of sustainable management practices and the revaluation of traditional cultural methods of natural resources management, among others.

The production models implemented within the framework of SAP-Bermejo, constituted pilot demonstration projects designed to provide support to the sustainable management of natural resources. A group of these projects was related to **water resources,** and specifically directed to the use of water for irrigation in small settlements and/or areas with severe shortages during a large part of the year. In all cases, the objective was to facilitate the use of the waters of the Bermejo River Basin and its sub-basins, managing these resources efficiently, and to increase the production potential of the areas selected. The other group involved projects related to **natural resources and production systems**, implemented in various eco-regions of both Argentina and Bolivia.

In both groups of projects, proposals for sustainable production models suited to each environmental and social scenario were developed, primarily related to livestock, agriculture, silvopasture, agroforestry, fruit farming and horticulture. In some cases, projects only covered the diagnostic analysis, planning and the corresponding production model proposal, while in other cases, actual implementation of pilot demonstration projects was achieved.

Within this Strategic Area, actions were also taken toward outlining an *Integrated Management Program for the Binational Basin of the Bermejo River* (PROBER), targeted at consolidating the programmatic framework for the comprehensive management of resources at the basin level developed during the Short-term SAP-Bermejo, defining a sustainable platform for the development projects to be implemented by the different jurisdictions, either jointly or individually, as well as actions conducive to the search for funding for the Program's implementation.

The specific actions undertaken in this Strategic Area were grouped into five main activities and their associated projects:

6.1. Sustainable practices for the rehabilitation of degraded areas

6.1.1. Sustainable management alternatives for natural resources in the humid and sub-humid region of the Bermejo River Basin

6.1.2. Productive diversification under conditions of sustainability in the Upper Basin of the Bermejo River;

6.2. Community extension programs for sustainable production and natural resource management

6.2.1. Validation and implementation of traditional natural and water resources management practices in the Basin;

6.2.2. Sustainable rural development in indigenous and native communities.

6.3 Sustainable agriculture and soil conservation practices in the San Jacinto project area

6.3.1. Systematization of irrigated areas in the San Jacinto project;

6.4. Search for financial resources for the Bermejo River Basin

6.4.1. Securing of financial resources for the Bermejo River Basin

6.5. Implementation of a planning framework for integrated water resource management and sustainable development of the Bermejo River Basin

6.5.1. Integrated Management Program for the Binational Basin of the Bermejo River (PROBER)

6.1. Sustainable practices for the rehabilitation of degraded areas

6.1.1 Sustainable management alternatives for natural resources in the humid and subhumid Bermejo River Basin.

This project, originally proposed to be implemented in the humid and subhumid Chaco region, was broadened, at the request of provincial governments, to span the whole territory of the Provinces of Chaco and Formosa in the Lower Basin. The general aim was to identify and define sustainable traditional practices aimed at balancing economic-productive use, increasing productivity, fostering a sustainable management of water resources and soils, decreasing environmental degradation and improving the quality of life of the rural population through training in the operation of production models suited to the specific characteristics of the region. Actions were directed to a wide range of producers and different production models, dealing with issues related to livestock management, both of goats as well as cattle, tropical pasture management, implementation of silvopastoral practices, development and strengthening of fruit and vegetable producer cooperatives and rehabilitation of degraded ecosystems. Additionally, basic research was performed to determine water supply and demand according to the production framework of the region. Hydraulic works were identified and sized for the provision of irrigation water where necessary.

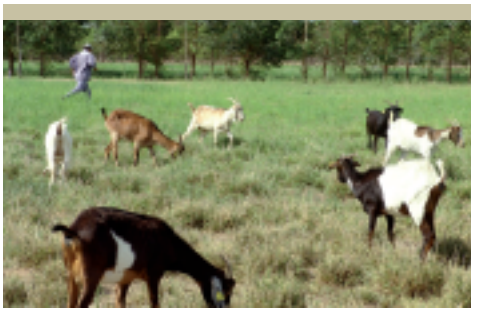
I) Improvement of Caprine Management

The main objective of this Project was to validate techniques to comprehensively improve goat herding in terms of management, nutrition, sanitation and genetics based on the tests performed at the Agricultural Technologies Validation Center (Centro de Validación de Tecnologías Agropecuarias – CEDEVA.). These training and technical support actions took place on farms of the region with the producers themselves. The production models included the integrated management of water and soils, not only offering social and economic benefits to the producers, but also improving environmental conditions in terms of a decrease in surface erosion, increase in vegetation cover, reduced

over-grazing and an improvement in sanitation, both for herds as well as for the producers' families.

The Project took place within a 50 km radius around CEDEVA in Laguna Yema, Formosa. This area was divided into four zones: Laguna Yema and its environs, Paraje Sumayén, Paraje El Quemado and Paraje El Cañón. The activities included the creation of a Provincial Genetic Breeding/Multiplication Center using high productivity breeds capable of generating improvements in the production indexes of pre-existing or newly introduced caprine animals, and the setting up of demonstration modules that could turn into production models adaptable to different investment scales, seeking to turn a subsistence activity into a commercial venture through training and provision of extension services, thus generating employment sources and better incomes for producers in order to improve their quality of life.

The approach for the Project's implementation and the design of the production demonstration module were perfomed by applying process technologies tested in the field that were shown to be effective and which offered alternatives to producers so that they could play an active role in improving their quality of life. These types of technologies, unlike input technologies, fostered an integrated approach in addressing and recognizing the relationships among different factors, taking into account both the management of livestock as well as that of soils and water, crops, disease, pastures, etc.



Goat management on pastures.

Delivery of genetically modified/improved male goats to beneficiaries, Province of Formosa – Argentina

Blood extraction from goats for subsequent analysis in laboratory. Province of Formosa – Argentina

Brucellosis Diagnostics and Parasitology Laboratory – CeDeVa Laguna Yema, Province of Formosa - Argentina

Different animal crossing of Anglo Nubian, Boer and Criolla breeds were suggested for the genetic improvement of herds and to validate productivity indexes and generate the best resulting combinations and/or pure lines. Artificial insemination guaranteed the quality of crosses and sped the transfer of secure material to the producers' farms. A selection pressure of 30% was exerted on the offspring taking specific and desirable characteristics for each breed into account.

A total of 80 producers took part in the Project, which were surveyed in terms of their location and situation, and their herd composition, sanitation, nutritional status, facilities and herd management practices. Also, all animals were tested for brucellosis and subjected to a de-worming campaign for goats, sheep and sheepdogs.

As part of the Project's activities, two laboratories were built and equipped to perform tasks that contributed to the regional development of caprine activity. A Reproduction Laboratory, for tasks such as freezing semen and conducting artificial insemination with the aim of contributing to a higher genetic quality for the herds in the area; and a Brucellosis Diagnostics and Parasitology Laboratory, which helped in the comprehensive sanitary management of goat herds, including the detection of brucellosis, not only in the animals, but also in the producers' families, thus adding benefits to public health. In this last aspect activities were performed within the framework of re-established agreements with health organizations in order to address issues relating to zoonosis.

For the nutritional component of the caprine production module, weight gains were evaluated under intensive and semi-intensive models in rebreeding and fattening categories, identifying the most economic and safe methods for the prevailing conditions in the area.

The demonstration project as a whole included an important training component on issues such as nutrition, sanitation, reproduction, herd management, commercialization, etc.

II) Management of Non-native and Native Tropical Pastures

This Project, implemented at the CEDEVA in Las Lomitas, Province of Formosa, included the creation of a natural and introduced pastures management center for cattle production, the validation of sustainable grazing systems and herding and pasture management techniques, the creation of production model demonstration modules and the training of agricultural technicians and producers.

Initial activities included a diagnostic analysis and evaluation of indigenous vegetation, determination of physical and chemical soil properties, selective weeding, fitting and preparation of soils for pasture sowing, facilities and equipment for production model evaluation and the setting up of a technical office.

Test plots for pasture evaluation were implemented (including a total of 19 grass species and 13 herbaceous legume species) to determine

production curves, resistance to frost, cutting time for storage, re-growth capacity and resistance to drought.

Measurements on pastures were performed at 60 and 120 days from the time of sowing in the case of grasses, and at 90 and 180 days for the leguminous plants, determining for each case the following variables: emergence, cover, height of plants and dry matter yield. Also, half of each plot was dedicated to phenologic follow-up and seed harvesting. To determine pasture yields, plots were cut three times to quantify the dry matter in the pastures: 30, 60 and 90 days, these last considered seasonal (March, June, September and December)

After the evaluation of fodder production, cattle was introduced under two production models: selective clearing and pasture (see box below)

As a result of the activities carried out, a wealth of information was obtained related to yields, phenology and response to fertilization and different stresses on a number of grass- and subtropical leguminous fodder-species. Also, a pasture-, grassland- and modified scrubland-based cattle production model was validated and evaluated from an agronomic, economic, social and environmental perspective.

According to the data on kilogram of meat per hectare and on kilogram per year shown in the production models, compared to existing data, it is estimated that production in the region could be quadrupled. These positive results show that the models are viable and represent a feasible alternative for managing livestock development in western Formosa.

Implementation of pasture demonstration plots

Plot with Grama Rhodes Callide, after 90 days

III) Fruit and Horticultural Production – Chaco Province

The aim of this Project, developed in cooperation with the Chaco Provincial Ministry of Production, Undersecretariat for Rural Development, was to generate local capacities in the areas of sustainable production technologies, soil and water management and conservation, organizational development and commercialization.

The Project was located in the Province of

Non-native and Native Pasture Management Pilot Project Production Models

Selective Clearing Model

The objective of this model was to establish meat production through selectively clearing and planting pastures on 40% of the area. Thirty creole bovines , representative of the cattle bred in the area, were evaluated. The average weight of the group was 196 kg per head. Seventeen had an average weight of 162 kg. The rest of the animals (13) had an average weight of 242 kg.

The grazing system was rotational on plots of 0.8 to 1.6 ha. The surface and grazing time on each plot was defined depending on fodder availability, using electric fencing to isolate plots.

The cattle area used over the 210 day trial was 40 ha. During this period, 1.3 ha per animal was required. The load expressed in equivalent cow per hectare represents 0.93. It started with 0.65 equivalent cow per hectare on natural grasslands and ended with 1.1 equivalent cow per hectare in selectively cleared plots with planted pastures.

The results of the weight gain over the whole herd averaged 0.746 g/day and the gain per head was 156kg.

Pasture Model

The objective of this management model was to establish meat production based on cultivated pastures. Thirty young Brangus bulls were introduced with an average initial weight of 206 kg. Grazing started with Gatton panic grass where they were assigned 0.5 ha per day.

Selective logging/clear-cutting for pasture implanting

Brangus cattle pasturing in demonstration plots

After that, grazing on leucaena protein was started. The cattle grazed for one hour in the morning and then they were moved to another Gatton panic grass plot. This system was maintained for a month with no meaningful differences in daily weight gain.

A 1.8 hectare sorghum forage plot was used for grazing during two 10-day periods. Then the cattle were kept on Gatton panic grass pasture before moving on to selectively cleared plots with Rhodes and Buffel grasses.

With the proposed management scheme, it was possible to move from 15-20 ha per animal (without a model) to 1 ha per head (for those categories tried), which means producers would require smaller areas to obtain favorable economic results without environmental degradation.

Chaco, San Martín Department, and included the implementation of demonstration plots of new technologies, the training of producers in production and commercialization, the strengthening of producers' organizations and the creation of a revolving fund.

Training and technical assistance activities, provided to groups or individuals, were oriented toward the development of horticultural crops, greenhouse production, soil and water management and conservation and the implementation of fruit and horticultural species production techniques and their post-harvest management. Didactic and informational materials on different crops were prepared to these ends.

Also, the strengthening of the commercialization process was undertaken in order to improve the sustainability and profitability of production. Actions included the installation of business premises for the use of producer groups and information distribution on the state of the market through local radio stations as well as training workshops on horticulture and commercialization of citrus products in Santiago del Estero and Bella Vista, Corrientes.

As a result of the Project, fruit and horticultural producer groups were strengthened both in terms of their organizational as well as productive capacities. Training in integrated water and soil management, efficient use of water and commercialization contributed to the strengthening of these institutions.

Implementation of under roof growing, Department of San Martín, Province of Chaco - Argentina

Irrigation system training to producers

Trading market organized by agro producers with traditional products

Lower Bermejo River Basin

IV) Integrated Development of the Teuco-Bermejito Watershed

The objective of this Project was to promote the adoption of sustainable practices leading to increased economic productive use of natural resources, improving environmental quality through soil rehabilitation and conservation and silvopasture practices, strengthening organizational practices and increasing profitability of operations, thus contributing to an improved quality of life for the population.

This Project, developed in cooperation with the Undersecretariat for Rural Development, Division of Forestry of the Ministry of Production of the Chaco Province, was implemented at the Teuco-Bermejito Watershed, at locations San Manuel and El Espinillo, in General Güemes Department, Province of Chaco, with the participation of the Toba and Creole communities.

Activities were grouped into three components: I) implementation of silvopasture systems; II) training; and III) strengthening of local capacities with a special focus on gender issues.

The objective of the first component was to install silvopasture systems with planted subtropical or tropical pastures, integrating forestry and livestock activities, using sustainable management practices for both activities, and applying recommended criteria for semiarid regions. As a result of the activities, 18 silvopastoral plans were outlined and filed for approval with the Forestry Division of the province, totaling 122 hectares, carrying out the clearing of the fields of the top three producers, which came to a total of 21 hectares.

The second component was oriented to training producers in the appropriate use of forest resources using a silvopastoral system and managing cattle using intensive rotational grazing systems, as recommended in the Chaco Province "Sustainable Forestry Management Manual" for semiarid regions. The basic training elements were oriented to: silvopastoral management, pasture planting, and intensive rotational grazing. In this regard, training courses were carried out on the implementation of silvopastoral models, mainly oriented toward the management of forestry lots.

The third component was aimed at consolidating and strengthening the capacities of the Association of Native Women Artisans, providing training in production management and commercialization of crafts made of leather, wool and other materials; also in apiculture and other activities, as well as the exhibition of their products in a place of business built at El Espinillo.

Institutional changes within the provincial government took place during the implementation process, which brought about the suspension of the Project until the new authorities could evaluate the performance and results of the activities in progress. This evaluation was positive, and resulted in the granting of a continuance from the government. Unfortunately, this coincided with the end of the SAP-Bermejo project. For this reason, all

pending activities from the three components have been given the highest priority to be carried out by the province with the support of COBINABE within the framework of PROBER.

V) Productive rehabilitation in modified/degraded environments in the Lower Basin of the Bermejo River in Formosa

The aim of this Project was to generate a diagnostic analysis to support the rehabilitation of production systems in modified and degraded environments in the region of Estero Belaco in southeastern Formosa. The execution of activities involved producers from the Departments of Misión Laishi and Pirané, and carried out by the Formosa Provincial Water Coordinating Unit.

The production remediation and rehabilitation studies, as well as the design of production models, were based on the preparation of a diagnostic analysis taking into account soil type, the distribution and area of each soil type, their specific management needs and the type of activity that coud be developed (agricultural, livestock, forestry, etc.) as well as climatic and vegetation information.

A compilation of bibliographic records of the area was carried out, which provided information on climate, soil, water management infrastructure, cartography and satellite imagery. Topographic surveys of existing channels/canals in the area were also carried out, and a base map prepared.

A description of the project area was completed, which included: documenting the ecosystems, climate, hydrology, soils, natural vegetation, fauna and socioeconomic characteristics of the population. An initial characterization of the production models and their hydrologic resource needs was also performed. The hydrologic and sediment management system of Estero Bellaco was defined based on analysis of the compiled data and development of hydrologic and hydraulic models of water runoff in channels/canals.

Lastly, sustainable production models were defined for rice growing and livestock in the project area, considering all technical, social and environmental elements in each case.

Through a multidisciplinary and comprehensive approach, proposals were elaborated for the regulation and management of the hydrologic system, and production models for rice growing and livestock were proposed.

VI) Optimization of Irrigation Infrastructure and Rehabilitation of Water Abstraction Works on the Teuco River – Laguna Yema – Formosa Province

This Project's objective was to: determine the system's water demand, taking into consideration current and future uses; define the availability of water in the system taking into account surface water inputs and rainfall as well as losses due to evaporation, infiltration and spills; assess different technical alternatives to optimize the abstraction and transport of surface water and production schemes that optimize the available hydrological resources while preserving environmental sustainability. It also aimed at defining operational

guidelines that could minimize maintenance, and to propose a Water Usage Plan to organize irrigation on a per crop basis and the arrangement of user or irrigator groups.

A diagnostic analysis of collection works, reservoirs and conveyance works was performed, with an emphasis on production and the use of water from the Laguna Yema reservoir. The main conflicts presented by the existing system were determined.

The current and potential uses of water were quantified. For this, all involved sectors were surveyed and their required annual volumes of water were quantified. The water demand was established on the basis of current and potential uses of the available water supply for human consumption and other uses (irrigation, industrial use).

Water intake from the Laguna Yema canal, Province of Formosa - Argentina

Water Canal for the the Laguna Yema Reservoir, Province of Formosa - Argentina

Regarding water availability, analyses were conducted to evaluate Bermejo River flows; the abstraction, storage and conveyance possibilities of the Río Teuco – Laguna Yema system; total precipation, and subsurface storage possibilities. Losses due to evaporation, infiltration and spills were also taken into account both from the reservoirs as well as from canals, including losses due to evapotranspiration.

Lastly, different technical alternatives were proposed for works to optimize the abstraction and conveyance of surface waters, and different production schemes were proposed to optimize the available hydrological resources under conditions of environmental sustainability.

Additionally, the engineering projects corresponding to the optimization of the existing irrigation infrastructure downstream from the Laguna Yema reservoir were identified, and their technical specifications and financing requirements were defined.

6.1.2. Production diversification under sustainability conditions in the Upper Basin of the Bermejo River

The objective of this Project was to reduce human pressures on native forest resources through the diversification of production options available to rural families. These actions, carried out as pilot demonstration projects, were related to the

sustainable use of forests, the management of lands for grazing and livestock, and the development of traditional small-scale crops.

I) Diversification of Production in the Yungas, Salta, Argentina

The goal of this sub-project was to implement and/or improve production systems based on the sustainable use of natural resources, carrying out activities to improve the quality of life among local mountain populations and at the same time reduce environmental degradation, contributing to the conservation of ecosystems in the Upper Basin of the Bermejo River.

Demonstration projects and production models were applied in the forest and mountain forest belts of the Departments of Santa Victoria, Iruya and Orán, Salta Province, Argentina. These areas represented typical montane ecosystems totalling 1,000,000 hectares in Argentina with a similar number in Bolivia.

The communities of the Municipalities of Los Toldos (Condado, La Misión, Los Toldos, Arazay, Lipeo and Baritú), San Andrés and Los Naranjos were involved in the execution of these activities.

The intervention strategy was implemented along the following guidelines:

- Diagnose, zone and plan properties together with farmers, and utilizing this information, identify activities and propose a schedule of actions to implement
- Maintain a strong and constant presence of

Improvements in the irrigation system, Los Toldos, Province of Salta – Argentina

Implementation of agroforestry demonstration plots

Forest and fruit trees nursery, Los Toldos, Province of Salta - Argentina

support staff in the field to assist those communities involved.
- Actively involve the municipality and other local organizations.
- Implement demonstration plots.
- Carry out periodic evaluations with the community.

The set of actions developed both as demonstration projects as well as training and participation opportunities were organized into three components: I) implementation of improvements in the use of hydrological resources, II) development of agroforestry plots and III) research and experimentation with native and introduced cultivated species.

The actions generated a positive involvement of native and farming communities in sustainable natural resources practices, closely linked to their own survival.

All of the communities in the Municipality of Los Toldos—Condado, La Misión, Los Toldos, Arazay, Lipeo and Baritú—became involved in the Project. Around 153 families representing about 37% of the families in the municipality took part in the project, maintaining working relationships with existing grassroots organizations.

The implementation of agroforestry plots through the planting of forest massifs and/or windbreaks, the incorporation of plant grafting practices and the building of greenhouses produced an important impact in the project area, supplemented by the introduction of pastures and the sanitary management of herds, thus allowing their integration into agroforesty practices.

The introduction of family orchards was a task in which communities became actively involved. These orchards, as well as farms, fulfilled the double purpose of introducing productive activities and generating organizational opportunities within groups. Similarly, the validation and experimentation with food production, grain storage, apiculture and disease management offered new alternatives and introduced new dimensions for the sustainability of productive activities in the Yungas.

II) Comprehensive Farm Management Plan in Arce Province, Bolivia

The Project's objective was to promote the rational use of natural resources, fostering the planning and modernization of agriculture through the introduction of low-cost technologies adapted to the physical and productive conditions of the Santa Clara, La Merced and La Mamora communities of the Muncipality of Padcaya, Arce Province.

Activities included the implementation of organic agricultural practices, irrigation systems adapted to different irrigation techniques (gravity, drip and spray/sprinkle), agricultural diversification, implementation of water and soil conservation and management techniques, organization of farmers associations and the development of commercialization strategies and business plans.

There were also training activities in vermiculture, and the planting and management of enclosures.

Three community workshops focusing on organization and programs were conducted where 30 diagnostics of family farms were developed.

As a result of this, 30 property plans were prepared, which included: location sketches, strategies for commercialization and business, production and processing plans.

III) Pilot Plan for the Conservation of Forest Resources at Serranía El Cóndor, Bolivia

The goal of this Project was to contribute to the sustainable development of the Tarija Central Valley through conservation and environmental rehabilitation processes, focused on comprehensive forestry protection and production systems oriented to improve the quality of rural life in the communities of Serranía El Cóndor, with the purpose of reducing threats to forests and biodiversity due to transformation in land uses (agriculture, urbanization, cattle raising, etc).

Activities included a detailed diagnosis of the natural resources and external organizations of the intervention zone, including assessing the socioeconomic, biophysical and production situation (using primary and secondary information sources), the organization and establishment of committees, elaboration and validation of community rules, usage and access to regulations relating to natural resources, organization of training workshops, design and construction of

Implementation of domestic orchards

Experience of grain storage in metallic silos

Farm management, Province of Arce, Bolivia

Fence and forestry, Serranía El Cóndor, Bolivia

production greenhouses and implementation of small conservation and rehabilitation works.

The main results were:

- A total of 82 families from the communities of Laderas Norte, Centro and Sud were organized around their parent organization (the Agrarian Union) to develop protection and rehabilitation activities regarding their natural resources.
- Participant communities were trained in issues of plant production in family-scale agro-ecological greenhouses, forestry plantations, and enclosures, as well as in soil conservation works and environmental education.
- A total of 135,858 native forest plant species adapted to the region and 12,300 fruit trees were produced in family and communal greenhouses, reforesting 102 hectares with native forest plant and species introduced into the area.
- Conservation and rehabilitation activities for soil and native forest species were developed and implemented through land conservation and management plans.

IV) Salinas and Chiquiacá Rivers Bank Protection, Bolivia

This Project was oriented to the sustainable use of natural resources of the Salinas and Chiquiacá River Basins, and the implementation of flood and bank erosion control practices and works.

An action plan was prepared for each area including, in each particular case, the necessary engineering studies for the works, budgets, material and labor requirements, and monitoring activities that would allow for the protection of the banks of both rivers, the recovery and consolidation of soils, control of floods, reduction of sediment transport and an increase in crop productivity.

V) Restoration of Degraded Forests in O'Connor Province, Bolivia

This Project contributed to increasing the wooded areas in the Province of O'Connor, promoting more extensive vegetation cover of soils through the planting of native species to minimize erosion in the headwaters of the Chiquiacá River Sub-Basin.

The activities included: the preparation of forestry management and reforestation plans, rehabilitation of headwater forests, training of producers in forest greenhouse management and research into alternatives for the economic development of communities based on environmental, productive, handicrafts, harvesting and other activities.

6.2. Community extension programs for sustainable production and natural resource management

6.2.1. Validation and implementation of traditional natural and water resources management practices in the Basin

The Project's goal was the identification and validation of traditional cultural aspects of water and natural resource management practices, seeking their dissemination and assimilation by

communities in the region as recommended practices for sustainable management.

To these ends, a proposal was prepared for the Perico Manantiales River Basin in the Province of Jujuy, Argentina, which included a survey of traditional practices and a replication plan for the most promising activities, to be implemented as pilot demonstration projects in collaboration with the communities involved. A program of action also was elaborated to promote the dissemination and application of the most relevant traditional practices related to the sustainable management of natural resources within the broader framework of the Bermejo River Basin.

Specifically, the project included:

- Consultations and data acquisition to verify the pre-existence of production and natural resource management systems that might be applied within the Los Pericos-Manantiales Sub-Basin.
- Surveys of practices in the sustainable management of natural resources in order to verify that they are adaptable to current situations and can act as demonstrative case studies.
- Dissemination of the results of activities carried out with the intention of replicating practices, training human resources and ensuring the continuity of implemented actions.

This project was not implemented due to the decision of provincial authorities, but has been prioritized for implementation within the

Traditional crops in the Basin: Oca (Oxalis tuberosa)

San Jacinto Reservoir, Tarija, Bolivia

framework of the Integrated Management Program for the Binational Basin of the Bermejo River (PROBER).

6.2.2. Rural development of indigenous and creole communities

The Rural Development Project was aimed at improving the quality of life of the native Wichi and creole communities through an increased awareness of techniques for the sustainable management of resources and the validation and implementation of production alternatives.

Actions were performed in the area of Coronel Juan Sola (Morillo) and other neighboring areas in the Chaco-Salteño, in the Province of Salta, Argentina, with the participation of different Wichi and creole communities, the Justo Pastor Santa Cruz School and NGOs in the region.

The approach to the various proposals and production systems utilized a service-learning concept, as an educational and supportive activity for the community, stemming from Justo Pastor Santa Cruz School.

Activites were grouped into three components: I) livestock management, including water management, silvopastoral management and sanitation management; II) implementation of orchards, breeding of laying hens and apiculture and III) validation of proposals including the manufacture of balanced feed and the use of carob trees and pork (see box below). In the latter case, the manufacture of sausages and pork byproducts was a new and as yet unknown activity in the Chaco Salteño. The intention was to demonstrate the feasibility of this option by experimenting with the manufacture of different products. The results obtained and knowledge acquired were transferred to the Wichi and creole communities through the various training programs.

6.3. Sustainable agriculture and soil conservation practices in the San Jacinto project area

6.3.1. Systematization of areas under irrigation in the San Jacinto project area

The aim of this Project was to develop and implement a technology package for water and soil management in the San Jacinto project area, located at El Portillo and Santa Ana.

The Project was developed as two components: the first related to land reclamation, infrastructure for irrigation, water conveyance and drainage and erosion control; and the second oriented to providing technical assistance, training, and demonstration activities in agroforestry development.

The activities included: the levelling of 22.5 hectares of land; irrigation of 39.5 hectares; construction of 2,451 meters of lined canals and 910 meters of PVC pipes; installation of 361 meters of anti-erosion canals; flood control practices using gabions (8 gabion dikes and the respective mats); a 7.5 meter high earthen dam (with a landfill volume of 2.875 cubic meters); the establishment of

Pilot Project for Rural Development in the Wichi and Creole Communities

I) Livestock Mamagement:

- *Water Management.* The reservoirs of the Chaco Salteño consist of natural or artificial depressions in the terrain, with an earthen embankment around their perimeter which serves the purpose of capturing rainwater and runoff allocated both for human and animal consumption. Due to the lack of adequate infrastructure, animals enter these reservoirs thus degrading the water quality and producing an effect known as "enlame" (silting). For this reason,to address this priority identified by the farmers, all of the reservoirs were cleaned and fenced. This activity involved the work of 10 people with the aid of their respective families and benefited 92 families in the La Cortada community. Additionally, a new 20 X 40 meter reservoir was built in the El Palo Blanco area.

- *Silvopastoral Management.* The production of creole cattle is an extensive cattle raising practice that overgrazes the scrublands. In addition, the forestry boom of the past several years, with the exploitation of quebracho colorado, palo santo and carob trees, have resulted in the degradation of the native forest as a consequence and and has been exacerbated by the lack of controls over the use of natural resources. In order to implement a silvopastoral module, a "desvarejado" (clearing) of the forest/scrubland was performed and the sowing of grasses promoted.

- Sanitary Management. A first aid kit was acquired and training related to vaccination of bovines was carried out with the students.

II) Improvement of consumption

- *Orchards.* This action included support to Wichi natives and creoles through the provision of tools (shovels, rakes, hoes, etc.), wire mesh or smooth wire enclosures and vegetable seeds with the aim of starting family orchards, thus improving their quality of life. Training activities on the use and conservation of the resulting products also took place.

- *Incorporation of laying hens.* Needy families received a stock of double purpose (meat and eggs) laying hens of the INTA Black variety, bred in the school's workshops. With a stock of 18 Plymouth Rock hens and 2 Rhode Island Red roosters, INTA Black chick production started. Eighty eggs were incubated every 15 days through four incubation periods with an approximate survival rate of 50% of the hatchlings. A batch of chicks was separated from the first incubation to start experimenting with the scheduled balanced feed.

- *Apiculture*. Among the different activities that contribute to survival in arid and semiarid regions, there is the harvesting of honey coming from wild beehives. This practice inevitably leads to the destruction of hives during the honey extraction process. That is why traditional beekeeping activities were

Stockyards and fences construction for silvopastoral pastures

Vaccination practices carried out with scholars

Implementation of domestic orchards

Manufacture of a sub-product from the Carob pod

promoted, mainly to meet personal consumption demands through the delivery of beehives (inner and outer hive covers, hive body and bottom board) and a full set of beekeeping equipment, and provision of training for their management.

III) Validation of proposals

- Production of balanced feed with local inputs. Work was carried out to feed double purpose hens (meat and eggs). Based on the chemical composition tables of the feed and taking into account the nutritional requirements of the different meat and/or egg production poultry and the availability of ingredients in the area, different types of feeds were formulated for use as a starter feed for laying hens and terminator feed for broilers.

- Production of subproducts from the Carob pod (Chaucha). Work was carried out on the production of various sub-products from the carob pod. The results of the carob pod use studies were published in the book "Subproducts of the carob pod" which was distributed in the local schools and other institutions.

- Integral use of pork. It was experienced in the development of different pork products, transferring the acquired know-how to the community by different training actions.

- Carob knapsacks. These actions consisted in developing improved knapsacks with Creole families and native Wichi communities in order to show their advantages regarding conservation throughout time. Carob pods were kept in 200 lts. cans. These cans' inside were painted with anti-oxide, using ash layers and local aromatic plants to preserve them from insect and fungus attack. Five kinds of carobs were used: traditional, improved traditional, subterraneous, adobe area and fibred cement tank.

Dual-purpose (meat and eggs) Black INTA hens

Pork products

orchards, windbreak curtains and hollow cane plantations and technologies for implementing irrigated agriculture in the Central Tarija Valley.

The works carried out were handed over to the San Jacinto Project Administration for their operation and mantainance, through an inter-institutional agreement dated 7 November 2006.

6.4. Search for financial resources for the Bermejo River Basin

6.4.1. Securing financial resources for the Bermejo River Basin

The objectives of this Project were to secure financial resources for SAP-Bermejo from regional or international donor or credit-giving institutions, with the goal of sustaining the catalytic contribution of the GEF. The original concept in the Project Document was to conduct a donors meeting; however, during the II Steering Committee Meeting, it was agreed to replace it with a search for financial resources.

To achieve these objectives, talks were started in March 2002 with the Inter-American Development Bank (IDB). There were also consultations with the World Bank, the Andean Development Corporation (CAF), the International Finance Corporation (IFC) and other international funding and development assistance agencies.

In coordination with the IDB, an international consultancy was carried out to review the project profiles of the initiatives included in the Long-term SAP-Bermejo, and to help define astrategy to follow for obtaining financing. As part of the process, those projects executed or in execution were identified, selecting from the remaining group those that could be of interest to potential sponsors or bilateral or multilateral funding agencies. The selected projects were then grouped in “packages”, in order to facilitate their review and funding through cooperative agreements and credits, with specific negotiations by source type, and through the governments of each country, under the coordination of COBINABE.

Based on the guidelines provided by the international consultancy, a new package of projects was prepared for submission to various funding agencies, including initiatives at different stages of formulation. For this purpose, the countries drew up a list of selected projects and the corresponding action plans. In the case of Argentina, a project was submitted from each of the four provinces in the Basin and two projects with regional coverage.

At the same time, COBINABE contacted CAF at its office in La Paz where it submitted for consultation a list of projects, at various stages of development, from both Argentina and Bolivia. In response, CAF anticipated that the projects could be included in the Border Development Program (“Programa de Desarrollo Fronterizo”) and that some of them might receive grant resources. COBINABE also presented the set of compiled projects to FONPLATA (Financial Fund for the Development of the La Plata Basin) through the

Argentine Ministry of Economy, in order to identify those of interest for funding by that organization.

Both the Bolivian and Argentine projects were submitted for prioritization by their respective Ministries of Finance, who agreed to continue negotiations to obtain the necessary endorsements that allow allocation of funding.

Complementary to the actions by COBINABE to secure financing for the Long-term SAP-Bermejo, several projects were implemented with the countries´ own financing. In Bolivia, specific Long-Term SAP-Bermejo projects were revised and successfully submitted for funding to the Departmental Prefecture of Tarija, through royalty funds from natural gas and petroleum sales. In the same way, in Argentina, several projects included in the Long-term SAP-Bermejo were executed with provincial and/or national funds, particularly those related to flood protection and erosion control and production-related initiatives. Similarly, water use infrastructure was financed through the Water Infrastructure Fund (of national scope).

In the final stage of execution of SAP-Bermejo, COBINABE prioritized the preparation of an Integrated Management Program for the Binational Basin of the Bermejo River (PROBER), seeking to consolidate and extend the activities developed by SAP-Bermejo, including projects identified in the Long-term SAP-Bermejo, based on a financing strategy that would provide for the sustainability of activities.

COBINABE´s funding strategy was based on:

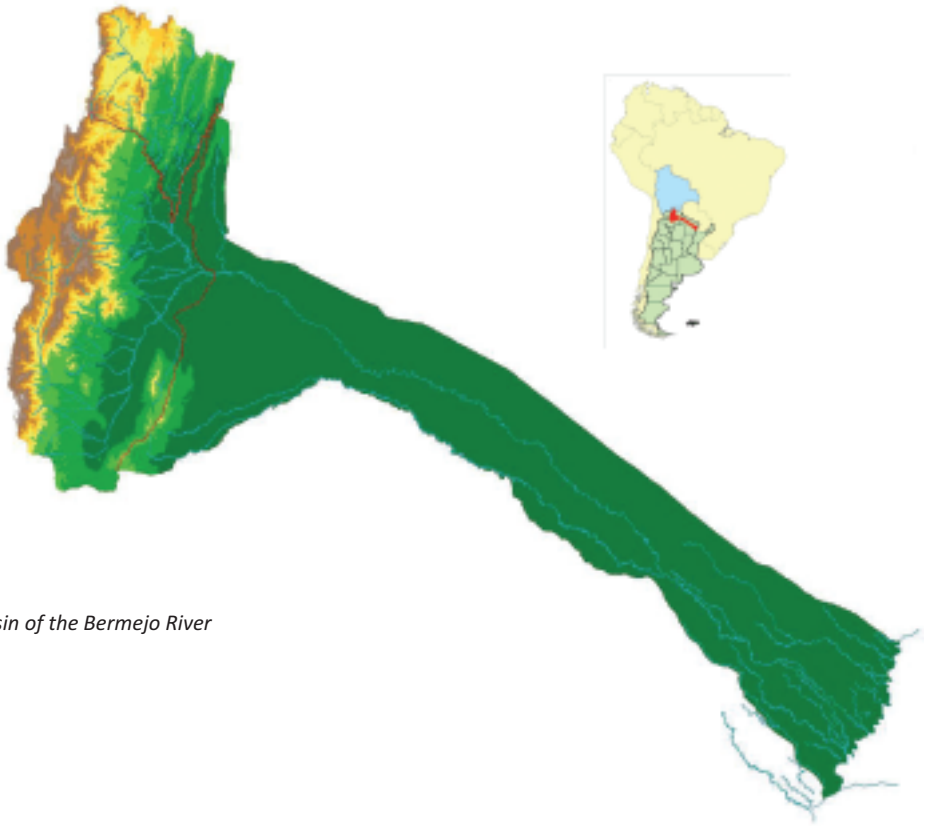
- The identification of priority projects classified by formulation stage, and the preparation of a studies and projects portfolio for inclusion in PROBER .
- The identification of funding sources, reviewing eligibility criteria, the conditions to access funds and the requirements for the filing of proposals, for both grants and loans.
- The presentation of PROBER to international funding organizations in Argentina and Bolivia, to the embassies of those countries that have international technical cooperation programs, and to other funding agencies.

By the end of 2009, the preparation of PROBER was completed, and presented to the World Bank, the Andean Development Corporation (CAF) and the IDB, with the aim of starting negotiations to obtain funding for the program, including i) technical cooperation, ii) use of funds available from programs in execution and iii) donations.

6.5. Implementation of a planning framework for integrated water resource management and sustainable development of the Bermejo River Basin

6.5.1. Integrated Management Program for the Binational Basin of the Bermejo River -PROBER

Based on the guidelines established in the Project Document, the preparation of PROBER had, as its main objective, the consolidation of a programmatic framework for the integrated management of the natural resources of the Basin,



Binational Basin of the Bermejo River

seeking to integrate development initiatives into the context of erosion and contamination prevention, conservation of nature and sustainable development. The formulation of PROBER is based upon the achievements of SAP-Bermejo´s implementation phase, as well as on the results of the participation process and seminars that took place during the final stages of execution of SAP-Bermejo.

The long-term aim of PROBER, which drives the purpose, specific objectives and strategic activities, is that ***"The populations of the Binational Basin of the Bermejo River have improved their quality of life through the management and sustainable use of its natural resources"***. To achieve this objective, PROBER will build on the experiences and lessons learned from SAP-Bermejo, as well as the technical, institutional and organizational capabilities needed for the integrated and sustainable management of the Basin.

PROBER responds to the challenges of sustainability in the integrated management of the Bermejo River Basin with an emphasis on its transboundary water resources, boosting the economic and social development of the communities settled therein. It continues strengthening the vision of the Basin as a management and planning unit and recognizes the central and prominent role of the Basin's inhabitants and jurisdictional institutions.

The PROBER is organized into four large *Strategic Areas*–each with their respective *Components* and a coherent set of *Actions*-which were defined and consolidated by inter-sectoral groups of specialists by topic area, maintaining a close relationship with

the Strategic Areas on which the SAP-Bermejo was implemented.

In general terms, the PROBER maintains:

- The binational hydrographic Basin as a management and planning unit, with water resources as the basis of its development, within the concept of integrated natural resources and ecosystem management.

- Consideration of the critical importance of a solid binational institutional framework, that facilitates and supports agreements and mutual cooperation between Bolivia and Argentina, sustained through COBINABE and articulated through technical institutions with responsibility for coordinating the management of development in the Basin; namely, COREBE in Argentina and the OTNPB in Bolivia.

- The central role of the participation of society and relevant institutions in decision-making processes related to development activities and projects that pertain to them. In this regard, SAP-Bermejo sought new participation channels, in line with the advancement of democratic processes in each country.

- The validity of the main conclusions of the TDA and the root causes of the problems affecting the Basin, which led to theSAP-Bermejo, acknowledging the need to update and enrich that analysis with new information.

- The replication and enhancement of successful integrated actions carried out in the Basin within the framework of SAP-Bermejo.

On the other hand, PROBER consolidates and extends the reach of SAP-Bermejo to include:

- Participation of the institutions responsible for the management, policies or coordination of water resources in both countries, not originally considered in SAP-Bermejo.
- Actions derived from international committments of national and societal priority, such as the fulfillment of the Millennium Development Goals, agreed upon by the United Nations in order to overcome poverty.
- Studies of alternative for multiple uses of the available hydrologic potential of the Basin, in cooperation with local communities and stakeholders.
- Social empowerment through information, communications and educational efforts in the communities and their organization for informed participation.
- Greater attention to measures to ease the negative effects of global changes in general, and of climate change and variability in particular, prioritizing sustainable and integrated management of surface and groundwater resources.

As an integrated action strategy for the Basin initiated by SAP Bermejo, PROBER has a long-term horizon of 20 years. However, with the aim of turning the Program into a practical and operational instrument that allows COBINABE and both governments to manage and implement the results

of SAP-Bermejo, two stages, clearly delimited in scope, have been identified: a 3-year short term and a 5-year middle term.

In the **short term**, the goal is to move forward with the implementation of *Actions* through specific projects, covering the investment needs and management priorities of each country and at the binational level to improve the quality of life of their populations and promote the environmental sustainability of the Basin. This stage is oriented toward furthering the results of SAP-Bermejo.

The short-term stage anticipates:

1. The management and implementation of projects of transboundary interest and the follow-up of national/jurisdictional projects of interest to the sustainable development of the Basin.
2. The implementation of the Decision-Making Support System and the follow-up of network operations.
3. The implementation of binational projects such as water quality and sediment control and monitoring; management of binational protective corridors; the identification and studies of possible environmentally-friendly alternative multipurpose uses of the Basin´s hydrologic potential; promotion of environmental education; social empowerment and public participation within the Basin.

The mid-term stage is considered as a logical consequence of the tasks that, in each *Strategic Area, Component and Action*, were developed during the short-term stage for the integrated management of the Basin. During this stage, it is planned to carry out those tasks derived from the investment studies identified as feasible and fundable, furthering institutional consolidation as the responsibilities of institutions broaden to address more complex management processes, and joint actions of increased importance are executed, both at binational, and national and jurisdictional levels.

6.6. Lessons Learned and Best Practices in the "Sustainable Development of Natural Resources" Strategic Area

The main lessons learned and best practices arising from the implementation of the activities related to sustainable development of natural resources carried out within the framework of SAP-Bermejo include:

- During the formulation stage of a project, it is paramount to analyze the issues of concern using a systematic approach in order to visualize all related components and their interactions. A full and participative diagnostic analysis is fundamental to understand the social, cultural, economic, productive and environmental situation of the project area.

- At the time of formulating a project's implementation strategy, it is important to take into account organizational and institutional needs. The strengthening and respect for the grassroots organizations, promotion of participation, need for consensus between the timelines of the community and those of the

PROBER: STRATEGIC AREAS, COMPONENTS AND ACTIONS

STRATEGIC AREAS/ COMPONENTS	ACTIONS
Strategic Area I: Institutional consolidation for integrated water resources planning and management of the Binational Basin of the Bermejo River	
I.1. Development of the institutional framework	I.1.1. Institutional consolidation of COBINABE as the Basin organization. I.1.2. Strengthening of COREBE and OTNPB and coordination of water and natural resources management entities of Argentina and Bolivia.
I.2. Adaptation of the legal framework for planning and management	I.2.1. Harmonization of the legal frameworks of jurisdictions of the Basin for integrated water resources management (IWRM) I.2.2. Implementation of zoning and land use regulation.
I.3. Design and implementation of the decision-making support system	I.3.1. Optimization of an information system for the management of the Binational Basin of the Bermejo River, incorporating the monitoring network of environmental parameters and the early warning and extreme events alert system. I.3.2. Implementation of the decision-making support system.
Strategic Area II: Sustainable use of natural resources	
II.1. Development of sustainable production in critical areas	II.1.1. Sustainable cattle management II.1.2. Management of intensive agricultural systems II.1.3. Sustainable forestry management II.1.4. Development of agro-forestry systems for small producers II.1.5. Development of tourism II.1.6. Management of fishing and aquaculture resources
II.2. Integral use of water resources (surface and underground waters)	II.2.1. Drinking water supply II.2.2. Livestock watering, irrigation supply, agricultural drainage, and other uses II.2.3. Ground water uses II.2.4. Atmospheric waters
II.3. Application of instruments and development of capacities for environmental management	II.3.1. Payment for environmental services II.3.2. Clean development mechanisms II.3.3. Reduction of carbon emissions
Strategic Area III: Reduction in vulnerabilities through integrated water resources management, considering climate variability and change	
III.1. Prevention and mitigation of erosion, sedimentation and desertification processes	III.1.1. Creation of a sedimentological monitoring and information system III.1.2. Implementation of control measures III.1.3. Expansion of knowledge and development of management instruments III.1.4. Dissemination of existing information
III.2. Pollution prevention and control and environmental sanitation in water bodies	III.2.1. Monitoring of water quality III.2.2. Environmental Sanitation of water bodies III.2.3. Systematization of information on water quality III.2.4. Training, communications, and information dissemination programs
III.3. Risk management, prevention and reduction of natural disasters	III.3.1. Strengthening existing forecasting systems and development of an extreme events alert system. III.3.2. Training, communications and information dissemination programs.
III.4. Conservation of ecosystems and biodiversity	III.4.1. Protection of ecosystems and management of protected areas III.4.2. Conservation of biodiversity related to water bodies and to the Basin III.4.3. Rehabilitation and restoration of degraded environments
Strategic Area IV: Social participation for the planning and integrated management of the Basin	
IV.1. Consolidation of participatory processes	IV.1.1. Promotion of societal participation IV.1.2. Generation of capacities for societal participation
IV.2. Environmental education	IV.2.1. Formal environmental education IV.2.2. Informal environmental education IV.2.3. Building awareness on environmental matters
IV.3. Systematization of information, dissemination, and communication	IV.3.1. Dissemination of information and communication IV.3.2. Development of new communications channels

project, creation of community groups and the identification of and support to "leader" producers, all showed to be good practices, facilitating the adoption of new proposals by the beneficiaries.

- During the execution of the projects, coordination between the different actors working in the area allows for harmonization and promotion of joint benefits arising from separate actions.

- The monitoring of a project's progress enables the generation of proposals for its continuity, and also can help identify, at an early stage, difficulties that may arise. To achieve the project´s goals and objectives, it is important to have a clear and correct administration of funds.

- The appropriate dissemination of information on the progress achieved by the project provides for easier replication and appropriation on the part, among others, of state organizations from the region and from other areas with similar characteristics.

- The production models must answer to the real needs of communities and a consensus must be reached with them on the different activities to be carried out.

- Production projects must consider an environmental approach, with coordination between and among all levels of society and government to unify criteria and approaches between all stakeholders.

Although the replication of identified best practices will always be subject to the characteristics of the sites where new projects are to be implemented, the following best practices can be considered for application to future projects.

- The joint planning of Project activities, strengthening of local organizations within a participative framework in decision-making process, education of leaders and providing training in various technical areas are all considered best practices. This was paramount in the success of the sustainable natural resources management project at Iruya, which addressed structural aspects as well as community development concerns.

- Agreements with public health organizations to approach issues regarding zoonosis allowed for a comprehensive approach to the sanitary management of goat herds in Laguna Yema, as it addressed the problem of brucellosis both in animals and in members of the producer families, with benefits to public health.

- In the tropical pastures management project, the elaboration and publication of sustainability indicators allowed for a comparison of systems and monitoring of changes over time and behavior of different species in different areas.

- Working with groups of producers, the installation of demonstration plots,

commercialization support and the radio broadcasting of technical and market information are practices that enhance and facilitate the appropriation of alternative production models.

- Training techniques based on participative principles such as those implemented in the Forestry Resources Conservation Pilot Planning Program in Serranía El Cóndor in Bolivia enriched local knowledge and encouraged communities to define and direct their own development processes, valuing and revaluing the local knowledge of communities, which facilitated the introduction and learning of new production methods and techniques.

6.7. Main Conclusions – Sustainable Development of Natural Resources Actions Performed by the SAP-Bermejo

The main difficulties or deficiencies that traditional production systems in the Bermejo River Basin present are centered around the non-sustainable use of soil and water resources and the destruction of forest ecosystems. Overgrazing, the inadequate use of soils, difficulties in accessing water sources, floods and droughts, lack of production diversification and organizational difficulties are common problems in the different communities of the Basin. These factors, connected to natural processes, bring about, in most cases, problems of erosion and degradation of natural resources with their subsequent impacts on production systems, family incomes and quality of life.

On these issues, in addressing the causes of problems relating to sustainable production, SAP-Bermejo´s input was highly valuable and led to the development and implementation of new sustainable production models, systems of water usage and support for local populations in mitigating and/or minimizing the problems associated with hydrologic risks. The implementation of training programs stands out as a fundamental tool for the adoption of new technologies and new proposed development models.

Given the dimensions and complexity of the Basin, the projects carried out were able to apply production models only at an experimental, demonstration or pilot scale. While in some cases, only the formulation of production alternatives was completed, in others the actual implementation of localized and integrated practices for the sustainable use of water, soils and forest resources was achieved, in close collaboration with the communities involved and within the integrated management of a sub-basin or subsystem of the Bermejo and Grande de Tarija Rivers. Each project left lessons learned and valuable experiences, which will be assessed for their potential replication, taking into account the production and organizational characteristics of each area and community.

The support to social organizations and the active participation of stakeholders involved, contributing to the empowerment of activities and innovation, turned out to be one the defining

factors for the success of activities carried out. Joining forces with existing or planned initiatives appears as one of the best practices identified in the implementation of SAP-Bermejo.

Organizational processes and the incorporation of new practices relate not only to the adequacy of the practice to be introduced, but also to the mutual education of the intervening agent with the culture of the community receiving and appropriating it, a process that requires time, social empowerement and confidence-building.

7. Strategic Area IV: Awareness-Building, Public Participation and Replication of Project Activities

A basic common cause of the environmental issues identified through Transboundary Diagnostic Analysis (TDA) was insufficient community awareness, commitment and involvement in natural resources management, as well as the lack of jurisdictional regulatory frameworks or mechanisms that could advance or enable community involvement in such management. In addition, the shortage of public participation was characterized by insufficient community access to necessary information and by limited capacity of the community and its organizations to join the decision-making process.

The implementation of actions in this Strategic Area sought to address these issues in an attempt to stimulate informed and participative decision-making processes, thus strengthening: (I) society awareness at all levels, through environmental education and training, (II) active community involvement in planning, the implementation of development activities and natural resources management and (III) public access to information.

Societal awareness was raised through environmental education programs in an attempt to incorporate environmental and sustainable development concepts into the public education system, both in the Argentine Provinces and in the Bolivian school districts of the Basin. In Argentina, the Program was implemented through Framework Agreements and Protocols signed with the Ministers of Education of the provinces, including content related to the Bermejo River Basin and the environment in general in formal education programs. School experiences that contributed to raising awareness and fostering commitment to the preservation of the Basin were also incorporated. In Bolivia, environmental education was framed within the Education Reform Program and implemented through an Inter-institutional

Agreement between the Department of Education and the corresponding Ministry.

Additionally, activities were carried out in the informal education system in both countries with the goal of incorporating civil society as a central player in work related to environmental conservation and sustainable development.

The implemented activities represented a very important qualitative leap in relation to the participative process developed during the Project formulation as key aspects of the participation of institutional actors were institutionalized and regulated that were previously dispersed in the framework of COBINABE. Additionally, the process articulated other regional areas and in the provinces themselves, as well as in the Department of Tarija, which implemented several of the strategic activities. Efforts were oriented towards the generation of new participation and involvement for decision-making through the Regional Coordination Committees, the Regional Advisory Committee and the Binational Coordination Committee.

Specific actions of participation were developed within the framework of each project: in the formulation, implementation and follow-up of the pilot demonstration projects, as well as in the internalization, by stakeholders, of different applied mechanisms and instruments. More than a hundred institutional and citizen participation workshops, inter-sectoral technical meetings,

Environmental Education Program – brochures

communications and consultations with civil society, all part of inter-sectoral institutional management processes, took place in the Argentine Provinces of the Basin through specific projects that provided access mechanisms to information on how to participate in the process in order to subsequently develop the remaining participation projects in a horizontal fashion. More than 65 activities were developed in Bolivia, including workshops, seminars and meetings with beneficiary rural communities, targeted at promoting institutional and societal participation in the dissemination and awareness-raising of the Basin's environmental issues.

Another important line of action developed under this Strategic Area was intended to improve community access to information as a key part of the process to promote and improve public awareness on environmental issues, seeking to foster the enhancement of citizen knowledge, increase management transparency and generate stronger citizen trust.

For such purpose, the Bermejo Information System (GSI-Bermejo) was designed and operationalized, which included important information on socioeconomic and environmental aspects of the Basin. The COBINABE website was also developed as an instrument to spread and give access to project information. Similarly, several communications and dissemination measures were implemented through workshops and briefings, periodicals and brochures on project activities and results, institutional and sectoral brochures, documentary videos, radio information and participation in regional, national and international events.

Finally, a set of replicable actions was carried out, targeted at expanding and disseminating the methodological approaches, conclusions and results of the SAP-Bermejoin the wider context of the La Plata River Basin.

The programs/activities and the corresponding projects developed within the framework of Strategic Area IV are set out below:

7.1. Environmental education program

7.1.1. Promotion of environmental education activities in the Basin

7.2. Public participation program

7.2.1. Establishment of a public participation program in the Bermejo River Basin

7.3. Bermejo River Basin Information System

7.3.1. Access mechanisms to information for participation;

7.3.2. Development of networks and other effective sectoral and jurisdictional cooperation and coordination mechanisms in the Bermejo River Basin;

7.3.3. Integrated environmental information system and database of the Bermejo River Basin;

7.3.4. Definition and adoption of international waters indicators

7.4. Replication of Project activities

7.4.1. Dissemination and replication from the SAP-Bermejo in the La Plata River Basin.

The following sections presents a description of the main activities and results achieved in each of the projects developed under this Strategic Area.

7.1. Environmental education program

7.1.1. Promotion of Environmental Education Activities in the Basin

The SAP-Bermejo considered environmental education as a key element to support sustainable programs on environmental protection and rehabilitation and of promotion of economic development.

In that sense, a binational program was designed and implemented, aimed at improving educational opportunities in the most vulnerable communities, seeking, through programs developed in local schools, to raise awareness on environmental issues in the Basin communities and foster the appreciation of positive environmental changes at a local level as a mechanism to improve quality of life.

The Program´s proposed result was to have stakeholders trained and educated about the need for conservation and sustainable management of natural resources, in general, and of water resources in particular, within the framework of new scenarios for the relationship between individuals and their habitat. More specifically, the proposed goals were to:

- Instill in the inhabitants of the Bermejo River

Regional Workshop aimed to define thematic contents for the teachers' manual production

Teachers' Contents Manual

Teachers' training certification ceremony in Oran, Province of Salta, Argentina

- Basin a sense of belonging to a common space;
- Promote a positive and responsible attitude for the integral management of natural resources and the joint pursuit of solutions to their needs;
- Foster a water culture based on the Bermejo River; and
- Create opportunities for participation within and based on educational institutions.

The Program's design and implementation considered the high social and environmental vulnerability of the Basin, as well as the need for a strong intervention to promote its sustainable development, requiring the participation and commitment of the different societal actors involved. In this process, education acquires an essential role given that it is the most important societal transformation instrument, enabling the transfer of knowledge, ethical values, responsible behaviors, fostering the continuing education of people and the modification of their behavioral patterns.

The results of the Environmental Education Program constituted one of the main achievements of SAP-Bermejo, especially in terms of establishing education as a tool of environmental management in the Basin and of strengthening capabilities within the education system. Some of the indicators of success are reflected in the inter-institutional agreements entered into between COBINABE and education authorities in Argentina and Bolivia; courses, workshops and seminars that were carried out both for development and the transfer of knowledge; the number of trained participants, including trainers, teachers, principals and students and the quantity of publications prepared and distributed among participating schools, education authorities and the Basin population.

The Environmental Education Program in Argentina

In order to bring sustainability to the experience, it was decided to take action within the formal education system, working only with elementary schools and based on making the most of existing professional capacities. Schools were surveyed in the provinces, jointly with local authorities, which resulted in a greater commitment and dedication by all the actors involved.

The methodology of action was based on public participation, both for specific educational activities and the preparation of materials, with a special focus on two key processes: the process of developing knowledge among regional educational actors and the process to transferring such knowledge.

The Program was implemented in 500 schools, which were selected based on predefined criteria, prioritizing rural or inner-city schools near the Bermejo River, and with populations where the majority were students with scarce resources, including indigenous and native populations.

The Program focused on six lines of action::
(I) Curriculum development;
(II) Production of educational materials;
(III) Training of trainers;
(IV) Training teachers;

(V) Institutional educational experiences; and
(VI) Providing vocational training in teacher training institutes.

(I) Curriculum development

The process of developing the central themes defined for environmental education was carried out taking into consideration the procedural and conceptual contents adopted by the Federal Culture and Education Council at the national level. From this process the proposal to include content related to the Basin in the provincial elementary education curricula was elaborated, taking general content from different subject areas (water resources, geography, social sciences, culture, economics, etc.) and specific content from the Upper and Lower Basins, in addition to provincial issues.

In formulating this content, each educational institution identified the appropriate elements to define the knowledge and institutional methods for environmental education in the Bermejo River Basin **and** its Institutional Education Project, with the corresponding classroom curricular projects.

(II) Production of educational materials

The development of learning materials using different media included the didactic development and design of support materials, the production of manuals (both on methodological strategies for teachers and trainers and on general and specific issues concerning the Bermejo River Basin) and the production of didactic materials in different media, including the graphic-communicational design of the materials, as well

CD with institutional educational experiences, Provinces of Salta and Jujuy, Argentina

Environmental Awareness Campaing Closure Workshop jointly with schools of the Basin

as printing the necessary materials to teach the trainers.

The publications for the educational component were discussed with local specialists, resulting in the preparation of the following basic textbooks:

a) *La Cuenca del Río Bermejo: un aporte para su tratamiento en la Educación General Básica* (*The Bermejo River Basin: a Contribution for its Treatment in Elementary Education),* content manual for teachers and trainers.
b) *La Cuenca del Río Bermejo: un aporte para su tratamiento en la Educación General Básica: Orientaciones para el formador* (*The Bermejo River Basin: a Contribution for its Treatment in Elementary Education. Training Guidelines).*
c) *La Cuenca del Río Bermejo en el diseño curricular de la Educación General Básica (The Bermejo River Basin in Elementary Education Curricular Design).*
d) *La Cuenca del Río Bermejo: cartografía simplificada para alumnos de la Educación General Básica (The Bermejo River Basin: Simplified Cartography for Elementary Education Students).*

(III) Training of trainers

First, a trainer profile and a training plan were elaborated and agreed upon. It was institutionally decided on that the preparation of trainers in each province would be done with the previously selected materials and thematic approaches, and that each province would be in charge of selecting the participants.

The main goal of this intervention was to provide skills for participants with a profile that coincided with the project's objectives.

The Program was co-managed by the education authorities of the four provinces involved and by the SAP-Bermejo. It involved specialists in different areas of expertise related to the issues in the Basin, provincial teachers and children from schools selected by each province, with a total of 500 institutions, 56 trainers and 2500 teachers.

Thirty-five specialists from the four provinces, fifty teacher-trainers and four provincial education coordinators appointed by local authorities participated in this stage.

(IV) Training teachers

The goal was to strengthen the institutional capacities of the schools, developing social capital both for teachers and for the education community as a whole.

The focus was not only on the application of the content, but also on attitude, aimed at achieving basin unit awareness and a water culture, and strengthening the use of pedagogical strategies that allowed the teachers to develop, along with their students, positive behavior and attitudes towards the project's goals.

In Salta and Jujuy, the process involved 23 teacher trainers and 955 trained teachers in 19 schools within these provinces. This training provided the tools necessary for teachers to

incorporate the core environmental education content into the classrooms.

(V) Institutional educational experiences

This activity consisted of incentivizing participating schools to develop projects that contributed to raising awareness of and commitment towards the Basin and the use of its resources among the students of the institutions involved in the Program.

Once the teacher training was concluded, participants had to prepare institutional projects to implement in their respective schools, promoting the Basin unit as part of the social imagination, developing preservation and conservation behaviors and incentivizing a water culture.

From this action, 165 projects were presented as institutional educational experiences; 67 in Salta and 98 in Jujuy. The Program resulted in the document *Experiencias educativas institucionales Salta y Jujuy (Institutional Educational Experiences in Salta and Jujuy),* which was edited in electronic format and of which 20,000 copies were distributed in the Upper Basin provinces.

(VI) Providing vocational training in teacher training institutes

Vocational training activities were promoted in teacher training institutes of the Upper Basin based on the experience of implementing the Program, through the redefinition of the contents in the institutes' curricula, incorporating environmental concepts originating from the Bermejo River Basin

Trainers Course in the Lower Basin, Resistencia, Province of Chaco, Argentina

It must be stressed that the same teachers selected at a provincial level worked on the development of this environmental education curriculum content redefinition project, the training of trainers for the teacher training institutes and the preparation of educational materials. The development of a continuous education project for the institutes was also fostered and implemented by the teachers.

The inclusion of interested stakeholders was not only aimed at introducing environmental issues into teacher training institutes, but also at ensuring that this knowledge could be replicated at other teaching levels.

Other environmental education activities taken in Argentina

In the informal environmental education sector in Argentina, the Municipality of San Salvador de Jujuy implemented the Urban Solid Waste Recycling – Selective Recovery of PET Plastics Program, targeted at stimulating citizen involvement in and awareness of the preservation of the environment, especially working with organizations and schools.

One of the main activities was to work with PET plastics, acknowledging that these had several negative environmental impacts and represented a high percentage of household waste. Thus, the Selective Recovery of PET Plastic Containers Campaign was organized. The objective of this campaign was to achieve real and effective citizen participation in an urban solid waste recycling program, ultimately decreasing the volume of waste for final disposal.

As a result of this Program, 21 training workshops took place in cooperation with several NGOs in the City of San Salvador de Jujuy, including community organizations that represented neighborhood associations, health centers, neighborhood advisory committees, day-care centers and cafeterias for children.

The Environmental Education Program in Bolivia

The Binational Environmental Education Program activities developed in Bolivia were targeted at educating and informing about the value and the need for protection of local water basins and, in particular, the Bermejo River Basin, as a key element in providing sustainability measures for environmental impact prevention and environmental rehabilitation.

The Program, developed as a pilot project, was executed within the framework of the Bolivian Educational Reform Act, which envisages environmental education as a crosscutting link, and in a sample of educational institutions (that make up the elementary school sector) located in the Basin, which had a relevant role in increasing awareness, sensitivity and perception of environmental issues among the population of the Basin.

The Program was aimed at incorporating the environmental reality of the Bermejo River Basin into the lives of the Basin inhabitants, enabling

them to participate in its environmental transformation and preservation.

An institutional agreement was signed between the Department of Tarija, through the Departmental Education Service (*Servicio Departamental de Educación, SEDUCA)*, the National Teacher Training Institute, of the Department of Education, and the National Technical Office of the Pilcomayo and Bermejo Rivers, through the SAP-Bermejo.

The Program was executed through the Permanent Training Institute (*Instituto de Formación Permanente, INFOPER*), whose mission is to develop actions for the permanent training of public servants in the administration and teaching areas of the Public Education Service. The following phases and activities were developed:

I) Preparation. The main goal of this phase was to establish a functional and operational structure for the development of the different scheduled activities, as well as to select the educational institutions to be considered.

II) Teacher training. This included the design and execution of Environmental Education Teacher Training Workshops, supported by specialists in different topics included in the Program, strengthening the academic (discipline) and methodological capacities of the principals and teachers in elementary and secondary school institutions within the Bermejo River Basin in the Department of Tarija. Additionally, the involvement

Meetings aimed to sociabilization of youth, Tomatitas, Tarija, Bolivia

Environmental Education Program, rural courses in Arrozales, Province of Arce, Tarija, Bolivia

SAP Bermejo in the Environmental Awareness Campaing

Didactic materials for teachers, Environmental Education Program, Bolivia

Trainers course, Bolivia

of municipal committee representatives and education experts was fostered and informational materials distributed among those participating in the Program.

III) Pedagogical interventions in the classroom. This phase was aimed at systematically and participatively developing learning processes leading to the development of environmental awareness among students and within the education community as a whole, and at critically and comprehensively developing pedagogical processes during the classroom intervention phase, taking into account different factors and the level of involvement of participants in the execution of classroom projects.

The pedagogical strategy employed, *Proyecto de Aula (Classroom Project)*, enabled the active participation of students and parents in different implementation phases through planning, organization, execution and evaluation, which facilitated the integration of the contents from different areas of knowledge, and was conducive to important advances in learning by the students.

Another important pedagogical activity was the specific systematization of teaching experiences through classroom projects. The classroom pedagogical intervention stage concluded with the *Teacher Experience Sharing Seminars,* an academic activity that was first developed in educational districts and then at a departmental level.

IV) Follow-up and assessment. The main goal of this phase was to identify the factors facilitating the Program implementation process, as well as the activities carried out, evaluating in both cases the degree of achievement of the proposed goals. The follow-up and assessment activities were developed with the involvement of INFOPER technicians, the SEDUCA Follow-Up and Monitoring Team and the Program Coordination Unit, aimed at applying corrective actions during Program implementation.

During the execution of the Program, 438 elementary and secondary school teachers and

principals belonging to 27 educational institutions geographically located within the Bermejo River Basin were trained in theoretical and methodological approaches. A total of 8736 students, of which 2360 (27%) were in secondary school and 6376 (73%) were in elementary school, participated of the Program. In addition, 27 classroom projects were prepared by the trained teachers.

Other environmental education activites implemented in Bolivia

Environmental Education Program for Rural Areas in the Bermejo River Basin

Based on the experiences generated during the Environmental Education Program implementation in the formal sector, the SAP-Bermejo identified the need to establish environmental education actions in the informal sector, more specifically, in rural areas that were characterized by a lack of information and training, and which were at risk of suffering from negative environmental impacts and imbalances.

These actions were carried out through the Environmental Education Program for Rural Areas in the Bermejo River Basin (*Programa de Educación Ambiental en el Área Rural de la Cuenca del Río Bermejo*, *PEAAR*) in the Department of Tarija, in the provinces of Méndez, O'Connor and Arce, with the participation of *SEDUCA*, the municipalities of the First and Second Sections of the Province of Arce, and of the provinces of Méndez and O'Connor, the Single Trade Union Federation of Rural Communities of Tarija and the Sub-prefecture and Township of the First and Second Sections of the Province of Arce.

Among the results obtained, it is worth highlighting the preparation of an environmental education program for rural areas, the design of training courses with clearly defined thematic content and modules, and an evaluation system, with indicators and criteria for follow-up and assessment of the program, which may be replicated in other rural areas of the Department of Tarija.

Environmental Awareness Campaign

This project proposed the development of communications actions to convey the idea that sustainable development and nature preservation are valuable for development and the quality of life of the inhabitants of Tarija. The importance of this project lay in proposing activities to incorporate environmental issues into the daily life of society as a whole and in the institutions related to environment, fostering increased sensitivity, awareness and a change of attitude towards these issues.

The project involved aset of urban and rural areas in the Department of Tarija, with a strategy based on the elaboration and implementation of communications and dissemination activities using different media, especially on the issues of: I) soil degradation; II) water pollution and indiscriminate water use; III) solid waste; IV) urban pollution; V) habitat and biodiversity preservation and sustainability and VI) preservation and sustainable use of fisheries.

Program beneficiaries meeting in Bolivia

It is worth emphasizing two events, which were aimed at spreading the campaign. The first event took place in October 2006 during the EXPOSUR 2006 Trade Show, where the project had a stand and the second event took place in December 2006, when the campaign was officially launched with the involvement of the participating institutions and media from the Department of Tarija.

7.2. Public Participation Program

7.2.1. Establishment of a public participation program in the Bermejo River Basin

The TDA highlighted the lack of community participation, knowledge and commitment as factors that were closely related to the low level of awareness and motivation among the population, thus generating a low level of societal involvement in natural resources management. As part of its strategy, SAP-Bermejo took on the difficult task of fostering sustainable development and participation of the various communities in the Basin, covering both countries and the five political-administrative jurisdictions, through an arduous and planned process that envisaged strengthening and the utilization of a variety of consultation and public participation tools.

The implementation of the Public Participation Program was characterized by the development of activities targeted at promoting a common vision through the participation of the government, NGOs, farmer organizations, rural and native communities, the academic sector and the population in general.

The principal **objectives** established for Public Participation Program were to:

- Incentivize the active participation of the population in planning and implementing projects for the rational use and management of natural resources to ensure their sustainability.
- Encourage and incorporate the population into

the management and decision-making processes for natural resources management.

- Promote and strengthen, in operational and institutional terms, the consultation and participatory mechanisms that foster dialogue between government agencies and communities, and facilitate the flow of and access to information for decision-making.
- Incorporate public participation as a work methodology in the execution of SAP-Bermejo projects.
- Involve local stakeholders in the execution of projects within their communities.
- Instill in local stakeholders a greater responsibility for decision-making relating to the design and development of the activities in each of the projects taking place in their communities.
- Facilitate access to and exchange of information among the population of the Basin as a way of ensuring informed stakeholder participation processes.
- Raise citizen awareness of environmental issues.

Two actions of the Public Participation Program should be highlighted. The first action was based on the ***institutionalization of public participation*** at thebinational and regional levels, defined by the creation and operationalizationof institutional mechanisms that ensured participation and consultation of all involvedstakeholders, not only at thegovernment level, but also at the level of social organizations and academic institutions. The second action was characterized by the ***promotion of public participation within the framework of the execution of each project,*** and, therefore, this was carried out primarily at the local level, but sometimes at the regional as well.

Three entities were established within the framework of the institutionalization of public participation: a) the Regional Coordination Committee b) the Regional Advisory Committee and c) the Binational Coordination Committee. These committees, established within the sphere of COBINABE, were comprised of representatives from Argentina and Bolivia, the Argentine provinces located in the Basin and the Department and the Municipalities of Tarija. The three committees formed an essential support system for the operation and execution of the project's activities.

In relation to the promotion of public participation in the framework of the execution of each project, the Program sought the involvement of relevant actors from its initial formulation phase until its implementation and follow-up. In this regard, the set of local actors involved was rich and diverse, including the participation of base organizations, local groups and leaders, mothers´ groups, community councils, native and creole farmer communities, small local farmers (agricultural farmers, cattle-breeders, bee-keepers, goat-breeders, etc.), artisans, private businesses, rural farmer associations, civil society organizations and social and environmental NGOs, among others.

Moreover, a wide range of public participation mechanisms were employed: seminars, workshops, institutional and working meetings, media and

Public Participation in the Development of the Binational Biological Corridor CALILEGUA - BARITÚ - TARIQUÍA

Geographical Area

The geographical area of the Corridor covers the Tariquía Reserve (Bolivia), Baritú and Calilegua National Parks (Argentina), other protected areas and the regions connecting them.

Project Goals

- To ensure biological connectivity and the continuity of the natural processes taking place in the protected Corridor areas.
- To design a long-term vision and to identify programs and projects enabling the sustainable development of the populations living in the Corridor area.
- To lay the bases to convert the Biosphere Reserve of the Yungas into a binational reserve.
- To facilitate the operation and organization of regional management committees in the Corridor.

Participation Mechanisms Used:

Binational Workshop *to define Strategies, Programs and Projects* (held in Salta, from 31 March 2005 to 2 April 2005). The General Coordinator and the sectoral advisors jointly developed the general Project framework with short-, mid- and long-term goals defined on the basis of the institutional vision for the development of the Corridor. From this general framework emerged short- and mid-term programs and short-term projects that were prepared and prioritized.

Bilateral Meetings aimed at generating aninstitutional management framework that could favorably establish the constitution and formalization of the General Management Committee.

Technical Work Meetings for the political-technical and organizational feasibility analysis present the proposal to set up a Binational Biosphere Reserve. These meetings defined: a) the positive elements of the proposal and b) the elements that should be considered to contribute to the development and acceptance of this binational proposal by regional decision-makers (within the governments of Salta and Jujuy).

Field Work with Communities and Beneficiaries for an updated analysis and diagnosis of regional issues. This field work was developed with the following landmarks:

16 March 12005. Calilegua National Park and its catchment area: Meeting with the Park Administration, Regional Committee and visit to the Town of San Francisco.

Binational Workshop for the strategies definition

Field trip – Lower Basin Iruya River, Province of Salta, Argentina

Management Plan Validation Workshop

17 March 12005. Survey of the Lower Iruya River Basin: The Binational Team went to the region of Orán and the mountain region ("La Bambú") to survey the regional geographical framework: Tributaries of the Iruya and Blanco Rivers, interactions with the community areas of Tinkunaku and Finca Santiago, and the farms in the mountain area.

18 March 12005. Survey of the Upper Bermejo River Basin in Bolivia: visit to the regions of Nogalitos and Emborazú: survey of the infrastructure developments influencing natural processes in general and biological connectivity in particular.

Informational Stakeholders Workshop for the validation of the project profiles prioritized by the Binational Committee.

Validation Workshop of the Management Plan of the Tariquía-Baritú-Calilegua Ecological Corridor with the participation of representatives from public and private entities and farmer organizations, where the following topics were put forth and discussed: general features of the Corridor, vision, objectives and projects with short-term priority.

Meetings and Workshops for the Participative Assessment of the regional issues. This development covered:

6 May 2005: Binational team working meeting in the City of Tarija: Assessment of the formulation of sub-projects and their interaction with local actors, as seen in the Orán Workshop.

6 May 2005: Binational team working meeting in the City of Tarija: Assessment of the formulation of sub-projects and their interaction with local stakeholders.

- 7 May 2005: Public participation workshop held in the Town of Calilegua.

networks (e-mail, mailing lists and websites), interviews with key figures, polls, meetings with agencies, communities and beneficiaries, community work, etc.

Within the implementation of activities under each Strategic Area, each of the projects used more than one public participation mechanism depending on their own needs and the customs of the beneficiary population (See box).

The experiences gained in the implementation of SAP-Bermejo were categorized with the goal of contributing to the design and implementation of the public participation components in programs for the sustainable management and use of natural resources. A summary of these experiences, including the participation categories or variables, as well as the participatory tools utilized, can be found in the SAP-Bermejo publication "Public Participation in the Binational Bermejo River Basin".

7.3. Bermejo River Basin Information System

The results obtained from the TDA identified the insufficient community access to necessary information and the limited capacity of communities and their organizations to get involved in decision-making processes as one of the causes for the Basin's environmental issues. The SAP-Bermejo incorporated activities for the generation, compilation and dissemination of information at two levels: first, in relation to technical information for natural and water resources professionals, at all government levels responsible for their

Participative planning in Colanzulí, Iruya, Argentina

management and, second, with the goal of providing information of general interest to the public and other entities interested in the sustainable development of the Basin.

These set of activities promoted institutional transparency, fostered informed participation in community decision-making and contributed to the standardization of practices between professionals and jurisdictions, both in the Basin and in the wider context of the La Plata River Basin.

To achieve these goals, an Environmental Information System was designed as a preliminary step, which was implemented through the following specific actions:

7.3.1. Access Mechanisms to Information for Participation

The purpose of the Project was to identify instrumental strategies and mechanisms to facilitate appropriate civil society access to information on water, natural resources and development projects and activities.

The strategy for access to information was founded on the development and operationalization of instruments based on Internet use. In this regard, databases and websites were developed and a mailing lists were used to disseminate information.

Together with the OTNPB in Bolivia, a **Data Center** was established with the goal of integrating, systematizing and disseminating information generated by state and private institutions of the Department of Tarija, making such information available to different users.

In Argentina, the storage and dissemination of environmental information related to the Basin was initially established on the COREBE and SAP-Bermejo websites.

The official binational website of COBINABE was subsequently designed, developed and established using the web address: www.cobinabe.org. This site contains the institutional information related to the organization, the projects in execution and basic information on the Basin regarding several environmental, social and economic issues. Moreover, it is the portal through which to enter the Bermejo River Basin Management Information System-GSI Bermejo, created as an instrument to establish and disseminate information on the condition and use of natural resources in the Basin, and to provide reliable information on different environmental parameters necessary for research, assessment, planning and control.

Free access to information through these instruments enhanced and established the foundation to achieve: I) improvements in the levels of public awareness on the Basin's environmental issues; II) improvement in the contributions and quality of participation and III) responsible participation based on the availability of reliable information.

7.3.2. Development of Networks and Other Effective Jurisdictional and Sectoral Cooperation and Coordination Mechanisms in the Bermejo River Basin

The Project was aimed at boosting the development of inter-jurisdictional and crosscutting cooperation mechanisms as instruments for the coordination of sustainable management activities among different economic sectors and jurisdictional authorities in the Basin.

Several successful experiences can be highlighted in the establishment of groups and committees within the framework of the SAP-Bermejo for the planning, execution, assessment and management of natural resources in the Basin. At the binational institutional level, three coordination entities were created, each with a different role: i) the *RCC*; ii) the RAC and iii) the *BCC*. Their respective functions, structures and operating mechanisms were also defined.

The RCC carried out the functions of coordination, program support and general supervision of its jurisdictions' activities, as well as ensuring the coordination between the

governmental departments appointed for the administration of the Basin at a sub-regional level within the framework of the SAP-Bermejo. It was comprised of representatives of the provincial administrations of Argentina and the Prefecture and the Municipalities of Tarija, Bolivia, appointed by the highest authority.

The RAC acted as the advisory body of the SAP-Bermejo in the adoption of communication mechanisms between the government and civil society in each jurisdiction, with the objective of facilitating the active participation of the community and defending the interests of academic entities, scientific organizations and different national, provincial and departmental NGOs. The Committee was made up of representatives of NGOs, academic entities, scientific and technical organizations, the private sector, citizens and corporations interested in the management of natural resources in the Binational Bermejo River Basin.

Finally, in 2008, COBINABE created and operationalized the BCC, which was based on the operation and organization of the aforementioned RCC and RAC incorporating representatives from the Argentine municipalities of the Basin.

The stakeholders belonging to academic institutions and civil society that participated with different roles and functions in the above-mentioned mechanisms was rich and diverse, including universities, research centers, public and private associations, professional councils, foundations, etc.

Meeting for the conformation of the Center-Salta area Committeee.

At the specific project execution level, the implementation of two coordination and cooperation mechanisms can be highlighted. The first experience is related to the project for the Biosphere Reserve of the Yungas (*Reserva de Biosfera de las Yungas, RBYUN*), where mechanisms ensuring that each community sector would be represented in the Regional Committees were established, with the goal of facilitating a dialogue that would allow for the participatory management of the RBYUN.

The Regional Committees made up the structure which supported the Reserve Coordination Committee. Each of these committees were comprised of the different actors that were considered critical at the time the structure was designed: municipalities, official local organizations, the local representative of the National Parks Administration, community representatives, businesses, local NGOs, small and medium producers and private landowners.

The Regional Committees turned into an inter-jurisdictional and sectoral coordination mechanism

between the different stakeholders from civil society and the jurisdictional authorities of Salta, Jujuy and the Argentine national government, with the goal of better management of the RBYUN.

The second experience was related to the Basin Water Quality Monitoring Network, which set up an "Expert Group" made up of water laboratory technicians and professionals from the four Argentine provinces and the Department of Tarija. This group was vital in the organization, execution, follow-up and assessment of the sampling campaigns performed at the selected Basin sites.

7.3.3. Integral Environmental Information System and Database for the Bermejo River Basin

The GSI Bermejo was designed and implemented as an instrument to establish and disseminate information on the condition and use of natural resources in the Basin, and to include reliable information on different environmental parameters aimed at research, assessment, planning and regulation.

The system was developed through the inclusion environmental variables at the Basin level, involving users and generators of institutional, operational and technical information. Its activities were focused on the inter-institutional strengthening and coordination of the agencies responsible for the management of natural resources in the Basin, both regarding information generation and incorporation at the user level, providing a basis for the harmonization of methodologies and procedures used by the different information generators of the Basin and consolidating the continuity of the systematic collection, processing and timely dissemination of information.

The GSI Bermejo is comprised of the following components:

Hydrometeorological Network

The network of hydrometeorological measurements, established by the SAP-Bermejo, provides real time information on the hydrological conditions in the different regions of the Basin. The principal objectives of the Network are to:

- Obtain hydrometeorological data for the Bermejo River Basin Management Information System by incorporating equipment for the automatic capture and remote transmission of data.
- Obtain real time hydrometeorological data from various stretches of the Bermejo River and its main tributaries, analyze the data and make the information available to regional users.
- Incorporate (I) flow measurements at some of the stations in operation and (II) hydrological data obtained from other, non-automated stations that belong to the National Hydrological Network, to complement the Information System.

The Hydrometeorological Network is composed of fourteen automatic Remote Stations, located at representative points in the Binational Bermejo River Basin, with data transmission through radio signal reflection using meteor burst communications (MBC), a Central Communications Station (*Estación Central de Comunicaciones, ECC*), two Operations Centers (Tarija and Orán) and a

Technical Support Office ((*Oficina Técnica de Apoyo Salta, OTAS*, in the City of Salta).

It also includes four Measurement Stations at: La Angostura and El Cajón, both on the Tarija River; in San Telmo, on the Grande de Tarija River and in Balapuca, on the Upper Bermejo River.

Concerning the sedimentological aspects of the Network, it includes sedimentological monitoring equipment consisting of a suspended solids sampler and a dredge-like bottom sampler.

The remote stations transfer their information to the Central Communications Station located in the outskirts of the City of Salta. The information is then transferred over the phone to the Technical Support Office where Systems Management Software (*Software de Gestión del Sistema, SGS*) is used to organize the communication flow between the remote stations and the ECC, in addition to managing the databases.

Another core function of the SGS is to make the information available to users. For such purpose, it administers database access, both for the users of the local network (through the TCP/IP protocol) and for Operations Centers and authorized external users.

The Tarija Operations Center (*Centro de Operaciones Tarija, COT*) is in charge of coordinating the operation and maintenance of the Bolivian part of the Network, as well as the management and distribution of information received.

The Orán Operations Center (*Centro de Operaciones Orán, COO*) coordinates the operations support tasks for Network maintenance and technical assistance when the river level rises.

Each remote station is composed of a set of sensors (rainfall and water level), a datalogger and data gathering module and a meteor reflection transmission module.

The following Figure shows the distribution and location of the 14 remote stations that make up the Network:

The Network's operational and technical characteristics offer an enormous potential for the management of natural and water resources at the Basin level given that this system covers the entire geography of the Basin. The Network also covers some neighboring basins due to a number of simultaneous remote stations that support the ECC (over 200). Because of these features, the Network is a cornerstone for the design and operation of a Bermejo River Basin Decision Support System.

Localization of Hydrometeorological Network Remote Stations

Key:

1. Tucumilla Remote Station.
2. Cañas Remote Station.
3. Tarija River Remote Station in La Angostura.
4. La Colmena Remote Station.
5 Bermejo River Remote Station in Alarache, International Bridge.
6. Tarija River Remote Station in El Cajón.
7. Bermejo River Remote Station in Balapuca.
8. Río Grande de Tarija River Remote Station in San Telmo.
9. Bermejo River Remote Station in Embarcación.
10. San Francisco River Remote Station in Caimancito.
11. Bermejo River Remote Station in El Sauzalito.
12. Bermejo River Remote Station in Puerto Lavalle.
13. Lavayén River Remote Station. Bajada de Pinto.
14. Río Grande de Jujuy River Remote Station. Chañarcito.

Cable and cart for flow measurment in the remote tation

Wing and sensor radar in Sauzalito Remote Station, Province of Chaco - Argentina

Central Communications Station Hydrometeorological Network

The strategic design of the Network, equipment selection, preparation of bidding specifications for the installation, start-up, bid analysis and award of the works were done with the participation of the Under-Secretary for Water Resources of Argentina and related entities from all the Basin provinces in Argentina, the Prefecture of Tarija in Bolivia, specialized professionals both from the National Technical Office of the Pilcomayo and Bermejo Rivers in Bolivia as well as from the Regional Bermejo River Commission in Argentina.

The sustainability of the Network is guaranteed by an agreement signed between COBINABE and several Argentine governmental agencies with jurisdiction over water resources for the permanent maintenance of the Network through the National Hydrological Network operator. An agreement was also signed for such purpose in Bolivia, establishing that the maintenance and operation of the stations located in its territory is entrusted to the National Hydrology and Meteorology Service (*Servicio Nacional de Meteorología e Hidrología, SENAMIH*).

The Network planning process, through the integration of technical teams, sought to reach consensus among all of involved jurisdictions, to give consideration to the needs of beneficiaries in the Basin and ensure its operation and maintenance through inter-institutional agreements with local entities. This participatory work methodolgy for the design, implementation and maintenance of the Network enables the replication of the experience in other similar basins.

Hydrosedimentological Network

This component contains available historical hydrosedimentological information from the Bermejo River Basin measurement stations that make up the National Hydrometeorological Network, comprised of over 40 stations.

The hydrosedimentological information contained in the **GIS Bermejo** includes data on:

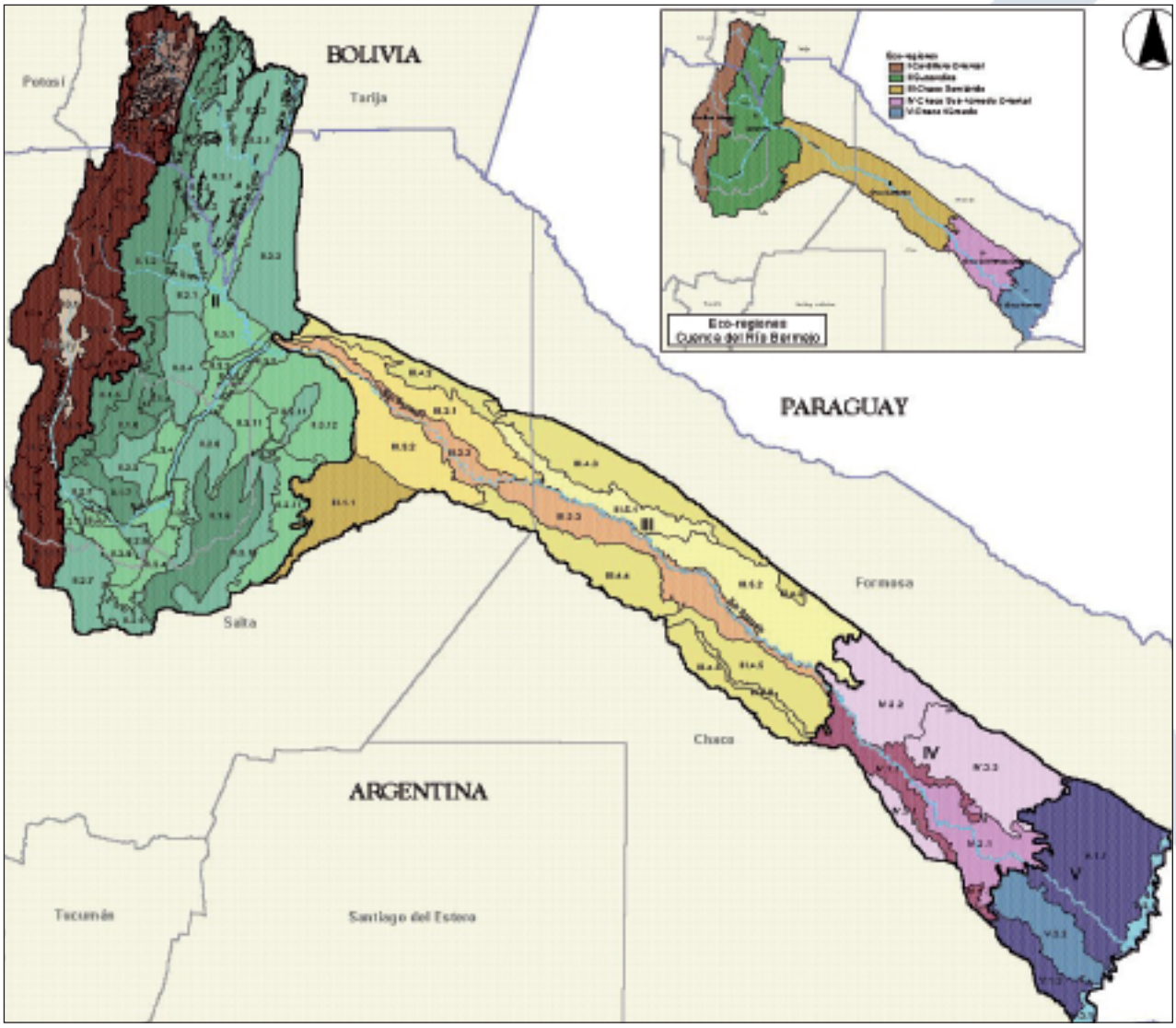
- Maximum monthly rainfall
- Monthly rainfall for Tarija
- Median daily flow
- Median daily rainfall
- Median monthly flow
- Hourly levels
- Historic suspended solids flow
- Measurements for the Argentine portion of the Basin

Cartography

The cartography, both in terms of maps prepared and the information in the GIS Bermejo in shapefile format, corresponds to materials prepared within the framework of the SAP-Bermejo during its formulation and implementation phases.

The GIS Bermejo cartographic base for the Basin is presented at a scale of 1:250,000 and is supplemented with various specific thematic layers, which have been prepared in more detail.

It is worth highlighting that interactive maps are available in ArcIMS format developed by ESRI/ServletExec New Atlanta/IIS, which enables online viewing and assembly of customized maps by users.



Zoning and ecological regionalization of the Bermejo River Basin

Statistics

This component contains the information related to population, housing, health, energy and farming derived from national censuses.

Water Quality Monitoring Network

The SAP-Bermejo designed and implemented the Bermejo River Basin Water Quality Monitoring Network in collaboration with the jurisdictional agencies of the Basin in Argentina (COREBE) and in Bolivia (OTNPB), the water laboratories of the Argentine provinces of Chaco, Formosa, Jujuy and Salta and the Juan Misael Saracho University in the Department of Tarija, Bolivia.

The location of the different sampling points, the frequency of measurement and the definition and selection of water quality parameters to be measured at each point were considered and agreed upon during the design of the Network. Thus, the Network was ultimately comprised of 40 sampling points where physical, chemical and biological parameters were systematically measured, of which four were placed in binational stretches of the river.

The definition of the quality parameters monitored at each station was selected taking into consideration the locations with the largest impact on economic activities and services in the Bermejo River Basin.

The Water Quality Monitoring Network was consolidated based on sampling campaigns between 2003 and 2009 through the combined efforts of all participants, who assessed, during workshops, the results, the sampling and sample processing and all the logistical and organizational aspects of the campaigns.

Finally, the participants elaborated and approved the Bermejo River Basin Water Quality Monitoring Network Operations Guide, which contains the basic elements that must be considered in order to establish and execute the water quality monitoring programs in relation to sampling activities and sample analysis.

This guide is a technical instrument that sets out the procedures for taking and analyzing samples using uniform criteria for on-site and laboratory-based sampling and analysis. In addition, it provides feasible technical alternatives, especially for regional laboratories and field staff.

Stakeholder Directory

This component gathered information on all the organizations that are involved in the management of theBermejo River Basin.

Document Center

The Document Center contains all of the documents related to the Basin, including pictures and written material.

7.3.4. Definition and Adoption of International Waters Indicators

The objectives of this component of the project was to define and adopt a set of indicators to measure the impact of project activities. Based on GEF guidelines, these indicators include: I) process indicators (emphasizing procedures designed to produce the desired results); II) stress reduction indicators (emphasizing measures with clear goals that will reduce environmental stresses on water resources) and III) environmental condition indicators (emphasizing actual improvement in ecosystem quality).

A Logical Framework Analysis (LogFrame) was prepared for each of the project components executed under the SAP-Bermejo. The Objectively Verifiable Indicators were classified as process, stress reduction or environmental condition indicators, as applicable, in each LogFrame Analysis.

The project's annual progress, in terms of achievements under each indicator, was recorded during "Project Implementation Reviews" or "PIRs", prepared in coordination with the agencies responsible for project implemention and execution.

7.4. Replication of Project Activities

7.4.1. Dissemination and replication from the SAP-Bermejo in the La Plata River Basin.

Many of the environmental issues, transboundary phenomena and their identified root causes in the Bermejo River are also present in other regions of the La Plata River Basin, although they differ in scope and intensity.For this reason, the methodological approaches and experiences of the SAP-Bermejo can be replicated in other areas of the Bermejo River Basin and in the wider context of the La Plata River Basin. These include research on the sediments, development of comprehensive soil management practices and sustainable production activities, environmental education and training.

Successful sediment management and erosion control measures and works were expanded within the Bermejo River Basin, including the construction of an additional dam in the Calderas Sub-Basin, as well as the implementation of farming, agricultural, livestock, agroforestry and soil and water management programs within the project's direct area of influence. Steps were also taken to mitigate the water deficit experienced during the dry season in the high valley of the Guadalquivir River, both in terms of maintaining supplies of drinking water for the City of Tarija and water for irrigation. Other complementary activities included training community leaders and officials in the preparation and implementation of productive demonstration projects in the Tariquía-Baritú-Calilegua Biological Corridor, supporting beekeeping marketing and production in the communities of Sidras and Emborozú and the design and implementation of the Environmental Education Program in the Rural Areas of the Municipalities of San Lorenzo, Padcaya, Bermejo and Entre Ríos in the Department of Tarija, as a complement to the formal environmental education activities developed with the participation of INFOPER and the informal environmental education activities developed by CETHA.

Within the replication activities implemented, it is worth highlighting the *"Research on the Bermejo River Basin Sediments and their Impact in the La Plata River Basin"* edited in collaboration with the Argentine National Water Institute, which, apart from accurately assessing the effects of the generation, transport and destination of sediments from the Bermejo River on the La Plata River system, determined the best practices for soil management and sediment control, and disseminated them into other areas of the La Plata River Basin experiencing similar conditions.

Based on the background prepared within the framework of the SAP-Bermejo formulation, research on I) sediment generation and transport in the Upper Bermejo River Basin—impact on the Hidrovia, La Plata River and Paraná Delta and II) the

analysis of the fluvial-morphological dynamics of the Lower Bermejo River, was completed with the goal of elaborating an updated diagnosis of the production, transport and destination of Bermejo River sediments and their impacts on infrastructure and water resources.

The principal activities carried out were:

- Updating the basic hydrosedimentological information and digitizing historical data.
- Assessment of the transport and sediment generation models used, includingupdated sediment balances in the Paraguay-Paraná-Delta and La Plata River system.
- Analysis of the current state of operating hydrosedimentological recording stations.
- Survey and assessment of sediment control projects and practices in the Upper Bermejo River Basin (in Bolivia and Argentina), both structural and non-structural.
- Analysis and evaluation of the impacts and effects of sedimentation: Study of the morphology of the Lower Bermejo River and its impact on infrastructure, floods in the Upper Bermejo River Basin, reservoir sedimentation in the Upper Bermejo River Basin and the incidence of suspended solid loads from the Bermejo River into the Paraguay-Paraná and La Plata Rivers.
- Harmonization of the methodology used to gather and process basic sedimentological data.
- Identification of feasible sediment control alternatives in the Upper Bermejo River Basin.
- Characterization of the La Plata River Basin regarding the generation, transport and

International Seminar on Sediment in the Bermejo River Basin, Salta, Argentina, March 2008

Binational Seminar on Environmental Education, Buenos Aires, Argentina. September 2009

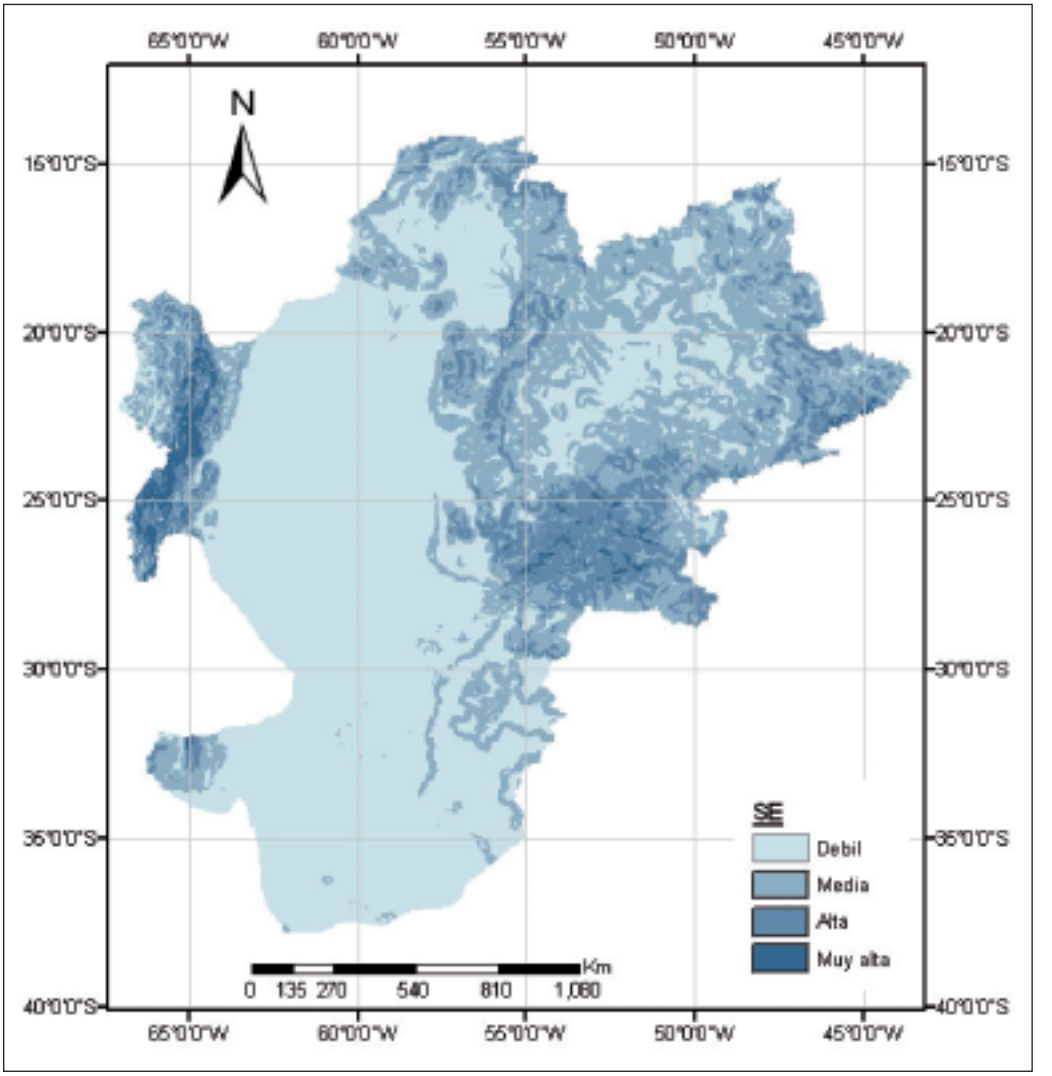
5th GEF Biennial International Waters Conference. SAP Bermejo booth

destination of sediments, considering the hydrosedimentological and morphological parameters of the main rivers, and zoning the La Plata River Basin based upon their typology.

The results of the study were made available to the Intergovernmental Coordinating Committee of the La Plata River Basin Countries (*Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata, CIC)* as a contribution to the management of that basin's water resources. The study concluded that, in terms of sediment transport and generation, there was a very clear similarity between the Bermejo River Basin and the Pilcomayo River Basin, which validated the methods used in the SAP-Bermejo. In addition, the analysis supported the validity of the methods applied in mountain basins in certain regions of the La Plata River Basin having similar rainfall and slopes. Furthermore, the studies and methods developed for the Lower Bermejo River Basin, which is a lowland river, can be directly replicated in similar environments in the La Plata River Basin.

The SAP-Bermejo also provided georeferenced information to the La Plata River Basin Digital Mapping Information System. The staff of the Technical Units and Head Offices of the SAP-Bermejo in Argentina and Bolivia participated in thematic workshops on the preparation of the La Plata River Basin Framework Program, financed by the GEF and FONPLATA (and prepared by the CIC with the support of OAS and UNEP), sharing project initiatives, ideas and experiences. Specific actions were agreed upon to advance both research and management activities on topics of interest in the Bermejo River Basin, which were being conducted in territories elsewhere at a larger level. Particularly important was the incorporation of the conclusions of the International Seminar (Argentina, Bolivia and Paraguay) and surveys and analyses related to groundwater carried out in the framework of SAP-Bermejo, in the pilot project and strategy components of the La Plata River Basin Framework Program with respect to the SAYTT Aquifer system. This freshwater aquifer system is found within geological formations that encompass the Pilcomayo, Bermejo and Salado River Basins, and constitutes a key reservoir of high water quality for the semiarid region of the Western Chaco, especially in view of the nescessity to adapt to climate variability and change that already affect the region.

In relation to water quality, different technical bodies linked to the La Plata River Basin were



Factor map, slope and rain in Cuenca del Plata

involved in planning, executing and designing the Monitoring System. These activities were initially developed jointly with those responsible for water quality management in the La Plata River Basin Framework Program (GEF-UNEP-OAS), and the document that was agreed upon in the regional workshops was used as a basis for these activities. Later, during implementation, parameters for analytical and sampling methodologies also were agreed upon with water quality technicians from the Pilcomayo River Basin in order to generate a consistent and comparable database for both Basins and that could be replicated throughout the entire La Plata River Basin.

The process of dissemination and sharing the approaches utilized in the SAP-Bermejo was based on the elaboration and distribution of informational and

technical materials, both through the website that included the Basin Environmental Information System and through literature and videos. Two videos are representative of this activity. The first, an institutional video, covers the objectives of the SAP-Bermejo and presents the achievements of each of the Strategic Areas. The second, called Hydrology of the Bermejo River Basin, describes in a friendly and educational manner, the hydrological characteristics of the Basin, the main problems associated with excess and shortage of water, sediments and Hydrometeorological Network stations.

Dissemination materials:

- SAP COBINABE brochure (2004)
- SAP COBINABE brochure (2005)
- Binational SAP COBINABE institutional brief (bilingual)
  Topical atlas of the Bermejo River Basin
- SAP COBINABE four-page brochure (English and Spanish)
- Hydrometeorological Network three-page brochure (English and Spanish)
- Environmental Education three-page brochure (English and Spanish)
- 25-minute institutional video (English and Spanish)
- Bermejo River Basin hydrology video
- SAP-Bermejo final institutional brief (English and Spanish)

Another key element for the regional integration of the SAP-Bermejo experiences and the socialization of knowledge acquired during the process was the organization of seminars, workshops and technical meetings, with the participation of renowned specialists from around the world. It is worth highlighting the International Seminars on Sediments, Environmental Education and Sustainable Development, as well as the workshops related to the Yrendá-Toba-Tarijeño Transboundary Aquifer.

Organization of International Workshops and Seminars:

- TOBA Aquifer Hydro-Geological Regional Workshop
- Yrendá-Toba-Tarijeño Transboundary Aquifer International Workshop
- International Seminar on Sediments
- International Seminar on Sustainable Development
- Binational Seminar on Environmental Education
- International Seminar on "Comprehensive Management of Urban Solid Waste"

Furthermore, the SAP-Bermejo actively participated in several regional and global events where Program experiences and progress were presented. In this regard, it is worth highlighting the Biennial GEF Conferences on International Waters, as well as other Latin American basin organization meetings and international events on public participation in integrated water resources management projects.

Participation in Events (Regional, Binational and International):

- Second GEF Projects Bienniel Conference, Dalian, China, 2002.

- Third Latin American Congress on Water Basin Management, Arequipa, Peru, 2003.
- Latin American Mountain Forum, "Integrated Mountains Ecosystems Management– Water and Mountains", Tucumán, Argentina, 2004.
- Third GEF Projects Bienniel Conference, San Salvador de Bahía, Brazil, 2005.
- Latin American Regional Workshop on Public Participation in Transboundary Water Resources Management, Montevideo, Uruguay, 2006.
- Fourth GEF Projects Bienniel Conference, Cape Town, South Africa, 2007.
- Fifth World Water Forum, Istanbul, Turkey, 2009.
- Fifth GEF Projects Bienniel Conference, Cairns, Australia, 2009.

Lastly, the final SAP-Bermejo documents were prepared and distributed. These are technical documents integrating all the experiences, achievements, lessons learned and conclusions drawn from the implementation stage.

Final SAP-Bermejo Documents:

- Institutional Strengthening and Development in the Binational Basin of the Bermejo River
- Public Participation in the Binational Basin of the Bermejo River
- Integrated Environmental Information System of the Binational Basin of the Bermejo River
- Production Models in the Binational Basin of the Bermejo River
- Environmental Protection and Rehabilitation in the Binational Basin of the Bermejo River
- Environmental Education in the Binational Basin of the Bermejo River

Sediment Generation and Transportation in the Binational Basin of the Bermejo River

- Strategic Action Program for the Binational Basin of the Bermejo River - Implementation Phase.
- Integrated Management Program for the Binational Basin of the Bermejo River
- Report of the Binational Commission for the Development of the Upper Bermejo River Basin and the Rio Grande de Tarija

7.5. Lessons learned and Best Practices from Strategic Area IV "Awareness-building, Public Participation and Replication of Project Activities"

The primary lessons and best practices emerging from the execution of the activites for the Awareness-building, Public Participation and Replication of Project Activities Strategic Area within the framework of the SAP-Bermejo are detailed below, under the headings of (I) environmental education program, (II) public participation program, (III) the Bermejo River Basin Information System and (IV) project activities replication.

I) Environmental Education Program

Lessons Learned

- The incorporation of the concepts of sustainable development and environmental conservation into the official curriculum of the formal public education system, through inter-institutional agreements, helps ensure the sustainability of activities.

- Educational processes related to the

environment, within the framework of the formal education system, enable students to communicate their new knowledge and behaviorial patterns to their families and local communities, contributing to environmental conservation and achieving sustainable development.

- For environmental education to have sustainable results, it must be planned and developed over time, through a gradual and systematic process, considering that it must promote attitude and behaviorial changes in students, families and the population in general.

- Trained teachers who need to transfer environmental knowledge from theory to practice (construction of knowledge and its applicability) are in a better position to systematically and participatively develop learning processes to raise environmental awareness among students and in the educational community as a whole.

- At the planning stage, it is important to incorporate the work of those who handle theory and those who produce local knowledge jointly in order to verify the existence of scientific information and effective and efficient community practices for their integration into formal academic knowledge.

- The joint work of specialists from different disciplines and teachers consolidates teamwork through the integration of knowledge, preventing the simplification of the "sum" of their knowledge, and giving a new meaning to participation and consensus-building practices.

- The planning stage for distance-learning teacher training programs must consider boththe current knowledge of new communication technologies and the limitations of access to information through digital communication media.

Best Practices

- The implementation of the Environmental Education Program within the framework of inter-institutional agreements signed between COBINABE and educational authorities in Argentina and Bolivia ensured the sustainability of activities by incorporating the concepts of sustainable development and environmental conservation in the official curriculum of the formal public education system.

- The binational decision to design an Environmental Education Program to be executed through the formal public education system enabled the spreading of environmental knowledge and practices acquired by students to their families and communities.

- Content elaboration and the preparation of various manuals and textbooks related to environmental issues used in the knowledge transmission process was undertaken in a participative fashion, by trainers, teachers and specialists.

- The joint work of specialists and teachers in the workshops organized during the Environmental Education Program design stage broke down preconceptions about professional practices and consolidated teamwork through knowledge integration.

- Teacher participation in trainer courses helped integrate "appropriate non-conventional technologies" related to community practices and knowledge not previously recognized as formal academic knowledge.

- The identification of more appropriate ways to communicate with teachers was considered before organizing courses and workshops in order to maximize the subsequent exchange of key information on the Program, especially considering the limitations on access to digital communications.

II) Public Participation Program

Lessons Learned

- Creating and strengthening social networks in the different communities of the Basin through the cooperation of all involved stakeholders, including the educational community, indigenous communities and small farmers, is paramount to fostering public participation in project execution.

- Depending on active local social organizations and institutions, such as local advocacy groups, mothers´groups, technical teams, community councils, landowner associations and farmers, is relevant for encouraging public participation.

- Involving municipal authorities (municipal governments, city councils and administrative bodies) and governmental organizations (water resources and environmental governmental agencies, among others) in the execution of projects strengthens the ties between authorities and local community populations, facilitating the joint, participative identification and solution of principal needs and issues.

- Strengthening the capacities of governmental institutions at the national, provincial/departmental and local levels, as well as the capacities of civil society organizations, small farmer associations and local communities, is relevant to advancing participatory dynamics in all the stages of decision-making processes.

- The signing of framework agreements between an institution like COBINABE and the different departmental/provincial government agencies is key to increasing transparency of public administration and the legitimacy of projects subject to public opinion.

- Using print and mass media (radio, TV spots, articles, etc.) is of vital importance in spreading key messages related to projects' objectives, activities and results.

- The creation and implementation of public participation mechanisms in project execution

are valuable tools to communicate and/or strengthen existing laws, principles and rules on an issue, facilitating its institutionalization in regional and/or local planning processes.

- The lack of knowledge and low levels of awareness among inhabitants located in protected areas is a limiting factor for achieving effective participation by and contributions from local communities in natural resources conservation planning.

- The idea of conservation is not easily accepted in local communities, so management plans and projects for the efficient use of natural resources in protected areas or areas of protection should reflect the development demands and perspectives identified by the communities as their own. In turn, production activities must ensure the economic basis to increase family incomes.

Best Practices

- The creation and continuous updating of the COBINABE website established a basis for horizontal communication between projects, and a tool available to citizens, which allowed them to get involved in decision-making processes of SAP-Bermejo projects through free access to information and improved citizen knowledge.

- The public participation strategy strengthened the environmental and social structure in localities of the Basin, allowing local stakeholders to participate in decision-making processes and make informed decisions.

- The First Conference on Water Use and Sustainability was the starting point for activities of the Tarija Water Forum, conceived as a space for discussion and reflection on these issues. The event was sponsored by SAP-Bermejo, and included 140 representatives from public institutions, the Ministry of Water, private organizations, NGOs and participants involved in water resources, among others from Bolivia.

- The creation and institutionalization of the Regional Coordination Committee, the Regional Advisory Committee and the Binational Coordination Committee ensured cooperation between public, academic, private and social institutions, as well as with other civil society organizations, thus generating opportunities to participate in the decision-making processes relating to the Integrated Water Resources Management of the Basin.

- The implementation of the Community Work Plan in the communities of Colanzulí and San Isidro, in the Province of Salta, Argentina, fostered a greater participation and valuation of community production in urban markets and a more efficient and environmentally-friendly use of water and land resources.

- The creation and operation of Local Advocacy Groups in the Land Use Zoning Project in the Municipality of Tilcara, Province of Jujuy,

Argentina, facilitated theimplementation of the project and its decision-making processes.

- In the Tariquía and Sama Reserves Management Plans formulation project in Bolivia, the active and institutionalized public participation practices were extremely valuable and ensured the sustainability of the proposals.

III) Bermejo River Basin Information System

Lessons Learned

- The participation of all involved sectors, both information users and generators, from the design stage of information systems, facilitates their subsequent implemention, because they are enriched through the specific contributions from each group.

- It is of the utmost importance to sign inter-institutional agreements before information systems are set up, clearly establishing the commitments made by each of the parties involved, both for the sustainability of the operation and the maintenance of the information systems.

- The generation of a technical forum where thematic specialists responsible for environmental management may discuss and exchange opinions and information is instrumental for the achievement of established objectives.

- The planning and organization of water quality monitoring campaigns is a complex process due to the number of parties involved and to the multiple elements that must be considered (supplies, materials, mobility, available human resources, opportunities, weather variables, etc.). In this regard, experience demonstrated that it is necessary to have enough time for these tasks before launching the campaigns.

- It is paramount to train stakeholders (information generators, users, operators, etc.) as new environmental information processing, acquisition and management systems are established.

Best Practices

- The Hydrometeorological Network design and implementation process is considered a good practice principally due to the wide participation of actors involved (decision-makers, operators and users) and the inter-institutional agreements that guarantee its operation and maintenance. This was reflected in the participation of COBINABE at a binational level, the Under-Secretary of Water Resources of the Argentine Nation, COREBE, the OTNPB, representatives of the responsible organizations within the Argentine Provinces of the Basin and the Department of Tarija, Bolivia, as well as of the Argentine National Water Institute (*Instituto Nacional del Agua, INA*).

- The selection of the meteor burst transmission system as a communications means with no operating costs and expansion capacity gives the information system an enormous potential for the management of natural and water resources.

- The formation of the expert group of water quality laboratory managers and technicians became the core of water quality monitoring activity in the Basin. The operation of this group facilitated the execution of actions and the allocation of responsibilities and contributed to its sustainability by strengthening local capacityand increasing commitment, both in personnel and institutional terms.

- It is important to train the principle users and operators of the Hydrometeorological Network both in Argentina and Bolivia in Network operations and maintenance, and to train the representatives of the Argentine Provinces and of the Department of Tarija, Bolivia, in the operation, maintenance and management of the GSI Bermejo.

IV) Project Activities Replication

Lessons Learned

- The complexity of the physical processes involved in mass erosion makes its quantification extremely difficult, both in terms of determining the volume of sediments produced and the design variables for works subject to this type of process.

- The application of mathematical models for sediment generation and transport without a thorough knowledge of the scope and calculation methods may lead to erroneous results, especially within the Bermejo River Basin due to the great volume of sediments produced.

- The implementation of reservoir dam projects in the Upper Bermejo River Basin, considering the very high suspended solids loads of the rivers, may be technically feasible if their analysis abandons the obsolete concept of a fixed lifespan and adopts modern techniques that seek reservoir capacity to last “forever”, in terms of which dams must utilize specific operating policies and cleaning procedures from their conceptual stage.

- The reservoir dam projects in the Upper Bermejo River Basin should consider that the floodplains of the Lower Bermejo River and the Paraná River nurture themselves with the sediments deposited by the rivers when their levels rise, most of which come from the Bermejo River.

- Successful project execution should be accompanied by a campaign to disseminate and communicate results and achievements in order to broaden the scope for the replication of successful actions.

- Participation in national, regional and international technical events has proven to be an efficient mechanism for disseminating results, conclusions and methodological approaches employed in implementing the SAP-Bermejo.

Best Practices

- The methodology developed within the framework of the SAP-Bermejo to determine

sediment production from surface erosion in mountainous river basins has been successfully applied in the Upper Bermejo River Basin, and the results obtained were validated with field data. Ithas been replicated in other mountainous areas of South America (in northeastArgentina, the Argentine Patagonia and Upper Pilcomayo River Basin, Bolivia) and has been successful, which implies that it can be used effectively in mountain environments of the region.

- The development of international seminars on specific issues (sediments, sustainable development, environmental education, solid waste, etc.) with the involvement of national and international authorities and experts on different topics enabled the dissemination of the results of SAP-Bermejo actions, the exchange of methodological and technical criteria and the identification of lessons learned, best practices and recommendations for water resources management in the Bermejo River Basin and their replication in the La Plata River Basin.

7.6. Main Conclusions - Awareness-building, Public Participation and Replication of Project Activities

The binational Environmental Education Program considered environmental education as a key element to support sustainable environmental protection and rehabilitation and economic development promotion programs. In this respect, it has implemented a set of environmental advocacy, education and awareness activities, both in formal and informal arenas. The project incorporated the concepts of sustainable development and environment in the framework of the Bolivian and Argentine educational systems, thus strengthening knowledge of issues related to the protection and sustainable use of natural resources by the students, teachers and the Basin community.

The Binational Program design and execution has improved educational opportunities in the most vulnerable communities, increased awareness in the Basin communities and, through local schools, helped people understand how to generate positive environmental changes at a local level and improve their quality of life.

The Program's implementation resulted in stakeholders that were trained and made aware of the need for conservation and the sustainable management of natural resources in general, and of water resources in particular, allowing the idea of new scenarios for the relationships between individuals and habitat. Management tools were also generated, such as inter-institutional agreements signed between COBINABE and Argentine and Bolivian educational authorities, materials for education and dissemination and the strengthening of capacities within the educational system.

Other results that are worth mentioning are the courses, workshops and seminars carried out both for the development and transmission of knowledge, the training of students, principals,

teachers and trainers, the institutional educational experiences developed and the distribution of publications that were prepared, edited and distributed.

The implementation of the Public Participation Program was an important innovation regarding the active incorporation of local communities in management processes and an appreciation for their traditions and cultures. It was critical to create and institutionalize the Regional Coordination Committee, the Regional Advisory Committee and the Binational Coordination Committee, which, with the involvement of all stakeholders, facilitated the programming and coordination actions necessary, not only for the execution and monitoring of Project activities, but also for the management of water resources in general.

In addition, the support and commitment of local, provincial/departmental and national governments were vital but, what was key was the participation of all affected/interested stakeholders in the issues affecting natural resources management in the Basin and the sustainable management of its production activities.

It is vital to consider that the specific implementation and use of public participation mechanisms changes depending on the goal, the issue addressed and the context of each project implemented. Various mechanisms were used to define priorities and proposals, in the validation of results, the execution of demonstration projects and in consulting the public on specific issues.

Another equally relevant issue was that the participative processes were principally based on the institutionalization of public participation in the formulation, implementation and evaluation of pilot demonstration projects, as well as the internalization of different mechanisms and instruments applied by stakeholders.

The SAP-Bermejo experiences in public participation processes tended to ensure gradual and dynamic participation in activities by the affected communities and civil society in general. This not only included the consultation process to validate proposals, but also the effective involvement of the Basin stakeholders in the identification of priority issues, the design of the strategy for their solution and the formulation and implementation of actions. In this regard, the seminars, workshops, technical meetings, hearings, electronic media and other participation mechanisms used were of vital importance to gaining and sustaining the involvement and support of interested communities and civil society, thus enabling the long-term sustainability of activities.

The SAP-Bermejo made progress in the three areas that are necessary for effective public participation: a) a well-informed public, b) an educated and aware population and c) mechanisms to allow public participation. In this respect, the actions developed have demonstrated that, if management for sustainable development is a shared responsibility between governmental agencies and social organizations who are, in turn, the subjects and beneficiaries of the processes, it is

important for projects dealing with issues such as the management and development of the Bermejo River Basin to not only foster participation and adoption of actions by the various stakeholders at different stages, but also, and principally, to pursue the generation of institutional opportunities and the legal basis to transform these practices into sustainable processes of social empowerment.

8. Conclusions

SAP-Bermejo was planned at an early stage in the history of the Binational Commission for the Development of the Upper Bermejo River Basin and the Río Grande de Tarija River (*Comisión Binacional para el Desarrollo de la Alta Cuenca del Río Bermejo y el Río Grande de Tarija, COBINABE*) as an instrument to incorporate environmental issues into the Basin's binational activities under a sustainable development approach. It was a project with a vision towards the future that faced national institutional complexities in each country, which, even though contributed to its implementation, were formally and legally far from the concepts being incorporated by SAP-Bermejo. In practice, this translated into a project preparation and execution with a strong interaction with the internal governance structures of each country and with participating institutions and jurisdictions, not free of succesive conflicts of adjustment, eventually demonstrating that the original approach was appropriate. Notwithstanding, the main issue was the lack of awareness of the time required for the consolidation of processes of change, especially when these imply social and cultural adjustments, as well as modifications in institutional and legal foundations.

SAP-Bermejo was a successful project as a whole, contributing much more to the integrated management of the Bermejo River Basin than suggested by the partial successes of its components, projects and activities. In this regard, the project's successes and failures are those associated with the introduction of an integrated basin management approach and promotion of guidelines for sustainable development at the local level, together with the involved communities, and beyond the participation of state institutions whose role is to lead and create the framework for coordinated and concerted efforts to address, in a

participatory maner, the causes of the common problems suffered by communities, jurisdictions and countries (transboundary).

In particular, SAP-Bermejo achieved important progress in each of the four Strategic Areas. Concerning Institutional Strengthening and Development, the main results were related to the development and consolidation of a binational mechanism to articulate and coordinate actions, the promotion of a comprehensive vision of the Basin and the advancement of integrated, eco-system based sustainable approaches for natural resources management. As mentioned, the main achievements included the strengthening of binational institutions, with a special focus on COBINABE, the establishment of its headquarters and a direct budget allocation from each government, thereby ensuring its future sustainability.

At the level of COBINABE, achievements were complemented by a renewed institutional framework established in Argentina through the Regional Coordination Committee, with institutional strengthening and capacity-building of local governments and civil society organizations related to water resources management. COBINABE and the National Technical Office of the Pilcomayo and Bermejo Rivers (*Oficina Técnica Nacional de los Ríos Pilcomayo y Bermejo,* the OTNPB) supported the jurisdictional institutions of the entire Basin and signed agreements and created working mechanisms that remain key elements for the long-term sustainability of the SAP-Bermejo activities, fostering the application of integrated water resources management (IWRM) principles in the development of the Bermejo River Basin.

Another of the main goals achieved, catalyzed through the Regional Coordination Committee, was the change in the legal and administrative status of the National Bermejo River Commission (*Comisión Nacional del Río Bermejo, COREBE*) in Argentina, passed by an Executive Order, whereby the regional institution was transferred from the Department of the Interior to the Subsecretariat of Water Resources of the Federal Ministry of Planning and Public Investment of Argentina. This transfer helped promote and consolidate the Water Policy Guiding Principles approved by the provinces, the involvement of the Federal Water Council (*Consejo Hídrico Federal, COHIFE*) and the coordination of federal water resources policies in Argentina, in keeping with the stated objectives of the SAP-Bermejo. The Deputy Coordinator of the Provincial Water Coordination Unit of Formosa, a permanent representative to the Regional Coordination Committee of the Bermejo project, was appointed as Chairman of COREBE, providing a solid political foundation for the sustainability and continuity of SAP-Bermejo.

Finally, the establishment and consolidation of a binational information system, a database and the design of COBINABE website facilitated the dissemination of a unitary vision of the Basin. Technical agreements and the launch of a new series of binational monitoring campaigns, focused on the Basin's water quality, included the creation

of a Water Quality Control Lab Network in both countries.

In Bolivia, an important accomplishment was the establishment of a formal link between the project and the Ministry of Water Resources (created after the project was implemented), then the Ministry of Environment and Water, under the auspices and with the coordination of the Ministry of Foreign Affairs. Activities were initiated to harmonize the basin management of SAP-Bermejo with the National Water Basins Management Policy, a key element to ensuring the future of the Program .

Regarding environmental protection and rehabilitation, actions sought to limit erosion and to restore degraded environments through the application of community land management processes and erosion control practices in critical areas, the consolidation of protected areas, the management of buffer zones and the protection and restoration of water quality in critical sections of the Basin.

Effective land management and erosion control measures were applied. These were identified during SAP-Bermejo´s formulation phase and implemented in the Upper Bermejo River Basin, especially in the Central Valley of Tarija, and in the basins of the Iruya River and Grande de Tarija River, demonstrating successful erosion control and sediment transport actions in cooperation with the communities of the Upper Bermejo River Basin. The small multipurpose works that were constructed proved to be economically and socially feasible.

These actions included both structural and non-structural measures for sediment retention and erosion control in the basins of the Tolomosa and Huasamayo Rivers, the application of soil conservation practices, land use planning and regulation and integrated management planning in critical areas.

The integrated micro-basin management experiences developed in Bolivia, in partnership with rural communities, have demonstrated the simultaneous benefits of the application of sustainable production and development practices, through sustainable natural resources management and control of erosion and sedimentation in bodies of water, while protecting infrastructure works associated with large-scale actions.

Erosion control actions were accompanied by the application of community activities to protect and restore water quality in critical areas, including the installation of pilot sewage treatment plants in rural communities, especially near the cities of Bermejo and Tarija, and the development and dissemination of techniques, technologies, information and programming for the protection of surface and ground waters.

Important goals were also accomplished with regard to the consolidation of protected areas and the protection of biological diversity. This included the sustainable development of eco-tourism and transition forestry management activities in the piedmont areas of the region, Calilegua – Baritú – Tariquía Biological Corridor, biological reserves and

national parks, for which management plans were prepared, as well as important actions to promote the creation of a Transboundary Biosphere Reserve, recognized by UNESCO, connecting Baritú National Park in Argentina with Tariquía National Reserve in Bolivia. This also entailed the drafting of legal and technical documents to establish the Binational Yungas Corridor, as well as the formalization of relations between Argentine provincial authorities, their Bolivian counterparts and the UNESCO Biosphere Committee, to move forward in the official approval process.

The Strategic Area of Sustainable Development of Natural Resources helped promote and disseminate the application of production alternatives designed to bring greater economic opportunities to local communities, while contributing to the reduction of environmental degradation processes, with a special focus on soil depletion and erosion. Through approaches based on sustainable production alternatives at a community level, community extension programs were implemented, covering issues related to sustainable production, diversification of production alternatives, and natural resources management in rural and native areas, especially in the humid and sub-humid regions of Chaco, the Yungas forest, and the economically disadvantaged areas of Chaco and Formosa.

In the Strategic Area of awareness-building, public participation, and replication of project activities, significant results were obtained through the application of environmental education programs. This component enabled the incorporation of environmental concepts into the official curricula of the Provinces of Salta, Jujuy, Chaco and Formosa, in Argentina, through resolutions of their respective Ministries of Education. More than 500 schools and 2,400 teachers were trained in environmental education.

In the Upper Basin, in Bolivia, an environmental education program was developed in 27 schools, including 438 principals and teachers, and over 8,000 students, who were trained in environmental issues. The activities carried out included a series of workshops, meetings and seminars, as well as the preparation and distribution of project-related information, including a monthly radio program, which resulted in a significant increase in environmental awareness across the Bermejo River Basin.

In relation to access and exchange of information, a Binational Hydrometeorological Network was implemented and put into operation, and is comprised of 14 remote stations in the Upper Bermejo River Basin, with a central station in Salta, and operational centers in Tarija and Orán. The system enables the monitoring of water quality and the quantification of various environmental and hydrological indicators, which will serve to give early warning in case of extreme events. In addition, plans for this Network's integration into the hydrometeorological network of the La Plata River Basin are underway. Similarly, the Bermejo River Basin Management Information System (SIG Bermejo) was established. This system incorporates

multiple databases related to climate, rainfall, water quality, sediments, hydrogeology, land use, transport, farming capacity, demographics, economic development, and other types of information, facilitating planning and monitoring, foster informed community participation in decision-making processes, promote institutional transparency, and help standardize practices between professionals and jurisdictions.

Upon completion of SAP-Bermejo´s implementation phase, the Basin's institutional framework is strengthened under COBINABE, supported by an exceptional understanding between the governments of Argentina and Bolivia, developed during more than a decade of joint work. This reinforced institutional framework was able to overcome adjustments in its goals and objectives, changes in government administrations of both countries, and severe internal crises that marked SAP Bermejo implementation period, demonstrating that the protection and sustainable use of natural resources transcends situations of change and crisis. SAP-Bermejo leaves the Basin with an installed capacity and the recognition of both countries on the need to coordinate, with the basin as the planning and management unit for the sustainable use of water resources, with field experiences that have provided valuable insights to tackle soil loss and degradation of water resources and ecosystems, ecological and water risk zoning, valuation of cultural practices, incorporation of techniques for production sustainability, as well as a formal education system that addresses the local aspects of global environmental management.

An effective binational information system has been put into operation, providing ample access to information, fed by hydrometeorological and water quality and monitoring networks, including geo-referenced information on a system of thematic maps. Important progress was obtained in the protection of valuable ecosystems and in the protection of water quality and quantity, promoting efficient and rational water use to improve the quality of life of poorer rural populations and indigenous communities.

The success and progress established by SAP Bermejo in the Basin, for the countries, and as a global international experience, was not exempt of errors and limitations. These included the incorrect conceptualization of the time factor, given the coverage and complex structure of this ambitious project; the lack of a joint strategy to advance key binational initiatives; a continuous waste in program implementation due to uncertainties generated in the international arena; little consideration for adjustments required by political changes and the diverse jurisdictional actors with decision-making power on the development of the Basin; difficulties in creating appropriate participation opportunities at different levels; the confusion of institutional roles and responsibilities; the limited consideration of the existing asymmetries in the legal and institutional bases within each country including their technical capacities, and difficulties in eliminating action and vision along sectoral lines.

The lessons learned and best practices

generated through the development of SAP-Bermejo will be extremely useful and serve as a reference framework for the continuity of actions for integrated water resources management. Similarly, the project demonstrated that local benefits in both countries were significant and concrete, mainly targeted at a population suffering from the consequences of environmental degradation. From a quantitative viewpoint, these local benefits demonstrated an increase in the communities' ***Physical Capital,*** through investment in machinery, tools, land ownership regulation and production infrastructure; in their ***Financial Capital,*** through the generation of savings, increases in production, productivity and diversification of labor and through risk reduction by improved marketing opportunities; in their ***Natural Capital,*** through the appreciation and improvement of natural resources conservation and use and, finally, in their ***Social Capital***, with strengthened institutional capacites, improvement in communities' abilities to relate beyond their own areas, increase in social and gender equality and empowerment of women and minorities in decision-making processes.

Sustainable water resources management is basically achieved through a slow and complex process, were addressing the social causes underlying environmental issues, such as social organization, institutionalization, participation and education, are essential to advance the sustainable development of the Basin. In this respect, SAP-Bermejo, beyond the individual successes or failures of each element of the various components, projects or activities, was able to initiate a process aimed at incorporating the environmental dimension into local, national and binational activities within the Basin, utilizing a sustainable development approach.

SAP-Bermejo, executed as a catalyst for the Basin's sustainable development, has made important progress toward the consolidation of an institutional framework and the implementation of experiences and practices for ecosystem protection and rehabilitation, production development and public participation. Moreover, within the framework of SAP-Bermejo, an Integrated Management Program for the Binational Basin of the Bermejo River (PROBER) has been prepared, extending the vision embodied in the activities already implemented over the short, mid and long term, identifying priority projects and actions to strengthen the basis of sustainable development in the Binational Basin, with a special focus on those actions that, due to their transboundary importance, should be coordinated by both countries and their corresponding jurisdictions, based on an institutional framework open to the participation and empowerment of local stakeholders.

9. Lessons Learned from The Strategic Action Program For The Binational Basin of The Bermejo River

The identification of *lessons learned* from the implementation of SAP-Bermejo has considered the binational character of the initiative to address the causes of the main transboundary problems that are important to both countries and the international community and the local benefits generated in the area of the Basin. Two key variables have been taken into account to assess the possible and necessary extension and strengthening of the progress achieved through SAP-Bermejo: the **sustainability** of key activities, and their **replicability** in the Basin and in the region, within the global context to which it is thematically related.

The identification of the main lessons learned seeks to identify the good practices and mistakes made during Program implementation. The exercise is not understood as an end in itself, but as a means to support, promote and strengthen IWRM policies as the foundation to advance economic, social and environmental development in the Binational Bermejo River Basin and in the wider region where it is located.

The main lessons learned include:

The continuity of the identification-preparation-implementation process embodied in a strategic action program is critical. The opportunity offered by the GEF to provide continuity to the process that started by identifying the need for the Strategic Program and its execution, though limited to a catalytic program, had very positive results, breaking the prevailing practice of having cooperation for the identification and preparation of a project, but leaving uncertain its future implementation. This element could have been optimized, and its significance has not been sufficiently acknowledged.

- **Conceptual progress in the validation of strategic environmental management actions for sustainable development.** In practice, SAP-Bermejo resulted in an environmental valuation of the Basin and its natural resources, not generally acknowledged in the economic and financial assessments used by traditional development projects. New indicators were incorporated for the validation and recognition of the Program's benefits.

- **Regional cooperation for the development of transboundary water projects is crucial.** The existence and availability of regional (multi-country) funds became a factor that fostered consensus between Argentina and Bolivia to solve common problems in the Basin, which, in turn, have regional and global significance. The funds provided by the GEF through SAP-Bermejo were critical to strengthening the unified vision of the Basin, developing the process of understanding and anticipating potential conflicts that could arise from unilateral actions by any of the parties. In this regard, SAP-Bermejo should not only be assessed not only on the basis of the degree to which it reached its goals, but also as an element of peace, integration and understanding in the region..

- **The rationality of the methodology for participative diagnosis and identification of strategic actions (TDA-SAP process) proved to be valid and useful.** The identification of the main transboundary problems of the Basin and their root causes, followed by a logical and comprehensive program to address the root causes of the issues through strategic actions selected with stakeholders, proved to be functional in practice. The process has been a methodological factor that enabled the formulation of SAP-Bermejo, incorporating technical capacity and scientific expertise into the initiatives of the jurisdictional stakeholders and organized beneficiaries in local communities.

- **A flexible design with a small number of clear indicators is important.** This is based on the need for shared goals and purpose among key stakeholders at different levels of action. These indicators must be limited in number, well-defined, possible to achieve and measurable based on substantive progress, not based on specific activities. Although SAP-Bermejo can generally be assessed as a milestone, progress was difficult to measure in aggregated terms, given the lack of a baseline with clear indicators for the measurement of its benefits and limitations.

- **Flexibility in the timing of the execution of activities is required.** During project design, it is important to develop realistic timeframes, and to include contingency plans and flexible timetables, especially in complex institutional settings as in transboundary binational or regional projects. Notwithstanding, it is important to avoid introducing activities to the project that represent additional programming efforts and modification of the products

originally agreed upon, which could affect contracts in progress and discourage the work of institutional actors involved.

- **Active participation of social stakeholders involved is critical.** Effective participation mechanisms should be established for each project stage, enabling stakeholders to internalize their goals and objectives, and develop local capacities.

10. Annex

ANNEX I - LOGICAL FRAMEWORK MATRIX

Goals	Objectively verifiable indicators	Verification means	Achievements
GENERAL GOAL:			
To promote the sustainable development of the Bermejo River Basin through the implementation of the Strategic Action Program for the Binational Basin of the Bermejo River (SAP-Bermejo).	The full implementation of the Strategic Action Program for the Binational Basin of the Bermejo River (SAP-Bermejo), with verifiable advances in: - The incorporation of environmental issues in regional policies, plans and programs. - The establishment of regional cooperation, coordination and public participation mechanisms. - The implementation of programs, projects and actions for environmental protection and remediation and for the sustainable development of natural resources prioritized by the SAP.	Reports prepared by the Regional Coordination Commission established by the SAP-Bermejo. Final progress and project assessment reports, implemented or underway.	**- Fulfilled.** The SAP-Bermejo was fully implemented between 2001 and 2009. Excluding a few exceptions, all the projects agreed upon in the Project Document were executed and the stated goals were met, at the activity, component and Program levels. The Final Reports on each of the implemented projects are available on the COBINABE website(www.cobinabe.org). The activities of the Program were able to considate a vision of the Basin, strengthening binational and inter-jurisdictional coordination and cooperation capacity for the integrated and sustainable management of natural resources, starting a process for the incorporation of the environmental dimension in binational activities of the Basin under a sustainable development approach. Concrete cooperation and coordination mechanisms were established through the Regional Coordination Committee (RCC) and the Regional Advisory Committe (RAC), achieving to institutionalize participative processes, regulation, follow-up and consultation in the management of the Binational Basin. The SAP-Bermejo not only catalyzed programs, projects and actions, included and prioritezed in long-term planning, but also facilitated and promoted the implementation of other activities regarding institutional strengthening, environmental protection and remediation, sustainable development and public participation.
PURPOSE:			
To foster and reestablish adequate environmental operation of the system, through the execution of selected strategic actions to complementand facilitate governmental and institutional efforts in Argentina and Bolivia for the implementation of the SAP-Bermejo.	The institutional, financial, organizational and legal mechanisms operating in the asin, studies and the pilot demonstration projects carried out and the ongoing SAP-Bermejo implementation process.	- Final Project Assessment Report - Steering Committee Report	**- Fulfilled.** The SAP-Bermejo established institutional, financial, organizational and legal mechanisms operating in the Basin in the framework of COBINABE at a binational level and of COREBE and the OTNPB at a national level in Argentina and Bolivia, respectively. Additionally, the demonstration projects and studies agreed upon in the Project Document were completed. The final Steering Committee meeting and the objective to make a final project assessment are scheduled for May 2010.
PRODUCTS:			
I) INSTITUTIONAL DEVELOPMENT AND STRENGTHENING: To develop a participative legal and institutional framework that includes both	The work program implemented and goals reached in a term of 4 years through 31 projects and 4 components, achieving: I) A legal and institutional fra-	- Final Project Assessment Report - Reports prepared by the Regional Coordination and Organization Commission established	**- Fulfilled, extended and innovative.** Although the execution of the SAP-Bermejo took about twice the time that had originally been planned, all the stated goals were fulfilled and, in several ways, both the goals and some actions were expanded and implemented in an innovative fashion, which strengthened and increased the value of the results of the Project as a whole.

LOGICAL FRAMEWORK MATRIX - Continuation

Goals	Objectively verifiable indicators	Verification means	Achievements
the public and private sectors, and providing a multi-sectoral and holistic approach to the Basin's economic development and environmental management. II) ENVIRONMENTAL PROTECTION AND REHABILITATION: To implement basin management measures aimed at addressing priority trans-boundary issues related to the prevention and control of sediment production and transport water quality pollution and degradation, nature conservation and biodiversity protection. III) SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES: To promote the application of sustainable environmentally-friendly production alternatives that minimize environmental degradation and provide better economic opportunities to the population in a context of integred water resources management and basin-level planning. IV) AWARENESS-BUILDING AND PUBLIC PARTICIPATION: To coordinate and support the interests of the various Basin actors through environmental education, institutional transparency, social participation and information generation and exchange.	mework for the integrated management of the Basin, which has been consolidated and is in operation. Specifically: II) Pilot demonstration activities and basic complementary studies executed, which have generated the technical foundations for environmental protection and rehabilitation of the ecosystems. III) a) An integrated basin planning system, which has been consolidated and is in operation. The Integrated Basin Management Program adopted by the Binational Commission, the governments of Argentina and Bolivia, their provinces/districts and other actors involved with the Basin. b) Sustainable practices for the use of natural resources,which have been developed and disseminated. IV) A population that is sufficiently informed and aware, which is actively participating in the Basin's natural resources management programs, projects and actions.	in the framework of the SAP-Bermejo	The Binational Basin has a consolidated and strengthened institutional framework with the legal, financial and organizational tools necessary for the integrated management of the Basin, including institutionalized mechanisms for the involvement of all stakeholders, both in decision-making and in consultation processes. The baseline studies and the pilot demonstration projects were successfully completed and have consolidated a significant amount of practical and scientific-technical information that enables planning and executing environmental protection and rehabilitation activities in the Basinwith a view towards its sustainable development. In addition, a set of natural resources use practices and sustainable production models were disseminated widely and considered in the planning of Basin development. The set of actions was developed in the framework of a largely participative process, both in the design and prioritization of actions and in their execution and follow-up. The public participation program, environmental education program and establishment of the information system resulted in an aware population with access to reliable information and that participates in the Basin's management processes. Finally, an organizational framework was established for the sustainable development of the Basin. This was realized in the Bermejo River Basin Comprehensive Management Program (Programa de Gestión Integral de la Cuenca Binacional del Río Bermejo, PROBER), which was agreed upon at a binational and inter-jurisdictional level between Argentina and Bolivia, and which encompasses and expands the vision, goals, experiences, lessons learned and best practices of the SAP-Bermejo.

STRATEGIC AREA I: INSTITUTIONAL DEVELOPMENT AND STRENGTHENING

Goals	Objectively verifiable indicators	Verification means	Achievements
GENERAL GOAL:			
1.1. INSTITUTIONAL FRAMEWORK DEVELOPMENT: Consolidated institutional framework for the integrated management of the Basin, through the Binational Commission with the participation of both countries´ institutions and jurisdictions, through the implementation of the following actions: • Institutional development and strengthening of the Binational Commission. • Basin-level institutional development in Argentina. • Strengthening of institutions andof the capacities of government agencies and of civil society organizations.	a) An inter-jurisdictional coordination, organization and regulation mechanism, competent across the Basin, which has been established and is in operation. b) Strategies for the institutionalization of the functions of the Basin organization at a binational level have been designed and agreed upon. c) The Binational Commission, jurisdictional institutions, private entities and NGOs have been strengthened and have actively participated in the organizational structure and implementation of programs and projects in the Basin. Aninter-jurisdictional basin organization has been consolidated and is operating in Argentina. The Bermejo River Regional Commission (Comisión Regional del río Bermejo, COREBE) and the jurisdictional entities have been strengthened.	- Inter-jurisdictional binational agreement formalizing the implementation of regulation, organization and coordination mechanisms - Final Activities Report - Statutes of COREBE, which is operating as a basin organization	**- Fulfilled and extended.** The inter-jurisdictional agreement prior to the SAP-Bermejo, the Orán Treaty, was formalized institutionally and operatively. The bylaws of COBINANE were modified and it was formalized with the approval of Argentine and Bolivian Government authorities. COBINABE has acquired its own identity and image, which was defined through a new functional and operating structure and was provided with equipped and functional headquarters in each country,. It has its own autonomous budget. Binational Coordination was established. The Integrated Environmental Information System was set up and is in operation. It provides public and interactive access and works in cooperation with the Hydrometeorological Network and the Water Quality Monitoring Network. **- Fulfilled.** The work planned for the institutional development and consolidation of the Binational Basin was completed, articulating and incorporating the different jurisdictions involved in the Basin. The final reports on the work carried out are available and are included in the Integrated Environmental Information System, at www.cobinabe.org. Based on the RCC and RAC created for the implementation of the SAP-Bermejo, COBINABE has consolidated and institutionalized participation in activities planning, follow-up and regulation processes by decision-makers and by different stakeholders through the Binational Coordination Committee. **- Fulfilled and expanded.** COREBE acquired a new institutional framing in Argentina, under the framework of the Under-Secretary of Water Resources, as the most appropriate institution for its functions as an inter-jurisdictional water regional authority of the Basin, and fostered the Federal Water Policy Principles of Argentina and the Federal Water Council (Consejo Hídrico Federal, COHIFE) guidelines in keeping with the SAP-Bermejo and supporting its technical/executive presence. COREBE was subject to restructuring through a decentralization and federalization process, both in technical and operative terms. It was also strengthened in regards to relevant aspects for the execution of the Basin Management Plan whose implementation is scheduled for the time when the SAP-Bermejo was completed. In Bolivia, the OTNPB was strengthened with the creation of a SAP-Bermejo Technical Unit. Its bylaws as a basin agency were strengthened with new statutes and its institutional placement was adjusted to a new institutional framework where water , its sustainable use and its social and cultural value were given importance. The OTNPB's image and identity were consolidated for the construction of a new, equipped headquarters of its own. These actions were oriented at providing the OTNPB with capacities to: I) actively participate with jurisdiction and competency in all strategic actions, activities and projects to be executed within the Upper Bermejo River Basin in Bolivia and II) design and implement a planning, coordination, organization and regulation system for the integrated development of the entire Bermejo River Basin, supporting the Bolivian COBINABE delegation.

STRATEGIC AREA I: INSTITUTIONAL DEVELOPMENT AND STRENGTHENING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
	Enhancement of the technical capacities and of the equipment of government entities and civil society organizations, which are responsible or involved in the management of the Basin's natural resources.	- Final Activities Report - Inventory of the supplied equipment - Assessment Reports on the courses provided	**- Fulfilled.** At the level of the Argentine provinces and of the Department of Tarija in Bolivia, the capacity of government entities and/or civil society organizations of the Bermejo River Basin, which are responsible for or interested in the sustainable management of natural and water resources, were strengthened. For such purpose, measures were implemented to support training in management and technical levels, to consolidate the organizational capabilities and equipment of such entities, and to contribute to the successful execution of actions related to the accomplishment of the missions and functions of the entities responsible for environmental and water resources management. The strengthened entities were: - Provincial Water Coordination Unit (Unidad Provincial Coordinadora del Agua, UPCA), Formosa; - Under-Secretary of Natural Resources and Ecology, Formosa; - Provincial Water Administration (Administración Provincial del Agua – APA), Chaco; - Secretary of Production and Environment, Jujuy; - Integrated Water Basin Management Unit (Unidad de Gestión Integrada de Cuencas Hidrográficas, UGICH) Jujuy; - Secretary of Environment and Sustainable Development (Secretaría de Medio Ambiente y Desarrollo Sustentable, SEMADES), Salta; - Water Resources Agency, Salta; - Groundwater Institute for Latin America (Instituto de Aguas Subterráneas para Latinoamérica, INASLA), National University of Salta; - Water Quality Labs of the Provinces of Chaco, Formosa, Jujuy and Salta; - Secretary of Environment of the Department of Tarija; - School of Agricultural and Forestry Sciences of the Autonomous University of Juan Misael Saracho (Universidad Autónoma Juan Misael Saracho, UAJMS). The final reports on the work performed are available and are included in the Integrated Environmental Information System, at www.cobinabe.org.
			- Fulfilled. The inventory of the equipment of the institutions/organizations that were identified and included in the SAP-Bermejo for their consolidation is available.
			- Fulfilled. All courses given were evaluated and reported.
1.2 DEVELOPMENT OF A LEGAL FRAMEWORK: Strengthened regulatory framework for the use and conservation of the Basin's natural resources, through the following actions: • Development and harmonization of the regional judicial framework. • Environmental and land use zoning regulation. • Strengthening and development of economic instruments.	Developed and harmonized regional and jurisdictional judicial frameworks, especially those related to environmental laws, water codes, environmental impact assessment, public participation and access to information.	- Final Activities Report	**- Fulfilled – Partially met.** The SAP-Bermejo made the diagnostic analysis and has the final consulting reports on environmental and water laws of the different jurisdictions of the Basin, as planned. These final reports were prepared together with the relevant parties and, finally, submitted to provincial/departmental/national governments, regional entities in both countries and COBINABE. Several technical manuals, guidelines and regulations were prepared in relation to water management in its quantitative aspects such as knowledge and monitoring of water quality. Some of them are focused on IWRM practices for the integrated management of basins and land use regulation. These are all shown on the COBINABE website or are available from the offices to which they were submitted. The SAP-Bermejo fulfilled the verification methodology for indicators, but only partially with regards to the indicators themselves. While the SAP-Bermejo formed inter-jurisdictional institutions to address common issues, such as the RCC, the RAC and the Inter-Ministerial Committee (IC), the

STRATEGIC AREA I: INSTITUTIONAL DEVELOPMENT AND STRENGTHENING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
• Incorporation of social and environmental costs into development projects.		- Prepared Regulations, Guidelines and Manuals - Land use regulation plan for the Upper Basin in Bolivia	changes and harmonization of standards within each jurisdiction were not considered in these arenas. It is clear that although the Program prepared anticipated process indicators that consider final achievements with legally approved progress, it did not take into account the steps and stages that should have been organized together with the legislators, nor the costs of such activities. Thus, this is considered as a shortcoming of the SAP-Bermejo since its preparatory phase. Notwithstanding, the SAP-Bermejo made proposals for modification and harmonization of certain legal frameworks, mainly related to water codes and protected areas.
	Land use regulation applied and promoted as aplanning instrument for land settlement and development of economic activities in terms of natural resources quality. In Argentina, the application to demonstration pilot cases in order to providecommon methodological and technical criteria. In Bolivia, the preparation of a land use plan for the whole Basin.	- Final Activities Report	**- Fulfilled, innovative and expanded.** The pilot demonstration land use regulation projects were successfully implemented in the Argentine provinces. These had the desired impact based on their objectives to promote the management and application of an appropriate instrument for critical situations due to water use conflicts, water risk ordegradation of soils and water. The Departmental Land Use Plan, currently in force, was prepared and approved together with the Department of Tarija in Bolivia. In this case, the results exceeded the scope that was originally intended in the SAP-Bermejo and was absorbed and put into operation by the Departmental Prefecture. In addition, in Argentina and Bolivia, protection activities and IWRM served as instruments for the regulation of basins and micro-basins with multiple and successful structural and non-structural actions. In all cases, they were implemented with a participatory approach and strengthened the institutions and organizations involved. The process of environmental land use zoning in the Yungas Biosphere Reserve must be highlighted, since, as a result of the approval by the UNESCO MAB Program, the reserve was granted consideration as a core area, made up by the national and provincial protected areas and the buffer and transition areas.
	Agreed upon economic instruments that have been incorporated as mechanisms for water valuation and genuineeconomic resources generation for integrated water resources management.	- Final Activities Report - Rules for the implementation of management instruments	**- Partially fulfilled.** Although the proposed indicator was met, the strategic activity was designed with more ambition than required by the indicator and its means for verification. The issue of development and putting into operation economic instruments was successfully included as part of the activities executed in the SAP-Bermejo, which justified its integrated design. However, it did not have the intended success as an issue per se, given that the orientation of national policies, without rejecting these instruments, avoided them due to the priority of the cultural-human dimension of water and of the rights to its access and use. An important course was given on this matter in Argentina, which clarified its concepts and its potential application. It was attended by the entities related to the execution of the SAP-Bermejo in the four provinces. Additionally, a proposal was prepared for its execution in the Sub-Basin of Los Pericos-Manantiales as a pilot area for a case study on the value of water in terms of the productivity of crops and of more efficient water use alternatives.
	Agreed upon, essential strategic and methodological criteria designed and agreed uponfor the inclusion of social and environmental costs into the assessment of development projects, through methodologies that appraise natural resources and services. The methodology applied to pilot case studies and to results assessment.	- Final Activities Report	**- Fulfilled, innovative, with difficulties.** In relation to the inclusion of social and environmental costs into projects, a course was given for the parties responsible for the planning and management of natural and water resources in the Basin, targeted at the formulation of forestry and farming projects.

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION

Goals	Objectively verifiable indicators	Verification means	Achievements
2.1 SOIL MANAGEMENT AND EROSION CONTROL: Application of appropriate structural and non-structural measures for soil conservation and erosion control through a basin management approach in selected critical areas of the Basin. The following actions will be executed: • Sediment control in the Tolomosa River Basin. • Integrated natural resources management in the Santa Ana River Basin. • Integrated management of the Iruya River Basin. • Basin management. Huasamayo River Sub-Basin systematization.	Controlled soil erosion and sediments in transit, with a 25% decrease in the sedimentation of the San Jacinto Reservoir and in the loss of arable lands. Practices applied to the Mena River Sub-Basin: - Construction of 5 earth-fill dams; - 10 gabion dams; - Fencing of 160 hectares for natural regeneration; - Reforestation of 80 hectares; - Soil management on 600 hectares; and - Technical assistance and training.	- Final Activities Report - Site inspection	**- Fulfilled.** This project's indicators were successfully met and verified, both by the reports prepared and by the inspections performed during execution and upon completion of the works. The intervention area of the demonstration project accounted for about 60% of the total of the Mena Sub-Basin The works have a sediment retention capacity of 33,400 m3/year, accounting for 5% of the sediments entering the San Jacinto Reservoir (730,000 m3/year). The total project sediment retention amounts to 387,000 m3 of total reservoir volume, estimated based on a lifespan of 12 to 15 years. These measures demonstrated a favorable cost/benefit ratio since the retained sediment cost amounts to USD $0.80 /m3, which is lower than the USD 0.95 / m3 benefit to the San Jacinto Reservoir project. In addition, it was shown that erosion control in micro-basins through soil management and conservation practices extends the lifespan of small reservoirs. Finally, it is worth pointing out that the managing authority of the San Jacinto project adopted the structural and non-structural measures.. - Eleven earth-fill dams and 1 gabion dam were constructed; - Sixty-three hectares of crops were put under irrigation; - Ten thousand trees and 3,000 fruit trees were planted; - Thirteen thousand meters of live barriers, 6,450 meters of borders, 556 meters of collector channels and 15,139 meters of fence were built; and - Five training courses and technical and farming support were given.
	An integrated natural resources management plan implemented in the Gamoneda River Sub-Basin through flow-regulation works for irrigation use, the conservation of arable lands and the mitigation of erosion processes. This pilot project comprises the sustainable management of: - 200 hectares of unirrigated crops; - 50 hectares of irrigated crops; and - 500 hectares for silvo pastoral use.	- Final Activities Report - Site inspection	**- Fulfilled.** The soil conservation practices and works carried out (slow formation terraces, living fences and forestation, etc.), jointly with technical assistance, wide participation of the local community and the use of locally available material, contributed to the success of this pilot plan. As a result of the following construction, 93 hectares were added as irrigated crops: - Three flow-regulation dams; - One rehabilitated earth-fill dam, with the construction of an overflow spillway and reinforced dam structure; - Approximately 9.7 km of coated channels, pipelines and tubing; - Twelve deposits of cyclopean concrete for night compensation and storage, with capacities ranging from 10 to 80 m3, and a total volume of 474 m3. Forestation: - Six thousand five hundred trees; - Two thousand fruit trees. Soil conservation and management, with the construction of: - Twenty-seven gabion dams (948 m3 and earth-fill 1082 m3); - Seven hundred forty m3 of lowstone walls; - Two thousand eigh hundred m of fences. Technical assistance: - Forty training courses in Caldera Grande and Caldera Chica; - Organization of irrigation committees for the management, operation and maintenance of 16 systems and sub-systems in the intervention area; - Technical support in cultural practices to 71 farmers. Final Study and Design of the Comprehensive Management of Natural Resources in the Calderas River Sub-Basin. - Incorporation of 93 hectares of irrigated crops;

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			- Forestation (8500 units). Soil conservation and management. Technical assistance.
	Applied and evaluated management plan or soil conservation practices and sediment transport and production control and prevention for the Iruya River Basin. A pilot demonstration project for erosion reduction in terrace production carried out. Structural actions implemented in the Colanzulí pilot project. Results transferred to the community. Designed and adopted regulation plan. Designed and implemented participation activities.	- Final Activities Report - Work inspection reports - Community participation meeting and workshop reports	**- Fulfilled.** The Iruya River Basin Management Program was implemented with a wide and active participation of local actors. Actions related to sediment transport control and prevention were carried out through structural and non-structural measures. In the first case, the construction of walls to consolidate the banks of the Milnahuasi and Colnazulí Rivers, together with the walls crossing across the latter, riverbank defenses and storm drains, mitigated erosion and decreased the vulnerability of the Town of Iruya to erosion by extreme events. The channel regulation solution has proved to be efficient for sediment retention and in the decrease of riverside and bank erosion processes, with an estimated sediment retention of 232,000 m3. Concerning non-structural measures, these were based on the design and implementation of sustainable management of natural resources and integrated water resources and soil management. Moreover, the foundation for land use regulation was laid through the zoningof flood risk and the interaction between society and landin the town and its surroundings. Land Use Component: A social and land use diagnosic analysis of the environmental risk of the Town of Iruya was developed, aimed atdefinitingan Early Flood Warming System (including topography) and a social and land use survey focused on the value of culture as a factor of comprehensive development in Colanzulí and San Isidro. The "Course on Administrative Foundations for Risk Management (Bases Administrativas para la Gestión del Riesgo, BAGER)" was carried out with the involvement of the community for the preparation of a town contingency plan for extreme events. Structural and Non-Structural Control Measures Component: Implemented pilot demonstration projects on the systematization works of the Iruya River channel. - Colanzaulí River bottom control and rehabilitation; - Milmahuasi River bottom control and rehabilitation; - Execution of 2 bottom-control walls crossing across the Colanzulí River; - Town of Iruya storm drains; - Execution of side walls for the protection of the Milmahuasi Benchmark; and - Colanzulí riverside forestation. Natural Resources Conservation and Management Program Component: Natural resources management aimed at production development under conditions of sustainability: - 126 families in Colanzulí and 78 families in San Isidro are implementing traditional planting, land and water sustainable management practices. - 3 trips to Buenos Aires and 2 trips to farming trade shows for the marketing of classified and selected traditional products (oca and ulluco). - 2 pilot demonstratione projects aimed at decreasing pasturage pressure have been implemented. - Irrigation water channeling and collection in Abralaite. 5 community infrastructure works for water and irrigation management. Channeling of 1,492 meters of irrigation ditch. - 4 families have been benefited by the incorporation of sheep breeders into their flocks. - 6 pilot risk management experiences have been performed. - 78 families are implementing traditional livestock and pasturage sustainable management practices.

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			- 7 fences for pasturage management, 2 community animal health kits for 1000 animals. - Animal health training workshop with 28 participants. - Active involvement of the local community in the project's decision-making process. - 14 technical meetings and community workshops. - 11 trained farming leaders. Educating through Forestation - Elaborated and initiated Forestation Plan, production of tree and fruit tree species, irrigation ditch maintenance with community involvement. - 120 students participating in orchard and nursery activities. - Reformed and producing greenhouse. - Farmers, students and teachers trained in aromatic and pasture management experiences. Waste Management in Iruya. - Waste management workshop with 23 participants from different community sectors. Alternative waste management, separation at source, press and plastic recycling, manure obtention. - 272 beneficiary families in the urban region. - 2 teacher workshops with 22 participants. Environmental education: Plastic, basketwork, compostage and handcraft paper courses for teachers. - Identified, approved and built landfill, considering: Public Hearing and Environmental Impact Assessment. Educating by producing in the Campo Tapial Elementary School - 96 students and 25 families have benefited from the drinking and irrigation water supply. - Repaired and operating greenhouse. - Producing orchard. Sustainable Development Plan Component: The base guidelines have been defined for the community and executors meeting, where the future action strategies will be determined. - 3 workshops and 1 executors meeting have been held with 112 participants representing the different Civil Society stakeholders. - 11 base documents have been prepared.
	Structural actions and management measures designed, agreed upon and implemented in order to: a) Reduceerosion from extreme events in the Huasamayo River Sub-Basin; b) Assess and select practices for their implementation throughout the Grande River Basin.	- Final Activities Report - Work inspection reports - Community participation meeting and workshop reports	**- Fulfilled. Partially met – innovative.** Based on an initial vision principally focused on water issues, the project was gradually expanded to incorporation of other dimensions, especially to reinforce the need to modify the complex local scenario. The Huasamayo River Basin systematization required the identification, implementation and coordination of several components, concurrently from different points of view. In this respect, the initial goal to prevent or reduce extreme erosion events through structural and non-structural measures was expanded. The need to reduce risks suffered by people and their possessions, train the local population, regulate land use and promote sustainable development were incorporated. - Twenty-two gabion dams were built for flood control, with a total of 1000 m3 of gabions and protection of the right bank. - The riverbank was cleaned from Tilcara to its confluence with the Grande River. Over 120,000 m3 of soil were moved for the defense and protection of the town's 4,358 inhabitants. - Native plantnursery: established and in operation. Construction of the Germoplasm Bank, 10 beds constructed, 12 m3 of compost and 23 m3

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			of substrata prepared, 100,000 seedlings produced and 10 educational campaigns developed. Trained municipal staff and the awareness raised of thegeneral population. - Land use regulation: Land Use Plan, thematic maps and risk and vulnerability maps prepared. Urban and services cartography prepared.
2.2 CONSOLIDATION OF PROTECTED AREAS AND BIODIVERSITY PROTECTION: Biodiversity protection and promotion of the sustainable development in local communities through the consolidation and development of protected areas, implementation of buffer zones, the conducting of baseline studies on natural resources and implementation of pilot activities on carbon fixation. This entails the following actions: • Implementation of eco-tourism alternatives in the El Rey and Calilegua National Parks; • Sub-Andean carbon fixation; • Biodiversity study; • Implementation of the Baritú – Tariquía Biological Corridor; • Sama and Tariquía Reserves Management Plan andzoning; • Sun-Andean pasture assessment; • Future Teuco National Park zoning.	Eco-tourism activities established in mountain forests, including the monitoring and assessment of eco-tourism alternatives in the El Rey National Park, and the identification, design and implementation of eco-tourism alternatives in the Calilegua National Park buffer zone.	- Final Report of the Work Compenent - Agreements with property owners in the buffer zones - Reports on improvements and investments made	**- Fulfilled. Partially met.** This activity was mainlly implemented in the Protected Natural Areas of El Rey and Calilegua. In both cases, the focus was on the valuation of the environment and scenery of the parks, through the elaboration of descriptive distribution material, adequate facilities and park signage and the implementation of interpretation trails. In this regard, the Interpretation Trail of the Guaraní Culture in the Calilegua National Park must be highlighted. This was directly designed and implemented by the different Guaraní communities of the region. In relation to the buffer zones, several circuits with eco-tourism potential were identified, principally in Calilegua National Park. The most prominent trails were within the area between the National Park and the Quebrada de Humahuaca, composed of three sectors: 1- San Francisco / Alto Calilegua; 2- Valle Grande / Valle Colorado; and 3- Valle Colorado / Santa Ana. Finally, the Calilegua National Park Visitor Center was designed, with the intention to place it on Route 34 at the turnoff to the Park entrance. This activity was not implemented due to setbacks in the transfer of land by a private owner and then due to the lack of support from national and provincial authorities.
	a) Studies carried out on the current state of Sub-Andean natural resources and the design of a pilot plan for natural resources conservation and management. b) Animplemented pilot plan, focused on higher carbon fixation through sustainable production practices, the organized use of natural resources and the application of techniques for the protection, conservation, management and rehabilitation of degraded habitats.	- Final Activities Report - Site inspection	**- Partially fulfilled.** Even though indicators demonstrated an increase in carbon fixation due to project activities, in practice, they were focused on natural resources management and conservation, sustainable production practices and productive forest management. Thus, though the goal to increase forest cover and improve management was met, resulting in a higher carbon fixation, the magnitude or quantification of such was not reflected in the documents. The Sub-Andean Carbon Fixation Pilot Plan was comprised of three components: a) forest plantation production, b) Agroforestry practices and c) productive natural forest management. In order to elaborate and formulate the Pilot Plan, an environmental and socio-economic characterization of the area was completed, the baseline for carbon fixation and sequestration was set in the areas of intervention and projects were selected. It is worth highlighting the General Forest Management Plan (Plan General de Manejo Forestal, PGMF), elaborated in accordance with Technical Resolution 132/97 of the Forestry Act. The Plan entails a net forest surface area of 75.61 hectares, with 1,803 trees/hectare, representing 3.46 m3/hectare. The management unit, or PGMF administrative use unit, is 58.52 hectares. The cutting cycle is 1 and 20 years. The cutting intensity amounts to 64.8% of the usable trees, cedar (Cedrela balansae) and walnut (Junglas australis). - Fifty-seven hectares were fenced with barbed wire. - Approximately 4,459 fruit trees were planted in agroforestry plots. - Over 4.6 hectares of forage were implemented. - Three hundred sixty hectares with forest plantations were fenced in. - Seven thousand six hundred cedar trees were planted.

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
	Studies carried out on the current state of biodiversity in the Upper Bermejo River Basin, of ecosystem conservation and the proposed lines of action for their management and conservation.	- Final Activities Report - Report by implementing agencies - Reports oncommunity workshops and meetings	**- Fulfilled.** The document on the current state of biodiversity and the outlook for its potential development in a framework of sustainable development is available. More specifically, there are thematic maps and reports, systematized flora and fauna databases and an Action Plan for biodiversity use and conservation.
	A connectionbetween the protected areas of the Baritú National Park in Argentina and the Tariquía National Reserve in Bolivia assured through the legal and administrative consolidation of the Biological Corridor between these two protected areas and through the adoption of a program for the integrated management of natural resources and of these areas.	- Final Activities Report - Report by implementing agencies - Reports on community workshops and meetings-	**- Fulfilled and expanded.** In order to expand the conservation area, reestablish a connection and prevent habitat fragmentation between close protected areas, the SAP-Bermejo implemented the Binational Ecological Corridor between Tariquía National Flora and Fauna Reserve in Bolivia and Baritú and Calilegua National Parks in Argentina. The Ecological Corridor Management Plan was elaborated and approved with the cooperation of a group of expert advisors selected by public tender and through a process where communities, officials, the private sector and several NGOs and farmer associations were widely involved. This Plan integrated three components (environmental, institutional and economic), the priority actions for short-term implementation. In terms of the Corridor's legal and administrative consolidation, and as a result of a workshop carried out with the participation of national and provincial authorities, the communities and COBINABE, it was decided that for the Corridor's management, they would use the Management Committee of the Biosphere Reserve of the Yungas (Reserva de Biosfera de las Yungas, RBYun). This Biosphere Reserve was presented to UNESCO by the provinces of Salta and Jujuy in 2002 with the support of the SAP-Bermejo and was approved under the framework of the Man and the Biosphere (MAB) Program. The Management Plans for the Provincial Reserves "Laguna de Pintascayo", in Salta, and "Potrero de Yala", in Jujuy, were subsequently elaborated, aimed at promoting the application of the management plans leaning toward natural resources conservation in the Upper Bermejo River Basin. Both protected areas are part of the core areas of RBYun.
	a) A prepared proposal for the redefinition, re-categorization and zoning of the Sama and Tariquía Biological Reserves. b) Management plans designed for both reserves.	- Final Activities Report - PROMETA Report	**- Fulfilled.** At first, PROMETA was identified as the project executor. In the end, actions were directed and implemented through the National Service for Protected Areas (Servicio Nacional de Áreas Protegidas, SERNAP). Both protected areas' Management Plans took into account the General Regulations for Protected Areas, which consider social, economic, cultural and institutional dynamics, social participation and conservation goals. There is a Management Plan for the Sama Mountain Range Biological Reserve and an Action Plan for the Tariquía Flora and Fauna National Reserve.
	A study conducted on zoning and the description of the natural grasslands of the Sub-Andean eco-region, based on ecological and socio-economic criteria, the quantification of their state of management and the outlining of a sustainable management plan for these natural grasslands.	- Final Activities Report	**- Fulfilled.** The distribution and specific features of the Sub-Andean natural grasslands were assessed in physical, biological and socio-economic terms. The technical parameters of the current management of cattle were defined and the problems and constraints of livestock in the area were identified. Finally, a livestock development action plan was developed for the Sub-Andean region.

STRATEGIC AREA II: ENVIRONMENTAL PROTECTION AND REHABILITATION - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
	Definition of the real potential of the area as a protected area, establishing its conservation goals, the zoning of the area (250,000 hectares) and recommendations for its management andimplementation as a protected area.	- Final Activities Report	**-Unfulfilled.** On the basis of a resolution passed by the National Director of the SAP-Bermejo in Argentina and enquiries made to the representatives of the provinces of Chaco and Formosa in the SAP-Bermejo RCC, this project was not implemented due to lack of support from the pertinent national and provincial authorities.
2.3 WATER QUALITY PROTECTION AND RESTORATION Water quality restoration in critical pre-established areas, through the implementation of the following actions: • Guadalquivir River environmental sanitation; • Study on the environmental sanitation of the Triángulo de Bermejo watercourses.	Two waste water treatment systems (pilot plants) built in small rural areas, anestablished aquifer pollution control system and an outlined wastewater monitoring plan.	- Final Activities Report - Site inspection - Surface and ground water quality measurements	**- Partly fulfilled.** Despite the complexity of the water quality issue in the rural area of the Upper Guadalquivir River Basin due to scattered human settlements and inadequate livestock management, the works completed by the project were a step forward in the cleanup of the river. - Approximately 1,840 meters of pipe in Tomatitas, 29 inspection chambers and 34 household connections. - San Lorenzo maturing pond with 2,433 meters of sewerage connection. - Over 3,310 meters of pipe for sewerage connection in the Canasmoro infiltration field with 229 meters of piping. - Sixty-three septic tanks and 20 lavatories built. The execution of the infiltration field was not completed in the Canasmoro System and the formulation of the wastewater Monitoring Plan is pending.
	Completed research on the assessment of the extent of pollution , thechief causes and the proposed solutions for the environmental and sustainable cleanup and of the waters of the El Nueve and El Cinco Streams and the Grande de Tarija and Bermejo Rivers. The targeted products are a Scenario Diagnosis and an Environmental Cleanup Plan, at a final design level.	- Final Activities Report	**- Fulfilled.** The pollution of the waters of the Bermejo Triangle was surveyed and assessed, identifying the main sources. This analysis resulted in the Environmental Cleanup Plan and in the definition of the actions necessary for cleanup, mainly consisting of the treatment of household and industrial wastewater. In the first case, the sewerage project on the outskirts of the City of Bermejo and the sewerage and wastewater treatment in the rural areas of Colonia Linares, Barredero and Campo Grande were developed. In the second case, household and industrial wastewater treatment projects were developed at the sugar mill of the Bermejo Agricultural Industries Plant (Planta de Industrias Agrícolas de Bermejo, IABSA).

STRATEGIC AREA III: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
3.1 ORGANIZATION AND PLANNING Development and strengthening of regional capacities, procedures and policies for organization and planning, through the: • Bermejo River Integrated Water Resources Management Program.	a) Anoutlined Integrated Water Resources Management Program, integrating development initiatives in the context of the prevention of erosion prevention and sediment transport, water quality degradation and nature conservation. b) Activities carried out in relation to the coordination and management of the project, follow-up and oversight of contracts and set up of a technical team.	- Final Activities Report - Minutes of the Regional Coordination Committee meetings - Reports on the meetings and workshops attended by the communities and social stakeholders of the Basin.	**- Fulfilled.** Based on studies, demonstration projects and institutional activities carried out in both countries, the SAP-Bermejo outlined the Integrated Bermejo River Basin Management Program (Programa de Gestión Integral de la Cuenca del Río Bermejo, PROBER), as a catalyst for the updating and continuity of the long-term actions presented by the SAP-Bermejo. In this regard, the set of lessons learned throughout the development of the SAP-Bermejo were extremely useful and served as a reference framework for the continuity of actions for integrated water resources management It is worth highlighting the progress in the institutionalization of the basin organizations, both at the binational and national levels in Argentina and Bolivia: the results of environmental prevention, conservation and rehabilitation actions; the high levels of acceptance and response to participative processes; the multiplying effect of environmental education in community awareness-raising; the safety and benefits of access to information and principally, the implementation of sustainable development projects, which demonstrated the numerous and concrete local benefits in both countries and were mainly targeted at a population that is suffering the consequences of environmental degradation. For its part, the implementation of the SAP-Bermejo was performed in accordance with the Project Document (ProDoc) and the agreement signed between the countries and the OAS, through the creation and establishment of two Technical Units, one in each country, responsible for the coordination, management, follow-up and assessment of the different activities developed in the framework of the Project. Unit Reports, as well as the Final Activities Reports, are available at www.cobinabe.org.
3.2 SUSTAINABLE MANAGEMENT PRACTICES FOR THE REHABILITATION OF DEGRADED AREAS Implementation and disseminationof sustainable productiondevelopment practices that help mitigate environmental problems emerging from the degradation of soils and forests as a result of human activities. The actions that will be implemented are: • Alternatives for the sustainable management of natural resources in the humid and sub-humid regions of Chaco. • Sustainable production diversification in the Yungas.	Sustainable management practices disseminated and adopted by farmers, including the recovery of degraded environments in the Lower Basin, forage management in humid and sub-humid regions, productive recovery of lumber forests, agro-silvopastoral potential management in subtropical regions, soil management and conservation and agronomic management of water deficit and excess.	- Final Activities Report - Systematic measurement of bio-geophysical, economic and financial indicators - Reports on meetings and workshops attended by farmers and communities	**- Fulfilled. Innovative.** The alternatives for the sustainable development of natural resources originally planned for the humid and sub-humid regions of Chaco were expanded to cover all the areas in the Lower Basin of the provinces of Chaco and Formosa, by virtue of a request by the Argentina National Director's Office and approval by the Project's Steering Committee in 2003. Although the activities carried out were not those detailed in the Project Document, based on the priority given by the provincial authorities for new actions, the specific goals defined for the activity were met, and there was a contribution to the general goals of the component. In this respect, the set of activities carried out were comprised of baseline studies (water supply and demand, land use capacity, etc.); demonstration projects in tropical pasture and livestock management; improvement of the fruit and vegetable production through sustainable water and soil management and marketing, the design of sustainable production models based on the hydrological management of drainage channels and implementation of silvopastoral model. Furthermore, as a common factor in the development of all activities, it is worth underscoring the wide involvement of local communities (farmers, officials, indigenous communities, etc.) and the training processes that strengthened local capacity, both among direct beneficiaries and among the population in general: - Eight-six western Formosa farmers implemented sustainable goat management models. - Twenty agricultural technicians were trained in goat management. - Fifty farmers were trained in goat reproductive management and parasitic diseases. - A deworming campaign was developed in 82 properties; 5,960 goats, 1,498 sheep and 34 sheepdogs were treated.

STRATEGIC AREA III: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			- Two laboratories were built and equipped: for reproduction purposes and the diagnosis of brucellosis and parasitosis. - Three goat production seminars were given with more than 95 participants each. - The 1st Carob Tree Production Seminar was held with more than 145 participants. - The "Goat Producer Manual" was written and distributed. - Two cattle production models were developed and validated. These surpassed all proposed indicators, the limit of sustainability. - More than 39 species of tropical forage leguminous grasses and legumes were evaluated in productive and phenological terms. - Technical assistance on cattle and pasture management was given to 51 farmers. - 3 field seminars, attended by 65 producers and 17 technicians, and 2 training-spreading workshops, attended by 20 technicians, were given on pasture and cattle management. 3 technical publications were edited and distributed. - 1 internship for 8 students was organized. - 16 groups of fruit and vegetable producers were trained. - Crop management and efficient water use training and assistance were provided to 175 small farmers. - 25% of farmers have irrigation equipment which is appropriate for their needs. - 90% of farmers received market information through the radio. - 50% of the farmers marketed their products through reliable channels. - A nursery of fruit trees was set up and is in operation. - An environmental, climatic, hydrological and productive diagnosis of the Estero Bellaco was performed. - The regulation and the hydrological system of the Estero Bellaco were developed. - The Rice Production Model Proposal was outlined. - The Cattle-Breeding Model Proposal was outlined. - 18 Forestry and Pasture Management Plans, with a total of 122 hectares, were prepared in the Teuco Bermejito watershed area.
	a) Production systems based on the sustainable use of natural resources implemented in the communities of Victoria and Orán, including the development and diversification of small-scale cash crops, forest use, silvopastoral management and the development of small industries and crafts. b) Improvement in the quality of life of the local populations and reduced environmental degradation processes.	- Final Activities Report - Site inspection - Survey of participating families - Assessment of the improvements in the population's living conditions and income	**- Fulfilled.** Production systems were implemented and upgraded based on the sustainable use of natural resources, achieving a better quality of life for local mountain populations, reducing environmental degradation processes and contributing to the conservation of the Upper Bermejo River Basin. The intervention strategies for the activities of this component were founded on a process to diagnose, zone and plan the plots with the farmers themselves, maintaining a strong and continuous presence on the ground and actively involving the municipalities and other local organizations. Water resources use was improved through the construction and/or improvement of irrigation systems in Condado and La Misión (Los Toldos), as well as through the establishhment of a micro-irrigation system in San Andrés. Agroforestry plots were implemented, including the production and acquisition of forest and fruit trees from nurseries, keeping in mind the dual benefit of consumption and sale, and focused on organic production, strongly based on local potential. Research and experimentation with native and non-native species, including grain storage, food preparation and preservation and disease control, introduced new dimensions of sustainable production activities in the Yungas.

STRATEGIC AREA III: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			Experimental management of native forest, through dissemination and training on forest management and through forestation with different species, had a strong impact on the degraded areas. Finally, pasture management, through the development and implementation of experimental plots with winter pastures, enabled the improvement of silvopastoral practices. A complementary Livestock Group was made up, a community first-aid kit was prepared and the group that would be responsible for its implementation was trained. Los Toldos: - Teacher training course. - Construction and improvement of irrigation system infrastructure, to the benefit of 24 families. - Fifty-five families have implemented agroforestry plots. - Twenty-eight farmers have incorporated forest species, resulting in 7.5 hectares with clumps, 1200 plant lines and 16,000 plants produced. - 17 farmers got involved in winter pasture tests. - 54 families received support for the production of balanced hen food. - Support was given to 6 honey producers. - 86 families developed an orchard. - 4 nurseries were put into operation and their staff was trained. - Creation of revolving funds to support productive activities: 5 beneficiaries. - Revolving funds for crafts production: 60 beneficiaries. - Post-harvest technology training (25 participants), construction of 20 silos. - Jam preparation training given to 12 families. - Creation of a first-aid kit for cattle. Los Naranjos and San Andrés: - Supplementary courses for secondary school teachers in Los Naranjos. - 2 community irrigation systems benefiting 6 and 42 families, respectively, 4 family irrigation systems and an irrigation system for the secondary school. - 1 nursery in each community and nursery-staff training. - Fruit-tree grafting training. - 50 families incorporated line forest species and 48 fruit trees. - 15 projects for the development of farming and forestry plots were delivered. 4 families implemented pasture-assessment plots. - Post-harvest technology training (20 participants), 10 silos. - Jam preparation and marketing training, 4 participants. - Support was given to a family of bee-keepers. Training on rational native sting less bee-keeping was given to 24 students and 5 neighbors. - Creation of a first-aid kit for cattle.
3.3 TRADITIONAL COMMUNITY FISHING AND FARMING SUBSISTENCE PRACTICES Validation and extension of traditional water and natural resources management practices to populations with subsistence economies. This activity comprised the following activities:	a) Surveyed and appraised traditional cultural practices related to water and natural resources management in subsistence communities. b) Evaluated application of demonstration pilot cases. c) Designed action program aimed at promoting and applying the most relevant traditional practices.	- Final Activities Report - Reports on community workshops and meetings.-	**- Partially fulfilled.** A pilot project proposal was identified and elaborated in the Perico-Manantiales River Basin (province of Jujuy), incorporating a set of traditional natural resources management practices, principally the production of camelids and the recovery of traditional crops, such as corn and quinoa.

STRATEGIC AREA III: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
• Traditional water and natural resources management practices. • Sustainable rural development of creole and native communities.		- Final Activities Report - Community participation survey	**- Fulfilled. Innovative.** The improvement in the quality of life of the indigenous Wichi and creole communities was fostered through awareness-raising regarding the sustainable management of resources and the validation and implementation of production alternatives. Activities were classified into four components: (1) Livestock Management, including water, silvopastoral and sanitary management; (2) Consumption Improvement, taking into consideration the preparation of gardens, laying hens and beekeeping and (3) Proposal Validation, including the preparation of balanced feed, carob tree use and the integrated use of pork. The consumption component proved to be very important in terms of consolidation of the existing inter-institutional links, nutritional improvement based on a larger variety of food and the development of an attitude of commitment to the community and an appreciation of solidarity. Regarding the validation of proposals, it is worth emphasizing the balanced feed produced, which, due to its protein content, is suitable as starter feed for laying hens and as feed for the end of the rearing phase for broilers, resulting in an important source of protein for the project. Finally, the book "Carob Bean Byproducts" (Subproductos de la chaucha de algarroba) was published. This book contains the results of the experiences with carob bean use and was distributed in local schools and other institutions. - Construction of a reservoir in the community of La Cortada, with 92 beneficiary families. - Fencing of 20.5 hectares, fencing and seeding of pastures for 16 hectares and unfenced seeding of pasture for 36.5 hectares in different communities. - Acquisition of a veterinary sanitary first-aid kit. - Ten schoolsbenefited from gardens. - Laying hens were given to the school of La Horqueta. - Sixteen setsof bee-keeping equipment were given to schools and farmers. - Development of suitable feed for laying hensand broilerswith local input. - One thousand copies of the book "Carob Bean Byproducts" were distributed for free to more than 50 regional institutions. - Fourteen pork-butchery training courses were given and attended by more than 500 people. - Construction of a small cold storage. - Five recipients of granaries and training for the conservation of carob.
3.4 SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES Sustainable use of natural resources through the following strategic action: • Land systematization – irrigated areas of the San Jacinto Project. • Search for financial resources.	a) Sustainable management of agro-silvopastoral systems by the Wichi indigenous and creole communities. b) Improved qualitiy of life of these subsistence communities. a) Technological packages for soil and water management designed and implemented in irrigated areas and marginal land within the San Jacinto project area. b) Optimized water and soil use. c) Increased crop productivity.	- Final Activities Report - San Jacinto Association Report - Site inspection	**- Fulfilled.** Technological packages are available for water and soil management in the San Jacinto area based on two components: The first is related to land reclamation, infrastructure to channel water for irrigation and drainage and erosion control works. The second, agronomic in nature, was targeted at providing technical training, assistance and support with practices in demonstration areas. - Twenty-two and a half hectares of leveled land. - Thirty-nine and a half hectares of land prepared for irrigation. - Over 2540 meters of coated channels. - Nine hundred ten meters of piping. - Seven and a half meter-high and 2875 m3-compacted volume dam. - Eight gabion dams. - A half-hectare of fruit tree plantations. - Approximately 13.60 meters of windbreak lines and 250 meters of hollow cane plantation. - Technological package developed for replication.

STRATEGIC AREA III: SUSTAINABLE DEVELOPMENT OF NATURAL RESOURCES - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
	d) Controlled erosion of arable land and surrounding areas. a) Procedures undertaken with the Inter-American Development Bank (IADB), the World Bank, the International Finance Corporation (IFC) and other international development funding agencies to request financing. b) Organization of a Donors Roundtable. c) Documents prepared for submission to the funding institutions.	- Final Activities Report	**- Partly fulfilled. Innovative.** The initial actions taken to the Inter-American Development Bank were unsuccessful. Thus, it was decided to prepare a long-term funding request strategy for the SAP-Bermejo. This was based on the analysis of the project portfolio and its classification according to the state of progress and possibility of funding from grants and credits. This analysis and the joint work of the RCC representatives concluded that institutional changes, both at the national and provincial/district levels, resulted in changes in each jurisdiction's priorities in terms of project type, issues and geographical areas of intervention. In addition, the extension of the deadlines for the SAP-Bermejo implementation resulted in the loss of momentum of some projects included in the portfolio or were implemented with their own financing from each jurisdiction. Thus, in the framework of the funding strategy prepared by COBINABE, it was decided to contact funding institutions during the final phase of the SAP-Bermejo, since the Integrated Bermejo River Basin Management Program (Programa de Gestión Integral de la Cuenca del Río Bermejo, PROBER) was ready and supported the necessary actions for the sustainable development of the Basin. This program incorporates and enlarges the long-term SAP-Bermejo project portfolio. In the end, contact was established with regional representatives from the World Bank, the IADB and the Andean Development Corporation (Corporación Andina de Fomento, CAF) to request funding for PROBER. A positive response was received and the prospects for the funding and sustainability of the actions initiated with the SAP-Bermejo seem very positive.

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING

Goals	Objectively verifiable indicators	Verification means	Achievements
4.1 ENVIRONMENTAL EDUCATION PROGRAM IMPLEMENTATION Implementation of environmental education and awareness-raising programs as a key element for sustainable development through the following strategic action: • Promotion of environmental education activities in the Basin.	a) Teachers, students, parents and communities who weretrained and made aware of the need of the sustainable management and conservation of natural resources in general, and water resources in particular. b) Indigenous communities that were made aware of sustainable forest management.	- Final Activities Report - Surveys and assessments of teachers, students and the communities. - Reports on meetings, workshops, training modules and courses	**- Fulfilled. Innovative.** Societal awareness was raised through the incorporation of environment and sustainable development concepts into the public education system, both in the Argentine provinces and in the Bolivian school districts of the Basin. In Argentina, the Environmental Education Program was implemented by means of Framework Agreements and Protocols signed with the Ministries of Education of the provinces, including content related to the Bermejo River Basin and the environment in general in formal education syllabi. School experiences that contributed to raise awareness on and foster commitment to the conservation of the Basin were also incorporated. In Bolivia, environmental education was framed in the Education Reform Program and implemented through an Inter-Institutional Agreement between the Departmental Education Service and the corresponding Ministry. In both cases, trainers and teachers were trained and experiences were developed in the schools of the Basin by using manuals that were specifically designed and elaborated by professionals and experts belonging to the communities of the Basin. Additionally, steps were also taken in the informal education system with the goal of incorporating civil society as a central player in the tasks related to conservation of the environment and sustainable development. In this case, the activities for the promotion of and awareness-raising on the sustainable management of natural resources and conservation were executed through an Awareness Program based on dissemination campaigns, principally on water and soil pollution and solid waste, for Bolivia, and a Waste Recycling Program - Selective PET Collection Campaign, developed with the students and the community of San Salvador de Jujuy. Four Framework Agreements with the Ministries of Education of the four Argentine provinces of the Basin. Content and activities included in the official curriculum. - Five hundred participating elementary schools. - Two field surveys on teacher training institutes in Salta. - Two field surveys on teacher training institutes in Jujuy. - Five teacher training institutes in the province of Salta (No. 6021 of Tartagal and its annex in Aguaray, No. 6027 of Salvador Maza and its annex in Mocitos, and No. 6015 of Embarcación), included in the program. - Four teacher training institutes of the province of Jujuy (No. 3 of San Salvador de Jujuy, No. 6 of Perico and No. 10 of Libertador Gral. San Martín and its annex in Calilegua and No. 2 of Humahuaca), included in the program. - One seminar for regional specialists. - Two trainer preparation courses: 48 prepared trainers. - Forty-eight courses for teachers: 2400 trained teachers. - Approximately 153 institutional educational experiences developed by teachers and students in the Argentine provinces of Salta and Jujuy. Eight experiences received awards, 5 from the province of Salta and 3 from the province of Jujuy. - Three workshops developed in teacher training institutes in Salta. - One workshop developed in a teacher training institute in Jujuy. - Ten teachers from educational institutions in Salta were trained. - Fifteen teachers from the educational institutions in Jujuy were trained. - Three thousandprepared and distributed curriculum booklets. - Two thousand five hundred prepared and distributed content manuals. - One hundred prepared and distributed teacher manuals. - Five hundred prepared and distributed boxes of library materials. - Five hundred prepared and distributed boxes with laboratory material.

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			- Five hundred prepared and distributed atlases. - CDs, brochures and posters made. - Inter-institutional agreement signed between the Prefecture of the Department of Tarija, the Ministry of Education, Culture and Sports and the National Technical Office of the Pilcomayo and Bermejo Rivers (OTNPB). - Inter-institutional agreement between the Prefecture of the Department of Tarija, through the Departmental Education Service (Servicio Departamental de Educación, SEDUCA), the National Teacher Training Institute, reporting to the Ministry of Education, and the National Technical Office of the Pilcomayo and Bermejo Rivers (OTNPB). - Ten trained environmental advocates, including 21 educational centers (on average about 1 environmental advocate for every 2 centers), which enabled and encouraged the learning processes that will incorporate the crosscutting theme of environmental education. - Training and informational workshops aimed at 39 representatives from School Boards, district experts and municipal technicians from the Basin. - Approximately 438 elementary school teachers and principals and 27 secondary school teachers and principals were trained. - Twenty-seven classroom projects, prepared by the trained teachers, reflecting the results of the training. - Approximately 8,736 students participated, of which 6327 (73%) were in elementary school and 2,360 (27%) were in secondary school. - Nineteen TV spots. - Five documentaries. - One interactive DVD. - Twenty-one radio jingles. - Five radio program cycles. - Two thousand copies of a calendar. - Four thousand copies of 4 booklets. - Twelve thousand thematic maps in 4 different designs. - Eighteen thousand three-page leaflets in 6 different designs. - Seven thousand posters in 7 different designs. - Nine thousand stickers in 3 different designs. - Twenty-one training workshops.
4.2 PUBLIC PARTICIPATION PROGRAM Promotion and strengthening of public participation in environmental management through information, environmental education and the establishment of appropriate participation and public consultation mechanisms. The strategic action that will be executed is the: • Public participation program.	a) Implemented Public Participation System, involving the population in management and decision-making processes through: workshops, meetings, consultations, surveys, websites, discussion forums, etc. b) Elaboration and establishment of public participation and consultation procedures and guidelines. c) Citizen participation as a work methodology incorporated for the implementation of SAP-Bermejo projects.	- Final Activities Report - Reports on meetings and workshops	**- Fulfilled. Expanded and innovative.** The Public Participation Program was implemented in accordance with plans and agreements made during the formulation stage and with the consideration of what was documented in the ProDoc. The participatory process was enhanced in the implementation stage with a very important qualitative leap as institutions that were previously scattered in the framework of COBINABE were institutionalized and regulated. Additionally, the process encompassed other regional areas and the provinces themselves, as well as the Department of Tarija, which implemented several strategic activities. The implementation of activities oriented the general efforts in the Basin towards the generation of new spaces for involvement and participation in decision-making processes. The RCC and the RAC were institutionalized in the framework of COBINABE by specific resolutions of the binational entity, including national (national committees) and binational areas of work. At the next stage, the participatory process was primarily developed in the framework of each project, institutionalizing public participation in the formulation, implementation and follow-up of pilot demonstration projects, as well as through the assimilation of different mechanisms and instruments that were applied by social actors.

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			Two stages of participation can be underscored. The first stage was based on the institutionalization of public participation at the binational and regional levels, defined by the creation and implementation of institutional mechanisms aimed at ensuring participation and consultation by all the actors involved, not only at thegovernmental level, but also at the level of social organizations and academic institutions. Regarding this stage at the binational and regional levels, the following institutions were established: a) the Regional Coordination Committee (Comité de Coordinación Regional, RCC) and b) the Regional Advisory Committee (Comité Asesor Regional, RAC). The second stage was characterized by the promotion of public participation in the framework of the implementation of each project and, therefore, it was primarily oriented to the local and regional scales. Concerning this stage, the relevant actors were involved in the project from the initial formulation phase until its implementation and follow-up, as an essential condition to ensure the sustainability of the process. In this regard, the set of local stakeholders involved was rich and diverse, including the participation of grassroots regional organizations, local advocacy groups and leaders, women's groups, community councils, native and creole farmer communities, small local farmers (agricultural farmers, , beekeepers, cattle and goat ranchers and others), craftsmen, private companies, rural farmer associations, civil society organizations and social and environmental NGOs, among others. Moreover, a wide range of public participation mechanisms was employed. For instance: seminars, workshops, institutional and work meetings, use of networks and communication media (e-mail, mailing lists and websites), interviews of key figures, polls, meetings with institutions, meetings with communities, meetings with beneficiaries, community work, etc.
4.3 CREATION OF AN INFORMATION SYSTEM FOR THE BASIN Creation and operation of an environmental monitoring and information system for the Basin, as a mechanism to supply water and natural resources information to stakeholders in the Basin. The following strategic actions were implemented: • Mechanisms to access information for participation. • Network development and coordination mechanisms among different economic	a) Suitable mechanisms for access to information identified by civil society. b) Technical, institutional and legal assessment carried out based results of the results ofselected pilot cases. c) Recommendations on instrumental strategies for their implementation atdifferent jurisdictional levels.	- Final Activities Report	**- Partly fulfilled.** This project's goals and scope were largely met through the Public Participation Program of the SAP-Bermejo. It is worth highlighting the bi-national COBINABE website at www.cobinabe.org, which includes all the information related to the institution and access to the Basin's Integrated Environmental InformationSystem. - Fulfilled. In order to cover the gaps identified for the proper organization, coordination and participation of the jurisdictional and institutional actors linked to the development of the Basin, and with the objective to carry forward a demonstrative experience to implement its priority actions, the SAP-Bermejo established three consultative bodies of its own, each with a different role: I) the RCC; II) the RAC and III) the Inter-Ministerial Committee (Comité Interministerial, IC). Their respective functions, structures and operating mechanisms were also set forth. After they had been in operation for some time, the first two Committees were permanently established by COBINABE, aimed at institutionalizing and enhancing the planning, regulation and consultation mechanisms. Regional Coordination Committee. The RCC carried out the functions of coordination, program support and general supervision of its jurisdictions' activities, and it also ensured the coordination of the governmental departments appointed for the management of the Basin at a sub-regional level in the framework of the SAP-Bermejo. It was made up by members

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation

Goals	Objectively verifiable indicators	Verification means	Achievements
sectors and jurisdictional authorities. • Bermejo River Basin Environmental Monitoring and Information System. • Definition and adoption of international waters indicators. • Dissemination and replication of the Binational Basin of the Bermejo River project in the La Plata River Basin.	Networks and other sectoral and inter-jurisdictional coordination mechanisms developed and in operation as an instrument for the coordination of sustainable management activities among diverse economic sectors and different jurisdictional authorities of the Basin.		of the provincial administrations of Argentine and the Department and the Municipalities of Tarija, Bolivia, appointed by the highest authority. Regional Advisory Committee. The RAC acted as an advisory body and was instrumental tothe SAP-Bermejo for the adoption of communication mechanisms between the government and civil society of each jurisdiction, targeted at facilitating the active participation of the community and defending the interests of academic institutions, scientific organizations and different types of national, provincial and departmental NGOs. The Committee was made up of representatives of NGOs, academic institutions, scientific and technical organizations, the private sector citizens and corporations interested in the regulation of natural resources in the Binational Basin of the Bermejo River. Inter-Ministerial Committee. The IC emerged from the integrated character and the holistic vision of the SAP-Bermejo preparation phase, in order to advance the development of the Bermejo River Basin in a sustainable manner. The implementation of the SAP-Bermejo involved the participation of several sectoral and thematic institutions, with different roles, in the framework of a Program that required the coordination, cooperation and concentration of strategic activities to effectively and efficiently reach its goals. Reality showed that the proposal to create this Committee generated a very costly superstructure for its effective operation in the scale of a basin of the magnitude of the Bermejo River Basin, with enormous distances to travel foractors to meet that, in some cases, had their headquarters in the same capital cities in different jurisdictions. The SAP-Bermejo actually fostered inter-ministerial meetings under the coordination of provincial governments, in Argentina, and of the Department of Tarija in Bolivia, in agreement with the OTNPB. Five inter-institutional meetings were held in the framework of the SAP-Bermejo. In each case, they were developed in a different manner, depending on the SAP-Bermejo activities implementedin each jurisdiction. Binational Coordination Committee (BCC) In 2008, COBINABE prepared an institutional proposal for the creation and operation of the Binational Coordination Committee (Comité Binacional de Coordinación, BCC), which had as a base the operation and organization of the CCR and CAR mentioned above.
	a) Established and operating integrated environmental information system on environmental basin variables. b) The operationalization of the following components: hydrometeorology and sedimentology, water quality monitoring, follow-up and assessment of water quality and use, biodiversity, legal and institutional information, socio-economic drivers, institutional and human resources, document center and guidelines for information technology. Set of water indicators defined pursuant to	- Final Activities Report - Reports on meetings and workshops	**- Fulfilled.** The SAP-Bermejo designed and established the Integrated Environmental Information System (SIG Bermejo), which coordinates the activies related to the generation, acquisition, processing and storage of information on the state and use of natural resources in the Bermejo River Basin, with free access through the COBINABE website, at www.cobinabe.org. The system was developed to include environmental variables at the basin level, involving information generators and users in an institutional, operative and technical manner. The SIG Bermejo is made up of the following components: Hydrometeorological Network. The Hydrometeorological Network is composed of fourteen Remote Stations, located in representative points along the Binational Basin of the Bermejo River , which automatically gauge the river level and rainfall, with data transmission through radial signals reflection in a meteor burst system; a Central Communications Station; two Operative Centers (Tarija and Orán) and a Technical Support Office (City of Salta). Hydrosedimentological Network. This Network contains the historical

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
	international standards and applied at the binational level in the Bermejo River Basin.		hydrosedimentological data available in the Bermejo River Basin measuring stations that make up the National Hydrometeorological Network, comprised of more than 40 stations. It gathers data on: maximum monthly rainfall, monthly rainfall level, median daily flow, median daily rainfall, median monthly flow, historical solid flow and other measurements. Cartography. This component contains the cartographic information of the Basin, both previously elaborated maps and GIS information in shapefile format. Information is organized by: thematicbased maps, an interactive map implemented under the ArcIMS de ESRI/ServletExec New Atlanta/IIS product and a layer catalogue. Environmental Regulations. The System provides a link with direct access to the Federal Water Council, containing the Argentine environmental legal digest for water. Statistics. This component contains socio-economic data (population and housing, health, energy, farming, etc.) gathered by National Agencies responsible for its generation, processing and dissemination. Water Quality Monitoring Network. This Network is made up of 40 sampling points, of which 4 are placed in binational sections of the river, where physical, chemical and biological parameters are systematically measured. It is worth highlighting the preparation and agreement for the utilization of the Bermejo River Basin Water Quality Monitoring Network Operating Guide by Tarija and the provincial Water Laboratories, outlining the common criteria and methodologies to implement monitoring. Stakeholder Directory of . This component gathers the information of all the entities involved in the Bermejo River Basin management. Document Center. The center gathers documents related to the issues of the Basin, both photographs and written documents. - Partially fulfilled. Although the workshops were not carried out, the goal to define a set of indicators for principal SAP-Bermejo activities was met. In this regard, a Logical Framework matrix was prepared for each of the projects established in the Project Document, including Objectively Verifiable Indicators for each project. In turn, these indicators were classified into different typologies defined by the GEF, that is: Process indicators, essentially related to the attainment of institutional goals; Stress Reduction indicators, related to the processes that have an impact on pressuring natural resources and Environmental Scenario indicators, related to the state or situation of natural resources use. Furthermore, some of these indicators and verification elements were utilized in the semiannual reports on Project progress (PIR).
	Methodological approaches, conclusions and results of the SAP-Bermejo disseminated in the wider context of the La Plata River Basin as a means to foster the formulation of a strategic framework for the Basin's integrated management.	- Final Activities Report - Reports on the regional technical workshops conducted for the definition and adoption of a set of indicators - Final Activities Reports - Designed and edited informative, educational and SAP-Bermejo promotion material (documents, videos, CDs, etc) - Reports on SAP-Bermejo involvement in national and multinational technical meetings related to water resources and	**- Fulfilled.** One of the main characteristics of the Bermejo River Basin is the high rate of sediment generation and transport and relatedissues. This is primarily linked with restrictions on water resources use and the impact of infrastructure works that are mainly related to water collection, transport and storage. This feature was key in defining of SAP-Bermejo. Both in its formulation and its implementation phases, successful activities were carried out and important research on sediments was conducted. In effect, it wasthis theme that was disseminated and to which were applied the methodological approaches of the SAP-Bermejo in the wider context of the La Plata River Basin. The study on sediment generation and transport in the La Plata River Basin was done for such purpose and the study results were made available to the Intergovernmental Coordinating Committee for the La Plata Basin Countries (Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata, CIC), as a contribution for the management of this basin's water resources. In relation to water quality in particular, different technical institutions associated with the La Plata River Basin were involved in the Monitoring

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
		environmental issues - Reports on the organized seminars, workshops and fora presenting, explaining and promoting SAP-Bermejo,	System planning, implementation and design. These activities were initially developed jointly with the responsible parties for water quality in the La Plata River Basin Framework Program (GEF-UNEP-OAS) and the document that was agreed upon in the regional workshops was taken as a premise. During implementation, the analytical and sampling parameters methodologies were agreed upon with water quality technicians of the Pilcomayo River Basin in order to generate a consistent database that could be used to make comparisons between both basins and that could be replicated in the La Plata River Basin as a whole. The process to disseminate and communicate the SAP-Bermejo approaches was based on the elaboration and distribution of informational and technical material, both through the website included in the Basin Environmental Information System and through literature and videos. The institutional video and the Hydrology of the Bermejo River Basin video stand out due to their development and aesthetics. The former summarizes the SAP-Bermejo goals and presents the achievements of each Strategic Area. The latter makes a description in a friendly and didactical manner of the main hydrological features of the Basin, the main issues related to water excess and shortage, sediments and the Hydrometeorological Network stations. Another key element for the regional integration of the SAP-Bermejo experiences and the dissemination of acquired knowledge was the organization of different events such as seminars, workshops and technical meetings, with the participation of renowned specialists from different parts of the world. It is worth highlighting the International Seminars on Sediments, Environmental Education and Sustainable Development, as well as the workshops related to the Yrendá-Toba-Tarijeño (SAYTT) Transboundary Aquifer. Furthermore, the SAP-Bermejo actively participated in several regional and world level events where the Program experiences and accomplishments were presented. In this regard, it is worth highlighting the Biennial GEF Conferences on International Waters, as well as other Latin American basin entities meetings and international events for public involvement in water resources comprehensive management projects. Finally, the final SAP Bermejo documents were prepared and distributed. These are technical documents integrating all the experiences, achievements, lessons and conclusions of the implementation stage. Spreading material: – SAP COBINABE brochure (2004); – SAP COBINABE brochure (2005); – Binational SAP COBINABE institutional brief (bilingual); – Topical atlas of the Bermejo River Basin; – SAP COBINABE four-page brochure (English and Spanish); – Hydrometeorological Network three-page brochure (English and Spanish); – Environmental Education three-page brochure (English and Spanish); – 25-minute institutional video (English and Spanish); – Bermejo River Basin hydrology video; – SAP Bermejo final institutional brief (English and Spanish); Organization of International Workshops and Seminars: – TOBA Aquifer Hydro-Geological Regional Workshop; – Yrendá-Toba-Tarijeño Transboundary Aquifer International Workshop; – International Seminar on Sediments; – International Seminar on Sustainable Development;

STRATEGIC AREA IV: PUBLIC PARTICIPATION AND AWARENESS-RAISING - Continuation			
Goals	**Objectively verifiable indicators**	**Verification means**	**Achievements**
			– Binational Seminar on Environmental Education; – International Seminar on "Urban Solid Waste Comprehensive Management". Participation in Events (Regional, Binational and International): – Second GEF Projects Bienniel Conference, Dalian, China, 2002; – Third Latin American Congress on Water Basin Management, Arequipa, Peru, 2003; – Latin American Mountain Forum "Mountain Ecosystems Comprehensive Management – Water and Mountain", Tucumán, Argentina, 2004; – Third GEF Projects Bienniel Conference, San Salvador de Bahía, Brazil, 2005; – Latin American Regional Workshop on Public Involvement in Transboundary Water Resources Management, Montevideo, Uruguay, 2006; – Fourth GEF Projects Bienniel Conference, Cape Town, South Africa, 2007; – Fifth World Water Forum, Istanbul, Turkey, 2009; – Fifth GEF Projects Bienniel Conference, Cairns, Australia, 2009; Final SAP Bermejo Documents – Institutional Strengthening and Development Program in the Binational Basin of the Bermejo River . – Public Participation in the Binational Basin of the Bermejo River. Environmental Information System for the Binational Basin of the Bermejo River – Sustainable Production Models in the Binational Basin of the Bermejo River – Environmental Protection and Rehabilitation in the Binational Basin of the Bermejo River. – Environmental Education in the Binational Basin of the Bermejo River. – Sediment Generation and Transportation in the Binational Basin of the Bermejo River – Strategic Action Program for the Binational Basin of the Bermejo River - Implementation Phase. – Integrated Management Program for the Binational Basin of the Bermejo River -PROBER

ANNEX II

Bermejo SAP Implementation Phase Reports, Listed by Strategic Area and Project

STRATEGIC AREA I

Development and Strengthening of the Binational Commission

- "Recommendations for Operationalizing the Regional Coordination Committee (RCC) and Creating the Inter-ministerial Committee and the Regional Advisory Committee (RAC)." Graciela Adán, 2002
- "Development and Institutional Strengthening of the Binational Commission" Communicational Plan. - Implementation of the COBINABE's Communicational Actions: School Painting Contest and FERINOA. Graciela Adán, 2004 – 2006
- "Compilation of COBINABE's Meeting Minutes." Dr Fermín Aranda, 2005
- "Proposals for the Implementation of COBINABE Institutionalization Mechanisms." Luciana Término, 2008
- "Preparation of Proposals for the COBINABE's Bylaws, Internal Regulations and Seat Agreement." Dr. Horacio Daniel Piombo, 2008
- "Institutional Strengthening of the Binational Commission for the Upper Bermejo and Grande de Tarija River Basins." Dr. Arrien, 2007

Strengthening of Governmental and Civil Society Organizations

- "Institutional Strengthening of the Secretariat of Environment and Sustainable Development of the Salta Province in Terms of Leadership and Coordination of Governmental and Civil Society Organizations with Competence or Interest in Natural Resource and Environmental Management for the Implementation of the Yungas Biophere Reserve (YUNBR)." Secretariat of Environment and Development – Salta Province, 2003
- Water Quality Monitoring Laboratory Equipping – APA – Provincial Water Administration – Chaco Province, 2003
- "Institutional Strengthening of the Provincial Office for Environment and Natural Resources of Jujuy Province." Ministry of Production, Infrastructure and Environment – Secretariat of Environment – Jujuy Province, 2006.
- "Institutional Strengthening of the Integrated River Basin Management Unit – UGICH." UGICH – Ministry of Production and Environment of the Jujuy Province, 2006
- "Strengthening of the Water Resource Agency of the Salta Province." Ministry of Production and Employment – Salta Province, 2007
- "Institutional Strengthening of the Provincial Drinking Water and Sanitation Service's Laboratory of Formosa Province." UPCA – Provincial Water Coordination Unit – Formosa Province, 2008.
- "Institutional Strengthening of the Water and Environment Agencies." UPCA – Provincial Water Coordination Unit – Formosa Province, 2008.
- "Jurisdictional Institutional Strengthening" - Environmental Management Training. Juan Misael Saracho Autonomous University, 2004.
- Construction of the OTNPB's Office. Archi Serv SRL, 2004
- "Jurisdictional Institutional Strengthening" – Equipment for the UAJMS's Laboratories. Sistemas Analíticos SRL. 2006

Organization of the Regional Legal and Political Frameworks for Integrated Water Resource Management

- "Analysis Update of the Bermejo River Basin Environment Legal Diagnostic" Desarrollo Norte Foundation, 2006.

Environmental and Territorial Zoning in Selected Areas

- "Land Use and Territorial Zoning in the Jurisdiction of the Municipality of Los Toldos - Salta Province- Argentina." Municipality of Los Toldos – Salta Province, 2002.
- "Determination of Hydrological Risk Zoning Based on Local Rain Surpluses in the Bermejo River Basin Area in the Province, between Puerto Lavalle (National Road Nº 95) and the Mouth of the Paraguay River; and Definition of the Isorisk Areas by means of the Identification of Flood Mark Envelopes in the River Corresponding to Events of the Same Recurrence for the Considered Sections." Provincial Water Administration – Chaco Province, 2007.
- "Determination of Hydrological Risk Areas in the Bermejo River Basin Zone in the Formosa Province, between the Barilari Line and the Mouth of the Paraguay River." UPCA – Provincial Water Coordination Unit – Formosa Province, 2005.
- "Preparation of the Land Use and Territorial Zoning Plan for the Department of Tarija." DHV Sudamérica SRL, 2005.
- "Official Approval and Printing of the Land Use and Territorial Zoning Plan for the Department of Tarija." Comunicación Inteligente, 2007.

Strengthening and Development of Economic Instruments for the Sustainable Use of Water Resources

- "Course on the Economic Value of Water". Association of the School of Engineering at National Northeastern University – AFIN - UNNE – Chaco Province, 2006

Development of a Strategy for Incorporating Social Costs into Project Management and Decision-Making Processes

- "Course on Environmental Management." Association of the School of Engineering at National Northeastern University – AFIN - UNNE – Chaco Province, 2008

STRATEGIC AREA II

Sediment Control in the Tolomosa River Basin

- "Sediment Control in the Tolomosa River Basin – Mena River Sub-Basin" – Study. ICTAR Asociados, 2003
- "Sediment Control in the Tolomosa River Basin – Mena River Sub-Basin" – Works. CIABOL Ltda., 2004
- "Sediment Control in the Tolomosa River Basin – Mena River Sub-Basin" – Rural Works and Farming and Forestry Practices. SOINBOL S.R.L. Construction Company, 2004.
- Pollution Control of the Tributaries to the San Jacinto Lake. SAIPA SRL, 2008
- Final Design of the Project on Sediment Control in the Tolomosa River Basin. COTED SRL.,2007

Integrated Management of the Santa Ana River Basin's Natural Resources

- "Integrated Management of the Santa Ana River Basin's Natural Resources – Calderas River Sub-Basin" – Study. Consultores Asociados Multidisciplinarios Consulting Company, 2003
- "Integrated Management of the Santa Ana River Basin's Natural Resources – Calderas River Sub-Basin" – Works. Erika Consortium - Guadalquivir, 2004
- "Integrated Management of the Santa Ana River Basin's Natural Resources – Calderas River Sub-Basin" – Rural Works and Farming and Forestry Practices. Construcciones ALINCO S.R.L, 2005

Integrated Management of the Iruya River Basin Program

- "Transverse Walls and Fixed Points" – Work, Norobras S.A., 2002
- "Pilot Project on Water Supply" Iruya - COREBE – Municipality of Iruya – Colanzulí's Kolla Council, 2002
- "Campo Tapial" Irrigation Works COREBE, 2002
- "Waste Management in the Town of Iruya" – Environmental Education. Secretariat of Environment and Sustainable Development – Salta Province, 2002
- PROMIRUYA Coordination. Silvia Rafaelli, 2003
- "Educate Afforesting," Senador Emilio Correa High School School Cooperative – Iruya – National University of Salta - UNSA - Salta Province, 2003
- "Social and Territorial Diagnostic Analysis of Environmental Risk in the Town

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Bermejo SAP Implementation Phase Reports, Listed by Strategic Area and Project

of Iruya," Identification of Alluvial Risk Areas in Iruya and Pueblo Nuevo," Claudia Natenzon and Team, 2003
- Social and Territorial Survey Valuing Culture as a Factor for Integrated Development. Colanzulí- San Isidro, Luis Daniel Hocsman, 2003
- "Sustainable Management of Natural Resources for Production Development under Sustainable Conditions with Indigenous Communities in the Iruya River Basin. Colanzulí and San Isidro" Association for Integrated Promotion – API – National University of Salta – UNSA, 2004
- Construction of Side Walls for the Protection of the Fixed Point over the Milmahuasi River. SEMAC S.H., 2004
- Contingency Plan and Flood Alert System for the Town of Iruya. Bager Course, 2004
- "River Bank Afforestation and Construction of Rain Drainage Systems" Agroiruya Cooperative – Iruya – Salta Province, 2006

Huasamayo River Sub-Basin Erosion Prevention and Control
- "Clean-up of the Huasamayo River Bed," Provincial Office for Water Resources of the Province of Jujuy, 2002
- "Incidence of Sedimentological Problems in Development Strategies in the Bermejo River Basin," Edgardo Sosa (Engineer) – Jujuy Province, 2002
- "Forest Nursery" Municipality of Tilcara – Jujuy Province, 2002
- "Territorial Zoning of Tilcara" "Design of Torrent Correction Works in the Piedmont" University of Jujuy – Jujuy Province, 2002
- Construction of Torrent Control Works in the Huasamayo River Basin Piedmont. Provincial Office for Water Resources of the Jujuy Province, 2003

Ecotourism Activities in Piedmont Transition Forests
- "Identification of Ecotourism Alternatives in the Surrounding Areas of the Calilegua National Park," Architect Gilardi, 2001
- "Guarani Symbolic Interpretation Path," National Park Administration – APN, 2005
- "Design and Preparation of Interpretative and Informative Material for Visitors and Neighboring Communities and Construction of the Entrance of the El Rey National Park," National Park Administration – APN, 2007

Carbon Fixation in the Yungas
- "Carbon Fixation in the Sub-Andean Region" Preparation of the Pilot Plan, AGROSIG SRL, 2003
- "Carbon Fixation in the Sub-Andean Region" Execution of the Pilot Plan, EL CEIBO Construction Company, 2005
- "Carbon Fixation in the Sub-Andean Region" Supervision of the Pilot Plan Execution, Jaime Mendoza, 2007

Biodiversity Study
- "Biodiversity Study", Foundation for Ecology Development – Bolivia, 2007

Implementation of the Calilegua-Baritú-Tariquía Biological Corridor
- "Calilegua-Baritú-Tariquía Biological Corridor Management Plan – Corridor Workshop." Argentina-Bolivia Binational Counseling (Ruiz, Somma, Beltrán, Ortín, Valiente), 2005
- "Regulation of the Provincial Protected Area System Act - Management Plan for the Potrero de Yala Provincial Park" Secretariat of Environment and Natural Resources of the Jujuy Province, 2008

  Management Plan for the PINTASCAYO Provincial Reserve. Ministry of Environment and Sustainable Development of the Salta Province, 2008

  Implementation of the Training Component, CETHA 2007

  Implementation of Production Demonstration Projects, SPC SRL, 2008

  Creation of the Transboundary Biosphere Reserve, CONADE SRL, 2008

Management Plan for the Sama and Tariquía Biological Reserves
- "Management Plan for Sama Biological Reserves" Preparation, National Service for Protected Areas – SERNAP, 2005
- "Management Plan for Tariquía Biological Reserves" Preparation, National Service for Protected Areas – SERNAP, 2005

Evaluation of Pastures in the Sub-Andean Region
- "Evaluation of Pastures in the Sub-Andean Region," FACE S.R.L. Consulting Company, 2007

Environmental Clean-up of the Guadalquivir River (Pilot Water Treatment Plant in Rural Communities)
- "Clean-up of the Guadalquivir River, Upstream of Tomatitas" Studies. CONAM S.R.L. Consulting Company, 2003
- "Clean-up of the Guadalquivir River, Upstream of Tomatitas" Execution. PAULA Construcciones Construction Company, 2005

Evaluation and Design of Bermejo Triangle Pollution Control Strategies
- "Environmental Clean-up of the Bermejo Triangle Watercourses," COTED Tarija S.R.L. Consulting Company, 2005

Study of Basin Sediments
- "Yrendá-Toba-Tarijeño Water System" Workshop – BINATIONAL, INASLA Argentina, 2004
- "Sediment Studies," National Water Institute - INA – Argentina, 2008

STRATEGIC AREA III

Integrated Management of Natural Resources within the Santa Ana River Basin: Calderas River Sub-Basin
- Plan for Managing Santa Ana River Basin's Natural Resources – Design, CONAM SRL 2003
- Plan for Managing Santa Ana River Basin's Natural Resources – Execution of Hydraulic Works, Erika – Guadalquivir, 2004
- Plan for Managing Santa Ana River Basin's Natural Resources – Execution of Farming, Forestry and Rural Practices, Alinco, 2005
- Plan for Managing Santa Ana River Basin's Natural Resources – Construction Supervision CITER Ltda., 2005

Integrated Management of the Bermejo River Basin's Water Resources
- Pilot Plan for the Conservation of Forest Resources in the Mountainous Region of El Cóndor El Ceibal, 2008
- Pilot Plan for Farm Management in Arce Province, CONSIM, 2008
- Restoration of Degraded Forests in O'Connor Province. SPC SRL, 2008

Technique Development and Promotion of the Sustainable Management of Resources in the Humid and Sub-Humid Chaco Region
- "Goat Improvement and Crop Management, Equipment and Irrigation Training to Agronomy Technicians," Central Program Management Unit – UCAP – Formosa Province, 2004
- "Thorough Study on the Teuco River – Yema Pond Multiple Exploitation – Formosa Province" Central Program Management Unit – UCAP – Formosa Province, 2004
- "Management of Tropical, Natural and Exotic Pastures with Cattle and Buffalos," Las Lomitas Farming and Cattle Raising Technology Validation Center – CEDEVA – Central Program Management Unit – UCAP - Formosa Province, 2005
- "Fruit and Vegetable Farming Improvement, Training and Commercialization in the Department of San Martín." Ministry of Production of the Chaco Province, 2006
- Irrigation Infrastructure Optimization and Adaptation of the Teuco River – Yema Pond Multiple Exploitation Collection Work.

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- "Recovery and Productive Adaptation of Modified / Degraded Environments within the Bermejo River Lower Basin in the Formosa Province," Central Program Management Unit – UCAP – Formosa Province, 2007
- "Teuco-Bermejito Watershed Integrated Development Project - Chaco Province." Ministry of Production of the Chaco Province, 2008 / 2009

Diversification of Production Alternatives in Order to Reduce the Anthropic Pressure on Forest Resources in the Yungas Region
- "Productive Diversification Under Sustainable Conditions in the Upper Bermejo River Basin," ProYungas Foundation, 2002
- "Water Collection Practices at Microbasin Level." Marcelo Arzelan (Engineer), 2007

Promotion of Sustainable Production and Natural Resource Management Activities in Indigenous and Creole Communities
- "Rural Development of Creole and Indigenous Communities of the Chaco Region in Salta" Justo Pastor Santa Cruz School Cooperative Association – Salta Province, 2003
- "Follow-up, Monitoring and Evaluation of the Activities included in the Project: Rural Development of Creole and Indigenous Communities of the Chaco Region in Salta." Carlos Pastor (Engineer), 2008

Pilot Project for Testing and Disseminating Water and Soil Management Techniques for Irrigated Farming in the San Jacinto Reservoir Area
- Study – Design: "Systematization of Irrigated Areas in the San Jacinto Project." CREM y Asociados, 2004
- Execution of works: "Systematization of Irrigated Areas in the San Jacinto Project." IBAZA y Asociados, 2005

STRATEGIC AREA IV

Environmental Education Program
- Environmental Education Program for the Bermejo River Basin - Design and Implementation in Argentina. Prof. Altube and Prof. Palacio - 2003 - 2006
- Urban Solid Waste Recycling Program – PET Municipality of San Salvador de Jujuy, 2006
- Environmental Education Program – Program Design / Preparation, Juan Misael Caracho Autonomous University, 2004
- Environmental Education Program – Document Review, Individual Consulting Service, 2005
- Environmental Education Program – Program Execution, INFOPER, 2007

Environmental Education Program in Rural Areas
- Environmental Education Program in Rural Areas – Bermejo, Julio César Guerrero, 2008
- Environmental Education Program in Rural Areas – Entre Ríos, Juan Carlos Bleischner, 2008
- Environmental Education Program in Rural Areas – Padcaya, Rober Azama, 2008
- Environmental Education Program in Rural Areas – San Lorenzo, José Manuel Segovia, 2008

Public Participation Program for the Bermejo River Basin
- "Conceptual Framework and Guidelines for the Public Participation Program."Vargas – Argentina, 2003
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Acronyms and Abbreviations

AAA *(Área Anual de Aprovechamiento)* Annual Area Use
AART *(Asociación de Apicultores de la Reserva Tariquía)* Tariquía Reserve Beekeepers Association, Bolivia
AFIN *(Asociación de Apoyo a la Facultad de Ingeniería de la Universidad Nacional del Nordeste)* Support Association for the National University of the Northeastern Region's Engineering School, Chaco Province, Argentina
AOPEB *(Asociación de Organizaciones de Productores Ecológicos de Bolivia)* Association of Bolivian Ecological Producers Organizations
APA *(Administración Provincial de Agua)* Provincial Water Administration, Chaco Province, Argentina
APME *(Asociación de Productores de Miel Ecológica)* Ecological Honey Producers Association
APS *(Atención Primaria de Salud)* Primary Health Care
AUTAPO *(Apoyo a las Universidades de Tarija y Potosí)* Support to Tarija and Potosí Universities, Bolivia
BAGER *(Bases Administrativas para la Gestión de Riesgo)* Administrative Bases for Risk Management
CAF *(Corporación Andina de Fomento)* Andean Promotion Corporation
CAR *(Comité Asesor Regional)* Regional Advisory Committee
CBC *(Comité Binacional de Coordinación)* Binational Coordination Committee
CCR *(Comité de Coordinación Regional)* Regional Coordinating Committee
CD *(Comité Director del Programa)* Project Steering Committee
CEANID *(Centro de Análisis Investigación y Desarrollo)* Analysis, Research and Development Center
CEDEVA *(Centro de Validación de Tecnologías Agropecuarias)* Farming Technologies Validation Center, Formosa Province, Argentina
CERDET *(Centro de Estudios Regionales para el Desarrollo de Tarija)* Center for Regional Studies for the Development of Tarija, Bolivia
CETHA Emborozú *(Centro de Educación Técnica Humanística Alternativa de Emborozú)* Alternative Technical Humanistic Education Center, Emborozú, Bolivia.
CI *(Comité Interministerial)* Interministerial Committee
CIC *(Comité Intergubernamental Coordinador de los países de la Cuenca del Plata)* Intergovernmental Coordinating Committee for the del Plata Basin Countries
COBINABE *(Comisión Binacional para el Desarrollo de la Alta Cuenca del Río Bermejo y el Río Grande de Tarija)* Binational Commission for the Development of the Upper Bermejo and Grande de Tarija River Basins
COFEMA *(Consejo Federal de Medio Ambiente)* Federal Environment Council, Argentina
COHIFE *(Consejo Hídrico Federal)* Federal Water Council, Argentina
CONIAG *(Consejo Interinstitucional del Agua)* Interinstitutional Water Council, Bolivia
COO *(Centro Operaciones Orán)* Orán Operations Center
COREBE *(Comisión Regional del Río Bermejo)* Regional Commission of the Bermejo River
COT *(Centro Operaciones Tarija)* Tarija Operations Center, Bolivia
ECC *(Estación Central de Comunicación)* Central Communication Station
EIA *(Evaluación de Impacto Ambiental)* Environmental Impact Assessment
FERINOA *(Feria Internacional del Norte Argentino)* Northern Argentine International Fair
FMAM *(Fondo para el Medio Ambiente Mundial)* Global Environment Facility
FUND-ECO *(Fundación para el Desarrollo de la Ecología)* Ecology Development Foundation, Bolivia
GEF Global Environment Facility
GIS Geographic Information System
GTGPEA *(Grupo de Trabajo Gubernamental para la Formulación del PEA)* Governmental Working Group for SAP Preparation, Argentina
HPLC High Performance Liquid Chromatography
IDB (*Banco Interamericano de Desarrollo)* Inter-American Development Bank
IICCA *(Instituto de Investigación y Capacitación Campesina)* Rural Research and Training Institute
INASLA *(Instituto de Aguas Subterráneas para Latinoamérica, Universidad Nacional de Salta)* Groundwater Institute for Latin America, National University of Salta, Argentina
INFOPER *(Instituto de Formación Permanente)* Continuing Education Institute, Bolivia
IWRM Integrated Water Resources Management
JMPC *(Junta Municipal de Protección Civil)* Civil Protection Municipal Board
MAB Man and the Biosphere Program, UNESCO
NBI *(Necesidades Básicas Insatisfechas)* Unsatisfied Basic Needs

NCPE *(Nueva Constitución Política del Estado)* New State Constitution
NGOs Non-Governmental Organizations
OAS Organization of American States
OTAS *(Oficina Técnica de Apoyo en Salta)* Technical Support Office, Salta Province, Argentina
OTNPB *(Oficina Técnica Nacional de los Ríos Pilcomayo y Bermejo*) National Technical Office of the Pilcomayo and Bermejo Rivers, Bolivia
PDOT *(Plan Departamental de Ordenamiento Territorial)* Departmental Land Management Plan
PEAAR *(Programa de Educación Ambiental en el Área Rural)* Rural Environmental Education Program, Bolivia
PGMF *(Planes Generales de Manejo Forestal)* General Forestr Management Plans
PIR Project Implementation Review
PIMyD *(Plan Integral de Manejo y Desarrollo del Parque Provincial Laguna de Pintascayo*) Comprehensive Management and Development Plan for the Laguna de Pintascayo Provincial Park, Salta Province, Argentina
PLUS *(Plan de Uso del Suelo)* Land Use Plan
PMIRH-CRB *(Programa de Manejo Integrado de los Recursos Hídricos y el Desarrollo Sustentable de la Cuenca del Río Bermejo)* Integrated Water Resources Management and Sustainable Development Program of the Bermejo River Basin
PMIRHDS *(Programa de Manejo Integrado de los Recursos Hídricos y el Desarrollo Sustentable)* Integrated Water Resources Management and Sustainable Development Program
PROBER *(Programa de Gestión Integral de la Cuenca Binacional del Río Bermejo)* Integrated Management Program for the Binational Basin of the Bermejo River
RBCS *(Reserva Biológica de la Cordillera de Sama*) Biological Reserve of the Sama Mountain Range, Bolivia
RBYUN *(Reserva de Biosfera de Las Yungas)* Yungas Biosphere Reserve
RNFFT *(Reserva Nacional de Flora y Fauna de Tariquía*) Tariquía Flora and Fauna National Reserve, Bolivia
RSU *(Residuos Sólidos Urbanos)* Urban Solid Waste
SAP BERMEJO *(Programa Estratégico de Acción para la Cuenca Binacional del Río Bermejo)* Strategic Action Program for the Binatonal Basin of the Bermejo River
SAYTT *(Sistema Acuífero Yrendá-Toba-Tarijeño)* Yrendá-Toba-Tarijeño Aquifer System
SEMADES *(Secretaría de Medio Ambiente y Desarrollo Sustentable de la Provincia de Salta*) Environment and Sustainable Development Secretariat. Salta Province, Argentina
SENAMHI *(Servicio Nacional de Meteorología e Hidrología*) National Meteorology and Hydrology Service, Bolivia
SERNAP *(Servicio Nacional de Áreas Protegidas*) National Service of Protected Areas, Bolivia
SGS *(Software de Gestión del Sistema)* System Management Software
SIAN *(Sistema de Información Ambiental Nacional)* National Environmental Information System
SIAP *(Sistema de Información Ambiental Provincial)* Provincial Environmental Information System
SPAP *(Servicio Provincial de Agua Potable*) Potable Water Provincial Service, Formosa Province, Argentina
SPAT *(Sistema Participativo de Alerta Temprana)* Early Warning Participatory System
TBC Tariquía-Baritú-Calilegua
TDA *(Diagnóstico Ambiental Transfronterizo)* Transboundary Diagnostic Analysis
TPH Total Petroleum Hydrocarbons
UAJMS *(Universidad Autónoma Juan Misael Saracho)* Juan Misael Saracho Autonomous University, Bolivia
UARS *(Unidades Administrativas Representativas)* Representative Administrative Units
UDSMA/OAS *(Unidad de Desarrollo Sostenible y Medio Ambiente – Organización de los Estados Americanos)* Environment and Sustainable Development Unit, Organization of American States
UGICH *(Unidad de Gestión Integrada de Cuencas Hidrográficas*) Comprehensive Water Basin Management Unit – Jujuy Province, Argentina
UNEP United Nations Environment Program
UNESCO (Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura) United Nations Educational, Scientific and Cultural Organization
UNSA *(Universidad Nacional de Salta)* National University of Salta, Argentina
UPCA *(Unidad Provincial Coordinadora del Agua*) Provincial Water Coordinating Unit – Formosa Province, Argentina

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SAP BERMEJO

STRATEGIC ACTION PROGRAM FOR THE BINATIONAL BASIN OF THE BERMEJO RIVER

ARGENTINA BOLIVIA

BINATIONAL COMMISSION FOR THE DEVELOPMENT OF THE UPPER BERMEJO AND GRANDE DE TARIJA RIVER BASINS

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FMAM - GEF
GLOBAL ENVIRONMENT FACILITY

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UNITED NATIONS ENVIRONMENT PROGRAM

OEA - OAS
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