ESM322

Best Practices in Mainstreaming Environmental & Social Safeguards into Gas Pipeline Projects

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ESMAP
c/o Energy and Water Department
The World Bank Group
1818 H Street, NW
Washington, D.C. 20433, U.S.A.
Tel.: 202.458.2321
Fax: 202.522.3018

Best Practices in Mainstreaming Environmental & Social Safeguards into Gas Pipeline Projects:

Learning from the Bolivia-Brazil Gas Pipeline Project (GASBOL)

July 2006

Juan Quintero

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(ESMAP)

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Abbreviations and Acronyms

BBGP	Bolivia-Brazil Gas Pipeline
BG	British Gas Americas, Inc., a subsidiary of a UK company
BHP	Broken Hill Proprietory, a subsidiary of an Australian company
BIC	Bank Information Center
BNDES	Brazilian National Development Bank
BTB Group	British Gas + Tenneco Energy + BHP
CABI	Capitanía del Alto y Bajo Izozog
CAF	Corporación Andina de Fomento
CIDOB	Corporación Indígena del Oriente Boliviano
CONAMA	Comisión Nacional de Medio Ambiente
EC	Environmental Committee
EDC	Environmental Document Control
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIs	Environmental Inspectors
EIT	Environmental Inspection Team
ES	Environmental Supervisión
ESp	Environmental Specialists
EMP	Environmental Management Plan
EMS	Environmental Management System
EMU	Environmental Management Unit
ESP	Environmental Specialists
ESMAP	Energy Sector Management Assistance Program
FUNAI	Indigenous Brazilian National Organization
FATMA	Fundación de Medio Ambiente
GASBOL	Proyecto de Gasoduto Bolivia-Brasil
GO	Governmental Organization
GTB	Gas Transboliviano S.A. , the gas transport company on the Bolivian side
IAIA	International Association of Impact Assessment
IBAMA	Instituto Brasilero do Meio Ambiente
IDB	Inter-American Development Bank
IFIS	International Lending Institutions
IPDP	Indigenous People Development Plan
IPHAN	Instituto de Patrimônio Histórico y Artístico Nacional
JEXIM	Japanese Export and Investment Bank
NGO	Non Governmental Organization
PAD	Project Appraisal Document
Petrobrás	Petróleo Brasilero S.A., the Brazilian Petroleum Company
Ops	World Bank Operational Policies
QAP	Quality Assurance Program

RIDA	Registro de Información Diaria Ambiental
ROW	Right of Way
RS	Reporting System
SCP	Social Communication Program
SEA	Strategic Environmental Assessment
SEC	Social and Environmental Committee
SEGEN	Engineering Department of Petrobrás, responsible for the pipeline construction
SERNAP	Servicio Nacional de Áreas Protegidas
TBG	Transportadora Brasileira Gasoduto Bolivia-Brasil S.A.
TCO	Tierras Comunitarias de Origen
TORs	Terms of Reference
Transredes	Transporte de Hidrocarburos S.A., a Bolivian gas transport company forms as a result of the capitalization process and inheritor of YPFB interests in the pipeline
WB	World Bank
WCS	World Conservation Society
YPFB	Yacimientos Petrolíferos Fiscales Bolivianos

Executive Summary

This paper presents the Bolivia-Brazil Pipeline Project (GASBOL) as a case study for environmental and social safeguards analysis. The activities carried out during the construction and operation phases of the project accomplished the main objectives of the Energy Sector Management Assistance Program (ESMAP)[1]. It is hoped that the lessons learned from GASBOL will inform task team leaders, environmental and social specialists, the private sector, government agencies and Non Governmental Organizations (NGOs) in order to improve the planning and implementation of similar projects within the tropical, subtropical and temperate zones

The primary purpose of the GASBOL project was to supply the Brazilian market with Bolivian gas. The pipeline runs from Rio Grande, Bolivia, to Porto Alegre, Brazil, a distance of 3,150 kilometers. The Bolivian section, owned by Gas Transboliviano (GTB), is 557 kilometers long and runs from Rio Grande to Puerto Suárez. The Brazilian section - owned by Transportadora Brasileira do Gasoduto Bolivia-Brasil S.A. (TBG) - crosses the states of Mato Grosso do Sul, Sao Paulo, Paraná, Santa Catarina, and Rio Grande do Sul and is nearly 2,600 kilometers in length. Eighteen compression stations and 35 city gates are included, the latter in Brazil. The pipeline capacity is 30 MMm3/d with an agreed delivery of 16 MMm3/d. Despite the geographical scope of the project, environmental issues were key components in each phase of the project. For this reason, ecologically sensitive and densely populated areas were mostly avoided, despite some additional cost.

In terms of the World Bank (WB) Environmental Policies, GASBOL was classified as a "Category A" project, i.e.- having likely significant environmental impacts that are sensitive, diverse or unprecedented. In part, this rating was due to the fact that the 'Right of Way' (ROW) contained numerous environmentally sensitive ecosystems and protected areas including "El Gran Chaco" National Park, "El Pantanal", and the "Mata Atlântica". In order to minimize negative impacts on these ecological sensitive sites, the project team identified alternate routes and used special construction methods.

The Project faced significant environmental, social and institutional complexities stemming in part from its bi-national scope, it size and scale, and the fact that it had to deal with two legislative frameworks, inequalities in infrastructure, complex institutional agreements, Indigenous communities and sensitive ecological areas. Despite these considerable challenges, the design, construction, implementation, and operational phases of the project were well managed and as a result GASBOL has established itself as a benchmark for the management of large infrastructure projects.

Environmental management of the project was a responsibility shared by the Project Sponsors-- including Petrobrás, YPFB, Enron, Shell, El Paso Energy, British Gas (BG), BHP-- and an Environmental Committee (EC) consisting of Petrobrás, YPFB, Enron, representing Shell, and El Paso, representing BG and BHP (BTB). The EC selected a consortium consisting of Dames & Moore, Prime Engenharia and Biodinâmica to carry out the Environmental Supervision.)

Feedback from representatives of civil society was actively solicited. An Ombudswoman facilitated the Social and Environmental

[1] The Energy Sector Management Assistance Program (ESMAP) is a global Technical Program managed by the World Bank which promotes the role of energy in poverty reduction and economic growth with redistribution in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and directly contributes to achieving the Millennium Development Goals

Committee (SEC) interaction with the project sponsors and other stakeholders and acted as a liaison between the Project, local communities and NGOs. Like the Auditor, she reported on her activities bimonthly to both the multilateral agencies involved and to the Environmental Committee (EC). She held regular meetings with local communities and NGOs and established communication mechanisms including a claims reception procedure. Claims about social impacts during construction were investigated with serious problems or deficiencies reported to the Environmental Committee (EC).

The EC coordinated and monitored implementation of the Environmental Management Program (EMP), periodically meeting with the various stakeholders including governmental regulatory institutions and multilateral lending institutions. It coordinated implementation of the Compensation and Communication Strategy, monitored all environment-related activities as well as providing oversight for the tasks performed by the EMP. An Environmental Inspection Team (EIT) monitored construction activities in the field. Non-construction activities were monitored by the Environmental Management Unit (EMU), a subcomponent of the EIT, which was responsible for implementation of the Socio-economic and Ecological Compensation Programs, the Indigenous People Development Program (IPDP), and the Social Communication Program (SCP).

The Environmental Committee (EC) selected a consortium consisting of Dames & Moore, Prime Engenharia and Biodinâmica to implement Environmental Inspection. To accomplish this task the EC convened an Environmental Supervisory Unit consisting of Assistant Environmental Inspection Supervisors, the Environmental Field Inspectors, an Environmental Management Unit (EMU) Supervisor, and a team of Environmental Specialists. The Environmental Specialist, reporting directly to the Environmental Committee (EC), supervised the Compensation Programs, the IPDP and social inspection activities. Field inspectors assigned to specific geographic regions reported to and were supported by lead Environmental Inspectors assigned to the same region. They and interacted regularly on site with the Environmental Specialist. A spread inspector and his assistants supervised the contractors and were responsible for guaranteeing that construction activities adhered to EMP guidelines. An Environmental Auditor (EA) guaranteed compliance with regulatory requirements, environmental management plans, the IPDP, and the WB and Inter-American Development Bank (IDB)'s environmental and social policies. Environmental Specialists and Social Impact Inspectors visited communities along the pipeline's route and administered the EMP Socioeconomic Compensation and the Social Communication Programs. In terms of qualifications, the inspectors chosen by the Environmental Committee had at minimum a bachelor's degree in either Engineering or Science. Based on the EMP an intensive training program was implemented. Environmental Inspectors were also trained in health, safety, Quality Assurance Program Program (QAP), Reporting Systems (RS), and communication strategies.

Precise and up-to-date information which gauged the EMP's progress was documented and disseminated. A computerized Report System allowed Environmental Inspectors to track daily environmental compliance along the pipeline and to identify and correct potential challenges quickly and thereby ensure compliance. The system facilitated the production of daily and weekly reports for the entire pipeline that were stored in a central database. Weekly field meetings ensured the adoption of necessary corrective measures. An Environmental Document Control (EDC) system assured prompt approval of the large number of documents produced. The system also fulfilled document control procedures required by ISO 9000 rules. A Quality Assurance Program (QAP) was designed to guarantee the efficient functioning of the Report System, by assuring the production of rigorous and high quality reports. All

environmental staff was trained in the Quality Assurance Program (QAP) and a procedural handbook was created for easy reference.

The EA, while under the jurisdiction of the Environmental Committee, reported directly to the WB and IDB. He had broad authority to investigate all facets of compliance and to determine whether the environmental and social agreements, the mitigations plans, the EMP, and the IPDP were properly implemented. He evaluated construction and inspection activities as well as the communication and compensation programs. Bimonthly audit reports were submitted to the multilateral organizations as well as to the Environmental Committee. Executive summaries from these reports were submitted to NGOs and other interested parties.

Based upon the Environmental Impact Assessment (EIA), the EMP was designed to identify and qualify potential environmental impacts and to provide either for their mitigation or compensation through the adoption of improved management procedures. The EMP is composed of the following programs: (i) Environmental Management System; (ii) Environmental Protection and Mitigation Measures during Construction; (iii) Environmental Operation; (iv) Compensation Programs (Ecological Compensation Programs, Indigenous Peoples Compensation Program, Non-indigenous peoples' Socio Economic Compensation Program).

The Environmental Impact Assessment (EIA) identified the main positive and negative effects that the project might have. Firstly, the Bolivian and Brazilian Gas Pipeline routes were evaluated separately. In 1994, Petrobrás & Engevix produced an Environmental Impact Report (EIR) for the Brazilian portion of the project which covered the implementation, construction, assembly and operation phases.[2] Dames & Moore produced a similar report for the Bolivian portion of the project in 1996[3]. Petrobrás[4] delivered a consolidated report in 1996 which met the multilateral lending institutions' (WB and IBD) requirements for a more integrated approach in light of the project's geographical scope.

The project's innovative approach as concerned environmental protection and social support resulted in a number of good practices, of or relating to:

- Mainstreaming environmental issues into energy sector activities;
- Protection of native flora and fauna species;
- Planning benefits downstream and identifying potential upstream impacts through the Elaboration of a Strategic Environmental Assessment (SEA);
- Stakeholder Consultation and Community Participation;
- Cost-benefit Analysis;
- Sustainable Financial Management of Protected Areas;
- Camp Management;
- Relationship with Property Owners;
- Critical Sites Monitoring;
- Vegetation Removal and Disposal;
- Wetlands and River Crossing;
- Topographical challenges and erosion control;
- Right of Way Delineation;
- Cultural Heritage;
- Indigenous People Development Plan (IPDP);
- Bolivian Ecological Compensation Plan: Co- Management of the Parque Nacional El Gran Chaco;

[2] Petrobrás & Engevix. 1994. Environmental Impact Report; Petrobrás & Engevix. 1994. EIS. Volumes I, II, III, and IV.

[3] Dames & More. 1996. Environmental Impact Study for Bolivia-Brazil Gas Pipeline Project (Bolivian Portion). Final Report. Prepared for: YPFB, Enron Corp., Petrobrás and BTB, August 30, 1996.

[4] Petrobrás. 1996. Environmental Impact Study. 1996. Consolidated Report. Bolivia-Brazil Gas Pipeline.

- Brazilian Ecological Compensation Plan;
- Management of the Socio-economic Compensation Plan in Brazil;
- Social Programs;
- The Quality Assurance Program's (QAP) Reporting System;
- Supervision Costs;
- Communication During Construction;
- Strategic Alliances with academics, NGOs and the private sector;
- Community involvement and participation in the Project; and
- Improved Inter-institutional Coordination.

The following are representative of some of the lessons learned from both the successes and shortcomings of the project:

- Environmental impacts assessments must be standardized across regions to facilitate comparison.
- Planning must be a continuous process applied in all project stages.
- Mapping of sensitive areas should be prepared before construction begins.
- Timely sequencing of construction activities can minimize the effects from erosion and slope instability.
- The training program is a key element of the EMP and requires adequate resources.
- Construction contracts should contain incentives for compliance with environmental safeguards as well as penalties for non-compliance.
- The role of Environmental Supervisor and Inspector should be clearly defined before construction begins.
- The publication of Public consultation reports must remain a priority.
- The law of consultation: consult early and consult often.
- The role of the Auditor and Ombudswoman should be clearly defined.
- The environmental management cycle during the operational phase must emphasize identification and monitoring of geographically challenging areas along the ROW.
- Social and security considerations must receive equal attention as environmental concerns.
- The Project must be accurately characterized to local communities.
- Continuous documentary information (films/ photos) of existing conditions along the ROW is indispensable to monitor and evaluate impacts.

It is auspicious that three years into its operation, GASBOL has met world-class environmental standards, such as the World Bank's environmental and social safeguards[5] by using both conventional and innovative practices. While by no means without its challenges, the Project's current status has been achieved through flexible and adaptive methods, the results of which have been recognized by its having received the World Bank's Green Award[6], the International Association of Impact Assessment's Environmental Award (IAIA)[7] in 2001, and the ISO 14002 and 9001[8].

It is hoped that the lessons learned from this exercise will serve to improve the planning and implementation of similar projects within the tropical, subtropical and temperate zones.

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5 OP 4.01- Environmental Management Plan, OP 4.02- Environmental Action Plans, OP 4.04- Natural Habitats, and OD 4.2 – Indigenous People.

6 The *First Annual World Bank Green Award* was granted on June 5, 2001, World Environment Day.

7 Corporative Award IAIA´01 in honor of excellent environmental and social management including the use of impact assessments design and construction of the pipeline.

8 GTB is currently negotiating the OHSAS 18001 (Health and security management).

Figure 1: The project area with inset area of detail

1

Introduction

1.1 The mainstreaming[9] of social and environmental issues into energy sector activities, an important achievement of the Bolivia-Brazil pipeline project (GASBOL), is one of the World Bank Group's (WB) core environmental strategies. This strategy, recently documented in *Fuel for Thought* [10], has a number of concrete objectives, summarized as follows[11]:

- Facilitate more efficient use of traditional fuels and/or their substitution by modern fuels in rural and peri-urban areas;
- Protect human health of urban residents from air pollution attributed to fuel combustion in the residential, transport, industrial and power sectors;
- Promote environmentally sustainable development of energy sources;
- Mitigate the potential impact of energy use on climate change;
- Develop capacity for environmental regulation, monitoring and enforcement across all levels of governance; and
- -Make the Bank more responsive to addressing environmental impacts from the energy sector.

1.2 The Bolivia-Brazil pipeline project (GASBOL) is analyzed as a good practice case study for the mainstreaming of environmental and social issues-- such as socially sustainable development, biodiversity and natural habitats conservation-- into project design and implementation of large infrastructure projects. Considerable attention was given to operational and analytical procedures adopted to coordinate field operations, information management, and communication between the project's main stakeholders. The ultimate aim of this paper is to improve the evolution of similar projects within the tropical, subtropical and temperate zones in terms of planning, construction, operation and abandonment stages. This project fully supported the main objectives of the Energy Sector Management Assistance Program (ESMAP)[12]to promote the sustainability of energy investments.

1.3 The GASBOL project is, at 3,150 km in length and with a capital budget of US$2.1 billion, the largest gas pipeline to date in South America. A brief description of the project is provided in the next section. Execution of the GASBOL project involved the application of World Bank environmental and social policies, a comprehensive Environmental Management Plan (EMP) and a dynamic and flexible approach to problem solving. This paper provides an analysis of the innovative best practices implemented during the course of the project in order to mitigate and/ or resolve adverse environmental and social impacts.

1.4 It is hoped that the lessons learned from GASBOL can be adapted to other major pipeline projects in Latin America and elsewhere, and in so doing serve as a useful tool for the international community.

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9 Merriam Webster Dictionary defines mainstream as a prevailing current or direction of activity or influence.

10 World Bank.1999. Fuel for Thought: An Environmental Strategy for the Energy Sector Washington, D.C., World Bank. *Fuel for Thought* was firstly presented to the World Bank Executive Board on July 20, 1999, after extensive consultation with the Bank Group, as well as with external stakeholders (i.e., client and donor governments, nongovernmental organizations (NGOs), and private sector entities).

11 World Bank. 2002. *Energy and the Environment. Energy and Development Report 2001*. ESMAP, World Bank, Part One.

12 The Energy Sector Management Assistance Program (ESMAP) is a global Technical Program managed by the World Bank which promotes the role of energy in poverty reduction and economic growth with redistribution in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and directly contributes to achieving the Millennium Development Goals

Specifically, these best practice tools will be useful for task team leaders, environmental and social specialists, the private sector, government agencies, Non Governmental Organizations (NGOs) and others dealing with complex social and environmental issues in energy sector projects.

The GASBOL Project in Brief

1.5 The Bolivia-Brazil Gas Pipeline Project (GASBOL), South America's largest gas pipeline project to date, has matched Brazilian demand for energy with Bolivia's abundant gas supply. The total project budget was approximately US$ 2.1 billion with $436 million allocated to Bolivia, $1.42 billion allocated to Brazil, and $229 million allocated for recurrent costs, such as operation and maintenance among others. More than $30 million dollars was allocated to address social and environmental issues[13].

Chronology

1.6 In the years between the signing of the *Treaty for Integration of Energy* in 1988 and the signing of the *Gas Sales Agreement* between Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) and Petrobrás in 1993, a number of activities designed to facilitate the sale of Bolivian gas to Brazil were completed. Private sector partners were found to participate in the project: Petrobras enlisted the BTB Group, a consortium consisting of British Gas, Tenneco Energy (later replaced by El Paso Energy) and Broken Hill Proprietory (BHP); YPFB partnered with the Enron Corporation. In 1990, YPFB commissioned an Environmental Impact Assessment (EIA)[14]. Similarly, in 1992, an EIA of Corumbá-Curitiba and Curitiba - Porto Alegre sections of the project was completed in Brazil. These EIAs were approved by the official agencies in their respective countries and the Brazilian government granted a provisional license. In 1997, the Bolivian and Brazilian governments, along with YPFB and Petrobrás in consultation with their private partners, decided to formally launch the project. Construction was officially initiated in August 1996 and concluded in December 2001.

Project Description

1.7 The pipeline runs from Rio Grande, a locality close to Santa Cruz de la Sierra, Bolivia to Porto Alegre, Rio Grande do Sul, Brazil, a distance of 3,150 kilometers. The Bolivian section, owned by Gas Transboliviano (GTB), is 557 kilometers long and runs from Rio Grande to Puerto Suárez. Within Brazil, where the gas transport company is Transportadora Brasileira Gasoducto Bolivia-Brasil S.A.(TBG) the pipeline crosses five states - Mato Grosso do Sul, Sao Paulo, Paraná, Santa Catarina, and Rio Grande do Sul - and is approximately 2,600 kilometers in length. The pipeline includes 18 compression stations and 35 city gates, the latter in Brazil. The pipeline varies in diameter from 32" to 16". It has a capacity of 30 MMm^3/d with an agreed delivery of 16 MMm^3/d.

1.8 Although the primary purpose of the project was to supply the Brazilian market with Bolivian gas supplies, environmental issues were a key component in all phases of the project. The pipeline route was chosen on the basis of avoiding environmentally sensitive and densely populated areas despite the additional cost.

[13] Primary financial support was provided by: the World Bank (WB), which provided US$ 130 million for the Brazilian side; the Inter-American Development Bank (IDB), which provided US$ 220 million; the Corporación Andina de Fomento (CAF) which provided US$ 50 million; the European Investment Bank (EIB) which provided US$ 60 million; the Banco Nacional de Desenvolvimento Econômico e Social do Brasil (BNDES) which provided US$ 177 million and; the Japanese Export and Investment Bank (JEXIM), which provided US$ 234 million. The Brazilian government was the loan guarantor.

[14] This assessment was updated in 1996.

Unique Project Challenges

1.9 The social, environmental and institutional complexities facing the GASBOL Project presented a number of remarkable and unique challenges:

- *Bi-national nature*: the project is shared by two countries which adds the challenge of sometimes having to reconcile divergent interests and development strategies.
- *Size and scale of the project:* at 3150 km in length and a budget of US$2.1 BN billion, GASBOL represented one of the largest and most complex energy projects in South America.
- *Different legislation*: as the project crossed national jurisdictions, two sets of laws, and in particular laws relating to environmental issues, indigenous communities, and the hydrocarbon sector, had to be adhered to.
- *Inequalities in infrastructure*: the infrastructure available for the Project in Brazil was not as developed in Bolivia.
- *Complex institutional agreements*: project development was governed by country-specific agreements where the policies differed according to the arrangements made with the government, private sector, multilateral lending and financial organizations (WB, IDB, CAF), public and private banks, and NGOs.
- *Adherence to World Bank Safeguard Policies*: although loans from the WB formed a small percentage of project financing, the Project had to conform to the WB's environmental and social safeguards (see Box 1).
- *Indigenous communities*: the project had to interact with different indigenous communities affected by the pipeline, directly (Bolivia) and indirectly (Brazil). In both countries, indigenous communities played an active role in each phase of the project. Harmonization of these groups'interests with those of the other stakeholders was a considerable achievement.
- *Multi-stakeholder involvement*: the project had a variety of stakeholders with divergent interests in both Bolivia and Brazil. Representation included the private sector, federal, state and municipal government organizations, international lending institutions (IFIs), indigenous organizations and non-government organizations (See Table 1).
- *Sensitive ecological areas*: this project crossed fragile ecological areas in both Bolivia and Brazil, including the Wet and Dry Chaco forest, wetlands such as the Izozog marshes in Bolivia, and the Pantanal and the endangered Mata Atlântica forest of Brazil.

Box 1: The World Bank's Environmental and Social Safeguards

Projects receiving Bank funding must comply with World Bank Operational Policies comprised of the following environmental and social safeguards: Environmental Assessment (O.P. 4.01), Natural Habitats (O.P. 4.04.), Pest Management (4.09), Involuntary Resettlements (4.12), Indigenous Peoples (O.P. 4.20), Forestry (4.36), Safety of Dams (OP/BP 4.37), Projects in International Waterways (OP/BP 7.50), Projects in Disputed Areas (7.60), Cultural Property (OPN 11.03) and Disclosure of Information (BP 17.50). The main policies triggered by the Bolivia-Brazil Gas Pipeline Project are provided in Annex 1.

2

Environmental Management Framework

2.1 The institutional structure created[15] for the management of the environmental and social aspects of the GASBOL Project's (Chart 1) various activities and to address the aforementioned challenges is described in the following sections.

Project Sponsors

2.2 The Bolivia-Brazil Gas Pipeline Project had four primary sponsors: Petrobras, YPFB, Enron (Representing Shell), and El Paso Energy (Representing British Gas and BHP). El Paso Energy (Brazil) and YPFB (Bolivia) acted as coordinators for the Environmental Committee. The sponsors monitored the Project's environmental progress and reported directly to the international lending institutions.

The Environmental Committee

2.3 An Executive Environmental Committee (EC) with decision-making authority carried out environmental coordination of the Project and monitored the status and achievements of the Environmental Program. The Committee acted in concert with the Bolivian and Brazilian governments' regulatory institutions as well as the multilateral lending organizations. The Committee periodically met with the following stakeholders: the Construction Organization and Management teams, Environmental Inspectors (EIs), Socioeconomic Programs Management, the auditor, and the ombudsman. It was responsible for fulfilling the Project's environmental requirements and solving those issues related to the construction process. Additionally, it coordinated implementation of the Compensation and Communication Programs.

[15] Further information on the Environnmental Management System is provided by Beasley, K.P. 2000. Environmental Management System of the Bolivia-Brazil Pipeline Project. SPE, El Paso Energy Corporation, 8 pp, and Bustamante, N. 1999. The Bolivia-Brazil Gas Pipeline Project. A Case Study on Environmental Supervision and Management of a Large Linear Project. Dames & Moore

3

Environmental Management and Supervision

3.1 Environmental management and supervision consisted of monitoring the Project's environmentally related activities and implementing the Environmental Management Plan (EMP). The environmental requirements broadly fell into two categories:

- *Construction Activities:* an Environmental Inspection Team monitored construction activities in the field; the creation of an environmental structure within Petrobras as well as the participation of contractors played a key role in the success of these activities.
- *Non-construction activities:* monitored by a subteam of the Environmental Inspection Team, known as the Environmental Management Unit (EMU) which was responsible for the implementation of the Socioeconomic and Ecological Compensation Programs, the Indigenous Peoples Development Program (IPDP), and the Social Communication Program (SCP).

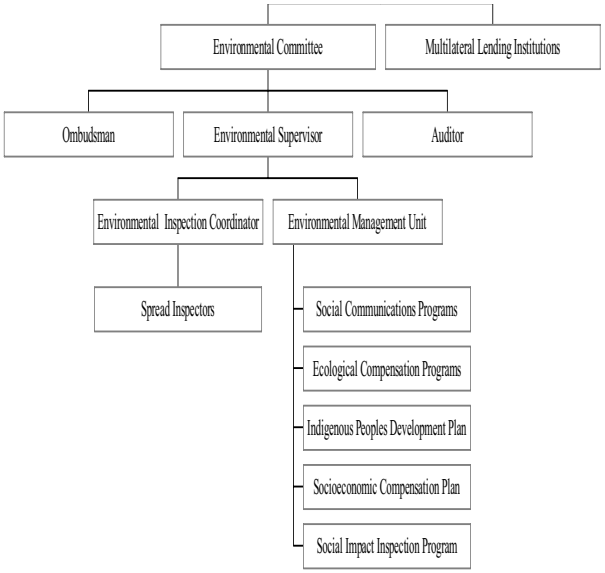
Environmental Supervision Unit

3.2 The Environmental Committee selected a consortium consisting of Dames & Moore, Prime Engenharia and Biodinâmica to carry out the Environmental Supervision (ES). The Environmental Supervision (ES) included an environmental supervisor, the environmental inspection assistant supervisors, the field environmental inspectors, an Environmental Management Unit (EMU) Coordinator, and a team of environmental and social specialists, responsible for the Social and Environmental Programs. A spread inspector and his assistants supervised the contractors and were responsible for guaranteeing that construction activities adhered to EMP guidelines. Environmental Specialists and Social Impact Inspectors visited communities in the pipeline's area of influence and administered the EMP Socioeconomic and Environmental Compensation and the SCPs.

Environmental Inspector Training

3.3 The inspectors chosen by the Environmental Committee (EC) had to possess at minimum a bachelor's degree in either Engineering or Science. Based on the Environmental Management Plan (EMP) an intensive training program was carried out which included theoretical and field work. Environmental Inspectors (EIs) were also

Chart 1: Environmental and Social Management System of the GASBOL Project



trained in health and safety, quality assurance procedures, the "Registro de Información Diaria Ambiental" (RIDA) tracking systems, and communication strategies.

Reporting System

3.4 Precise and up-to-date information which gauged the EMP's progress was regularly documented and disseminated via a computerized reporting system called (RIDA) ("Registro de Información Diaria Ambiental). Daily environmental reporting allowed the environmental inspectors (EIs) to track environmental compliance along the pipeline in near real-time. This information allowed them to identify areas of concern and quickly implement measures to guarantee compliance. The system proved to be an efficient tool for monitoring and evaluation, facilitating the production of daily and weekly reports for the entire pipeline that were stored in a central database. This systematic approach ensured consistent application of environmental procedures. Weekly field meetings ensured implementation of any necessary corrective measures.

3.5 An Environmental Document Control (EDC) system was implemented to control the large number of documents produced from the Project as delays could have had serious implications for the construction schedule. The system also fulfilled document control procedures required by ISO 9000 rules.

Quality Control and Assurance

3.6 A quality control system was formalized through the creation of a Quality Assurance Program (QAP) designed to guarantee that the Reporting System functioned efficiently. This program helped ensure the production of technically rigorous and high quality reports, consistent and reliable field supervision and monitoring of environmental and social impacts, uniformity in how field committee meetings were conducted, and effective communication with all internal and external clients. All environmental staff was trained in the QAP and a procedural handbook was created for easy reference.

Environmental Auditor

3.7 A full-time Environmental Auditor guaranteed compliance with regulatory requirements, environmental management plans, the IPDP, and the WB and IDB's environmental and social policies. The Auditor, while under the jurisdiction of the Environmental Committee (EC), reported directly to the Multilateral Lending Institutions. He had broad authority to investigate all facets of compliance and to determine whether the environmental and social agreements, the mitigations plans, the EMP, and the IPDP were properly implemented. He revised and evaluated construction and inspection activities as well as the communication and compensation programs. Bimonthly audit reports were submitted to the multilateral organizations as well as the Environmental Committee. Executive summaries from these reports were submitted to NGOs and other interested parties.

Ombudswoman

3.8 Initially, the Environmental Auditor was also responsible for dealing with NGOs and local communities. An Ombudswoman was later added. She facilitated the Social and Environmental Committee (SEC) interaction with the project sponsors and other stakeholders and acted as a liaison between the Project, local communities and NGOs. Like the Auditor, she reported on her activities bimonthly to the multilateral agencies and to the Environmental Committee. She held regular meetings with local communities and NGOs and established communication mechanisms including a claims reception procedure. Claims concerning social impacts related to construction activities were investigated and any serious problems or deficiencies were reported to the Environmental Committee (EC). On the Brazilian side, one NGO from each of the 5 states affected by the pipeline represented the interests and concerns of the rest in front of the

EC. This structure facilitated the ombudswoman's coordination of various tasks.

Additional Environmental Supervision

3.9 In addition to GASBOL's internal environmental safeguards, both countries carried out additional environmental supervision and audits during the construction stage. On the Brazilian side, PETROBRAS maintained an independent Supervision Team that supervised environmental and social compliance in the field. On the Bolivian side, the GASBOL Bolivian Project Management team initiated two independent audits of the project in its territory during the construction stage.

4

The Environmental Management Plan

4.1 Based upon the EIA, the EMP[16] was designed to identify and qualify potential environmental impacts and to provide either for their mitigation or compensation through the adoption of improved management procedures. The EMP was composed of the following programs:

Environmental Management System

4.2 This program's activities include overall coordination and environmental management during construction, community relations, monitoring, inspection and auditing. Its main functions relate to management structure, communications amongst and between the organizations and individuals involved, reporting procedures and improved communication regarding environmental issues.

Environmental Protection and Mitigation Measures during Construction

4.3 This program provided specific guidelines for environmental protection and mitigation measures during construction. This included ensuring observance of all environmental regulations governing the project. It addressed several environmental issues related to natural, social and cultural resources including biodiversity conservation, erosion and sedimentation control, habitat restoration, waste management, air quality and noise control, archaeological rescue, measures to protect sensitive habitats, and worker conduct, health and safety issues.

Compensation Programs

4.4 These programs were designed to compensate communities within the Project's area of influence if environmental impacts adversely affecting physical, biological and socio-economic components could not be sufficiently mitigated. Ecological Compensation Plans implemented in both countries mainly focused on Natural Protected Areas and protection and management of Conservation Units. In terms of social impacts, they included indigenous and non-indigenous compensation programs.

Indigenous Peoples Compensation Program

4.5 This program was carried out in both countries and was designed in accordance with World Bank Operational Directive 4.20[17]. Its objective was to ensure that the project either benefited indigenous people or mitigated and/or compensated them for any potential negative impacts stemming from the project.

4.6 Three indigenous groups were identified in Bolivia – the Izozeño Guaraní, Ayoreo and Chiquitanos. These communities were identified in a defined project-impacted area that extended 10 km south of the pipeline Right of Way (ROW) and 10 km north of the Santa Cruz – Puerto Suárez railroad. These indigenous groups actively participated in the political and economic decision-making process (see Box 2). Executive and financial committees were created to coordinate the program and manage the disbursement of funds. Both committees included indigenous people, civil society, and Gas Transboliviano S.A. representatives. The IPDP budget for the Bolivian side was US$ 3.7 million. One of the most important achievements of the plan in Bolivia was the Land Titling Program which successfully provided legal title to indigenous people's land through an innovative revolving fund.

[16] Dames & Moore.1997. Plan de Manejo Ambiental: Sector Boliviano. Manual de Gerencia. Volumen II. PRIME Engenharia. 1997. Plano de Gestão Ambiental: Detalhamento dos Programas de Controle Ambiental (Trecho Brasileiro). Relatorio Final. Volume II. PRIME, Segen. São Paulo.

[17] This Directive has now been converted to Operational Policy 4.12

Indigenous Community in Bolivia receiving titles

4.7 In Brazil the pipeline did not directly cross indigenous communities' territory. Nevertheless, a Commission including representatives of PETROBRAS, Fundacão Nacional do Indio (FUNAI) and IBAMA was formed. This Commission, in conjunction with a Project consultant team, organized seminars and meetings to give voice to the various indigenous groups and villages affected by the project and to ensure the project's long-term sustainability. These groups were located within 30 kilometers of the pipeline ROW. Agreements with governmental authorities dealing with these issues were signed in order to assure the project's sustainability during operation. These agreements enabled the construction of schools and hospitals. These authorities were responsible for finding teachers and physicians as well as maintaining and replacing obsolete or lost materials. Indigenous groups demonstrated a high degree of flexibility in terms of deciding on specific programs. Evident also was the display of solidarity with communities not included in the program.

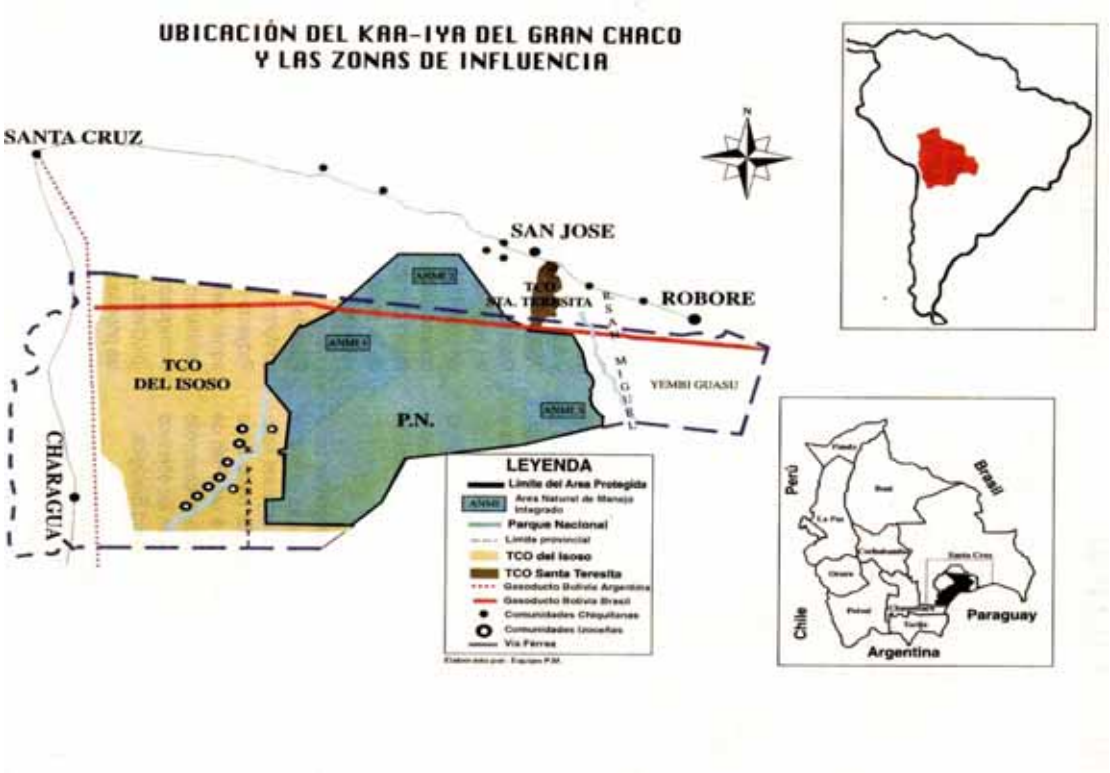
Non-indigenous Peoples Socio-economic Compensation Program

4.8 The program had a budget of US$ 4.4 million, of which US$3.6 million was allocated to Brazil and US$800,000 allocated to Bolivia. The main objective of this program was to compensate non-indigenous peoples adversely affected by the Project. Projects eligible for the Compensation Program were identified through a consultative process involving town mayors, councils, communities, social organizations, the military, hospital authorities, educational institutions, energy and water cooperatives, and Non Governmental Organizations (NGOs). Project feasibility was evaluated on the basis of budget and time requirements, community participation, design, and sustainability.

Box 2: Bolivian Indigenous People role in the administration of the Kaa-Iya "Gran Chaco" National Park (NP) and its Integrated Management Area (IMA)

The NP and IMA include Izoceña, Ayoreode and Chiquitana's indigenous communities as well as part of Charagua, Pailón, San Jose de Chiquitos and Roboré townships in the Cordillera and Chiquitos provinces, Santa Cruz Department. This area, the best protected dry forest in Boreal Chaco and the largest protected area in Bolivia (3,441,115 ha), is one of the largest legally protected National Parks in Latin America (Figure 2). It is considered one of the most sensitive ecosystems within the pipeline's area of influence which extends 140 kilometers within the Park. A harmonious relationship between the Bolivian gas transport company (GTB) and the area's Indigenous Peoples was achieved through the creation of an Executive Committee charged with implementation of the project's Environment Management Plan (EMP) within the Park. The objectives of the project were, and are: Biodiversity Conservation in the Gran Chaco NP; the strengthening of Indigenous People capacity to manage protected areas and; the promotion of the harmonious and sustainable development of indigenous peoples.

Figure 2: ROW within the Kaa-Iya Park. Source: WES 2003



4.9 In Brazil, fifty-one projects were implemented along the pipeline route. These included building schools, health care installations, and community centers and providing hospital equipment. The location of each project was determined by proximity to construction camps and to the pipeline ROW. Project budgets were formulated along the lines of the expected magnitude of impact, the number of people potentially affected, the duration of construction activities, community socioeconomic-specific needs and available financial resources. All projects were defined by the communities. Once the projects were defined, agreements were signed with the respective municipalities which were also charged with the sustainability of the projects.

4.10 In Bolivia, six towns were selected for compensation. Eighteen infrastructure and equipment acquisition projects including school improvements, water supply systems, health installations, community centers, and pedestrian bridges were undertaken. The engineering unit assisted these projects by providing cost estimates, checking technical specifications, identifying local companies to implement the projects through a competitive bidding process and then monitoring construction.

5
Best Practices

5.1 Mainstreaming is the incorporative and institutional process responsible for integrating environmental and social concerns throughout the project cycle through: (i) preparation of initial environmental studies and as part of civil works; (ii) integrating environmental and social considerations into the project design, construction and operation plans; (iii) providing specific budgets and other financial incentives to guarantee social and environmental compliance; (iv) creating and enhancing institutional capacity to effectively execute such programs and; (v) implementing monitoring and supervision programs to ensure the success of projects' environmental and social mitigation and compensation plans. "Best practice analysis" identifies specific examples where innovative approaches are used to achieve environmental and social compliance throughout all phases of the project cycle.

5.2 Innovative environmental protection and social support best practices in the GASBOL project are described in this section.

Mainstreaming of Environmental Issues into Energy Sector Activities

5.3 One important achievement of GASBOL was that it mainstreamed environmental issues into energy sector activities. This was evidenced by the innovative solutions that were employed to address several challenges encountered both during the construction and operation phases of the project. In order to understand the environmental requirements fully and to apply them uniformly, project inspectors were subjected to intensive environmental training consisting of both theoretical and practical programs. This included training in health and safety, quality assurance procedures, the RIDA, tracking systems, and communication strategies.[18]

Planning Benefits and Identifying Upstream Impacts through the Elaboration of a Strategic Environmental Assessment (SEA)

5.4 GASBOL's environmental impact identification was not limited to the elaboration of EIAs of a limited and project-related scope. In order to assess the medium, long-term and cumulative impacts of this large project, and taking into account potential inter-project synergies, PETROBRAS contracted PRIME Engenharia to prepare a Strategic Environmental Assessment (SEA)[19]. The study examined the upstream impacts of oil and gas extraction in Bolivia and the downstream impact of fuel replacement in Brazil. Based on this precedent a SEA was conducted on the upgrading of the Santa Cruz Puerto Suarez road corridor.

Stakeholder Consultation and Community Participation

5.5 The Bolivia-Brazil Pipeline Project used stakeholder consultation and community participation to bolster its credibility and thereby enhance its chances of success. The satisfactory outcome achieved by GASBOL can in part be attributed to its high level of stakeholder involvement. The project contributed to the debates of community-based organizations and committees and consulted the public on draft regulations and on the Project's environmental assessment process. During construction, the project's environmental personnel informed

[18] Workers also had to go through environmental and social awaness trainiong at job inception.

[19] A SEA is a study requested by multilateral organizations financing programs involving multipurpose work or large projects with important structural components and their associated projects. The importance that the WB assigns to the SEA lies in its longer-term advantages. This approach surpasses the limitations of the EIAs which are more project specific. The SEA analyses aspects such as implied policies, induced development, cumulative impacts, management capacity, and institutional framework in order to provide a broader context to the environmental assessment process as applied to single projects.

communities of construction schedules and responded to any concerns they might have regarding environmental and social issues. Access to project related information was provided in reading rooms along the length of the pipeline route. Additionally, both Bolivia and Brazil established a free-line were people from the communities located along the ROW could seek assistance with pipeline-related issues as well as report any damage along the route.

Cost-benefit Analysis

5.6 In contrast to many similar projects with equally important environmental components, the GASBOL Project factored environmental benefits into its economic cost-benefit analysis. It is noteworthy that the Project's economic analysis assigned an environmental premium to the replacement of more polluting fuels with cleaner burning natural gas.

Ecological Compensation

5.7 A portion of the GASBOL project budget was allocated to the integrated management of Protected Areas. For example, Brazilian environmental law requires that at least 0.5% of a project's capital budget be allocated to improve Natural Conservation Units. In this instance, this amounted to $7.5 million Reais which was used to finance 12 projects in Brazilian parks and protected areas.

5.8 In Bolivia, a trust Fund of US$1 million was established to assist in the management of the Kaa-Iya National Park which is co-managed by an indigenous NGO (CABI) and the Wildlife Conservation Society WCS in collaboration with Bolivia's National Protected Areas Agency (SERNAP).

World Bank Environmental and Social Safeguard Policies

5.9 The GASBOL project fully complied with all relevant World Bank environmental and social Safeguard Policies. The project was internationally acknowledged in part because its environmental and social mitigation measures met the highest international standards.

Location of Construction Camps and Worker Conduct

5.10 Most of the project's construction camps were located at least 5 km from the nearest populated area[20]. A Code of Conduct that applied to both workers and visitors was established at the camps and nearby villages in both countries (Box 3). Compliance was awarded while non-compliance was penalized with fines, or in extreme cases dismissal.

5.11 This best practice was exemplified by the "Consórcio Camargo Correa," however, it was not accomplished to the same degree by all subcontractors. Brazil has its own criteria for site selection for camps.

Box 3: The Worker's Code of Conduct: "Environmentally Friendly Commandments" as adapted from the Consortium CAMARGO CORREA (Campo Grande, November 11, 1997)

Obligations:

1. To treat people from neighboring communities with respect.
2. To gather and store all waste from the project.
3. To report all accidents involving wild animals.
4. To adequately provide all instruments necessary for the work.
5. To monitor and control erosion.
6. To report all archaeological findings including burial sites.

Prohibitions:

7. To go outside of the project area without authorization.
8. To consume alcoholic beverages.
9. To hold crowded meetings outside of the project area or in inadequate sites.
10. To burn excess materials.
11. To hunt, to keep in captivity or to domesticate wild animals.
12. To fish.
13. To collect and transport plants, flowers or roots.
14. To carry firearms or bladed weapons.
15. To exceed posted speed limits.

[20] It is necessary to note that this rule was not followed by at least one camp.. The placement of a camp in El Carmen violated the 5 kilometer rule.

Specialized Environmental Construction Practices

5.12 A number of specialized construction techniques were employed to eliminate or minimize associated environmental impacts (see next page).

Vegetation Removal and Disposal in the Pipeline ROW

5.13 To minimize the impact of necessary vegetation and tree removal, the process was carried out manually with chain saws. Trees were felled within the ROW to avoid damage to surrounding vegetation avoiding the so-called domino effect.

Wetlands Crossing

5.14 As the pipeline traversed large and ecologically sensitive wetlands, such as the Izozog Marshes and the Pantanal, special construction techniques were adopted to prevent or minimize any negative impacts upon these important ecosystems. In the Pantanal, a "push-pull" technique was adopted to place the pipe in the trench using a series of temporary mounting platforms that were later removed. Today, no visible footprint of the project's construction activities remains (see photographs in on page 21).

The Use of Tunneling Techniques for Important River Crossings

5.15 When crossing important rivers, such as the Rio Grande, the Rio Paraguay, the Rio Miranda, the Rio Paraná, the Rio Tiete, and the Rio Sinos, special construction methods were employed in order to avoid negative impacts on vegetation and water quality. Horizontal drilling techniques were used to tunnel under river beds. This minimized disturbance to riparian vegetation and protected the pipe against pipeline scouring.

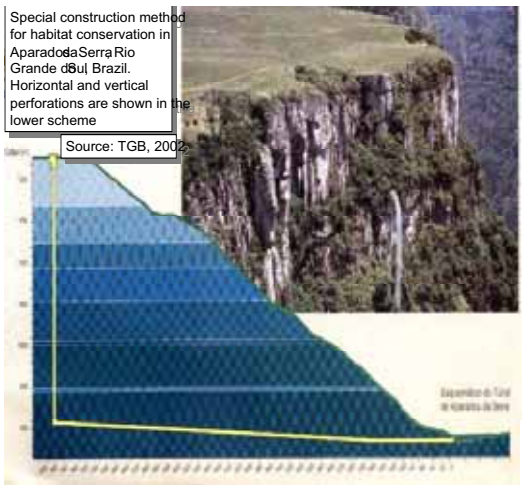
Conventional river crossing

Drilling under the river bed

Topographical Challenges and Erosion Control

5.16 In the Aparados da Serra region of Brazil, special methods were used to protect an important natural area, eliminating erosion, sediment accumulation, slope instability and landscape alterations typically associated with pipeline construction in steep terrain. A special tunnel was built, 780 m in length and 320 m in height, to allow passage of the pipeline and thereby avoid terrain disturbance.

Figure 3: Special Construction Methods



5.17 Aggregate loss of hill mass is monitored during operation by *de visu* checking the inclination angle of strategically placed stakes as well as indirectly by strain gages monitored by the Operation Center in Rio de Janeiro.

Right of Way Width

5.18 While assuring efficient transport of vehicles and machinery along the entire ROW, its width was adjusted to the individual needs of both countries. In Bolivia, little access to the pipeline existed, and the ROW width was increased to 30 meters to allow equipment movement, rather than opening new access roads. A 13 m strip of the ROW was restored by planting new vegetation once the construction phase was completed. Access to the ROW in Brazil was readily available, as a result only 20 meters were needed.

Visual Representation of Sequencing during the "El Pantanal" Crossing

Trenches opening

Platforms

Tubes with floaters

Tubes placement in trench

Trench refilling

Current Status of the ROW

Current stage after platform removal

5.19 In Bolivia, access control provided significant benefits including a reduction in habitat fragmentation, colonization and deforestation. This is noted in the accompanying satellite photo which shows the condition of the ROW before and after construction. It can be seen that there has been very little increase in access as a result of pipeline construction.

2000

2002

Satellite images show no increase in deforested areas.

Box 4: Archaeological Discovery and Preservation

The Project's Environmental Planning included archaeological studies. Prior to this research being carried out, the dry wooded plain located between Santa Cruz de la Sierra and Puerto Suárez was little known in archaeological terms. Construction surveys resulted in the detection of thirteen archaeological sites (four of them outside of the ROW). These sites provided the first data about Pre-Hispanic people in this area. In Río Grande, the Izozog Wetlands, the Parapetí-San Miguel river area, and in Puerto Suárez, these studies provided information on the cultural identity of historically inhabited towns in this region. The hypothesized relationships between these sites were mainly derived from the more than 16,000 recovered archaeological remains. Restored pieces are currently on display at the "Museo Arqueológico de Santa Cruz de la Sierra," sponsored by "Gas Transboliviano," which has been open to the public since 1999. Despite the prevalent view that most of the ethnic groups of the "Chaco" are related to the Tupi-Guaraní culture, the evidence shows that this may be true in the area of Puerto Suárez. Pottery and other artifacts discovered in Río Grande suggest the existence of cultural ties with the Andean Region. Artifacts recovered from the Izozog Swamps and Parapetí-San Miguel river area seem to indicate similarities with the Río Mamoré culture found in the Department of Beni. This suggests that the indigenous people that settled there may have originated in the Bolivian "Amazonía".

In Brazil, Petrobras carried out archaeological research along the different stretches of the pipeline. This was undertaken with the assistance of researchers from the "Universidade Federal do Mato Grosso do Sul", "Universidade de São Paulo", "Museu Paranaense"and "Universidade Federal do Rio Grande do Sul." The research consisted of an assessment of the potential impacts on cultural remains, training of technicians and controllers, accompaniment during civil works, the preservation of identified archaeological sites and analysis of rescued materials. Besides the area of direct influence (20 m), those areas indirectly affected were also surveyed and the sampled material identified. Approximately, 275 sites were identified in Mato Grosso do Sul (94), Paraná (95), São Paulo (76), Santa Catarina (6) and Rio Grande do Sul (4). They were related to different groups, mainly hunters-collectors and horticulturist and ceramists.

Preservation of Cultural heritage

5.20 Pre-construction and construction activities uncovered previously unrecorded archaeological treasures including some pre-Columbian sites (Box 4). The recovered artifacts increased scientific knowledge of the area and this cultural heritage was displayed in local museums including "Museo Arqueológico de Santa Cruz de la Sierra" in Bolivia and "Museu da Universidade de Campo Grande" in Brazil. In Bolivia, the archaeological sites that were discovered and information relating to the artifacts recovered there are explored in detail in a textbook[21].

Artifacts recovered in Bolivia

Innovative Approaches to Integrated Pest Management

5.21 The use of chemical pesticides and insecticides was forbidden during the early stages of the construction phase. However, workers in the City-Gates[22] in the Brazilian southern leg were protected against wasp attacks through the use of semi-domesticated birds whose diet consisted of insects including wasps. Another best practice involved indigenous people in vegetation restoration along the ROW, particularly in the Gran Chaco area of Bolivia. They actively participated in sowing and harvesting native plants for their subsequent reintroduction into their natural habitat.

Indigenous People Development Plan (IPDP)

5.22 In order to either avoid or minimize potential social conflicts, one of the Project's aims was to establish and maintain open communication between the project and the indigenous communities of both countries. These communities were regularly informed of the Project's status during each of its phases.

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21 J.E. Myers & W. Esquerdo. 2001. "*Al Oeste de los Andes, al Sur del Amazonas*", Dames & Moore, Inc. 2001.

22 The City gates are the point where gas from the GASBOL pipeline is transferred to a municipal distribution system.

Public health assistance was provided to these communities as an additional benefit.

5.23 In Bolivia, a natural resources sustainable management program was established which financed: (i) fellowships for young indigenous people; (ii) technical assistance to promote and improve indigenous peoples' knowledge about natural resources management; (iii) specific studies proposed by indigenous people, such as ethno and eco-tourism and water resources management; and, (iv) training in productive activities such as horticulture, artisan workshops, animal husbandry, beekeeping, and medicinal herbs and plants.

5.24 Also, in Bolivia, titling assistance was provided for indigenous lands as "Tierras Comunitarias de Origen" (TCOs). Under the IPDP, indigenous peoples' land rights were established through land titling and communities were supported in developing sustainable resource management practices. A total of US$ 1.5 million was allocated for the first TCO in Bolivia. At the same time, private lands were delimited at owner expense. This provided additional funds to expand the titling of community lands into an area twice as large as the originally targeted area.

5.25 In Brazil (Box 5), fewer indigenous communities were located along the pipeline ROW. Those communities within 30 km of the ROW benefited from compensation activities which they themselves designed. Twenty-two communities were identified: eighteen in Mato Grosso do Sul, one in Sao Paulo and three in Santa Catarina. These activities related to land acquisition, sanitary equipment, schools, support for productive activities, and electricity supply.

Box 5: Indigenous Peoples Development Plan (IPDP) In Brazil

An Indigenous Peoples Development Plan (IPDP) for the Brazilian side was discussed and approved in 1998 by the different stakeholders, including indigenous groups and constructors. On April 2 of that year, both caciques and indigenous groups met to sign a recognition letter addressed to the financial institutions (WB, IDB, CAF) among others stating "we want to emphasize this process as an unprecedented fact of respect towards us, as leaders responsible for the well being of our people". They also added "we request the World Bank that in future projects they support in our region they would use as a reference the work we carried jointlky with PETROBRAS As these statements indicate, the negotiation process was debated and approved in a transparent manner. In order to assess the needs of the different indigenous groups, the IPDP included local research. The result was that 1 million dollars was invested in land acquisition, ambulances, buses, and construction material. Facilities such as, houses, schools, hospitals and energy networks were constructed. In order to assess individual communities' needs, various meetings were held beginning with 4 Terena towns and expanding to 14 in Mato Grosso do Sul, 1 in Kaingang, São Paulo and 3 Guarani in Santa Catarina, for a total of 22 indigenous towns each of which received 50.000 reais.

The Terena groups decided to shared their funds with other groups such as Moreira and Passarinho. Other indigenous groups also shared their funds such as those in São Paulo where funds were used to substitute wood houses for brick and mortar houses The Guarani Groups, Biguaçu town shared their funds to help aquire lands for the Aldeias Morro dos Cavalos e Massiambu. PETROBRAS and TBG bought the first land titled by FUNAI in Santa Catarina for the Guarani groups.

Bolivian Ecological Compensation Plan: Co- Management of the Gran Chaco National Park

5.26 As stated previously, the project sponsors established a trust fund of US$1million for Gran Chaco National Park, which was co-managed on the Bolivian side by means of an agreement between CABI and GTB. Interest from the trust fund financed: (i) salaries, expenses, and "per diem" for Park guards; (ii) management and surveillance activities; (iii) construction of fences, camps and wildlife refuges; (iv) training of park guards and; (v) vehicles.

Brazilian Ecological Compensation Plan

5.27 GASBOL allocated 0.5 % of total project financing in Brazil (US$3.75 million)

for ecological compensation activities agreed upon by IBAMA and the Secretaries of Environment from the five affected states of Mato Grosso do Sul, São Paulo, Santa Catarina, Paraná, and Rio Grande do Sul. Twelve subprojects were implemented to invest in conservation units at both the national and state level. This allocation of resources (Table 1) for land acquisition was notable. In fact, the UNESCO Biosphere Reserve in Mata Atlântica was initiated by GASBOL. Annex 3 presents detailed information by region on activities and investments in each protected area.

Management of the Socio-economic Compensation Plan in Brazil

5.28 By means of an agreement between Petrobras and township authorities, a number of works were carried out which involved active community participation. A special account was set up to disburse funds and encourage dialogue (Table 2). The Social Communication Plan (see Box 6) targeted a population of 8 million people. By dialing 0800-260400 they could get information on the pipeline, make claims and alert the project team of any emergency.

Hotline in Brazil permits community feedback

The Quality Assurance Program's (QAP) Reporting System

5.29 Creation of the QAP Reporting System contributed greatly to the production of reliable and timely field supervision reports and facilitated environmental and social impact monitoring. The reporting system made field meetings more efficient and increased effective communication between internal and external clients. All environmental staff received QAP training and a procedural handbook.

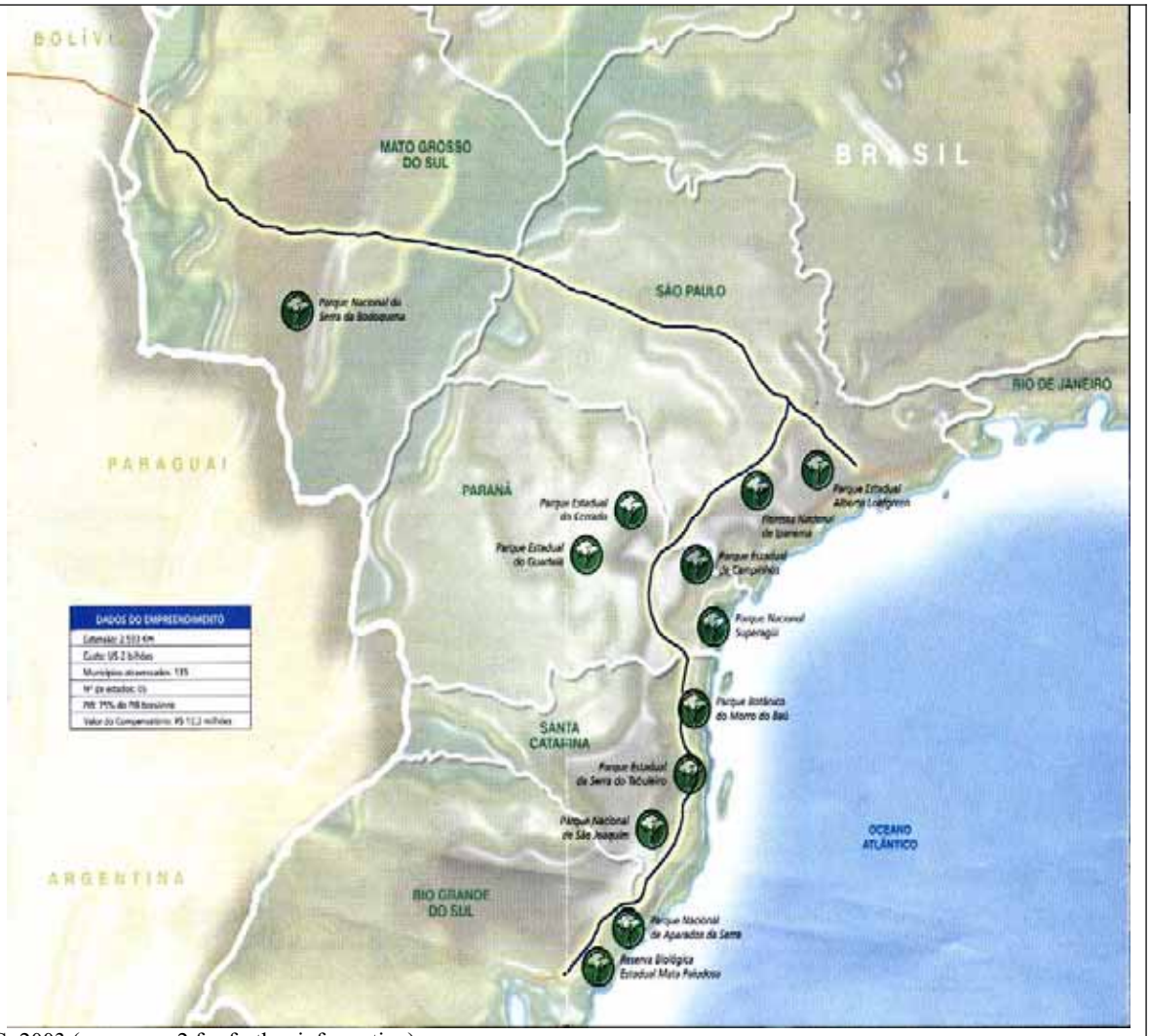
Supervision Costs

5.30 Approximately US$ 8 million, or 4% of the total project cost, was spent on environmental supervision.

Communication during Construction

5.31 Weekly meetings were held in each spread in order to ensure both communication among members of the construction group and the timely application of environmental mitigation measures. Challenges were identified and collaborative solutions suggested and decided upon in real-time.

Figure 4: Protected Area in Brazil



Source: TBG, 2003 (see annex 2 for further information).

Table 1: Compensation Plan in Brazil

Compensation Plan	*Value (Mil. Reals)*	*Value Disbursed (Mil. Reals)*	*%*	*Number/type of recipients*	*Completed (late 2003)*
Ecological	7.5	4.54	61%	12 Parks	5 Parks
Socio-economic	3.6	3.59	99%	51 Municipalities	50 Municipalitites
Indigenous Peoples' Development	1.1	1.10	100%	22 Villages	22 Villages
Total	12.2	9.23	86%		

Source: GTB/TBG 2003

Table 2: Socio-Economic Plan in Brazil

State	*Number of Municipalities Involved*	*Number of Projects Executed*
MS	7	15
SP	18	19
PR	3	3
SC	16	19
RS	5	5
Total	49	61

Source: GTB/TBG 2003

Box 6: Brazilian Socio-economic Compensation Plan

The Compensation Program broadly targeted: (i) localities affected by damage caused by construction traffic (risk of accidents, noise, dust, infrastructure damage), and perceived potential social impacts by male workers (prostitution, violence, family conflicts, etc); and, (ii) communities located next to the pipeline, due to problems caused by construction (traffic, accidents, among others) and possible risks of accidents during the process.

US$ 3.6 milion dollars of compensation was used in each community for relevant social projects including: construction or improvement of community houses, schools, hospitals, craft centers, water and sewage networks, house improvements, road improvements and libraries.

The selection criteria included:

- Cities with a population < 30.000 inhabitants in small urban clusters close to the ROW.
- Communities located within 1 km of the ROW, affected by construction equipment.

Disbursment criteria included:

- Among municipalities and localities: (i) relevance of additional labor force (weight 40); (ii) civil works impact (peso 15); (iii) impact length, permanence in the construction site (weight 20); (iv) capacity to respond to impacts (weight 25).
- Between communities: (i) community population (weight 40); (ii) distance from cluster to ROW (weight 25); (iii) degree of basic needs of community (weight 20); e (iv) traffic impact (weight 15).

Plan implementation Strategy

- Public consultation to define the project.
- Municipal govenment ('City Hall') support for work plans and previous technical and econmic analysis,
- TBG- City hall agreement (Major's office) Agreement between TBG – City Hall.
- Execution by City Hall.
- Environmental Management Unit supervision and monitoring of project implementation

TBG disbursements were gradual following the different stages agreed in the above Agreement wich were inspected by TBC officials.

5.32 In Brazil, workers were informed of procedures prohibiting hunting**,** fishing and the collection of plant and animal species. Incentives were given to those workers who demonstrated knowledge of environmental protection measures.

Strategic Alliances with academics, NGOs and the private sector

5.33 In Brazil, collaboration amongst Petrobras, Universidade Católica Don Bosco, IBAMA, Biodinâmica, Prime and Dames & Moore greatly contributed to the achievements of the IPDP. Cultural heritage protection, including archaeological preservation, required agreements between Petrobras and the Universidade Federal do Mato Grosso do Sul, Universidade Federal do Paraná, Universidade Federal de Santa Catarina, Universidade Federal do Rio Grande do Sul and Universidade do São Paulo.

5.34 International experts supervised the Environmental Management Plan. In Bolivia, the "Kaa Iya del Gran Chaco" Management Plan was supported by a number of groups including CABI, "Fundación IVI Iyambé" and WCS, Servicio Nacional de Áreas Protegidas (SERNAP), CIDOB, the "Museo de Historia Natural Noel Kempff Mercado," sociologists, agronomists, zoologists, botanists, ecologists, landscapes planners, and economists. The Natural Dry Forest and the Indigenous Communities projects inspired academic papers in Bolivian universities, including the Universidad Autónoma Gabriel René Moreno, in Santa Cruz and the Universidad de San Andrés in La Paz."

Community involvement and participation with the Project

5.35 The environmental inspectors (EIs), the environmental auditor[23] and the ombudswoman held a continuous dialogue with local communities and civil society which were then better informed and therefore able to identify new problems and to monitor the progress of the compensation programs in the field. This engagement helped define the roles and functions of the environmental field inspectors, the environmental inspection team, the independent environmental auditor, and the ombudswoman.

Improved Inter-institutional Coordination

5.36 In order to begin construction and operation and to install the different pipeline sections, the project had to obtain environmental licenses from relevant government agencies. These licenses, conditioned upon proof that the Project's activities were environmentally responsible, were granted on a provisonal basis after which a longer-term license was issued to enable operational work. The licenses were renewed only if monitoring and maintenance functions were adequately performed.

[23] During the first stages of the Project the relationship between the environmental auditor and the remaining stakeholders was extremely difficult; this was overcome once the first hired environmental auditor was replaced.

6

Concerns

6.1 Despite numerous examples of best practices, the project did face some challenges that are worth pointing out to illustrate where improvements can be made.

- The institutional framework of the Environmental Management Organization was rigorously designed[24] so that the finest detail could be checked, inspected, and audited closely and continuously. However, the volume of documents produced by this process made their prompt approval difficult and increased the risk of project delays.
- The decision to site a camp within the community of El Carmen, Bolivia violated the '5 kilometer' rule resulting in an increased number of claims from the resident population. This decision ran counter to international rules and recommendations. This decision was made by the municipal authorities under pressure from commercial interests and the community itself which perceived economic benefits from sales of goods and services and from renting houses.
- On occasion, the work advanced so quickly that industrial health and safety measures could not keep pace, resulting in an increased risk of accident for workers, local communities and wildlife, including fatal accidents caused by open trenches.
- Government agencies' administrative and technical limitations in processing grants delayed implementation of the Ecological Compensation Plan. This was exacerbated by currency devaluations in Brazil.
- There were some community relations failures. Certain townships did not receive compensation proportional to the amount of work carried out within their territories. The duration of potential impacts, and therefore the ability of the township to meet its own obligations within this context, was at times inadequately assessed. Community interest in the project and its sustainability was in certain cases not fully understood. A limited number of communities did not understand who owned the pipeline and/or felt that their lands were being appropriated.
- Initial construction contracts were signed before environmental requirements were in place necessitating their renegotiation.
- Compensation plans were weighted more heavily towards ecological than social problems.
- The independent supervision and auditing functions performed by the host governments at times replicated what had been done within the scope of the Project's environmental supervision.
- Initially, there was no provision for an ombudswoman and though it became evident that one was necessary, this was perhaps too large a task for any individual given the size of the project.

Box 7: The El Carmen Camp violated the 5 kilometer rule

Violation of the 5 km rule resulted in a number of complaints from the affected community members of which expressed their discontent. The main complaints identified by the Ombudswoman included: lack of safety in the locality, harassment of young girls by workers, increased consumption of alcoholic beverages, scarcity of food and medicine and increased costs, lack of sanitary infrastructure, growth of infectious diseases and childhood illness, increased vehicle and heavy

[24] The system fulfills document control procedures required by ISO 9000 rules.

equipment traffic, deterioration of roads, educational impacts (students unable to concentrate in school), depletion and contamination of the potable water supply, increased noise pollution (mainly from generators and explosives), and non-compliance with the code of conduct.

In a general sense, these complaints were often minimized by project sponsors and stakeholders involved in construction activities. Several problems were at least in part due to insensitivity to local customs, habits, ethics, expectations and lifestyles. Adherence to the Worker Code of Conduct was not evenly enforced. Education and sensitivity training for both workers and local communities may have been helpful but if a general consensus in the community had been achieved regarding the merits of the project, decisions affecting the community could have been endorsed. The establishment of a local commission comprised of community members could have been a potential solution as it would have provided a forum for their views and ensured their participation in decision-making.

Gasbol Today

6.2 The mainstreaming of environmental and social issues into development projects can be regarded as one of GASBOL's primary achievements. Constant monitoring and evaluation of construction practices has resulted in a process of continuous improvement and superior environmental performance. This dynamic management style has extended into the operational phase of the project. Three years after construction activities ended, a trip along the ROW confirms that GASBOL and its contractors are continuously monitoring, evaluating and improving their methods of operation. GTB and TBG personnel continue their ongoing dialogue with project stakeholders.

Minimum footprints along the entire project area.

Environmentally sustainable practices

6.3 The project adhered to internationally accepted environmental standards. This resulted in extensive efforts to protect air, soil and water quality. The use of pesticides and herbicides was prohibited with benefits for both natural habitats and local populations. Environmentally sensitive areas, including approximately 300 critical areas (i.e. river crossings, wetlands, areas with steep slopes, garbage disposal sites) are monitored regularly. Constant monitoring of the ROW ensures that pipeline operation is environmentally and socially sustainable and is done in a manner consistent with the high standards employed to assess structural integrity of the pipeline itself.

Innovative row stabilization measures in Brazil

6.4 Conservation of natural habitats is another practice that has been achieved with a focus on sustainable development. As was mentioned earlier, in Bolivia, a trust fund co-managed by CABI and GTB finances the conservation and protection of the Kaa Iya National Park. In Brazil, environmental organizations, in collaboration with, Petrobras, TBG and the twelve Conservation Unit Area managers, have raised funds for, and disseminated information about, environmentally sustainable development programs arising from the project.

Current Environmental Situation

6.5 Restoration of disturbed areas of the pipeline ROW has been highly successful overall. In Brazil, the ROW wherever possible followed existing linear corridors created by roads, railways and transmission lines, ensuring that any additional cumulative effect would be minimized. A recent environmental survey of the entire 3,150 km pipeline shows a relatively minor ecological footprint remains from construction activities. In Bolivia, traces of the pipeline ROW exist in the "Gran Chaco" dry forest area. Despite a hostile climatic and natural environment that has slowed the rate of re-vegetation there, the affected area has shrunk considerably and continues to do so. Some environmental organizations[25] have claimed that the Chaco dry forest has been managed in an unsustainable manner as demonstrated by the fragmentation of certain habitats. It must be noted, however, that the species in the affected areas do not seem to have been significantly affected by this habitat fragmentation as the width of the ROW does not present a significant barrier to movement. Other species such as the marsh deer (*Blastocerus dichotomus*) and jaguar (*Panthera onca*) face other challenges that pre-date the GASBOL project.

Outstanding Social and Environmental Aspects

Critical Sites Monitoring during the Operations Phase

6.6 Environmentally and/or socially sensitive areas are monitored at minimum on a monthly basis. The entire ROW is monitored comprehensively once a year and aerial reconnaissance and river crossing controls monitoring are carried out on a bi-annual basis (Table 3).

Co-Management of the Kaa Iya National Park by Indigenous Peoples

6.7 One of the most remarkable achievements of the project is that it includes Indigenous People as co-managers of the Gran

[25] The American NGO Amazon Watch has warned that the Chiquitano dry forest is seriously threatened by the Bolivia-Brazil Pipeline Project and that re-vegetation has not been adequately carried out. Moreover it argues that the ROW seriously impacts existing ecosystems, through habitat fragmentation and threatening endangered species included in the CITES list (Amazon Watch. 2002. Audit of Enron and Shell's Cuiaba and Bolivia-Brazil Pipeline Impacts).

Chaco National Park and helped foster the harmonious relationship that has developed between them and GTB.

Relations with private land owners

6.8 The project maintains a strong relationship with private owners adjacent to the project area, all of whom are visited on an annual basis to survey their concerns.

Table 3: Inspection Plan

Row Inspection Plan		
Maximum interval of time between inspections Inspection by foot, vehicle or aerial		
Area classification	*Crossings/junctions and parallel with rivers, highways and railways*	*Remaining regions*
1 e 2 (91%)	7.5 months and at least 2x/year	15 months but at least once a year
3 (9%)	4.5 months and at least 4x/year	7.5 months but at least twice a year
4 (0%)	4.5 months and at least 4x/year	4.5 months but at least 4x/year
TBG: Inspections by foot every 4 months Helicopter inspections every 4 months		

Environmental and social strategies of GTB for 2003

6.9 The core of the social strategy is encapsulated in the concept of an involved and cooperative civil society, empowered by education and transparency. The environmental strategy, which is managed jointly by GTB, municipal governments, and indigenous peoples, also incorporates the concept of environmental co-management. In order to protect fauna, GTB has enlisted local communities to help regulate hunting through the issuance of licenses. This gives them a stake in the regulatory process. GTB provides logistical support through the dissemination of information bulletins describing the rules, posting of signs and a wider communication campaigns. Indigenous leaders also visit the ROW in order to verify environmental compliance.

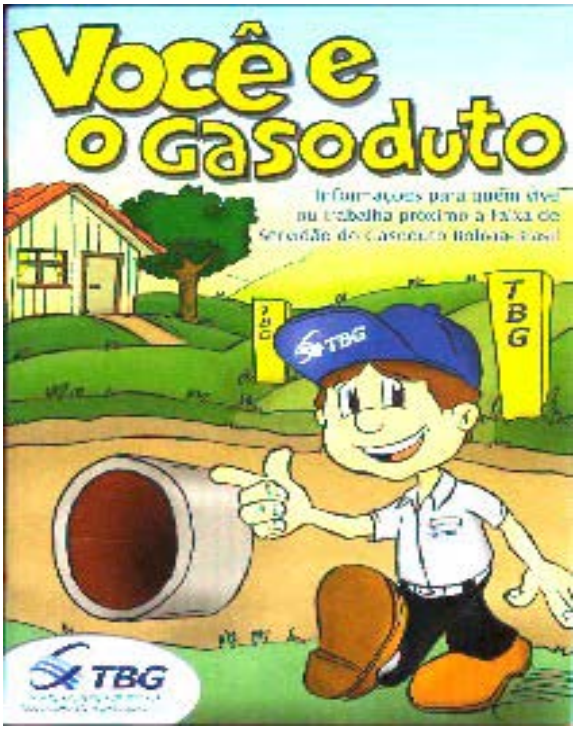
TBG Social Communication Project

6.10 Transparency in the decision-making and implementation processes has been augmented by actively seeking out feedback from the community. As mentioned previously, 8 million people, in over 135 townships in five Brazilian states have been provided avenues by which to give feedback and become involved in the GASBOL project. Not only has the pipeline become operational, but during each phase of its construction anyone interested in or affected by the project could call a toll free number (0800-260400) and receive information about the pipeline, express a complaint or provide information about an emergency.

6.11 A five minute radio program, "Radio Gasoduto Bolivia-Brazil," aired weekly and educated people living between Corumbá (Mato Grosso do Sul) and Grararema (São Paulo) about the regional importance and benefits provided by the GASBOL project. Another method employed to educate the local population was the use of booklets with easily understood language and messages. that were distributed free of charge[26]. These comics (Figure 5) contained valuable information about the project as well as guidelines to be followed while in the ROW. This information was useful, accessible to people of all ages and in an easily marketable format.

[26] TBG. 2003. Você e o Gasoduto. March 2003, Rio de Janeiro, Brasil.

Figure 5: Community Outreach in Brazil



7

Lessons Learned

7.1 The Bolivia-Brazil Pipeline Project was remarkably complex. The largest gas pipeline in Latin America, the project extended some 3,150 kilometers through terrain as diverse as the human cultures that exist along its route. Archeologically, naturally, and culturally, these regions offered remarkably diversity. The institutional frameworks necessary for the Environmental Management Organization and the Ecological and Social Compensation Programs alone were complicated. Add to that the various interest groups and the multiplicity of organizations involved, and one has an idea of the complexity faced by the project team. Nonetheless, this project became a success thanks to hard work, perseverance, innovative solutions and a dynamic approach to problem solving. Although not perfect, it is hoped that some of the lessons learned from this project are transferable to future pipeline and other development projects.

Strong and effective environmental and social safeguards must be in place before the project begins

7.2 In an attempt to mitigate negative environmental and social impacts, strong safeguards must be put in place before the project begins. These safeguards must be built into contracts, communicated effectively, monitored effectively, and enforced effectively. Before any of this can be accomplished, the safeguards must be designed effectively which requires an adequate supply of highly qualified experts from all relevant fields who will be available throughout the project life to address problems as they arise. Fluid projects require dynamic approaches, and flexibility should complement detailed planning and management.

Environmental impacts assessments must be standardized across regions to facilitate comparison

7.3 The environmental components included in the EIA's should have been evaluated using the same standards in both countries. The different assessment criteria adopted in Bolivia and Brazil made it difficult to compare environmental impacts across different stretches of pipeline. A standardized EIA approach and common terms of reference should be developed for future projects that embrace different jurisdictional and legal frameworks.

Greater use of impact scoping should be made

7.4 Impact scoping is the process of identifying and assessing project impacts and discussing them with project stakeholders during the project's design and planning phase. Scoping can assist in setting priorities for data collection, identifying major project concerns early in the process, and reducing potential conflicts.

Environmental Planning should be a continuous process applied throughout the entire project life

7.5 The project's affected area, particularly the ROW, is subject to environmental impacts, not only during, but after construction is completed. Impacts must be assessed during the project's operational phase when monitoring and maintenance is needed to prevent and control impact recurrence. Environmental planning and assessment should therefore consider the impacts of all activities in the project cycle before the project is initiated in order to maximize the success of mitigation efforts and ensure that monitoring is effective.

Tools such as Regional Environmental Assessments, Strategic Environmental Assessments (SEAs) and Analysis of Cumulative Effects can ensure that wider ranging project impacts are considered and addressed early in the project planning phase

7.6 The use of a SEA to consider the upstream impacts of oil and gas development in Bolivia and also the cumulative effects of construction of the Santa Cruz – Puerto Suarez corridor proved to be invaluable in addressing the wide range of impacts arising from the GASBOL project. Future projects of similar magnitude and complexity should consider the use of similar tools, particularly in cases where government capacity to address regional social, economic and health concerns is poorly developed.

Greater coordination between project engineering and environmental planning activities should have taken place

7.7 Project engineering details should have been considered in the initial project design and planning stage to ensure that they were addressed prior to the start of construction. Environmental and social planners should be part of the project design team in order to improve the likely success of mitigation measures and review project alternatives.

Mapping of sensitive areas should be prepared before construction begins

7.8 Sensitive areas along the ROW route should have been accurately mapped during the pre-construction phase. This would have facilitated choice of construction methods and obviated the need to adjust the pipeline route. The use of alignment sheets (suggested 1:10,000 scale) that contain important social, environmental and cultural information would have greatly assisted project planning. This information should be shared with project construction personnel.

The environmental management cycle during the operational phase must emphasize identification and monitoring of geographically challenging areas along the ROW

7.9 The pre-construction process failed to adequately plan and budget for the incredibly diverse topography along the pipeline's route. This initially led to problems of stability and erosion, particularly on steep slopes, resulting in a significant effort during the operational phase to monitor areas of slope stability and initiate immediate responses to problem areas. These efforts could have been reduced if planning for areas susceptible to slope stability and erosion problems had been considered during the planning and design of the final pipeline route. The EIA report could not have reached the level of detail required for this effort. Therefore, during construction, detailed environmental work is required prior to the initiation of construction of any pipeline segment.

Environmental concerns should not overshadow social health and safety issues

7.10 At the onset of the project, more attention was given to the mitigation of environmental impacts arising from construction activities than to the implementation of social programs. Inspection activities focused initially on environmental compliance. The Environmental Management Plan (EMP) contained at least five social programs that received less attention than initially desirable though social safeguards were ultimately improved upon throughout the course of the project.

Procedures for updating/improving EMP should be adopted

7.11 The EMP is not "set in stone" and should be viewed as a living and dynamic document. Should specific measures in the EMP need to be changed, formal change management procedures should be implemented and documented, including sign off and agreement of all environmental authorities in the project.

Set stronger requirements for all contractors to have their own EMS in place that complies with the project's EMP requirements

7.12 In the GASBOL project, there was not a standardized requirement for all contractors to have an Environmental Management System (EMS) in place that was consistent with the project's EMP. Some contractors performed better than others in this regard. There should be a standard clause in all construction contracts that says all contractors need to establish their own compliant environmental management system that is subject to external inspection and audit.

Equipment and personnel must be accounted for at all times

7.13 An accurate inventory of the stock of equipment, its exact location and availability must be kept up to date and accessible. This is equally true for personnel.

Timely sequencing of construction activities can minimize the effects from erosion and slope instability

7.14 Once the ROW has been cleaned and leveled, the trench must be excavated immediately and the pipeline sections welded, x-rayed, lowered into the trench and tested. The trench must be backfilled as soon as possible in order to minimize environmental and social impacts. Adequate planning and monitoring, as well as immediate corrective actions, should prevent prolonged exposure of the open ROW.

The role of Environmental Supervisor and Inspector should be clearly defined before construction began

7.15 Environmental Supervision was a significant component of the Environmental Management System (EMS) and the environmental supervisor and his inspectors clearly played an important role in this process. However, they were seen by some contractors as playing the role of policemen rather than advisors, creating a somewhat confrontational interaction which had negative consequences. This could have been mitigated had their role been made more clear to all parties involved.

Environmental non-compliance should be clearly defined

7.16 At the beginning of the project, there was no clear definition on what constituted non-compliance. Projects should ensure that a standardized system of non-compliance be established (e.g. Level 1, Level 2, Level 3) including immediate response measures and identification of when projects can be halted.

The training program the Environmental Management Plan should be comprehensive and delivered early on in project implementation

7.17 Before construction began, all personnel should have received more comprehensive training on the Environmental Management Plan's policies and procedures as well as other environmental requirements. In the early stages of the GASBOL project, implementation of the training program experienced delays leading to instances of non-compliance. It was generally perceived that inspectors with environmental backgrounds lacked understanding of construction techniques and vice versa. Each environmental inspector by design worked different spreads to avoid a prolonged involvement in any given sector, and while ideally a good practice, it was not an efficient procedure as the pool of specialists was not large enough to accommodate the variety of landscapes and ecosystems within the project area.

Strong industrial health and safety and security measures are needed to prevent accidents for workers and communities alike

7.18 Comprehensive construction guidelines must be well designed, well enforced and place health and safety measures at the highest priority. For example, delays in the backfilling of pipeline trenches, when coinciding with heavy rains, increased the risk of death by accidental drowning. Traffic accidents involving pedestrians resulted from the increased volume of project vehicles

moving along the ROW. This was compounded by non-compliance with posted speed limits which might have been corrected through the use of radar, fines and driver training programs.

Construction contracts should contain incentives for compliance with environmental safeguards and penalties for non-compliance

7.19 Despite the fact that the EMP was built into the contracts and therefore obligatory for all contractors, enforcement mechanisms and oversight were inadequate along certain segments of the pipeline resulting in instances of environmental non-compliance[27]. Penalties of varying severity could have remedied this situation. Alternatively, incentives for compliance could have encouraged the appropriate behavior by individuals or the firm as a whole.

In addition to penalties and incentives, other mechanisms to achieve environmental compliance should be incorporated into the project

7.20 Other financial incentives such as the use of environmental insurance, bonds or contract payment holdbacks should have been incorporated into construction contracts to ensure environmental compliance as penalties and fines are usually not sufficient as a deterrent.

Legal agreements for Bank loans should be comprehensive and incorporate environmental and social safeguards for all aspects of the project

7.21 The GASBOL project was one of the first World Bank projects where compliance with environmental and social safeguards was incorporated into the project's loan agreement. As has been previously stated, these conditions applied to aspects of the project, even though the Bank itself was financing only a small portion of the project. Future legal agreements of this nature could be improved to include all components of the project's EMP and associated environmental and social safeguards.

Clear characterization of the Project to the communities is critical for building up mutual understanding with the project sponsors

7.22 Incomplete knowledge of local communities, their customs and project expectations, perhaps a function of inadequate baseline surveys, led to later misunderstandings and conflicts. In certain instances, the potential environmental and social benefits of the project were overstated. Some towns found themselves economically worse off after construction ended than they had been before it began. Greater understanding of the socio-economic environment could have mitigated these effects. Also, a clear and consistent message of the project and its anticipated effects should be communicated to all stakeholders.

The code of good practice for public consultation is to consult early and consult often – there should have been a greater attempt at early consultation

7.23 Although the final result was positive, the public consultative process and claims mechanism should have been conducted earlier to avoid potential conflicts that arose in the early project stages. Once established, the GASBOL project consultation process was an effective mechanism for community/stakeholder involvement and participation. Consultations between the Environmental Management Organization team, local communities and Indigenous people manifested themselves in the form of community-based organizations and committees that provided public consultation on regulations and environmental issues in a highly transparent and efficient manner. Despite this eventual result, the public consultation process could have been improved by starting earlier, by being conducted on a regular and continual basis throughout the

[27] The different firms who took over the construction activities did not show a similar behavior about the penalties and incentives on the workers' performance. Although a few of them, especially the Brazilian Consortium Camargo Correa carried out this policy properly.

process and by ensuring that stakeholder messages and concerns were incorporated into the project planning process.

Box 8: The Auditor and the Ombudswoman: overlapping roles

The Environmental Auditor, whose original responsibilities were to audit construction and related activities, soon found himself dealing with social issues. A year into construction, it became evident that a social specialist was needed. It was at this point that the Ombudswoman was hired. Among other responsibilities, she regularly visited social stakeholders in the field in order to disseminate her and the Auditor's bimonthly reports to the public, to organize periodic meetings, to assess construction impacts and the advances of the Social and Environmental Programs, and to monitor compliance with the Workers' Code of Conduct. To a large extent these activities duplicated those of the Auditor leading to the conclusion that their roles must be more clearly defined. Despite their best efforts this proved a difficult task. In fact, it seems evident in hindsight that each would have been better equipped to handle these tasks if they had been provided a small staff and a clearer mandate.

The respective role of the Auditor and Ombudswoman must be clearly defined

7.24 Excessively ambitious and vague Terms of Reference (TORs) for the Auditor and Ombudswoman led to duplication of responsibility and duties (Box 8). The Auditor was responsible for regulatory requirements, environmental management plans, the IPDP, compliance with social and environmental safeguard policies, auditing of claims and investigative responsibility for the entire Environmental Management Organization. The Ombudswoman had a similarly large mandate that often times conflicted with the auditor.

Rotating work schedules should be adopted in most socially sensitive areas

7.25 The project should have implemented an "off-shore" (rotation of workers and mandatory leave to larger towns and cities) schedule policy for the camps in the most sensitive areas to avoid contact and negative social impacts with the surrounding population as it happened in few cases.

Environmental information should be consolidated to allow a "before and after" analysis of construction impacts

7.26 Institutional memory of the project would have been greatly enhanced had the sequential occurrence of environmental and social impacts been systematically recorded. In the case of the GASBOL project, a greater attempt should have been made to consolidate data sources from all entities involved in project supervision.

Financial management of all project funds must adhere to internationally accepted accounting and budgeting standards

7.27 This is equally true when dealing with social and environmental compensations schemes. It is very important to establish both time limits on the use of funds and a time frame for their release.

8
Final Remarks

8.1 Conservation International, The Nature Conservancy, the World Wildlife Fund, and the Smithsonian Institution[28] recently produced a paper which called for the Inter-American Development Bank (IDB) and the Export Import Bank (EXIM Bank), co-financers of the Camisea Gas Project in Perú, to ensure that all loan agreements to which they are a party include clauses designed to mitigate and control negative environmental and social impacts. Their paper lays out three general conditions to meet this objective: (a) compliance with world-class environmental standards, such as the World Bank's environmental and social safeguards[29]; (b) independent monitoring and evaluation plans; and (c) creation of a trust fund to promote the conservation of biodiversity and improve the quality of life and economic development of local stakeholders. It further recommended the active participation of civil society.

8.2 It is auspicious to note that three years into its operation, GASBOL has met these conditions using both conventional and innovative practices. While by no means without its own challenges, the Project's current status has been achieved through flexible and adaptive methods the results of which have been recognized by receipt of the World Bank's Green Award[30], the International Association of Impact Assessment's Environmental Award (IAIA)[31] in 2001, and the achievement of ISO 14002 and 9001 certification[32]. It is perhaps true that no project is perfect, but it is equally true that good projects can improve their perfection by incorporating best practices for environmental and social management. By doing so, the GASBOL project has established a benchmark standard for the development of other large infrastructure projects.

8.3 It has been recognized that the dynamic process achieved by GASBOL added value beyond the stated objectives and scope of the project[33]. Multilateral institutions including the WB and the IDB, initiated a new standard for active community participation in projects. It is also noteworthy that the lessons learned from GASBOL, both positive and negative, have been an important reference for the social and environmental management of other Hydrocarbon Sector projects. In fact, the Bolivian Learning and Innovation Loan, or 'LIL' in World Bank parlance, administered in partnership with the Ministerio de Minería e Hidrocarburos, has incorporated stakeholders from the Gas Pipeline's area of influence (i.e. "Comité Cívico de la Gran Chiquitanía" and the NGO ProBioma). The project, designed to strengthen social and environmental management capacity, has incorporated many of the lessons learned from GASBOL in terms of sequencing and community participation, including the creation of regional committees involved in environmental and social monitoring during project preparation (Comités de Fiscalización). Similarly, the IDB, drawing upon GASBOL experience along with input from civil society subjected loan approval for the construction of the Santa Cruz-Puerto suarez road in Bolivia"[34] to a consultative committee which consisted of representatives from government, the "Comités

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28 Conservation International, The Nature Conservancy, World Wildlife Fund and the Smithsonian Institution. 2002. Camisea Environmental and Protected Area Fund Principles and Criteria. October, 2002.

29 OP 4.01- Environmental Management Plan, OP 4.02- Environmental Action Plans, OP 4.04- Natural Habitats, and OD 4.2 – Indigenous People.

30 The *First Annual World Bank Green Award* was granted on June 5, 2001, World Environment Day.

31 Corporative Award IAIA´01 in honor of excellent environmental and social management including the use of impact assessments design and construction of the pipeline.

32 GTB is currently negotiating the OHSAS 18001 (Health and security management).

33 Suárez., R.V., M.A. Crespo C. & M. H. Guardia. 2000. *Problemática Socioambiental del Gasoducto Bolivia-Brasil. La Experiencia Boliviana.* ProBioma – Olca, Septiembre 2000.

34 This is an outstanding case of recognition of the relevant role of social and environmental monitoring and direct community participation in the monitoring and evaluation of civil works as well as the potential impacts on natural and social resources.

de Fiscalización," civil society, and NGOs. This demonstration effect speaks strongly to the example that GASBOL has set and it is hoped that the lessons learned from the GASBOL project case study will facilitate the further mainstreaming of environmental and social safeguards into the design and implementation of infrastructure projects.

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Annex 1: Main World Bank Operational Policies Complied with By GASBOL

Operational Policy (OP)	*Description*
4.01 – Environmental Assessment	In order to ensure their environmental sustainability all projects financed by the Bank have to undergo an Environmental Assessment (EA). The Bank carries out a preliminary study of each selected project and categorizes it as (i) Category "A" – the project effects can produce significant negative environmental impacts; (ii) "B" – the Project's potential impacts either on human populations or on ecologically sensitive areas are moderate; and (iii) "C" – the probabilities of environmentally negative effects are low or negligible.
4.04 – Natural Habitats	The Bank does not give financial support to those projects that produce significant deterioration of sensitive natural habitats. Unless a given project causing significant changes on natural habitats is accomplished by cogent mitigation or compensation alternatives, the Bank does not support its development; furthermore, its deep analysis should demonstrate that general benefits of the project significantly compensate environmental costs. To give support to a given project that includes potential negative impacts on natural habitats, the Bank evaluates the borrower capacity to implement adequate mitigation and compensation measures. If institutional problems are detected, the project must include programs or plans to strengthen institutional capacity concerning environmental management.
4.11 – Cultural Heritage	Cultural heritage includes archaeological, historic, religious and natural sites of a unique value. If such special sites are at potential risk, the borrower must prepare an EA report and identify and assess the expected potential impacts.
4.12 – Involuntary Resettlement	During a project planning which would require involuntary resettlements the Bank and the borrower must (i) evaluate the resettlement magnitude; (ii) explore all possible alternatives to either avoid resettlement or otherwise minimize its effects; (iii) historically evaluate project execution performance of those agencies which underwent similar situations; and (iv) define an adequate resettlement program if the project receive financial support.
4.20 - Indigenous People	This policy aim is to ensure dignity respect, human rights compliance, and cultural value protection to indigenous peoples; to guarantee they will not be exposed to deleterious impacts, and receive adequate cultural and economic profits. This commitment must favor those indigenous communities who dwell in the project area, and are expected to undergo negative impacts. In these circumstances, the borrower has to prepare an Indigenous People Development Plan.

Annex 2: Parks, Conservation and Protected Areas Supported by the Project in Brazil and Bolivia

Conservation Unit	*Brief description*	*Ecological Importance*	*Plan, programs, agreements and financial support*
1. Parque Nacional da Serra da Bodoquena	Covers more than 200 kilometers at Mato Grosso do Sul , from the border with Paraguay to Miranda township	The largest protected forested area within Mato Grosso do Sul containing three important rivers mouths from three hydrographic basins. Its poorly known fauna comprises species such as Onça, Lobo guará, Veado campeiro, Queixada, Ema, Arara azul and Tamanduá	IBAMA-TBG agreement will grant R$ 1.5 million for cartographic maps, land acquisition, equipment, inspecting vehicle, etc.
2. Floresta Nacional de Ipanema	Mountainous area rich in iron mining resources from Sorocaba township. First cast iron in Brazil, created in 1818, deactivated in 1895. Its abandoned buildings are part of "Fazenda Ipanema" . Transferred to IBAMA in 1992 when the "Floresta Nacional" was created	Transition area between Mata Atlântica and Cerrado	IBAMA-IPHAN-("Instituto de Patrimônio Histórico y Artístico Nacional") TBG allocated R$ 750,000 to building restoration
3. Centro de Manejo, Reabilitação e Triagem de Animais Silvestres do Parque Estadual Alberto Loefgreen	Reference Center (other centers planned)	Designed to increase compliance with legal requirements for wild animal protection. Information network and services will be linked to the worldwide conservation network	The Fauna Protection Program and the development of the "Parque estadual" will be supported by a TBG investment of R$ 750,000 through an agreement with the "Secretaria de Meio Ambiente do Estado de São Paulo
4. Parque Nacional Superagüi	Largest marine island from Paraná state. Created in 1953; since 1989 is one of the most important coastal conservation unit. Fish, crustacean and mollusks breed in the island. From 1997 the National Park enlarged to cover 35,000 ha	Houses important and rare species of Brazilian fauna	TBG-IBAMA agreement to preserve the park. TBG has approved an amount allocation of R$ 750,000 to carry out surveys relative to the land tenure organization and the acquisition of adjacent lands to be converted in Conservation Units.
5. Parque estadual do	Created in 1992, it covers 420	Represents the southernmost fragments	TBG-IAP (Instituto Ambiental do Paraná)

Cerrado	ha in Jaguariaiva township	of Cerrado system and is an important space for environmental education	are investing R$ 350,385 as part of the GASBOL Compensation Plan, including the creation of a faunal refuge
6. Parque Estadual de Guartelá	Created in 1992. Mountainous Park of 799 at an altitude of 1200 m. Located at Tibagi township, 200 kilometers from Curitiba.	Waterfalls ("cachoeiras") and rocky caverns. Houses animal and plant species typical of high fields and gallery forests.	IAP-TBG are investing R$ 245,000,some of which is designed to increase eco- tourism
BRAZIL			
7. Parque Estadual de Campinhos	Within the mountainous region of Agungui, the 204 ha Park, created in 1960, is located 65 kilometers from Curitiba. More than 500 people visit the Park each month, mainly 1st and 2nd degree students.	Mountainous region from the "Primeiro Planalto Paranaense". *Araucaria* forest still remains. The fauna is represented by "Venados", "Pacas", "Gastos-do Mato, "Gralhas", etc.	IAP-TBG invested R$ 154,615, mainly to build a visitor center, provide information, signs, and Environmental Management
8. Parque Estadual da Serra do Tabuleriro	Covers eight townships near Florianópolis. Its 81,000 ha include five of the six botanic landscapes of Santa Catarina and a large system of water resources	Mammals including Onças, Venados, Lontra, Gato maracajá and Bugio-ruivo. More than 270 bird species. There are several endangered species (i.e., Macuco and Gavião real)	FATMA (Fundación de Medio Ambiente) has allocated R$ 570,000 to construct a Visitor Center, administrative building, vehicles, bridges, equipment, environmental education programs, social and environmental studies, etc.
9. Parque Botânico de Morro Baú	Created in 1961, it is located in the coastal area of Santa Catarina. Its area is of 750 ha	Waterfalls receive 2500 visitors per year	TBG through an agreement with Herbário Barbosa Rodrigues allocated R$ 180,000 (Environmental Compensation Program) mainly to build a Research Center and perform environmental studies.
10. Parque Nacional de São Joaquim	Created in 1961, it is located in Santa Catarina state, and covers about 45,000 ha	Contains diverse biota components, among them forests including remnants of *Araucaria*.	IBAMA-TBG is investing R$ 750,000 for this federal protected area, the biggest at "Serra Geral". GASBOL Ecological Compensation Program is planning the elaboration of a cartographic plant, a

			diagnosis of land tenure situation, and the management of this conservation unit
11. Parque Nacional Aparados da Serra	Located 100 kilometers from Porto Alegre northwestern Rio Grande do Sul and penetrating part of Santa Catarina state. More than 35,000 ha include small hills ending in high and deep slopes, mixed with canyons, creeks and waterfalls.	The last refuge of extremely rare species, such as the "Puma" and the "Gavião-Pato".	A TBG-IBAMA project to fund disbursement of R$ 750,000 to purchase land
12. Reserva Biológica Estadual Mata Paludosa	The reserve covers 113 ha northeast Rio Grande do Sul, with low population density and an economy based on agriculture.	High biodiversity, typical of the "Mata Atlântica" , with forest systems in both, the plains and the coasts. Rich amphibian, reptilian, avian, and mammal faunas.	"Area de Proteção Ambiental Rota do Sol", TBG- FEIPAM/RS – Fundação Estadual de Protecao Ambiental Henrique Luis Roesseler" with an investment of R$ 750,000
BOLIVIA			
Parque Nacional "Kaa-Iya- del Gran Chaco y Area Natural de Manejo Integrado	The "Kaa Iya" was created in 1995. It is the largest protected area in Bolivia and one of the greatest in Latin America. It covers 3,441,115 ha.	The Park constitutes the Boreal Chaco best conserved tropical dry forest. It houses a high number of plants and animals species. Vascular plants: 880 species; Reptiles: 89 species; Birds: 301 species; Mammals: 124 species.	Managed by "Capitanía del Alto y Bajo Izozog (CABI) and the "Ministerio de Desarrollo Sostenible y Planificación". US$ 456,000 have been allocated for the Environmental Management Plan of the Kaa-Iya. Co-managed by CABI and Wildlife Conservation Society (WCS) and financed by USAID.

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Joint UNDP/World Bank

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	--
	Francophone Household Energy Workshop (French)	08/89	--
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
	Commercialization of Marginal Gas Fields (English)	12/97	201/97
	Commercilizing Natural Gas: Lessons from the Seminar in Nairobi for Sub-Saharan Africa and Beyond	01/00	225/00
	Africa Gas Initiative – Main Report: Volume I	02/01	240/01
	First World Bank Workshop on the Petroleum Products Sector in Sub-Saharan Africa	09/01	245/01
	Ministerial Workshop on Women in Energy	10/01	250/01
	Energy and Poverty Reduction: Proceedings from a Multi-Sector And Multi-Stakeholder Workshop Addis Ababa, Ethiopia, October 23-25, 2002.	03/03	266/03
	Opportunities for Power Trade in the Nile Basin: Final Scoping Study	01/04	277/04
	Énergies modernes et réduction de la pauvreté: Un atelier multi-sectoriel. Actes de l'atelier régional. Dakar, Sénégal, du 4 au 6 février 2003 (French Only)	01/04	278/04
	Énergies modernes et réduction de la pauvreté: Un atelier multi-sectoriel. Actes de l'atelier régional. Douala, Cameroun du 16-18 juillet 2003. (French Only)	09/04	286/04
	Energy and Poverty Reduction: Proceedings from the Global Village Energy Partnership (GVEP) Workshops held in Africa	01/05	298/05
	Power Sector Reform in Africa: Assessing the Impact on Poor People	08/05	306/05
	The Vulnerability of African Countries to Oil Price Shocks: Major Factors and Policy Options. The Case of Oil Importing Countries	08/05	308/05
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
	Africa Gas Initiative – Angola: Volume II	02/01	240/01
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU

Region/Country	*Activity/Report Title*	*Date*	*Number*
Burundi	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cameroon	Africa Gas Initiative – Cameroon: Volume III	02/01	240/01
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessment (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
	In Search of Better Ways to Develop Solar Markets: The Case of Comoros	05/00	230/00
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
	Africa Gas Initiative – Congo: Volume IV	02/01	240/01
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95
	Africa Gas Initiative – Côte d'Ivoire: Volume V	02/01	240/01
Ethiopia	Energy Assessment (English)	07/84	4741-ET
	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
	Energy Assessment (English)	02/96	179/96
Gabon	Energy Assessment (English)	07/88	6915-GA
	Africa Gas Initiative – Gabon: Volume VI	02/01	240/01
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
	Corporatization of Distribution Concessions through Capitalization	12/03	272/03
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea-Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
	Status Report (English)	05/84	016/84

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Kenya	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
	Power Loss Reduction Study (English)	09/96	186/96
	Implementation Manual: Financing Mechanisms for Solar Electric Equipment	07/00	231/00
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87
	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ
	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-NAM
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
	Strategic Gas Plan	02/04	279/04
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Energy Assessment (English and French)	07/91	8017-RW
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vols. I-IV (English)	12/93	-
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	-
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE

Region/Country	*Activity/Report Title*	*Date*	*Number*
Senegal	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program (English)	05/94	165/94
Seychelles	Energy Assessment (English)	01/84	4693-SEY
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
Republic of South Africa	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95
Sudan	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
Swaziland	Energy Assessment (English)	02/87	6262-SW
	Household Energy Strategy Study	10/97	198/97
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89
	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90
	Power Loss Reduction Volume 1: Transmission and Distribution System Technical Loss Reduction and Network Development (English)	06/98	204A/98
	Power Loss Reduction Volume 2: Reduction of Non-Technical Losses (English)	06/98	204B/98
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86
	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
	Energy Assessment (English)	12/96	193/96
	Rural Electrification Strategy Study	09/99	221/99
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84

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	Power Sector Management Assistance Project (English)	04/85	034/85
	Power Sector Management Institution Building (English)	09/89	--
Zimbabwe	Petroleum Management Assistance (English)	12/89	109/89
	Charcoal Utilization Pre-feasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP) (English)	12/94	--
	Rural Electrification Study	03/00	228/00
	EAST ASIA AND PACIFIC (EAP)		
Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry (English)	11/94	168/94
	Energy for Rural Development in China: An Assessment Based on a Joint Chinese/ESMAP Study in Six Counties (English)	06/96	183/96
	Improving the Technical Efficiency of Decentralized Power Companies	09/99	222/99
	Air Pollution and Acid Rain Control: The Case of Shijiazhuang City and the Changsha Triangle Area	10/03	267/03
	Toward a Sustainable Coal Sector In China	07/04	287/04
	Demand Side Management in a Restructured Industry: How Regulation and Policy Can Deliver Demand-Side Management Benefits to a Growing Economy and a Changing Power System	12/05	314/05
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84
	Power Generation Efficiency Study (English)	02/86	050/86
	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
	Institutional Development for Off-Grid Electrification	06/99	215/99
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA
Mongolia	Energy Efficiency in the Electricity and District Heating Sectors	10/01	247/01
	Improved Space Heating Stoves for Ulaanbaatar	03/02	254/02
	Impact of Improved Stoves on Indoor Air Quality in Ulaanbaatar, Mongolia	11/05	313/05
Myanmar	Energy Assessment (English)	06/85	5416-BA

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Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
	Strengthening the Non-Conventional and Rural Energy Development Program in the Philippines: A Policy Framework and Action Plan	08/01	243/01
	Rural Electrification and Development in the Philippines: Measuring the Social and Economic Benefits	05/02	255/02
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979-SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87
	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
	Why Liberalization May Stall in a Mature Power Market: A Review of the Technical and Political Economy Factors that Constrained the Electricity Sector Reform in Thailand 1998-2002	12/03	270/03
	Reducing Emissions from Motorcycles in Bangkok	10/03	275/03
Tonga	Energy Assessment (English)	06/85	5498-TON
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
	Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee (English and Vietnamese)	09/95	174/95
	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves (English)	01/96	178/96
	Petroleum Fiscal Issues and Policies for Fluctuating Oil Prices In Vietnam	02/01	236/01
	An Overnight Success: Vietnam's Switch to Unleaded Gasoline	08/02	257/02
	The Electricity Law for Vietnam—Status and Policy Issues—The Socialist Republic of Vietnam	08/02	259/02
	Petroleum Sector Technical Assistance for the Revision of the Existing Legal and Regulatory Framework	12/03	269/03
Western Samoa	Energy Assessment (English)	06/85	5497-WSO

SOUTH ASIA (SAS)

Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Pre-feasibility Study (English)	12/88	--
	Reducing Emissions from Baby-Taxis in Dhaka	01/02	253/02

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India	Opportunities for Commercialization of Non-conventional Energy Systems (English)	11/88	091/88
	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
	Environmental Issues in the Power Sector (English)	06/98	205/98
	Environmental Issues in the Power Sector: Manual for Environmental Decision Making (English)	06/99	213/99
	Household Energy Strategies for Urban India: The Case of Hyderabad	06/99	214/99
	Greenhouse Gas Mitigation In the Power Sector: Case Studies From India	02/01	237/01
	Energy Strategies for Rural India: Evidence from Six States	08/02	258/02
	Household Energy, Indoor Air Pollution, and Health	11/02	261/02
	Access of the Poor to Clean Household Fuels	07/03	263/03
	The Impact of Energy on Women's Lives in Rural India	01/04	276/04
	Environmental Issues in the Power Sector: Long-Term Impacts And Policy Options for Rajasthan	10/04	292/04
	Environmental Issues in the Power Sector: Long-Term Impacts And Policy Options for Karnataka	10/04	293/04
Nepal	Energy Assessment (English)	08/83	4474-NEP
	Status Report (English)	01/85	028/84
	Energy Efficiency & Fuel Substitution in Industries (English)	06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89
Pakistan	National Household Energy Survey and Strategy Formulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
	Clean Fuels	10/01	246/01
	Household Use of Commercial Energy	05/06	320/06
Regional	Toward Cleaner Urban Air in South Asia: Tackling Transport Pollution, Understanding Sources.	03/04	281/04
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84
	Industrial Energy Conservation Study (English)	03/86	054/86
	Sustainable Transport Options for Sri Lanka: Vol. I	02/03	262/03
	Greenhouse Gas Mitigation Options in the Sri Lanka Power Sector: Vol. II	02/03	262/03
	Sri Lanka Electric Power Technology Assessment (SLEPTA): Vol. III	02/03	262/03
	Energy and Poverty Reduction: Proceedings from South Asia Practitioners Workshop How Can Modern Energy Services Contribute to Poverty Reduction? Colombo, Sri Lanka, June 2-4, 2003	11/03	268/03

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	EUROPE AND CENTRAL ASIA (ECA)		
Armenia	Development of Heat Strategies for Urban Areas of Low-income Transition Economies. Urban Heating Strategy for the Republic Of Armenia. *Including a Summary of a Heating Strategy for the Kyrgyz Republic*	04/04	282/04
Bulgaria	Natural Gas Policies and Issues (English)	10/96	188/96
	Energy Environment Review	10/02	260/02
Central Asia and The Caucasus	Cleaner Transport Fuels in Central Asia and the Caucasus	08/01	242/01
Central and Eastern Europe	Power Sector Reform in Selected Countries	07/97	196/97
Central and Eastern Europe	Increasing the Efficiency of Heating Systems in Central and Eastern Europe and the Former Soviet Union (English and Russian)	08/00	234/00
	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Kazakhstan	Natural Gas Investment Study, Volumes 1, 2 & 3	12/97	199/97
Kazakhstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
	Natural Gas Upstream Policy (English and Polish)	08/98	206/98
	Energy Sector Restructuring Program: Establishing the Energy Regulation Authority	10/98	208/98
Portugal	Energy Assessment (English)	04/84	4824-PO
Romania	Natural Gas Development Strategy (English)	12/96	192/96
	Private Sector Participation in Market-Based Energy-Efficiency Financing Schemes: Lessons Learned from Romania and International Experiences.	11/03	274/03
Slovenia	Workshop on Private Participation in the Power Sector (English)	02/99	211/99
Turkey	Energy Assessment (English)	03/83	3877-TU
	Energy and the Environment: Issues and Options Paper	04/00	229/00
	Energy and Environment Review: Synthesis Report	12/03	273/03
	MIDDLE EAST AND NORTH AFRICA (MNA)		
Arab Republic of Egypt	Energy Assessment (English)	10/96	189/96
	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
Morocco	Energy Sector Institutional Development Study (English and French)	07/95	173/95
	Natural Gas Pricing Study (French)	10/98	209/98
	Gas Development Plan Phase II (French)	02/99	210/99
Syria	Energy Assessment (English)	05/86	5822-SYR
	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
	Energy Efficiency Improvement in the Fertilizer Sector (English)	06/90	115/90
Tunisia	Fuel Substitution (English and French)	03/90	--
	Power Efficiency Study (English and French)	02/92	136/91
	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96
	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96

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Tunisia	Rural Electrification in Tunisia: National Commitment, Efficient Implementation and Sound Finances	08/05	307/05
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91
	Household Energy Supply and Use in Yemen. Volume I: Main Report and Volume II: Annexes	12/05	315/05

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LCR Regional	Regional Seminar on Electric Power System Loss Reduction in the Caribbean (English)	07/89	--
	Elimination of Lead in Gasoline in Latin America and the Caribbean (English and Spanish)	04/97	194/97
	Elimination of Lead in Gasoline in Latin America and the Caribbean - Status Report (English and Spanish)	12/97	200/97
	Harmonization of Fuels Specifications in Latin America and the Caribbean (English and Spanish)	06/98	203/98
	Energy and Poverty Reduction: Proceedings from the Global Village Energy Partnership (GVEP) Workshop held in Bolivia	06/05	202/05
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	OECS Energy Sector Reform and Renewable Energy/Energy Efficiency Options	02/06	317/06
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	Pre-feasibility Evaluation Rural Electrification and Demand Assessment (English and Spanish)	04/91	129/91
	National Energy Plan (Spanish)	08/91	131/91
	Private Power Generation and Transmission (English)	01/92	137/91
	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92
	Natural Gas Sector Policies and Issues (English and Spanish)	12/93	164/93
	Household Rural Energy Strategy (English and Spanish)	01/94	162/94
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	Introducing Competition into the Electricity Supply Industry in Developing Countries: Lessons from Bolivia	08/00	233/00
	Final Report on Operational Activities Rural Energy and Energy Efficiency	08/00	235/00
	Oil Industry Training for Indigenous People: The Bolivian Experience (English and Spanish)	09/01	244/01
	Capacitación de Pueblos Indígenas en la Actividad Petrolera. Fase II	07/04	290/04
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	Estudio Sobre Aplicaciones en Pequeña Escala de Gas Natural	07/04	291/04
Brazil	Energy Efficiency & Conservation: Strategic Partnership for Energy Efficiency in Brazil (English)	01/95	170/95
	Hydro and Thermal Power Sector Study	09/97	197/97
	Rural Electrification with Renewable Energy Systems in the Northeast: A Preinvestment Study	07/00	232/00

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Brazil	Reducing Energy Costs in Municipal Water Supply Operations	07/03	265/03
	"Learning-while-doing" Energy M&T on the Brazilian Frontlines		
Chile	Energy Sector Review (English)	08/88	7129-CH
Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
Colombia	Energy Efficiency Report for the Commercial and Public Sector (English)	06/96	184/96
Costa Rica	Energy Assessment (English and Spanish)	01/84	4655-CR
	Recommended Technical Assistance Projects (English)	11/84	027/84
	Forest Residues Utilization Study (English and Spanish)	02/90	108/90
Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
	Energy Strategy Phase I (Spanish)	07/88	--
	Energy Strategy (English)	04/91	--
	Private Mini-hydropower Development Study (English)	11/92	--
	Energy Pricing Subsidies and Interfuel Substitution (English)	08/94	11798-EC
	Energy Pricing, Poverty and Social Mitigation (English)	08/94	12831-EC
Guatemala	Issues and Options in the Energy Sector (English)	09/93	12160-GU
	Health Impacts of Traditional Fuel Use	08/04	284/04
Haiti	Energy Assessment (English and French)	06/82	3672-HA
	Status Report (English and French)	08/85	041/85
	Household Energy Strategy (English and French)	12/91	143/91
Honduras	Energy Assessment (English)	08/87	6476-HO
	Petroleum Supply Management (English)	03/91	128/91
Jamaica	Energy Assessment (English)	04/85	5466-JM
	Petroleum Procurement, Refining, and Distribution Study (English)	11/86	061/86
	Energy Efficiency Building Code Phase I (English)	03/88	--
	Energy Efficiency Standards and Labels Phase I (English)	03/88	--
Jamaica	Management Information System Phase I (English)	03/88	--
	Charcoal Production Project (English)	09/88	090/88
	FIDCO Sawmill Residues Utilization Study (English)	09/88	088/88
	Energy Sector Strategy and Investment Planning Study (English)	07/92	135/92
Mexico	Improved Charcoal Production Within Forest Management for the State of Veracruz (English and Spanish)	08/91	138/91
	Energy Efficiency Management Technical Assistance to the Comisión Nacional para el Ahorro de Energía (CONAE) (English)	04/96	180/96
	Energy Environment Review	05/01	241/01
Nicaragua	Modernizing the Fuelwood Sector in Managua and León	12/01	252/01
	Policy & Strategy for the Promotion of RE Policies in Nicaragua. (Contains CD with 3 complementary reports)	01/06	316/06
Panama	Power System Efficiency Study (English)	06/83	004/83
Paraguay	Energy Assessment (English)	10/84	5145-PA
	Recommended Technical Assistance Projects (English)	09/85	--
	Status Report (English and Spanish)	09/85	043/85
	Reforma del Sector Hidrocarburos (Spanish Only)	03/06	319/06
Peru	Energy Assessment (English)	01/84	4677-PE
	Status Report (English)	08/85	040/85
	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
	Energy Strategy (English and Spanish)	12/90	--

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Peru	Study of Energy Taxation and Liberalization of the Hydrocarbons Sector (English and Spanish)	120/93	159/93
	Reform and Privatization in the Hydrocarbon Sector (English and Spanish)	07/99	216/99
	Rural Electrification	02/01	238/01
Saint Lucia	Energy Assessment (English)	09/84	5111-SLU
St. Vincent and the Grenadines	Energy Assessment (English)	09/84	5103-STV
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Energy End Use Efficiency: Research and Strategy (English)	11/89	--
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Guidelines for Utility Customer Management and Metering (English and Spanish)	07/91	--
Assessment of Personal Computer Models for Energy Planning in Developing Countries (English)	10/91	--
Long-Term Gas Contracts Principles and Applications (English)	02/93	152/93
Comparative Behavior of Firms Under Public and Private Ownership (English)	05/93	155/93
Development of Regional Electric Power Networks (English)	10/94	--
Roundtable on Energy Efficiency (English)	02/95	171/95
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A Synopsis of the Third Annual Roundtable on Independent Power Projects: Rhetoric and Reality (English)	08/96	187/96
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ESMAP Renewable Energy and Energy Efficiency Reports 1998-2004 (CD Only)	05/04	283/04
Regulation of Associated Gas Flaring and Venting: *A Global Overview and Lessons Learned from International Experience*	08/04	285/04
ESMAP Gender in Energy Reports and Other related Information (CD Only)	11/04	288/04
ESMAP Indoor Air Pollution Reports and Other related Information (CD Only)	11/04	289/04
Energy and Poverty Reduction: Proceedings from the Global Village Energy Partnership (GVEP) Workshop on the Pre-Investment Funding. Berlin, Germany, April 23-24, 2003.	11/04	294/04
Global Village Energy Partnership (GVEP) Annual Report 2003	12/04	295/04
Energy and Poverty Reduction: Proceedings from the Global Village Energy Partnership (GVEP) Workshop on Consumer Lending and Microfinance to Expand Access to Energy Services, Manila, Philippines, May 19-21, 2004	12/04	296/04
The Impact of Higher Oil Prices on Low Income Countries And on the Poor	03/05	299/05
Advancing Bioenergy for Sustainable Development: Guideline For Policymakers and Investors	04/05	300/05
ESMAP Rural Energy Reports 1999-2005	03/05	301/05
Renewable Energy and Energy Efficiency Financing and Policy Network: Options Study and Proceedings of the International Forum	07/05	303/05
Implementing Power Rationing in a Sensible Way: Lessons Learned and International Best Practices	08/05	305/05
The Urban Household Energy Transition. Joint Report with RFF Press/ESMAP. ISBN 1-933115-07-6	08/05	309/05
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Analysis of Power Projects with Private Participation Under Stress	10/05	311/05
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ESMAP/World Bank Group
1818 H Street, N.W.
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http://www.worldbank.org/esmap