Northeastern Brazil Groundwater Project
PROASNE
(2000 – 2004)

(CIDA Project A-019777-006)

Closing Report

Submitted to the

Brazil and Southern Cone Division
Americas Branch
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by

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EXECUTIVE SUMMARY

The Northeastern Brazil Groundwater Project (CIDA Project A-019777-006) also known by the acronym PROASNE from its title in Portuguese, ended on December 31st 2004 after nearly five prolific years of operation. This closing report is being submitted about one year after the end of the project. The relatively long time span between the termination date and the submission of this report permitted a better evaluation of the results and to assess whether the outcomes are showing signs of longer-term sustainability. On this last point, it is gratifying to observe that our Brazilian partners have already implemented some of the technologies and models introduced during the project. In other cases, however, further evaluation and testing will be required before the technologies are fully adopted.

PROASNE was a multi-partner project led by two prestigious national organizations: Serviço Geológico do Brasil (CPRM) of the Ministério de Minas e Energia, and the Geological Survey of Canada of Natural Resources Canada. The project operated in four pilot areas in three states of northeastern Brazil: Ceará, Pernambuco and Rio Grande do Norte. One of its greatest achievements was to have succeeded in implementing a highly technical agenda in conjunction with a community-oriented social and gender program in such a way that there was full collaboration between the two entities.

This report is made up of eight parts. Part 1 presents a summary of the project beginning with a table containing the project's tombstone data, followed by a brief outline of the content of the report and on how to use the accompanying CD-ROM. This is followed by an overview in which the technical and the social programs are described in some detail, as well as a description of how the project was managed and by whom. Also included in part 1 is a review of the project's goal and purposes, a list of activities and stakeholders, and how the project fared in terms of meeting CIDA's priorities and objectives in Brazil. Finally, part 1 ends with an examination of the variance between what was originally planned and what was effectively accomplished by the project.

Part 2 examines the results achieved at the output, outcome and impact levels. For each level, the actual results obtained are compared with what had been anticipated at the onset of the project. The overall conclusion is that the project accomplished far more than the organizers had originally thought possible particularly in the social and gender areas where neither of the lead partner organizations had much previous experience. The success achieved in the social and gender areas can be largely attributed to the competence and motivation of the operational teams made up of a few social service professionals and scores of students and volunteers.

Development and management factors are examined in parts 3 and 4 respectively. Amongst the development factors, we analyze the relevance and appropriateness of the project, its cost effectiveness and how sustainable the results are expected to be in the long term. Some factors affecting sustainability are presented and discussed. On the management side, the report examines the sharing of responsibilities, the utilization of human resources, and how the budget was administered. Budgetary and financial issues, with detailed expenditure tables showing the pledged and actual amounts contributed by all the partners, are further discussed in part 5.

Some of the main challenges faced by the management team during implementation of the project are discussed in part 6, along with some valuable lessons learned. Part 7 deals with the issue of intellectual property.

Finally, in part 8, the reader is presented with a discussion and a table showing how the project benefited Canadians in general, and specifically the Canadian private sector, which is always a concern to the Government of Canada and to the Canadian taxpayers.

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SUMÁRIO EXECUTIVO

O projeto Água Subterrânea no Nordeste do Brasil (projeto A-019777-006 da CIDA) conhecido também pela sigla PROASNE, terminou oficialmente no dia 31 de dezembro de 2004 após quase cinco anos em operação. Este relatório de encerramento está sendo submetido aproximadamente um ano após a conclusão do projeto. O período relativamente longo entre a data do termino do projeto e a elaboração deste relatório permitiu uma melhor avaliação dos resultados obtidos tendo, inclusive, condições de verificar se os mesmos estão mostrando sinais de sustentabilidade a longo prazo. Neste aspecto, é gratificante observar que os parceiros brasileiros já aplicaram algumas das tecnologias e modelos introduzidos pelo projeto. Em outros casos, entretanto, uma avaliação mais aprofundada dos resultados vai ser necessária antes que as tecnologias sejam plenamente adotadas.

O PROASNE foi um projeto desenvolvido em parceria com várias instituições governamentais e não governamentais, conduzido por duas organizações nacionais prestigiosas: o Serviço Geológico do Brasil (CPRM) do Ministério de Minas e Energia, e o Geological Survey of Canada do Ministério de Recursos Naturais do Canadá. O projeto atuou em quatro áreas piloto em três estados no Nordeste do Brasil: Ceará, Pernambuco e Rio Grande do Norte. Uma de suas realizações mais notáveis é de ter compatibilizado ações essencialmente técnicas com atividades sociais e de gênero em uma perspectiva comunitária, e que houve plena colaboração entre as duas áreas.

Este relatório é composto de oito partes. A primeira parte apresenta um sumário do projeto que começa com uma tabela que contem os dados de base do projeto, seguido por um esboço breve do conteúdo e como usar o CD-ROM que acompanha o relatório . Em seguida é apresentada uma visão geral do projeto onde são descritos detalhes dos programas técnicos e sociais, dando também uma descrição de como o projeto foi gerênciado e a composição do comitê de gestão. É incluída também nesta primeira parte uma apresentação do alvo principal e dos objetivos do projeto, listas das atividades e dos parceiros, e uma discussão sobre o alcance das prioridades e dos objetivos da CIDA no Brasil pelo projeto. Finalmente, conclui-se esta primeira parte com uma avaliação entre o que foi planejado e o que foi, de fato, realizado pelo projeto.

A segunda parte examina os resultados alcançados a curto, médio e longo prazo. Para cada nível, os resultados reais obtidos são comparados com o que tinha sido previsto inicialmente. A conclusão desta análise é que o projeto ultrapassou em grande medida o que se pretendia desenvolver, particularmente na área social e de gênero, onde nenhum dos parceiros principais tinha experiência anterior. O sucesso alcançado na área social e de gênero pode na maior parte ser atribuído à competência e à motivação das equipes que implementaram as ações, compostas de profissionais da área social com o apoio de estudantes e voluntários.

Os fatores de desenvolvimento e de gerência são examinados nas partes 3 e 4 respectivamente. Dentre os fatores de desenvolvimento, foi analisada a relevância e a aplicabilidade do projeto, sua eficácia em termos de custo e se há a possibilidade de esperar que os resultados sejam sustentáveis a longo prazo. Alguns fatores que afetam a sustentabilidade são apresentados e discutidos. Sobre a questão da gerência, o relatório examina a distribuição das responsabilidades, a utilização de recursos humanos, e como o orçamento foi administrado. As

questões orçamentárias e financeiras são discutidas em mais detalhes na parte 5, utilizando tabelas para comparar o que tinha sido inicialmente prometido por todos os parceiros com as contrapartidas que foram oferecidas na realidade.

Alguns dos desafios enfrentados pela equipe da gerência durante a execução do projeto são discutidos na parte 6, junto com algumas lições aprendidas. A parte 7 trata das questões de propriedade intelectual.

Finalmente, a parte 8, apresenta uma discussão e uma tabela mostrando como o projeto beneficiou os canadenses de uma maneira geral, e especificamente o setor privado canadense, um assunto que é sempre de interesse ao governo do Canadá e aos contribuintes canadenses.

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31 de outubro de 2005

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1. PROJECT SUMMARY

1.1 Tombstone Data

Country/region	Brazil/Northeast (states of Ceará, Pernambuco, Rio Grande do Norte)
Project name	Northeastern Brazil Groundwater Project - PROASNE
Project number	CIDA Project A-019777-006
Priorities addressed	Drought/water supply in NE-Brazil; institutional strengthening; social and gender equity in rural communities; environmental issues
Project budget (C$)	CIDA: Initial budget: $1,360,000 augmented to $1,565,000 in June 2002 Canadian lead partner: $912,680; Other Canadian partners (est.): $147,000; Brazilian partners (est.): $4,000,000
Key Project Dates	1. Project development begins: March 1998 2. Project approved: April 2000 3. Project Implementation Plan approved: January 2001 4. Amendment #1: Allowing coverage of local expenses: Feb. 01 5. Amendment #2: 15% budget increase ($205,000): July 02 6. Amendment #3: Extend project by 6 mo (to June 30, 04): Aug. 03 7. Amendment #4: Extend project by 6 mo (to Dec. 31, 04): June 04 8. End of project: December 31, 2004
Lead partners	Canada: Geological Survey of Canada (GSC); Earth Sciences Sector (ESS); Natural Resources Canada (NRCan) Brazil: Serviço Geológico do Brasil (CPRM); Ministério de Minas e Energia (MME)
Line of business	National natural resources and environmental research institutions

1.2 Notes on the content of report and on using the accompanying CD-ROM

Throughout this report, there are references made to the large number of separate documents that were produced during the life of the project. These include a variety of progress and specialty reports, published articles, media releases, Power Point presentations, and others. The majority of these documents can be found on the accompanying CD-ROM, which also contains an electronic version of the present report with live links to most of the documents referred to above. To access the report on the CD-ROM, double-click on the file "***PROASNE_Closing_Report.doc***" in the root directory (this is a shortcut to the source document of the same name in the directory called *PROASNE_PCR)*. The report is in MS-Word for Windows but most of the documents linked to it are either in *pdf* or *html* formats. If opening documents from the CD-ROM is sluggish, users should copy the entire content of the CD-ROM to their hard drive.

The complete project website is also included on the CD-ROM. The reader can access it from the root directory by double-clicking the shortcut file "***PROASNE_Web.html***". The project website contains links to most of the project documents plus hundreds of photographs, maps, newspaper articles and links to other websites which have highlighted the work of PROASNE.

The project website is expected to remain up and running on a server at the Geological Survey of Canada until at least December 2006[1]. It can be accessed through the following URL: http://proasne.net. This report is also posted on the project website and it can be accessed at: http://proasne.net/PROASNE_Closing_Report.pdf

Please read the "*Read me*" file on the accompanying CD-ROM for additional information on ways ton access this report and linked documents electronically.

1.3 Project overview

1.3.1 Introduction

The Geological Survey of Brazil (CPRM), the lead Brazilian partner, has the mandate of investigating, documenting and inventorying the country's groundwater supply. It also has the responsibility of monitoring the quality of the groundwater consumed by the public, and runs a quality control laboratory in Rio de Janeiro for that purpose. It compiles well data for the entire country, and keeps enormous data banks in its computers, which it uses to assess the supply vs. demand situation, allowing action to be taken whenever necessary.

A region where water-related action is constantly needed is the Northeast, an area of roughly 1 million square kilometres (about the size of Ontario), which some 25 million people call home. The Northeast is often referred to as the most densely populated semi-arid region on earth. Once every decade, on average, it is subjected to a catastrophic El-Niño related drought that can last between two and four years. These droughts are particularly devastating for the rural population by causing the disintegration of the main life-sustaining activity in the region, subsistence agriculture. When droughts occur, a large proportion of the population, mostly the young working-age men, migrate out of the region, leaving the women, children and the elderly to cope with hunger and diseases, and to become completely dependent on inadequate government food and water distribution programs.

Even when there is no drought, problems exist because of the scarcity and the poor quality of both ground and surface water. Precipitations are low (from 500 to 1000

[1] In mid-December 2004, the PROASNE website was averaging over 550 requests for pages per day from about 40 countries, with more than 80% of the requests coming from Brazil. The PROASNE website has links on the websites of more than 20 institutions, including the United Nations, the Department of Foreign Affairs and International Trade, and Environment Canada.

mm/year) and evaporation is very high (about 2000 mm/year) leaving most surface reservoirs with little water, which becomes polluted months before the rains begin to fall again. Groundwater offers little relief; it is scarce in most places due to the very hard and impervious nature of the bedrock, and where it occurs, it is generally too saline to be consumed by humans without treatment.

Even so, better groundwater access is one of the few options available to improve the lives of the millions who live in this region. Other options include piping water from the larger surface reservoirs that don't go dry during droughts – such a pipeline system seems to work well in Rio Grande do Norte – or from large rivers. One such scheme called the "Diversion of the São Francisco River" will probably never be implemented due to technical difficulties and costs, but continues to be a favoured solution of many politicians and provokes heated debates mostly at election time.

1.3.2 Technical Program

In an attempt to improve its capabilities in groundwater management in the Northeast, CPRM sought to take advantage of an existing collaboration agreement it had with GSC, to acquire relevant Canadian technologies. The two organizations began planning a project in January 1998. After a two-year development phase (see Development History on the accompanying CD-ROM), they had assembled all the elements necessary to launch a technology transfer project that became known as the **Northeastern Brazil Groundwater Project or PROASNE** (for *Projeto Água Subterrânea no Nordeste do Brasil*) and which turned out to be one of the most successful international collaboration projects ever conducted by either organization.

In a nutshell, PROASNE worked like this:

In 2000, CPRM launched a three-year plan to improve the groundwater knowledge base throughout the Northeast. Canada, through GSC, was asked to provide modern technologies that would help CPRM carry out this mandate. GSC offered some of its own personnel, but it was agreed that most of the technologies would be transferred to the Brazilians by Canadian private sector firms and universities, since GSC didn't have the human resources needed to accomplish this mandate on its own.

After much consultation in Brazil as well as in Canada, it was established that the technologies that could best help improve NE-Brazil's water situation, and that Canada was able to provide, included:

1. Advanced technologies in groundwater modeling;
2. Geophysical exploration for groundwater (both ground-based and airborne);
3. Groundwater information systems and database development;
4. Alternate energies (specifically solar) in groundwater management;
5. Groundwater geochemistry (specifically isotope methods to investigate the high salinity problem);
6. Remote sensing methods and geographical information systems;
7. Artificial aquifer recharge;
8. Hydrogeological mapping,
9. Borehole logging,
10. Drilling techniques,
11. Well stimulation by hydraulic fracturing, etc.

The technologies were transferred through different types of activities (see *Activities*, Section 1.5 below), in four pilot areas in three states (see Figure 1).

When the project was first submitted to CIDA for funding, the Agency was very enthusiastic because it contained several elements that corroborated its own strategic framework for Brazil. First, the project addressed the water theme, one of the priority issues for development worldwide; second, it focused on the northeast of Brazil, one of the poorest regions on the continent and one where CIDA was anxious to become involved; and thirdly, the project had strong partners with a proven track record (GSC and CPRM were finishing another successful CIDA-funded project initiated in 1995 – see *Stakeholders*, Section 1.6 below).

Despite their initial interest in the project, CIDA found several aspects of the proposal lacking in substance and insisted that these be addressed in a revised proposal before granting final approval. The two main areas of concern to CIDA were a lack of community involvement in the project plan, and the fact that the proposal didn't have a gender strategy. They also found weaknesses in certain administrative and management aspects, and they wanted the project proponents to develop an environmental strategy that would satisfy the requirements of the Canadian Environmental Assessment Act.

All these aspects were further developped during a 6-month inception phase (April to September 2000) at the end of which a Project Implementation Plan (PIP) was submitted to CIDA. CIDA finally approved the project in January 2001.

1.3.3 Social and Gender Programs

Incorporating a meaningful social and gender component to the project was, to say the least, a major challenge for organizations like GSC and CPRM that had no tradition of working in these areas. But in the end, the social and gender programs added immensely to the project and were regarded by many, including CIDA, as very successful elements of PROASNE.

The social and gender programs were conducted in parallel to the technical program, in the same pilot areas, but utilizing mostly Brazilian social workers. CPRM hired Luciana Cibelle dos Santos as National Social Coordinator to oversee the overall program, and GSC provided a social and gender specialist (hereinafter called the Canadian Social Coordinator) to assist her and to contribute Canadian experience. She was Ms. Sherry Nelligan of the Toronto firm Gender Equality Inc.

Once these key positions were filled, it was necessary to recruit one additional person for each pilot area who would coordinate the social activities in her region. It took some time for the project organizers and the National and Canadian social coordinators to reach a consensus about what role the pilot area coordinators would play, what would be their responsibilities, and from which segment of the labour force should they be recruited. For example, would they handle the social work only, or would they have the responsibility for both the social and gender agenda? Should they be consultants, employees of NGOs, or should they be attached to established organization that would continue to pay their wages?

These questions were critical for the success of the social program and needed to be considered carefully. They were finally resolved through trial and error. For example, the project experimented at first with distinct social and gender coordinators for each pilot area. But it was found that this formula created difficulties due largely to competing interests between the social and the gender specialists operating in the same pilot area, which at times gave rise to conflicts. Instead, the decision was taken to train the social coordinators into doing gender work, and have only one social/gender coordinator per pilot area[2].

[2] In Pernambuco, the project initially recruited Dr. Adélia de Melo Branco of Fundação Joaquim Nabuco, a specialist of gender issues educated in Canada, as gender coordinator for that state. She continued to provide valuable services and advice throughout the project even though the gender coordinator positions were abolished early in the project.

On the question of which segment of the labour force these coordinators should be recruited from, since CIDA and ABC do not authorize payment of local wages, hiring local consultants was not an option. Another possibility was to recruit a local or an international NGO to implement PROASNE's social program. After some discussions, the conclusion was reached that this was not a workable option either. The NGOs that we approached[3] indicated in no uncertain terms that they would run the program in accordance with their well-established methods. In other words, they wanted to operate independently, which would have made it difficult to harmonize the social and the technical components of the project, a condition that was considered important for the project to be successful.

Project organizers were therefore left with no choice but to recruit the needed personnel from local institutions that would continue to pay their wages. Qualifying institutions would have to be already engaged in social work, have properly trained personnel and be willing to let them work on a project that would not necessarily meet their current goals and objectives.

It turned out that the social services departments of the universities were keen to join the project partly as it would provide training and research opportunities for their students, and also because most wanted to be associated with a prestigious international project. Thus, several professors from the Federal University of Ceará (UFC) and the Federal University of Pernambuco (UFPE) became involved with some of their students; one professor from each university became the Social and Gender Coordinator for that state : Professor Walda Viana Brígido de Moura of UFC in Ceará, and Ana Cristina Brito Arcoverde of UFPE in Pernambuco (see also Table 1). The Social and Gender Coordinators of the two pilot areas in Rio Grande do Norte were recruited from two state organizations, which were also involved in the technical program: the Secretariat for Water Resources (SERHID) provided Ms. Fátima de Freitas Rêgo as coordinator for the Serrinha pilot area, and the Water and Sewers Company of Rio Grande do Norte (CAERN) provided Ms. Roberta Borges Medeiros as coordinator for the Caraúbas pilot area (identified as Apodi in Figure 1).

This method of recruiting social personnel turned out to be ideal and produced results that went far beyond our original expectations. The coordinators all became extremely

[3] Serious discussions were held with World Vision, Toronto; Water for People, St. John, New Brunswick; and Oxfam, Montreal.

dedicated to their tasks, they took complete responsibility and ownership of their projects, and they all showed a great deal of initiative and creativity in running their programs.

It should be mentioned that before the involvement of the Federal University of Ceará in 2002-2003, the position of coordinator was occupied by a social worker employed by the Municipality of Irauçuba, in which the pilot area is located. Her name was Rita Eugênia Santiago. For personal reasons, Ms. Santiago had to leave the project in mid-course, and this is when the University took over the coordination task in that pilot area. It should be noted, however, that having a coordinator who resided in the municipality meant that there was more frequent contacts between her and the residents, which offered some advantages.

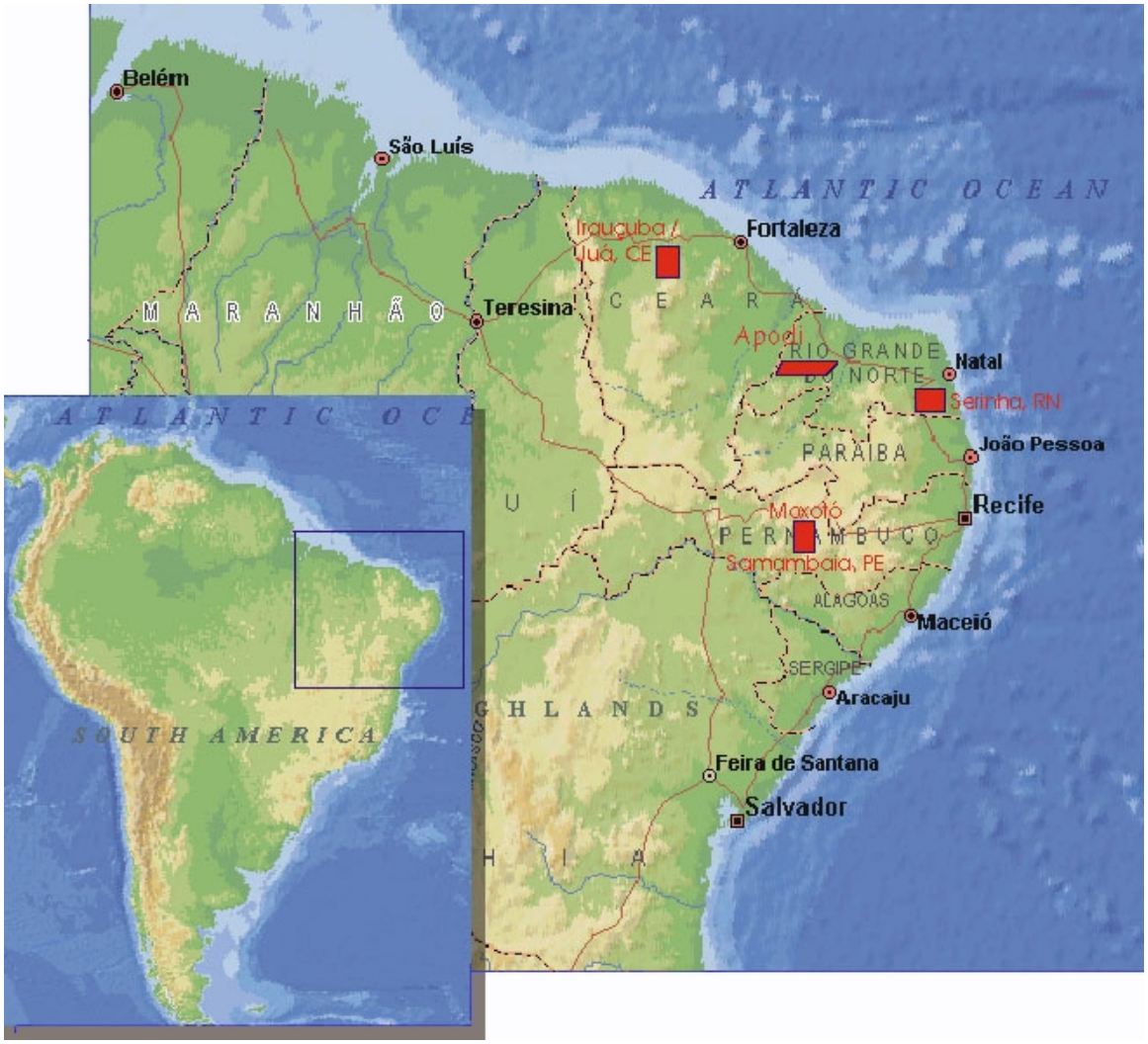

Figure 1. PROASNE operated in 4 pilot areas in 3 states: Ceará, Pernambuco and Rio Grande do Norte

The project's social area received a big boost when Comunidade Solidária/UniSol accepted to join forces with PROASNE by including all of PROASNE's communities in their Comunidade Ativa program. This national program was administered by the office of First Lady Ruth Cardoso and was designed to bring social development to the poorest communities in Brazil by recruiting volunteer university students and professors to carry out the social work in the field. Dozens of students and professors in a UniSol/PROASNE partnership carried out social work in PROASNE's pilot areas in 2001 and 2002.

1.3.4. Project Management

The GSC and CPRM co-managed the project. Each organization provided a full-time project manager or General Coordinator. CPRM also provided a Technical Coordinator, who oversaw all aspects of the technical program, and the National Social Coordinator to coordinate the social and gender activities. The Canadian General Coordinator was assisted by a Canadian social and gender specialist (the Canadian Social Coordinator) hired under contract, and whose responsibility it was to bring Canadian experience to the social and gender program run by the Brazilians. Each pilot area also had its own social and gender coordinator as indicated previously.

Technical coordinators were appointed in each participating state. In Ceará and Pernambuco, CPRM gave that responsibility to one individual from each of its regional offices in Fortaleza and Recife. In Rio Grande do Norte, where CPRM does not have an office, the technical coordinator was recruited from the Federal University of Rio Grande do Norte (UFRN) in Natal.

All these individuals formed the Steering Committee, which effectively ran PROASNE. The Steering Committee met twice a year, usually in April and September. For logistical reasons, Steering Committee meetings were usually held in Brazil. Table 1 lists the personnel that occupied the various positions on the Steering Committee during the course of the project (see also the corresponding web page which includes photos of the individuals and a project management chart).

1.3.5 Summary

For the readers who would like to learn more about how the project was developed, a document entitled *Development History* is provided on the accompanying CD-ROM. Other early documents which may be of interest to the reader include: the original *Concept Paper*, the first document to be submitted to CIDA in May 1998, which presented the rationale for the project; a report on the *First Development Mission* to Brazil in Dec. 1998; the *Project Proposal* which was conditionally approved by CIDA in April 2000; an *Environmental Analysis* required by CIDA for all its projects that might produce environmental impact; and finally, the *Project Implementation Plan* which officially gave the partners the green light to proceed with full project implementation when it was approved in January 2001.

Table 1: Project Management Team and Members of the Steering Committee – 2000-2004

Canadian Fiscal Year / responsibility	2000-2001	2001-2002	2002-2003	2003-2004
Brazilian Project Manager (General Coordinator)	**Samir Nahass** - CPRM, Rio de Janeiro	**Enjôlras de A. Medeiros Lima -** CPRM, Recife	**Enjôlras de A. Medeiros Lima** - CPRM, Recife	**Humberto Albuquerque** - CPRM, Rio de Janeiro
Canadian Project Manager (General Coordinator)	**Yvon Maurice** - GSC/ESS/NRCan, Ottawa	**Yvon Maurice** - GSC/ESS/NRCan, Ottawa	**Yvon Maurice** - GSC/ESS/NRCan, Ottawa	**Yvon Maurice** - GSC/ESS/NRCan, Ottawa
Technical Coordinator	**Humberto Albuquerque** - CPRM, Rio de Janeiro	**Fernando Feitosa** - CPRM, Fortaleza	**Fernando Feitosa** - CPRM, Fortaleza	**Humberto Albuquerque** - CPRM, Rio de Janeiro
Social Area Coordinator	Vacant	**Luciana Cibelle dos Santos**- CPRM, Recife	**Luciana Cibelle dos Santos**- CPRM, Recife	**Enjôlras de A. Medeiros Lima** - CPRM, Recife
Canadian Social & Gender Specialist	**Sherry Nelligan** - Gender Equality Inc., Toronto	**Sherry Nelligan** - Gender Equality Inc., Toronto	**Sherry Nelligan** - Gender Equality Inc., Toronto	Vacant
Ceará Technical Coordinator	**Fernando Feitosa** - CPRM, Fortaleza	**Oderson de Souza Filho** - CPRM, Fortaleza	**Oderson de Souza Filho** - CPRM, Fortaleza	**Oderson de Souza Filho** - CPRM, Fortaleza
Ceará Social/Gender Coordinator	**Rita Eugênia Santiago** - Municipality of Irauçuba	**Rita Eugênia Santiago** - Municipality of Irauçuba	**Walda Viana Brígido de Moura** - UFC, Fortaleza	**Walda Viana Brígido de Moura** - UFC, Fortaleza
Pernambuco Technical Coordinator	**Enjôlras de A. Medeiros Lima** - CPRM, Recife	**José Carlos da Silva** - CPRM, Recife	**José Carlos da Silva** - CPRM, Recife	**José Carlos da Silva** - CPRM, Recife
Pernambuco Social/Gender Coordinator	**Ana Cristina Brito Arcoverde** - UFPE, Recife	**Ana Cristina Brito Arcoverde** - UFPE, Recife	**Ana Cristina Brito Arcoverde** - UFPE, Recife	**Ana Cristina Brito Arcoverde** - UFPE, Recife
Rio Grande do Norte Technical Coordinator	**Walter Medeiros** - UFRN, Natal	**Walter Medeiros** - UFRN, Natal	**Walter Medeiros** - UFRN, Natal	**Walter Medeiros** - UFRN, Natal
Rio Grande do Norte (Serrinha) Social/Gender Coordinator	**Maria Fátima de Freitas Rêgo** - SERHID, Natal	**Maria Fátima de Freitas Rêgo** - SERHID, Natal	**Maria Fátima de Freitas Rêgo** - SERHID, Natal	**Maria Fátima de Freitas Rêgo** - SERHID, Natal
Rio Grande do Norte (Caraúbas) Social/Gender Coordinator	Vacant	**Roberta Borges de Medeiros** - CAERN, Natal	**Roberta Borges de Medeiros** - CAERN, Natal	**Roberta Borges de Medeiros** - CAERN, Natal

1.4 Project goal and purposes

The project goal, purposes, activities, as well as anticipated results (outputs, outcomes, impacts) were originally defined in the project's Logical Framework Analysis (LFA) which was included with the original project proposal in April 2000. A revised version of the LFA (Oct. 2000) was submitted as part of the Project Implementation Plan (PIP) and is presented in Appendix A-1. It can also be accessed on the accompanying CD-ROM.

On the revised LFA, the project goal and purpose were stated as follows:

GOAL: To contribute to greater equity in Northeastern Brazil by developing the region's groundwater resources

PURPOSE: To provide Brazilian institutions with the tools to improve the water situation (access, abundance, quality) to communities in pilot areas of three northeastern states (Pernambuco, Ceará, Rio Grande do Norte)

Although these definitions correctly reflected the essence of what was envisioned for the project, they did not adequately represent what the project was shaping up to become after about one year of operation, particularly with regards to its social and gender agenda. As a result a new LFA was produced in April 2001 during a Result Based Management Workshop in Recife, which was delivered by Ms. Simone Direito of CIDA/Brasilia and attended by most of the technical and social and gender coordinators (see Table 1 above for a list of project personnel). This New LFA exists in Portuguese only and is reproduced in Appendix A-2. It can also be accessed on the accompanying CD-ROM.

The goal and purposes were stated as follows on the new (April 2001) LFA (translated from Portuguese) :

GOAL: To contribute to greater equity in regards to the groundwater resources of semi-arid northeast Brazil, in order to achieve better quality of life for the local population through a participatory process

PURPOSES:

1. To provide Brazilian institutions with the tools they need to improve the water situation (access, abundance, quality) of the communities in the pilot areas of three states (Pernambuco, Ceará and Rio Grande do Norte)

2. To construct the socio-economic and environmental profile of the targeted communities

3. To build the capacity of the local population in the rational use of water

4. To develop social and educational applications in the area of health, the environment and education through the process of "citizenship"[4]

These new definitions were the ones that were maintained for the remainder of the project even though the social and gender program went far beyond the water issues in its attempts to improve lives in the rural communities in which it operated.

1.5 Activities

The activities carried out under the project were basically of three types:

1. ***Capacity Building/Technology transfer***, generally involving Canadians and Brazilians working together either in Brazil or in Canada. Depending on individual situations and requirements, this was done through:
    a. ***Training of Brazilian personnel in Brazil:*** short courses, workshops seminars, equipment demonstrations in the field, generally for periods ranging from 2 to 6 weeks.
    b. ***Training of Brazilian personnel in Canada:*** usually at the premises of a private sector partner, generally for periods ranging from 8 to 12 weeks.
    c. ***Joint pilot scale projects:*** generally long term, one year or more, involving several missions to Brazil and/or to Canada.
    d. ***Technical visits to Canada:*** generally involving 5 to 10 Brazilians traveling to Canada for 1 to 2 weeks.
    e. ***Participation at national and international events***, for the purpose of disseminating results of the project. Some events involved joint Canadian and Brazilian participation, but most were either attended by Brazilians or Canadians.
2. ***Community-based socio-economic and educational activities.*** These were carried out mostly by PROASNE's Brazilian social and gender coordinators and partner institutions in pilot area communities, with supervision/guidance from a Canadian specialist. They can be divided into the following categories:
    a. ***Diagnosis and planning:*** community social, gender, and economic sex-disaggregated data collection and analysis; environmental diagnosis; planning meetings, etc.
    b. ***Educational:*** workshops and seminars involving small community groups (children, adults, women, members of associations, etc.) on a wide range of

[4] This concept of "citizenship" (cidadania) is unique to Brazil. The document "Citizenship & Equity; a Brazilian vision of development and the Canadian contribution", on the accompanying CD-ROM, provides an interesting discussion of this topic.

topics including, water conservation and usage, citizenship, gender, health, hygiene, environmental protection, economic development of communities. etc.

c. ***Community-wide activities:*** organized by PROASNE coordinators and partners, mainly to stimulate interest and participation in project activities, sensitize the community to project issues, and to disseminate knowledge. They include community fairs (country; science); cultural events; community meetings; visits by Canadian delegations; special commemorations (e.g. World Water Day).

d. ***Small community projects:*** funded by PROASNE and partners, to generate income for the community (e.g. tilapia fishery in Juá); better the environment (e.g. garbage disposal/recycling in Juá and Caraúbas); improve living conditions (e.g. solar desalinization plant in Livramento; piped-in water in Mirandas).

e. ***In-depth research on specific topics (social and/or gender):*** carried out by PROASNE's social coordinators based on experience derived from their work with the pilot area communities and often resulting in major monographs as output. Topics range from Sustainable development of communities to Gender equity.

3. ***Implementation activities.*** These consist of activities carried out by the Brazilian partners with limited Canadian participation, to apply the technologies transferred to them through Type 1 activities (see above). Some of these projects have been initiated and completed, while others are ongoing or have not yet been initiated at the time of writing. In this category are also included the activities carried out by the Brazilian partners under CPRM's 3-year plan, to which PROASNE provided technological support as needed.

Lists of activities carried out during the project in the first two categories above can be found in table format in Appendix B (B-1 and B-2 respectively), with links to relevant documents on the accompanying CD-ROM. Note that the number of activities is very large, with individual activities often taking place simultaneously (e.g. during the same field trip) or over more than one event, so that it is very difficult to capture everything in a table. This is especially true of the community-based activities, which were delivered mostly by personnel on site with relatively easy access to the field. For this reason, we recommend examining the relevant reports by clicking on the hypertext links in Appendix B. Only by doing so will the reader get a full appreciation of the work that was actually done.

For the technical area, the reader may access a one-page list with brief descriptions of the principal technologies that were transferred during the project, by following this link.

1.6 Stakeholders

1.6.1 Original (founding) partners

PROASNE was funded by a contribution from **CIDA's Technology Transfer Fund (TTF)**. CIDA and its Brazilian counterpart, **Agência Brasileira de Cooperação (ABC)** jointly select and approve projects to be implemented under the fund and monitor progress. The **Geological Survey of Canada (GSC)** and the **Geological Survey of Brazil (CPRM)** jointly developed PROASNE over a two-year period (March 1998 to April 2000), and were the lead partners in the Project. GSC and CPRM have a long standing Memorandum of Understanding (MOU) and were lead partners in another CIDA-funded project before PROASNE: the Canada-Brazil Cooperation Project for Sustainable Development in the Minerals Sector – 1995 / 2000 (CIDA Project 204/13886).

There were four other founding partners of PROASNE:

- The Economic Development Agency for NE-Brazil - SUDENE;
- The Ceará Branch of the Brazilian Groundwater Association - ABAS/CE;
- The Ministry of Mines and Energy - MME;
- Comunidade Solidária Social Program and its community action group, UniSol.

These original partners played an important role during the early stages of the Project by providing much needed political and institutional support. The high profile Comunidade Solidária Social Program, with direct links to the office of the President of the Republic (Cardoso) and the First Lady went on to be extremely active and a major contributor of social actions in all of PROASNE's pilot areas until its operations were put on hold by the new Federal Government (Lula) when it took office in January 2003. SUDENE, on the other hand, was disbanded soon after the launching of PROASNE and contributed little to the Project.

1.6.2 Brazilian and Canadian partners and participants

The technology was transferred from Canada to Brazil mostly by Canadian private sector firms, and to a lesser extent by Canadian universities and GSC personnel. Although the transfer of technology was meant to enhance the capacity of Brazilian institutions, most

technology transfer events (workshops, seminars, etc.) included nearly as much knowledge transfer from Brazilian professionals to the Canadians and to other Brazilians taking part in each event. The transfer of technology was very much a two-way exercise.

The Brazilians received the Canadian technology, but also contributed very significantly to providing the all important background and complementary information, without which the Canadian technology could not be adapted to the Brazilian context.

In the social area, the program was delivered by teams of Brazilian social workers associated with a number of local organizations in the three participating states. Their actions were coordinated by a Canadian specialist and a Brazilian Social Area Coordinator (see Sections 1.3.3 and 1.3.4 above). They provided education on water and environmental issues (water conservation, preservation of water resources, hygiene, waste disposal, etc.), and dealt with numerous other topics that were aimed at reducing poverty and improving the lives in the communities. These included improving agriculture and beneficiation of agricultural products; income generation projects; enhancing the role of women in water management and decision making on a variety of issues; promoting women's self esteem and independence, etc.

An interesting fact is that even with minimal funding (see Section 5 on Budget), the social component of the project had no difficulty in attracting participants from a wide range of organizations resulting in new partnerships being (informally) created all the time. This may have been related to the fact that PROASNE provided a unique chance for the Brazilians to work on a highly visible international project, which for many was viewed as a very valuable career enhancing opportunity.

Table 2 provides a list of Brazilian and Canadian partners in the Project since its inception with links to their websites. Canadian partners are mostly private sector firms that contributed to the transfer of technology to Brazil, whereas the Brazilian partners are either organizations that have received this technology and/or that have conducted projects or have contributed to PROASNE's actions in the pilot areas.

Table 2: Brazilian and Canadian partner institutions (click underlined text to access website)

Brazilian Partners	Canadian Partners
ABC - Brazilian Cooperation Agency	CIDA - Canadian International Development Agency; funding agency, approved the project and provided advice and guidance throughout
CPRM - Geological Survey of Brazil	
CAERN - Water and Sewers Company of Rio Grande do Norte	Geological Survey of Canada, Earth Sciences Sector, Ottawa, Ont; provided expert management and accounting services; quality control of airborne survey data, and seminars and research in remote sensing/ GIS and geophysics in Brazil and in Canada
ABAS/CE - Brazilian Groundwater Association/Ceará Branch	
CPRH - Environmental Company of Pernambuco	Waterloo Hydrogeologic Inc., Waterloo, Ont; carried out a joint project in groundwater modeling; developed a Groundwater Information System and provided training in Canada and in Brazil
CS - Comunidade Solidária	
UniSol - Universidade Solidária	Sunmotor International, Calgary, Alb; developed equipment to pump and treat water using solar energy and participated in the building of the experimental solar station in Livramento, Ceará
FUNDAJ - Joaquim Nabuco Foundation	
IHAB - Hydro-Environmental Institute of Brazil	
SERHID - Water Resource Secretariat of Rio Grande do Norte	Fugro Airborne Surveys Ltd., Mississauga, Ont; carried out three airborne geophysical surveys in pilot areas, produced state-of-the-art maps and report
FUNASA - National Health Foundation	
CAGECE - Water and Sewers Company of Ceará	**Groundwater Services International**, Mississauga, Ont; provided information on groundwater management and drilling techniques
COGERH - Water Management Company of Ceará	
SOHIDRA - Waterworks Secretariat of Ceará	MIR Télédétection, Longueil, Qué; gave lecture in remote sensing at Fortaleza 2000
SEMACE - Ceará State Environmental Secretariat	CH2M Hill Canada Ltd., Waterloo, Ont; provided seminar and short course on artificial aquifer recharge and guided a tour of facilities in Canada
FUNCEME - Meteorological and Water Resources Foundation of Ceará	
SEBRAE - Brazilian Assistance Service to Small Businesses	University of Waterloo, Waterloo, Ont; provided training and conducted research in groundwater salinity; provided a tour of labs in Canada
ATOS - Applied Sustainable Technical Training Organization	
ESAM - Mossoró School of Agronomy	University of Victoria, Victoria, BC; conducted research in underground dams technology
DANCOR S.A. Indústria Mecânica, Rio de Janeiro	
UFPE - Federal University of Pernambuco	**Bemex Consulting International**, Victoria, BC; provided training in ground geophysics
UFRN - Federal University of Rio Grande do Norte	Infotierra Ltd., Sherbrooke, Qué; provided training in remote sensing and developed an integrated approach to groundwater prospecting
UERN - State University of Rio Grande do Norte	
UFC - Federal University of Ceará	Komex International, Calgary, Alb; trained Brazilians in ground geophysics and selected and characterized pilot areas for airborne surveys
Banco do Brasil	
Banco do Nordeste	PCI Geomatics, Toronto, Ont; provided software for training in remote sensing techniques
Municipal Prefecture of Serrinha/RN	
Municipal Prefecture of Caraúbas/RN	Gender Equality Inc., Toronto, Ont; organized and managed the project's social and gender programs
Municipal Prefecture of Custódia/PE	
Municipal Prefecture of Irauçuba/CE	Conflict Mediation Services of Downsview, Toronto, Ont; ran a short course during 1st Social Mission to Canada in September 2001
Municipal Prefecture of Tejuçuoca/CE	
Municipal Prefecture of Itapajé	**Palacky Services**, Ottawa, Ont; ran a gender short course in Ottawa during 1st Social Mission to Canada

1.7 Meeting CIDA's Priorities

As stated in Section 1.3.2 above, the joint GSC/CPRM proposal to conduct a project on groundwater in northeastern Brazil was received favourably at CIDA, largely because the project addressed several of the Agency's top priority issues in Brazil:

- The water theme, an issue of global importance, and one perceived as being at the root of inequity in the world's poorest countries, including Brazil;
- The Northeast of Brazil, one of the continents poorest regions, and one where CIDA was anxious to be present;
- Addressing the very top priorities of the Brazilian Government (i.e. reducing poverty in Brazil's poorest region and bringing solutions to the water shortages in that drought-prone area)

The project also contributed in many ways to CIDA's overall program priorities, which are[5] :

1. To provide basic human needs;
2. To foster gender equality;
3. To promote the development of environmentally sound infrastructure;
4. To enhance human rights, democracy and good governance;
5. To support private sector development;
6. To help protect the environment

The project contributed directly to the first two priorities by improving access to water, one of the most basic human needs, and by promoting women's equality through a variety of actions under PROASNE's gender program. With regards to access to water, the project provided improved access in each of the four pilot areas according to the needs expressed by the population.

In Caraúbas, RN, some 250 families were provided with piped-in water in their homes, a major accomplishment of PROASNE in partnership with CAERN. In Serrinha, RN, a simple water supply system (a well with an electric or wind pump and desalinization equipment) was installed in each of the three communities where the project operated. This was done in partnership with the *Secretaria dos Recursos Hídricos (SRH).* Piped-in water along with water tanks and three new wells were also provided by the project to the communities of the Samambaia pilot area in Pernambuco. In the Ceará pilot area, a solar pumping and desalinization station was installed in the small, non-electrified,

[5] These are given at this URL on CIDA's Website (updated September 24, 2004)

farming community of Livramento. This station, the first of it's kind in Brazil, makes use of Canadian solar technology and supplies some 25 families with good quality water. The station was inaugurated in November 2001 by then CIDA President Len Good, and later visited by the former Minister of International Cooperation, Susan Whelan.

In the area of gender equality, the project achieved remarkable successes in all four pilot areas, as is demonstrated throughout this report. Initially, the gender program was difficult to implant because few team members had any experience in this area. However, this was regarded as a challenge rather than an obstacle, and with time and a great deal of training, the team members all acquired the necessary skills and know how to conduct highly professional gender work in the communities. Through the creation of women's associations, women were trained in domestic water management, which provided them with a level of authority that they didn't have before and which in turn contributed a great deal to enhance their self-esteem.

Although PROASNE was not intended to address the other CIDA program priorities such as the environment, human rights or democracy, it did help develop the community-based private sector in all of the pilot areas by creating or improving local industries. In Juá, CE, for example, PROASNE established a small tilapia farming industry that now provides income to some 7 or 8 families, with great prospects for expansion. In Caraúbas, PROASNE's actions led to substantial improvement in the income generated by the local cashew and honey industries, amongst the most sustainable source of income for the region's farmers. PROASNE also created small clothing and arts and craft centres in all four pilot areas, which benefits the women.

1. 8 Variance between activities planned and implemented

In the Project Proposal and the Project Implementation Plan (PIP), as well as on the various versions of the Logic Model (see Appendix A), project activities were only defined in a general way. Which activities would be carried out was generally decided at the biannual Steering Committee Meetings to respond to specific needs identified by our partners.

Regarding the technical program, most – but not all – technologies that our partners wanted transferred to them were indeed transferred. A number of reasons can be given for not transferring those that were not, including the unavailability of specific technologies in Canada; the unavailability of Canadian specialists at the required time;

the unavailability of Brazilian technical staff with appropriate background and interest for training; difficulties of adapting certain Canadian technologies to Brazilian conditions; linguistic barriers; and other technical difficulties.

To list only a few examples, Artificial Aquifer Recharge was considered an important technology by the Brazilians and various attempts have been made to transfer this technology to Brazilian institutions. However, after a first seminar given by Canadian consultant CH2M Hill in June 2001, it was clear that to proceed with the next phase of the technology transfer, which was to carry out a pilot-scale project, could not be done in the pilot areas because the cost of carrying out the experiment could only be justified if a community of at least 50,000 people could be targeted. Since no community of this size exists in any of the pilot areas, the technology transfer in artificial recharge was suspended. It resurfaced as one of the activities proposed for a three-year extension to the project (2005-2008). It would have targeted a large urban centre, Recife, but CIDA turned down the request for an extension on the grounds that it constituted a major shift in the orientation of the project that should be dealt with in a new project.

Another area where technology transfer was curtailed due to operational factors was in the training of a technician in quality control of airborne geophysical surveys, specifically helicopter electromagnetic surveys. CPRM clearly needed someone properly trained in this area, but no one was available for training. It was important to train someone who would eventually become the person in charge of quality control of geophysical survey data at CPRM. The technician responsible for this task at CPRM left the organization in 2002, and no one was hired to replace him.

Language was a severe barrier to efficient technology transfer. It did not prevent the transfer of any specific technology, but it seriously limited the choice of trainers and trainees and the type of training that could be offered. For example, it was originally planned to train Brazilians in Canada on topics that required more in-depth teaching. But there were so few Brazilian that understood English or French amongst our partners, that the number that ended up coming to Canada for training was very small. Six came in total, and with one exception, they didn't speak English or French. Therefore, the training had to be done by trainers who could speak Portuguese or Spanish. Although this is not impossible to find in Canada, it seriously limits the choice of trainers and, consequently, the scope of what can be taught. The same applied for training in Brazil. In a few cases, non-Portuguese or Spanish speaking trainers were given the task to present seminars and courses to an audience made up largely of non-English speaking technicians. In

some cases, simultaneous translation was provided, but this could only be used in classroom situations and was rather expensive. In the field, usually an English or French speaking Brazilian, or a Portuguese or Spanish speaking Canadian could be found to translate. This was far from satisfactory, however, and in retrospect we can say that the language barrier was a major impediment to efficient technology transfer throughout the project.

In the social and gender areas, we can state with confidence that the project accomplished much more than had been anticipated. It is true that the initial expectations of the Project management team was not very high largely because of a lack of experience in this area, but it is also true that the level of achievement by the project astonished even the specialists who worked on the project, the beneficiary communities and their leaders, and even outsiders who commented after visiting the project's website where all these accomplishments are described in detail. Many testimonies exist to that effect, none more descriptive than the 80 or so local media articles that have been published about the project – see Appendix C-6. (See also transcripts of interviews with the Prefect of Caraúbas and other personalities following the Caraúbas Country Fair, 24-27 April, 2003 - in Appendix C-1)

2. RESULTS ACHIEVED

2.1 Results at the Output Level

2.1.1 Anticipated Outputs

Outputs are defined as the results derived directly from the activities of the project and measured using a series of indicators. The anticipated outputs and indicators are shown in the project LFA's in Appendices A-1 and A-2. The activities themselves are listed in Appendix B (B-1, B-2).

At the output level, the project's objectives for the technical area were to increase understanding of Canadian water management technologies and method through the transfer of these technologies to the technical personnel of partner/participating institutions. Since some of these technologies had never been used in Brazil, an assessment of their applicability to the Brazilian context was also required.

In the social and gender areas, what the project sought to achieve at the output level was to increase the consciousness of the communities and their leaders about what actions they can take to improve their lives in a number of areas, including community-based water management, health, poverty reduction, etc., and to provide them with some basic tools to achieve this.

2.1.2 Actual Outputs

In both the technical and social/gender areas, the project achieved the output level results that were anticipated and much more. One needs only to glance at the tables of activities (Appendices B-1 and B-2) to realize that the project covered a wide range of topics, reached a very large number of people through high, sometimes massive, participation in a large number of activities. The number of activities and participants were much larger in the social/gender areas than in the technical area because social/gender activities were conducted by personnel from local organizations and often involved entire communities. The technical activities always involved the participation of Canadians and a much more specialized audience. Nevertheless, the number of people reached in the technical sessions was high, and exceeded in many cases, the most optimistic forecast, except when it came to training Brazilian personnel in Canada. This mode of training had to be curtailed due mainly to linguistic barriers (see Section 1.8 above).

One of the basic means used by PROASNE to help communities improve their lives was by setting up citizens groups and associations. Thus, the project created Water Users Associations in Serrinha/RN, Women's groups in Serrinha/RN and Caraúbas/RN, an arts and craft cooperative in Caiçara/PE, a Fishermen's association in Juá/CE. These groups and associations proved extremely useful in generating long-term results (see Outcome and Impact level results below).

Many of the small community projects listed in Appendix B-2d are also basic development tools designed to increase local income and reduce poverty, and are regarded as output level results of the project. They include: the creation of a women club in Mirandas/RN; an artisan centre in Caiçara/PE; garbage recycling facilities in Juá/CE and Caraúbas/RN; a fish farming industry in Juá/CE; a cashew processing plant in Caraúbas/RN, and a meat processing plant in Samambaia/PE.

Amongst the indicators listed at the output level in the LFA is the level of satisfaction of the communities and their leaders with project activities and the results. This is often difficult to measure and document, but in this project, a special effort was made to collect testimonies from a number of stakeholders who either expressed satisfaction in writing through their own initiative, or were interviewed for that purpose. Testimonies of satisfaction are also contained in the various reports prepared by the pilot area coordinators, and in many of the local newspaper articles that have been written, especially in the Caraúbas pilot area.

The accompanying CD-ROM has many examples of such testimonies. Perhaps the most poignant expression of satisfaction came from the Municipal Chamber of Caraúbas which, on April 26 2003, sent a letter to CIDA and to the President of CPRM in which they praised PROASNE's accomplishments in their community (see Appendix C-3). The letter was signed by the Prefect and all the members of his council. (See also a similar letter from ATOS to CPRM President in which they plead for the continuation of PROASNE's social and technical activities in their community – Appendix C-4, and a motion of congratulations to the PROASNE Management Team passed unanimously by the Municipal Chamber of Caraúbas – Appendix C-2.)

Two series of interviews were conducted in the Caraúbas pilot area to measure the degree of satisfaction of the population with the project's actions as well as its impact in the community. These interviews are part of a research project undertaken by the

social/gender coordinator for the Caraúbas pilot area, Roberta Borges Medeiros at the Federal University of Rio Grande do Norte for a master's degree in social sciences. The first series was conducted in April-May 2003, immediately following the Caraúbas Country Fair organized by PROASNE to highlight project results, and the second was conducted in January-February 2005 to evaluate the sustainability of the results[6].

Other testimonies that demonstrate satisfaction/impact of project actions are contained in newspaper articles (see for example Solidariedade Ampliada describing a major expansion of the project's actions in Caraúbas, and Luzimar de Mirandas, an interview with Dona Luzimar, president of the Women's Club of Mirandas), in a poem on the benefits of PROASNE to the community of Juá/CE written by the students and teachers of the district school, which was recited to Minister Susan Whalen when she visited the area in March 2002, and in the various reports written throughout the life of the project (see, for example, final social and gender area report by Canadian Social Coordinator, Sherry Nelligan).

2.1.3 Summary of Output Level Results

With over 40 activities completed in various aspects of water management, involving more than 500 trainees, it is justified to say that the project achieved and largely surpassed its technology transfer objectives. There were shortfalls with some technologies due to circumstances described above (see Section 1.8) and at times there were difficulties in meeting the high expectations of the Brazilian partners (more on that in Section 6.1), but overall the transfer of technology from Canada to Brazil was successful and laid a solid base from which higher level results (outcomes and impacts) could be achieved.

The same can be said of the social and gender output level results. With scores of partners and armies of volunteers, especially in 2001 and 2002 when UniSol was in operation, activities went on almost daily in one or more of the 20 or so pilot area communities in which PROASNE was active (see Table 3).

[6] Transcripts of these interviews and other testimonies are presented in Appendices C-1 and C-5, and on the accompanying CD-ROM

Table 3: Demographic data for the communities in which PROASNE was active

Municipality, District or Community name	Total population (approx.)	Urban population (approx.)	Rural population (approx.)
Ceará			
Irauçuba (municipality)	17,000 people	9,000 people	8,000 people
Juá (district)	3,700 people	1,000 people	2,700 people
Livramento (community)	25 families		
Itapajé (municipality)	41,000 people	27,500 people	13,500 people
Tejuçuoca (municipality)	13,500 people	4,000 people	9,500 people
Pernambuco			
Custódia (municipality)	30,000 people	16,600 people	13,300 people
Samambaia (district)	130 households[7]		
Caiçara (district)	80 households		
Fazenda Nova (community)	110 households		
Salgado (community)	25 households		
Rio Grande do Norte (Caraúbas)			
Caraúbas (municipality)	19,000 people	12,000 people	7,000 people
Mirandas (district)	226 households		
Pedra I (community)	30 families		
Pedra II (community)	30 families		
Mariana (community)	150 families		
Baixa Grande (community)	30 families		
Apanha-Peixe (community)	150 families		
Pontal (community)	30 families		
Baixa Fechada (community)	30 families		
Petrolina (community)	150 families		
Retiro (community)	30 families		
Rio Grande do Norte (Serrinha)			
Serrinha (municipality)	7,500 people	2,000 people	5,500 people
Jacu Mirim dos Bentos (community	37 families		
Pendência dos Emídios (community)	40 families		
Boa Vista (community)	40 families		

[7] In the semi-arid Northeast, families average 5 members and households may have more than one family.

2.2 Results at the Outcome Level

2.2.1 Anticipated Outcomes

Outcomes are longer-term results that occur as consequences of the activities and the project's outputs. In PROASNE, the anticipated outcomes are defined in the project's LFAs as an increase in the capacity of Brazilian organizations to carry out groundwater development projects and research, and to manage their water resources. At the community level, they were identified as a greater acceptance of sound water management methods, such as taking measures to protect and conserve their water resources, for example by adopting antipollution measures and environmentally friendly agricultural practices.

The indicators by which these outcomes were to be measured included increases in the usage of the Canadian technologies by project partners (e.g. number of studies, surveys, projects, etc.) and changes in the institutions themselves to accommodate the new technologies (new equipment, new software, etc). At the community level, the indicators to watch for were changes brought about by the communities to improve management of their water resources based on training and education that they received from PROASNE.

Other outcome level results anticipated include closer ties between Canadians and Brazilians institutions through increased collaboration. In the gender area, women would become more involved in the planning, operation and management of the community water resources.

In the social and gender areas, as the project's focus went far beyond water resources management, and addressed issues such as poverty reduction and gender equality, many outcome level results that are reported below are not specifically listed in the LFAs.

2.2.2 Actual Outcomes

For most of the technologies transferred, the project achieved its anticipated outcome level results. For one of the technologies that the Canadians consider most promising for water resources management in northeastern Brazil, **structural mapping by airborne geophysical (electromagnetic) techniques**, the results of three pilot surveys (one in each participating state – see map) were very encouraging and show that the technology is a powerful tool for the development of water and other resources in the in the hard

crystalline rocks of the Northeast[8]. However, because it involves the use of helicopters, the airborne methods are expensive and the Brazilian authorities are not ready to make the necessary investment at this time. Nevertheless, the Brazilian partners have confirmed the validity and usefulness of the results of the pilot surveys done by PROASNE and it is expected that the technology will be implemented at some point in the future[9] (see Impact Level Results below).

Testing to confirm the validity of the airborne survey results, and to learn more about how to interpret them, was done by drilling wells on selected targets. This resulted in several high-yielding wells in three pilot areas. One of these, drilled near the town of Samambaia in Pernambuco, provides a much needed boost to the town water supply (see Impact Level Results below).

An important outcome of the airborne geophysical surveys is that the contractor who did the work, Fugro Airborne Surveys of Mississauga and its Brazilian affiliate, Lasa Engenheria e Prospecções S/A of Rio de Janeiro can claim to have acquired significant new experience in conducting airborne geophysical surveys for groundwater development. With growing worldwide interest for clean water, such experience can help these companies gain access to new markets. We should point out that the pilot airborne surveys done under PROASNE are believed to have been the first ever conducted anywhere in the world for the purpose of mapping groundwater in a semi-arid crystalline bedrock environment.

One of the most successful technologies to be transferred to Brazil under PROASNE is the **Groundwater Data Management System** developed by Canadian firm, Waterloo Hydrogeologic Inc in partnership with CPRM. The Systems uses modern communications (e.g. the Internet) to manage and make accessible large quantities of groundwater – water well – data. It was built on a system that already existed at CPRM known as SIAGAS. This improved system, called **New SIAGAS** allows CPRM to

[8] Interested readers can obtain an overview of the airborne geophysical work that was done by PROASNE in northeast Brazil and the result obtained, on the accompanying CD-ROM. An illustrated brochure that shows how investing in airborne electromagnetic surveys could be valuable for the Northeast is also presented on the CD-ROM.

[9] CPRM staff under the leadership of geophysicist Roberto Gusmão carried out high quality follow-up studies using ground-based geophysical methods introduced by PROASNE early in the project. Two reports, one of a study in Pernambuco and another in Ceará are available on the accompanying CD-ROM. The results show that the technique is promising but more work needs to be done to be able to used the results to the best advantage. Students at UFC under the supervision of Professor Mariano Castelo Branco carried out other follow-up studies of PROASNE airborne survey results, some of which have produced theses. Those results are not available at the time of writing.

centrally manage all of the nation's groundwater data and to make them easily available to anyone interested.

With regards to the other technologies that were transferred, we can confidently say that they are contributing to changes in the way the partner institutions are conducting their groundwater management and research activities. This is particularly noticeable in the following areas:

- **The remote sensing technologies** transferred by PROASNE have been incorporated into the ongoing groundwater exploration projects being carried out by CPRM and other partners. Furthermore, UFRN has added teaching Canadian Radarsat technology to its remote sensing program curriculum following ten weeks of training in Canada of a graduate student and a professor from that university. A Ph.D. thesis was written and a degree awarded to that student based in part on work done under PROASNE.

- Providing good quality (i.e. desalinized) water to un-electrified communities has always been a problem in northeast Brazil. Canadian firm Sunmotor International of Calgary developed special motors that are adaptable to Brazilian pumps and reverse osmosis (RO) equipment to produce potable water from brackish groundwater, using solar energy. Sunmotor and its Brazilian partners SOHIDRA, the principal water management organization in the state of Ceará, and DANCOR, a pump manufacturer based in Rio de Janeiro, built an experimental, but fully operational, **solar pumping and desalinization station** that supplies good quality water to the small farming community of Livramento/CE, benefiting some 25 families. This prototype can now be replicated elsewhere.

- The results of the **mathematical modeling of the Açu aquifer** in Rio Grande do Norte, a project carried out by Canadian firm Waterloo Hydrogeologic Inc. (WHI) in partnership with CAERN and UFRN, are being used by RN water authority CAERN to plan the sustainable development of this very important aquifer. Unregulated water extraction from the aquifer could have led to its overexploitation or its contamination, causing irreversible damage. In carrying out this project, WHI has enhanced its profile in the region and is now better positioned to offer its services to local clients.

At the community level, **environmental and other educational activities** combined with a series of small community projects implemented by PROASNE have profoundly influenced the lives of the residents. For example, projects such as "Você e o Porco" (You and the Pig) implemented in Ceará have imparted a consciousness in the population that roaming farm animals is unsanitary and can cause diseases and pollution of the surface water reservoirs and of the groundwater. As a result, measures to keep farm animals in corrals have been implemented in some pilot area communities.

In other communities, the outcomes of PROASNE's environmental education have been clean up campaigns organized by the local authorities and to set up garbage pick-up, disposal services and recycling facilities. This has already led to cleaner communities, less polluted waters and generated some income to those involved with the garbage pick-up and recycling.

As far as changes brought to the communities in their **water management systems**, a very successful outcome of the project has been the creation of Water Users Associations. These have been particularly active in Serrinha/RN where they serve as instruments for the population to deal more efficiently with the various levels of government on water management and other community issues. They provide an efficient mechanism for the community to identify and prioritize problems and needs, and to present them in a concerted manner to the authorities. It is quite noticeable that the authorities respond more readily to this collective approach than to random demands from individual citizens.

In the **gender area**, projects such as Viva Mulher (Praise to the Women) in Caraúbas have had a profound impact on improving women's self esteem and to help them deal with the male dominated society that exists in Brazil's sertão. The results show that the women became more aware of the injustices perpetrated against them, and vowed to take collective action to change the situation. In order to maintain the momentum, the women of several communities have organized themselves into associations and "Clubs" and meet regularly to discuss their place in society. This is an important outcome of PROASNE, and one that is very likely to remain sustainable in the long run[10].

[10] For an overview of the impact generated by PROASNE on the lives of the women of the Caraúbas/RN pilot area, read the transcripts of the interviews with various community leaders in Appendix C or on the CD-ROM. These interviews were conducted in January and February 2005, nearly two years after the official end of the project in Caraúbas, thus providing an indication of the sustainability of PROASNE's results.

A series of small, **income generating projects** were carried out in all of the pilot areas with very positive outcomes. Some examples:

- In Caraúbas/RN, a women's club (named Tereza Souza, after one of the first school teachers of Mirandas) was created, with PROASNE donating six sewing machines and providing training to some 30 women. The women have succeeded in finding a market for their production of clothing and arts and craft, and have gained enough income to support an expansion of their operation. The Club operates from a small house in the centre of Mirandas; the revenues are sufficient to cover the cost of water and electricity and other operational expenses. As a sign of growth, several club members have purchased their own sewing machines and operate from their homes.
- Similarly, PROASNE created a **Arts Cooperative (Coopeartca)** in the town of Caiçara in Pernambuco, with 22 female members and six sewing machines donated by the project, along with training in small business accounting, on how to run a cooperative and in sales techniques. Most sales occur through a kiosk in Custódia, the largest population center in the region, and business is said to be good. Overall the women agree that the project has improved their lives by enhancing their motivation, and stimulated them into making better use of their time, in addition to providing them with a modest but non-negligible income.
- In Caraúbas/RN, PROASNE revitalized the association of cashew growers and revamped the **Cashew Processing Plant** (*Cento de beneficiamento da castanha de cajú*) generating one of the most beneficial outcomes of the entire project. The raw cashew that used to be sold locally at extremely low prices is now processed (roasted, graded, etc.) and turned into an export-quality product fetching much better prices for the local growers. About 200 of the 250 families of Mirandas live from the cashew industry. PROASNE initially invested in some equipment and training. Recently, the centre announced a major expansion with government investments of over R$200,000 and the creation of 300 jobs. The PROASNE coordinator for that region, Roberta Borges Medeiros, has been invited to the inauguration scheduled for October 2005, because "everything started with PROASNE" (comment made by Aluísio, President of the Community Counsel of Caraúbas, Sept. 23, 2005).
- In Caraúbas/RN, PROASNE provided education and training to the local apiculturists and helped them modernize their techniques resulting in a 70% increase of the **honey production**. This led to a substantial increase in their

standard of living allowing the producers to upgrade their houses and to buy material goods (such as motorcycles), which they couldn't afford before.

- In Juá/CE, PROASNE laid the seeds to a small **fish farming industry**, which provides income to 8 families, members of the Juá Fisherman's Association. The project began in October 2003 with 6 cages, fries and equipment donated by PROASNE. The fishermen set up their operation in the Juá municipal reservoir after receiving permission from government water authorities. After 5 months, the first fish production was sold in the nearby town of Sobral with sufficient profit to support an expansion of the operation. The potential for economic success is such that neighbouring villages are seriously contemplating setting up their own fishing industry modeled after PROASNE's project in Juá.

2.2.3 Summary of Outcome Level Results

The technologies that were transferred have all contributed – some more than others – to increase the capacity of Brazilian institutions to carry out groundwater research and development, and/or to manage the region's water resources more efficiently. Whether it is geophysics (ground or airborne), or remote sensing, or mathematical modeling, the Brazilian partner institutions have adapted these new tools and new knowledge in their routine work and, in some cases, changes have taken place within the institutions to accommodate the new technologies (e.g. CPRM has modified its data management infrastructure to accommodate New SIAGAS).

At the community level, the environmental and other education programs provided by PROASNE have resulted in concrete measures by the population, which will eventually improve their lives (e.g. garbage disposal and recycling). The income generating projects also set up by PROASNE are contributing to improve the standard of living of residents, and are providing more equitable conditions and improved self-esteem for the community women.

PROASNE's social and gender programs have also generated changes within the partner institutions, particularly GSC and CPRM, neither of which had much experience in these areas before PROASNE. Now, both organizations consider that it essential to incorporate social and gender components in their projects that focus on improving the lives of people. The coordinators and others who have worked on the project's social and gender areas have learned a great deal about incorporating these components to technical projects, and their experience is already proving invaluable in setting up other projects in the region.

A compilation of the most significant outcomes and impacts (and potential impacts) generated by PROASNE are presented in Tables 4 (technical) and 5 (community level) below.

Table 4: A selection of activities that have produced outcome and impact (or potential impact) level results **in the technical area**

Activities: actual outputs	Actual outcomes	Actual impacts	Potential impacts	Constraining factors
A. Airborne geophysical surveys in 3 pilot areas: maps; reports; trained personnel	1. Brazilians have a powerful new tool for water resources development 2. Canadian companies offer services worldwide based on a genuine test case		1. Brazilians use this technique as their main tool to develop water resources in NE-Brazil. 2. Canadian companies win new contracts to carry out similar surveys elsewhere	1. Costs; major financing from federal government or outside sources needed (tens of millions $)
B. Ground geophysics and remote sensing workshops, hands-on training and field demonstrations: reports on applications of geophysics and remote sensing to NE-Brazil conditions; over 50 trained technicians and professionals in three states	Brazilian partners use acquired technologies to conduct high-quality groundwater exploration surveys in NE-Brazil; follow-up evaluation of airborne survey results in pilot areas; Radarsat technology added to remote sensing program at UFRN	Producing wells are drilled in three pilot areas and several communities benefit from increased water supply; fully operational wells with desalinization equipment are installed in Serrinha pilot area by SRH	In combination with airborne geophysics and solar energy, ground geophysics and remote sensing are used to develop the groundwater resources of large areas of the Northeast thus increasing many folds the amount of water available for agriculture and the population	Cost; this proposed groundwater management approach would require major investments from the government and outside sources and is not perceived as cost effective at this time; cost/benefit analysis needed
C. Application of Canadian solar technology in Ceará: development of specialized d.c. motors and their adaptation to Brazilian pumps and RO systems	1. Fully functional experimental solar pumping and desalinization station built with Brazilian partners in small Ceará community 2. Brazilian partners have a prototype solar station that can be replicated elsewhere	1. Good quality water supplied to some 25 families in Livramento, a small Ceará community with no electricity	2. Brazilian water management companies (SOHIDRA, CAERN, SRH) replicate the prototype station to other non-electrified communities in the Northeast	2. Costs; solar power is perceived as very expensive although bringing conventional electricity to remote communities may be more expensive
D. Development of groundwater information system (New SIAGAS): Brazil acquires a state-of-the-art data management system; trained personnel	1. Brasil groundwater data is managed centrally at CPRM and is accessible to everyone in the country via the Internet 2. Canadian developer has a new marketable product	1. Quality and usefulness of the information system is such that it is adopted as the national standard 2. Canadian developers generate significant revenues from sale of product worldwide		
E. Mathematical modeling of the Açu aquifer in Rio Grande do Norte: state-of-the-art project results (report, maps, recommendations); trained personnel	1. Water authority in RN (CAERN) has the tools and is better able to plan the sustainable development of the Açu aquifer 2. Canadian company acquires relevant expertise and enhances its visibility and credibility in the local market	1. Mirandas 100% supplied with piped-in water; 19-km pipeline built to supply water to 12 other Caraúbas communities; some 500 families and local agriculture benefits 2. Canadian company opens regional office and competes for local business contracts	1. Many more communities are supplied with water from the Açu without endangering the sustainability of the aquifer; expansion of local agriculture 2. Canadian company wins lucrative contracts for water resources development and management in NE-Brazil	1. Time and costs: more mathematical modeling studies will be needed before sustainability and vulnerability of the entire Açu and other aquifers are known 2. Competition: Brazilian contracts are subject to fierce worldwide competition

Table 5 : A selection of activities that have produced outcome and impact (or potential impact) level results **in the communities**

Activities: actual outputs	Actual outcomes	Actual impacts	Potential impacts	Constraining factors
A. Environmental education: communities that are more educated and more aware of the importance of a clean environment for health, aesthetics, and water resources protection	Measures taken to clean-up and maintain a clean environment: garbage pick-up campaigns; organized garbage pick-up and recycling; adoption of environmentally friendly farming practices including controlling roaming farm animals	Cleaner communities; less polluted surface water reservoirs; employment and income for those involved in garbage pick-up and recycling	Better health for population; less dependence on government water distribution programs during droughts; concept of the benefits of a cleaner environment spreads to nearby communities and towns	Mobilization of entire community: it is essential that the whole community participates in environmental/water resources protection initiative Cost: some costs are incurred by the farmers to change agricultural practices
B. Setting up Water Users Associations: groups of citizens better educated on water issues and sensitized to the importance of involving the local population in the management of water resources; trained operators	Needs and concerns of the population regarding water and other issues are brought forward in a concerted manner. Citizens groups gain experience in managing community water system and in working with community leaders to resolve problems	Action to resolve community problems is taken more rapidly; some communities obtain improved water systems through requests made through their Association; water systems function better as they are better maintained		Authorities and community leaders must listen to the collective voice of the Associations. Water has always been and will continues to be a political pawn
C. Gender work - establishment of women's associations/groups; variety of courses provided to women and men; public demonstrations and media campaigns: women and men better informed of women's rights and place in society	Women have stronger voice in community; improved women self-esteem; more independence of women due to income generated by association; men recognize and accept the place of women in community	Communities that function better with increased participation of women; less domestic violence; less abuse of women; happier families; real changes in the attitude of men towards women	Equal opportunities are provided to women and men in education, employment, holding public office. Domestic chores and raising children split equitably. Women and men have equal say on how household income is spent	Male domination continues to prevail despite attempts to educate men
D. Income generating and other community projects – setting up cooperatives and providing education on accounting, sales techniques, craft making, fish farming, honey production, etc: specialized workforce	Improvement in local production; significant income generated; value added to some products: tilapia; cashew; honey; arts and crafts; chicken meat; recycled products; horticultural products	Improved standard of living of co-op members; more wealth for the community; expansion of original projects (tilapia farming; cashew production); projects spread to other communities (tilapia)	PROASNE's best experiences are replicated with support from public or private investments, resulting in major expansion of industrial base and new wealth generated across the Northeast	Remoteness of some communities prevent efficient marketing of products
E. Setting up partnerships: informal arrangements are established with other community development organizations such as financial institutions; universities; public utilities; unions; NGOs, etc.	Reduced costs to PROASNE through cost sharing; significant increase in amount of work done; easier access to specialists; wider range of activities performed; increased benefits to communities	PROASNE's methods of community work are passed on to other organizations; PROASNE team members learn from experience of others; partners adopt PROASNE-style social work in their programs	PROASNE's social and gender actions are replicated and expand beyond the pilot areas thus ensuring long-term sustainability of project's actions and results	The passage of time and changes in the personnel of partner organizations will bring oblivion and lead to a gradual decline of PROASNE's influence on social/gender activities in pilot area communities

2.3 Results at the Impact Level

2.3.1 Anticipated Impacts

The LFAs (Appendices A-1 and A-2) show a unique target for the project (goal and anticipated impact), which was to increase the long-term access to a more regular and abundant supply of good quality water. This was achieved to a certain extent in the pilot areas (see actual impacts, below), but as the project unfolded, it became clear that greater equity in northeast Brazil – the project goal – could not be achieved solely by developing the region's groundwater resources. I was necessary to include other themes such as gender equality, poverty reduction and the environment.

2.3.2 Actual Impacts

Developing the water resources of northeast Brazil was initially, and continued to be, the main focus of PROASNE throughout the entire duration of the project. The project did achieve success in this area as access to water was improved in all four pilot areas:

- In Ceará with the construction of a solar pumping and desalinization station in the un-electrified farming community of Livramento, providing fresh water to some 25 families (see details);
- In Pernambuco with the drilling by CPRM of three new producing wells based on the airborne geophysical results, one of which drilled near Samambaia provides a much needed boost to the town water supply; and the installation of a new well and three new water tanks and pumps to supply part of the community of Fazenda Nova with piped-in water (see details).
- In Serrinha/RN with the installation by PROASNE partner SRH of one new well and desalinization equipment in each of the three pilot area communities, serving about 100 families (see details);
- In Caraúbas with partner CAERN installing piped-in water to every household (about 250) in the community of Mirandas; and with Petrobras constructing a 19-km pipeline to supply water to a dozen smaller communities in the municipality (see details)

As indicated above under "Outcomes" one of PROASNE's most successful technologies to be transferred to Brazil is the **Groundwater Data Management System** developed by Canadian firm, Waterloo Hydrogeologic Inc. in partnership with CPRM. This system delighted the Brazilian government authorities so much that they decided to make it the

national standard. It is being launched state by state and soon it will be the norm throughout the country. The technology also impressed Canadians and, as a result, a modified version of New SIAGAS was developed for the Ontario Ministry of the Environment in 2003 (see Section 8).

Another important impact level result of PROASNE's presence in the Northeast is the **opening of an office by Waterloo Hydrogeologic Inc. in Recife**. With this move, the company intends to continue working with the Brazilians, helping them to better manage their groundwater resources and expand the links that were developed under PROASNE. This new office, which was opened in Porto Digital in downtown Recife in 2003 under an initiative promoted by Secretaria de Ciência, Tecnologia e Meio Ambiente (SECTMA), is creating employment and training opportunities for Brazilian hydrogeologists and programmers.

The impact of PROASNE's actions on the **lives in the pilot areas communities** have been well documented, especially in Caraúbas, as the Social and Gender Coordinator for that pilot area, Roberta Borges de Medeiros, is conducting an investigation of PROASNE and the sustainability of its results, for a Masters degree at UFRN. Nearly two years after the end of the project in her pilot area, and well ahead of submitting her thesis, she produced an update of how and to what extent the community was continuing to benefit from PROASNE's actions and how the residents were adjusting their ways and behaviours.

The update discusses the status of several of PROASNE's community projects two years after, including the Women's Clubs of Mirandas and eight other communities, which are continuing strong; ATOS and the Rural Workers Syndicate, both of which received a boost from PROASNE; the cashew growers that have recently undergone a major expansion of their operation, and others. All this is an excellent demonstration of the impact and the long-term sustainability of PROASNE's results.

Most of what was accomplished under PROASNE, and the influence that the project had and will continue to have in the communities for some time to come, is largely the result of the **strong partnerships** that the project established and cultivated over the years. These, for the most part, were informal arrangements with other groups/institutions that had an interest in - or were persuaded to extend their actions into - PROASNE's pilot areas. These included financial institutions such as Banco do Nordeste and Banco do

Brasil, social services departments of universities, UniSol, public utilities, worker's unions, etc. (a complete list is given in Table 2).

The outcome of having these partners work in collaboration with PROASNE was to allow the project to accomplish a lot more than would have been possible with the limited resources at its disposal. It also provided easier access to a wider range of specialists, which resulted in more diverse activities being carried out. In the long term, these partnerships will also ensure that the actions initiated by PROASNE in the pilot areas are replicated and expanded beyond the pilot areas, thus ensuring the sustainability of the projects results and maximum impact.

Cost sharing and plenty of volunteer work by the partners turned out to be the key to success in PROASNE's social and gender programs. But the underlying reason for this success is undeniably the skills and dedication of the PROASNE's coordinators, who developed and nurtured the partnerships, learned from one another and shared experiences. All of this contributed to increase the capacity of the partner institutions themselves in performing community social and gender work and, in the case of GSC and CPRM, it introduced the concept for the first time, and both institutions have now incorporated social and gender work in their regular programming.

2.3.3 Potential Impacts

As stated previously, the project's most outstanding result, and one that could have the greatest impact, is the data produced by the **airborne geophysical surveys** in the three pilot areas. The Canadian partners that were involved with this technology – GSC and Fugro Airborne Surveys – are convinced that airborne electromagnetic mapping would be extremely useful for the development of northeastern Brazil's groundwater and other resources, including mineral resources. They see this as an excellent investment for the region[11], and to maximize the chances that Brazil will implement the technology sooner than later, GSC and CPRM approached CIDA requesting that the Agency grant an extension to the project so that the technique could be further demonstrated and promoted. Unfortunately, CIDA declined arguing that it should be up to the Brazilians to perform further assessment of this technology and to promote it. In a separate move, recommendations were made to senior Brazilian government officials that they seek

[11] Developing the groundwater resources of the Northeast using airborne geophysics as the main tool would cost in the order of $100 million. This compares favorably with other grandiose schemes such as the Million Cistern Project, currently being implemented at an estimated cost of $350 to $400 million, or the São Francisco River diversion project estimated at more than $1 billion.

funding from the World Bank or the Inter-American Development Bank to implement this technology but, at the time of writing, no action had yet been taken[12].

PROASNE has also proposed using solar power in combination with airborne and ground geophysics and remote sensing as a new approach for groundwater resource management of large portions of the Northeast by allowing to tap groundwater over large areas that are not currently being developed due in part to the lack of electricity (see details). Such a scheme would substantially increase the amount of water available, including for agriculture, and could prevent wide-scale devastation during droughts. The proposal was presented to the Brazilian authorities all of whom expressed interest, but have yet to take action due to the large investments involved. However, the seeds have been sown and it is our belief that this scheme will one day be implemented in whole or in part.

Other potential impacts are mostly related to replication of the project's successful accomplishments in the pilot areas. Most are hampered by the lack of funds. For example, the solar station experiment was very successful in Ceará, but there has not yet been any attempt by the Brazilian utilities to replicate the experiment in other communities. The reason is that solar energy is considered – and probably is – an expensive alternative to conventional electricity. However, for remote communities that have no hope of getting connected to the grid anytime soon, there is no real alternative.

At the community level, most of what was identified as potential impacts on Table 5 is time dependant (e.g. better health, cleaner environment, equal opportunities for women and men, etc.) and may well become reality one day.

2.3.4 Summary of Impact Level Results

The anticipated impacts for the project, those identified in the project's LFAs, were largely achieved as every one of the pilot areas got improved access to good quality water in one form or another. However, the real impact of PROASNE has not yet occurred and is identified here as a "potential impact": The Brazilians turn to airborne geophysical surveys as their main groundwater development tool and substantially expand the

[12] On April 29, 2003, a high level meeting took place at the Ministry of Mines and Energy in Brasilia to discuss implementation of airborne geophysics in the Northeast. Participants included Giles Carriconde Azevedo, Secretary of Federal Ministry of Mines and Energy, Agamenon S.L. Dantas, President of CPRM, Marcos A V. Freire, Director of the National Water Agency – ANA, Louis Verret, head of CIDA's mission in Brazil, and PROASNE's Brazilian and Canadian project managers. Subsequently, Mr. Verret held discussions on this issue with officials at the World Bank in Brasilia who were "very interested".

existing coverage of northeast Brazil. This would provide a wealth of data on groundwater-controlling bedrock structures and on other geological features and resources. There is no doubt that if these data were available for the region, they would become a very important economic development tool.

At the community level, PROASNE has already had a great deal of impact in all of the pilot areas, as can be ascertained by the successes of the environmental protection initiatives, the integration of women in society, the income generating projects, etc. supported by dozens of testimonies and newspaper articles that have resulted from the project's accomplishments.

2.4 Unexpected Results

2.4.1 Communications

The original Project Proposal and the subsequent Project Implementation Plan (PIP) had no communications plans despite the fact that CIDA had requested that such a plan be developed during the Inception Phase. The PIP simply mentions "*With regards to outreach and communications, this will be done as occasions arise.*" So, what happened with communications in this project was truly unexpected and is quite remarkable.

Firstly, the Brazilian media took an early interest in PROASNE and followed its progress to the end, resulting in more than 80 published articles in a dozen different newspapers and at least 15 live and taped television and radio interviews. Most of this publicity occurred in the Northeast, but some media events took place elsewhere. In Canada, for example, the **Discovery Channel** conducted a live television interview with Project Manager Dr. Yvon Maurice in May 2001. At about the same time, **Magazine Transatlantique** featured an article on PROASNE in its special issue on the **Summit of the Americas** (April-May, 2001). In June 2002, the **Canadian Solar Industries Association** (CANSIA) published a full article on PROASNE's solar pumping and desalinization station in Ceará, in its quarterly newsletter. All this publicity is added to the dozens of websites that have featured stories on PROASNE, including the United Nations, Environment Canada, Natural Resources Canada, Foreign Affairs and International Trade, and the World Water Council. The contribution of CIDA is acknowledged in the vast majority of these references.

The second PROASNE publicity instrument is an 8-page brochure on the project, produced by Waterloo Hydrogeologic in English and Portuguese. Some 4,000 copies were printed (see Appendix D). The brochure is attractive and was widely handed out in

Brazil and around the world, as NRCan senior officers used it (and are still using it) extensively whenever they attended international events where they needed to show a "good example" of NRCan's international work[13]. Waterloo Hydrogeologic also produced a children's book in Portuguese on the water cycle, which was widely distributed in pilot area schools and households.

Finally, there was no better promotional tool for PROASNE than its website. With hundred's of visitors per day, the site provides access to a wealth of information on project development, management, and results of all kinds. We are aware that it was used as a teaching aid in schools and colleges, and to develop similar projects in various parts of the world, including by hopeful Canadians seeking CIDA funding.

[13] The PROASNE brochure and/or Power Point or other types of presentations on the Project were taken by official NRCan delegations to the United Nations in Washington, Singapore, China, Ethiopia, Tunisia, South-Africa and several other sub-Saharan countries.

3. DEVELOPMENT FACTORS

3.1 Relevance

In terms of needs of a population and the Brazilian government priorities, as well as CIDA's own programming schedule in Brazil, it would be difficult to find a more relevant project than PROASNE. In the last years of the project, from the moment the Lula government was sworn in, the relevance of PROASNE became even more obvious as the newly elected administration sought to take immediate action to eradicate the chronic poverty and social problems that overwhelms the nation. It embarked on a major poverty reduction initiative called "Fome Zero" (zero hunger) that encompassed the entire country but focused more precisely on the Northeast.

To "Fome Zero" soon was added "Sede Zero" (zero thirst) in the Northeast as everyone recognises the intimate association of food and water in regions where rain is in short supply. One of the measures that the government launched as part of its Fome Zero/Sede Zero Program was the Million Cisterns Project under which the government would fund the construction of cisterns throughout the northeast, one million of them, to collect rain water from the roofs of houses (see photo). This is certainly a valid project as it would provide most households with water at their doorsteps. But is it enough to guarantee supply during a lengthy drought?

Developing the groundwater resources of the Northeast will always be an important component of any water supply strategy that may be implemented in the future, whether that strategy includes other schemes such as installing a million cisterns or diverting rivers. The expansion in the airborne geophysical coverage combined with remote sensing and solar energy to develop the groundwater resources of large areas that are not currently being tapped, as proposed by PROASNE, remains an attractive potential solution, albeit one that needs further evaluation[14].

[14] The proposed approach has been described in this short article presented at Americana 2003, March 19-20, in Montreal.

3.2 Appropriateness

Does Canada really have the technologies and the expertise to help Brazil develop its water resources? That question arose on several occasions as it became abundantly clear that Brazil is not far behind Canada in terms of technological capacity and know-how. After all, it was a Brazilian company that flew the airborne geophysical surveys in the pilot areas, compiled the results, produced the maps and wrote the report; Brazil's Instituto Nacional de Pesquisas Espaciais (INPE) ranks amongst the world leading remote sensing and earth observation institution; and some of the world's most reputed hydrogeologists are Brazilian. What PROASNE ultimately did to help Brazil was not so much to transfer Canadian technologies to Brazil, but more to promote the exchange of ideas between Canadians and Brazilians, which led to innovations in the applications of the technologies. For example, the application of airborne geophysics to map groundwater-bearing structures in the bedrock, the use of solar energy to desalinize water to make it potable, and the detection of chlorophyll distribution using Landsat images as a means of mapping soil humidity[15], just to mention a few, were innovative ideas – rather than new technologies – introduced by PROASNE which, for the most part, had not been tried in Brazil before. The fact that there was not a massive amount of new technologies brought in by the project frustrated some of the Brazilian participants who somehow expected PROASNE to provide them with a substantial amount of new knowledge (see also Section 6.1). Instead, PROASNE focussed its efforts on finding solutions to the water problems of northeast Brazil, at times by introducing new technologies but more often by adapting existing ones.

Neither were new Canadian methods widely introduced in the social and gender areas except for two concepts brought in by CIDA: first, the concept of having a social and gender component operating within an essentially technical project; and second, managing the entire project using a Result Base Management (RBM) approach. Both of these where highly innovative to the Brazilians and Canadians partners alike, and had a lasting and very positive impact on all who were involved with the project.

[15] See report on the application of this technology to the Ceará pilot area by Robert Bélanger of GSC on the accompanying CD-ROM.

3.3 Cost Effectiveness

PROASNE is an excellent example of how a small amount of seed money can generate a great deal more in value. Thanks to unrelenting management and logistical support from the project's lead partner CPRM and thousands of hours of volunteer work provided by all the Brazilian partners, especially in the social and gender area, PROASNE succeeded in accomplishing an astonishing amount of work with a relatively low budget.

The lead Canadian partner, GSC, contributed nearly $1 million to the project, mostly in unrecovered administration costs (see Table 6). This is more than double the amount of in-kind GSC contribution that had been estimated at the beginning of the project and represents nearly 60% of the total CIDA contribution. Such a remarkable ratio could only have been achieved by having a non-profit – in this case a Federal Government institution – manage the project. A private sector firm doing the same task would have recovered a much higher proportion of its costs leaving much less for the actual project delivery. There may be a valuable lesson for CIDA in this, in that by partnering with other government institutions to manage its international projects, the Agency can achieve much higher returns in terms of results, on its investment.

Budgetary issues will be discussed in greater detail in section 5 of this report.

3.4 Sustainability

The question of sustainability of the project's results has been a concern of the management team from the beginning. Several special projects have been carried out to seek the best approach to achieve sustainable results within PROASNE. Thus, Sherry Nelligan and her group at Gender Equality Inc. investigated the issue and excerpts from their report entitled "**Achieving Sustainable Results in Water Projects**" are included on the accompanying CD-ROM and on the project's website. Roberta Borges Medeiros, Social/Gender Coordinator in Caraúbas, carried out in-depth research on the sustainability issue as it applies to the Northeast of Brazil and, in the process, wrote a five-part booklet on the subject entitled "**Sustainable Rural Development: A Practical Guide For NE-Brazil Communities**", which is also on the accompanying CD-ROM and on the website. This booklet has been widely distributed in Rio Grande do Norte, including to all the PROASNE partners and collaborators, local schools and universities, and to the Canadian Embassy and CIDA. Ms. Medeiros recently (September 26, 2005) completed the first draft of her Master's dissertation entitled: "*O DESENVOLVIMENTO LOCAL SUSTENTÁVEL NO SEMI-ÁRIDO NORDESTINO: Um Estudo de Caso na*

Comunidade de Mirandas, Caraúbas/RN" which examines in detail PROASNE's efforts to achieve sustainability of its results in that community. This dissertation should be available within a year at UFRN.

In the gender area, sustainability of PROASNE's results are discussed in a paper by Adélia de Melo Branco of Fundação Joaquim Nabuco, the project's gender specialist who worked in the Samambaia pilot area in Pernambuco. The paper entitled "**Gender Relations and Empowerment of Women in the Context of Water: The Case of PROASNE in Pernambuco, Northeastern Brazil**" was presented at the World Water Forum in Kyoto in April 2002. It indicates that regrouping residents into associations and community action groups, and forming multiple partnerships between the local authorities and institutions, and social service providers is a key element to achieve sustainability in development projects.

It was clear at the onset of PROASNE that sustainability of project results would be achieved through different means for the technical area and for the social/gender community work. In the technical area, sustainability depends on the technologies being adapted and replicated by the partners, whereas in the communities, sustainability is identified more with lasting changes in the behaviour of the population and long term improvements in living conditions.

Of all the technologies introduced by the project, only the Groundwater Information System, New SIAGAS, had achieved unquestioned sustainability one year after the end of PROASNE. The technology has been fully adopted by CPRM, and it is now being rapidly replicated throughout the country as the standard national groundwater database system. It is also being introduced to other countries including Canada. This is the ultimate sustainable result for which PROASNE is very proud.

With regards to the other technologies (geophysics, remote sensing, solar energy, groundwater modeling, etc.), which are mostly used in groundwater exploration and development, it may be only when the next drought occurs[16] that the Brazilians will want to invest in them. Whether they will choose to do so is uncertain at this time. Some of these technologies are expensive (e.g. airborne geophysics) and whether or not the Brazilians will eventually adopt them in their groundwater development strategy for the Northeast, may very well depend on more testing and analyses being done in the near

[16] Northeast Brazil has not been subjected to a severe drought since the devastating drought of 1998-2000 that instigated PROASNE. The sense of urgency to find and invest in a solution has since abated considerably.

future. This, unfortunately, will not happen under PROASNE as a proposed project extension to carry out these complementary studies was rejected by CIDA.

For the social/gender and community programs, much effort was devoted to achieving sustainability of PROASNE's actions and in evaluating success, as indicated above. Early indications are that the project is having a lasting impact in the communities where it operated and that the models are being replicated in other communities[17]. Evidence of sustainability was provided by the communities themselves in the form of interviews with residents of Caraúbas/RN and community leaders. These have already been presented and discussed in this report (see section 2.3, Impact Level Results, above; see also Feb. 2, 2005 update).

[17] See section 4.2 Innovation and Creativity below.

4. MANAGEMENT FACTORS

4.1 Sharing of Responsibilities

The project's management structure and the Steering Committee members have already been presented in Section 1.3.4. Managing PROASNE was done in accordance with a set of rules that were established at the onset of the project and adjusted as time went on. The first set, which defined the roles and composition of the various committees and coordination units, was laid out in the Project Implementation Plan or PIP produced in November 2000, at the end of the 6-month Inception Phase (see Part 3, Management Strategy, beginning on Page 17 of the PIP). Although changes in the composition of the committees did occur as the project evolved[18] the fundamental role of each unit remained more or less the same throughout. As part of its responsibilities, the Steering Committee also established a series of norms on procedures and on dealing with certain issues that required clear guidelines to assist in the administrative and decision making process. Thus, norms were established for 1) the reimbursement of field and other expenses; 2) the preparation of mission reports for missions within and outside Brazil; 3) administrative procedure for CIDA's special social fund; 4) the preparation of progress reports; and 5) the selection of participants for mission within and outside Brazil.

The Steering Committee in its regular operations was composed of two Canadians and ten Brazilians (see Table 1). It met a total of 9 times, twice in Canada (September 2001 and October 2003), four times in Rio de Janeiro (May and December 2000; May 2003 and April 2004), once each in Fortaleza and Recife (June 2001 and April 2002, respectively) and once in Florianópolis/SC (September 2002) during the National Groundwater Congress in that city at which several committee members presented PROASNE results[19]. Other meetings with or without the presence of Canadians were held to discuss specific and/or regional issues, whenever the need arose. At all these

[18] The Steering Committee (Comitê de Direção) was originally formed by representatives of the founding institutions (CPRM, ABAS, SUDENE and MME). In less than a year, however, the project was effectively run by a Steering Committee composed of the National and State Coordination Units (Coordenações). The reader is referred to Section 1.3.4 and Table 1 of this report for an overview of the project's management structure as it was for most of the project's duration.

[19] A total of six formal presentations, including three in the social and gender area, were given at the congress. This was the first time that this prestigious annual conference included papers on the social and gender aspects of water management in its program. The innovation was well received by the audience. Five of the six papers presented on PROASNE, can be accessed through the following links: Arcoverde et al., Medeiros et al. (1), Medeiros et al. (2), Nelligan et al., and Maurice and Medeiros Lima.

meetings, minutes were meticulously taken, compiled, edited and distributed to all committee members for reference (see example).

The management structure described above allowed for complete sharing of responsibilities and transparency in the in running the project's day-to-day affairs. However, as GSC was the sole partner accountable to CIDA for the funds, it had greater responsibilities in deciding how the money would be spent and in ensuring that the administrative arrangements between CIDA and GSC were respected.

The process was also shared when it came to deciding on the details of the technologies that would be transferred. Canadian and Brazilian partners either prepared together, or jointly reviewed work statements before they were put out to tender. However, the actual selection of Canadian consultants for the delivery of project components could not be shared to the extent that our Brazilian partners may have wanted. The process of selecting a consultant for the Canadian Government is a competitive one, which has to abide by the rules of contracting set by Public Works and Government Services Canada. Even allowing the Brazilians to review proposals before awarding contracts was complicated by the fact that the proposals were written either in English or French, as required by PWGSC, making it difficult for the Brazilians to review them. Nonetheless, to increase the Brazilian's involvement in the selection process, the requirement that the respondents produce their proposals in Portuguese or Spanish in addition to English or French, was added to the RFPs in the last year of the project.

In the social and gender areas, the sharing of responsibilities went even smoother than in the technical area as there were no contracts awarded other than a service contract to the Canadian Social and Gender Coordinator. Even CIDA's social area funds were largely controlled by the Brazilian National Social Coordinator. The Canadian partner's role here was only to ascertain that the Brazilians followed the written guidelines for spending these funds and that the reporting schedule was adhered to.

4.2 Innovation and Creativity

The systematic development of the groundwater resources using geophysics, remote sensing and solar power, which was proposed by PROASNE based on successful, albeit limited, testing is truly an original and innovative approach to resolving the problems

related to drought in the Northeast, and one that would cost significantly less than some of the other solutions that have been proposed[20].

It can be said that PROASNE is pioneering these technologies because airborne geophysics, a tool developed and used mostly to explore for minerals in the past, had not been extensively tested for groundwater exploration anywhere in the world. The pilot surveys carried out in northeast Brazil by PROASNE will likely become classic examples of the application of airborne geophysics to groundwater exploration and help disseminate this important technology worldwide.

The fact that PROASNE was able to bring social workers and gender specialists to work along side scientists and engineers in a common-goal project, that of contributing to greater equity by developing a region's groundwater resources, can also be considered original and innovative. There are very few examples, if any, in the world where such a combination worked so well as it did in PROASNE. The experience was so successful that the principal partner institutions, GSC and CPRM, have adopted the concept of having social work as part of their development projects. Already, new projects are being planned and implemented with these elements[21], something that would have been considered out of place only a few years ago in these essentially technological institutions. This is another demonstration that the results of PROASNE are sustainable and are being replicated.

4.3 Human Resource Utilization

The Geological Survey of Canada is in a unique position to be able to attract and recruit the very best talent in the country because of its credibility and excellent reputation, both in Canada and abroad. Furthermore, GSC staff are recognized worldwide for being amongst the best in their field. The project benefited a great deal from this situation and, in every project activity, the personnel involved was always of the highest quality. This was also the case in the area of project management. Both CPRM and GSC assigned top personnel to fill the positions of Program Manager or General Coordinator. GSC maintained the same Program Manager for the entire duration of the project, while CPRM had three different people occupying this post at various times (see Table 1), all of them

[20] See Footnote 11 on Page 36.

[21] CPRM has recently launched a new project called "Sistemas Simplificados de Abastecimento Público Sustentável" through which they plan to bring into production some 30,000 currently non-functioning or abandoned wells throughout the Northeast. They have included as a key component of this project, the implementation of a PROASNE-style social program to help the population take control of their water resources.

highly competent and extremely devoted to the task. All were assigned to the project on a full-time basis.

All members of the project management team fulfilled their responsibilities very competently, especially the six Brazilian social and gender coordinators and the Canadian social area specialist who, at times, had to deal with the challenge of operating side by side with technicians who didn't always understand their role in the project. However, their determination to become accepted, and to change attitudes in the process, impacted the project very positively and was a major factor in its success.

4.4 Prudence and Probity

The GSC being a Federal Government organization, the administration and financial management of the project was carried out following well established government practices. Treasury Board guidelines were followed at all times. Financial records were kept both by the departmental administrative unit, and by the project manager, which facilitated verification and ensured accuracy. In addition, well established government practices for contracting out provided for maximum economy of the funds at hand.

In November 2002, at the request of CIDA, the project underwent a thorough financial audit by the firm Samson et Associés of Gatineau, Qc. According to Ms. Karen Austin[22] (personal communication), PROASNE came out with the best result of all of CIDA's Brazil projects that were audited that year.

[22] Senior officer at CIDA, and responsible for PROASNE.

5. BUDGETARY AND FINANCIAL ISSUES

5.1 Project Budget and Expenditures

Tables 6 and 7 provide detailed summaries of project expenditures for all the partners and for CIDA funds by administrative categories (Table 6), and major project activities (Table 7). Table 6 also compares the actual expenditures with the amounts that were pledged at the beginning of the project. It is interesting to observe that GSC's in-kind contribution far exceeds the value that was estimated at the beginning of the project, largely because the original estimates were based on a 3-year project when in reality the project had a duration of nearly 5 years (4.75 to be precise). The expenses shown were mostly for managing the project although a significant amount of unclaimed personnel time ($120K) was used on technical projects.

The lead Brazilian partner, CPRM, maintained its relentless support for the project throughout, both with the administration and the delivery of the technical and social programs. It is remarkable that the resources that CPRM estimated would be needed to run the project at the beginning are very close to the resources that were actually consumed for the project. The cost of administering the project at CPRM, with a full time Project Manager and support staff, is estimated to be somewhat higher than at GSC despite lower wages in Brazil, because there were more people involved (i.e. technical and regional coordinators) and more office space and facilities dedicated to the project (i.e. in Rio, Fortaleza and Recife) than at GSC. CPRM also contributed 50% to the cost of the three pilot airborne geophysical surveys that were carried out in 2001. That portion amounted to exactly $225,370 Cdn$.

The expenditures by the other Brazilian partners are significantly less than had been anticipated at the beginning of the project because many of the waterworks projects that had been planned were never implemented. For example, there were far fewer wells drilled by the partners than had been promised, the anticipated artificial recharge pilot study was never initiated, etc. One reason that might explain the differences is that there was no drought to contend with in the latter years of the project, and therefore no sense of urgency for the partners to get involved in costly waterworks projects. But there may have been other factors such as a freeze of government funding during a large portion of 2002 and 2003 which prevented most of PROASNE's partners from delivering on their earlier promises.

The amounts shown on Table 6 however, are expenditures related directly to project activities. Other expenditures were made in continuation of the work initiated by PROASNE, and if these were counted, the contributions by "other Brazilian partners" would be considerably more. One example, is the money spent by PETROBRAS to build a water distribution system to supply some 280 families in the Caraúbas region. Another is the recently announced upgrade of the cashew processing centre in Caraúbas, an investment of more than R$200,000 by the government which began with PROASNE's earlier input in the project.

It is befitting to mention here some of the contributions of our Canadian industrial partners that came completely unexpectedly, and contributed a great deal to the success of the project. Sunmotor International donated 27 solar panels to the project, an estimated value of $25,000. Sunmotor had these panels which it had obtained at a good price, and agreed to donate them as a humanitarian gesture. Unfortunately, they were held at customs in Fortaleza, and the project had to pay close to R$12,000 in storage and custom fees to have them released. This was an absurd situation considering that these panels were being donated to Brazil to provide water to a community in need.

Another humanitarian gesture came from Waterloo Hydrogeologic who donated $2,000 Cdn$ to the municipality of Caraúbas towards the drilling of a new well. The Company President had made a collection amongst it's employees in Canada and came up with this amount[23].

Waterloo Hydrogeologic also spent a great deal more in developing the New SIAGAS Information System than the value of it's contract with PROASNE, an estimated $120,000 more. In the end the company was left with a better product that they were able to commercialize more easily (see section 8, Canadian Commercial Benefits), but it remains a good example of cost sharing.

One of the most fortunate developments in PROASNE was the fact that CIDA agreed to bend its own rules and allowed local expenses in the social and gender areas to be paid from project funds. In fact, a special fund of $205,000 (or 15% of the original budget) was created and added to the budget; it was announced in March 2002 by former

[23] It was later found that the Brazilians were unable to process the cheque through any bank in Brazil, and its period of validity expired. For administrative reasons, related to the fact that WHI changed hands in 2004 (the company was acquired by multinational Schlumberger), it became very complicated to regain access to this money. Negotiations are continuing at the time of writing.

International Cooperation Minister Susan Whelan at a reception in Rio de Janeiro attended by several senior CPRM and Canadian Government officials.

Early in the project, a request was made to CIDA by PROASNE's social coordinators to provide funding in support of the social and gender programs. Ms. Teresa Pires, at the time CIDA's senior officer in charge of Brazil, recognized the need and wasted no time in creating this new fund, which made the difference between having a successful social and gender program and not having one at all. Unlike the technical partners, those operating in the social area had no financial support from their institutions for the social activities that they performed within PROASNE. The fund was put in place to cover field expenses for the social and gender field parties. The amount in the fund ($205K) was not expected to go much beyond covering the bear minimum to carry out field work, considering that there were four pilot areas to provide for, and dozens of volunteer workers wanting to spend a lot of time in the field. However, strict guidelines and responsible management by the coordinators, allowed a great deal more to be accomplished with this small amount of money than had been originally thought possible. Thus, the fund covered not only for travel expenses, but paid for PROASNE's share of all the community projects that were carried out (see part "d" of Appendix B-2), air fares for the coordinators to attend Steering Committee meetings, the release of the solar equipment from customs in Fortaleza (see above); organizing visits by CIDA and other Canadian Government officials to the pilot areas, etc.[24]

The fund was set up in Brazil and was managed by PROASNE's National Social Coordinator, Luciana Cibelle dos Santos, from Recife. Setting up such a fund in Brazil, which required processing cheques issued by the Canadian Government and easy withdrawals, could have been a very complicated matter. We were fortunate, however, that ABAS/CE and later IHAB, both non-profit organizations and PROASNE partners, agreed to provide banking and accounting services at low cost to the project. But processing Canadian government issued cheques remained a problem and was not possible through the regular Brazilian banking system. It had to be done through a broker at exchange rates that were not always the most advantageous.

[24] PROASNE received frequent visitors from Canada. Amongst the dignitaries that were welcomed was the Canadian Ambassador to Brazil, Jean-Pierre Juneau in June 2001; the Minister for International Cooperation, Susan Whelan in March 2002; the President of CIDA, Len Good accompanied by Vice-President Bob Anderson and Director General Don MacMaster in November 2001; Member of Parliament Vic Toews, Anne-Marie Bourcier, CIDA's Director General for Brazil and Southern Cone Region. Amongst CIDA officials to visit were: Karen Austin, Louis Verret, Simone Direito, Teresa Pires, and others.

But aside from the actual money in the social fund, which was directly available to support development work in the pilot areas, it was gratifying that the fund also generated many times its value in the form of volunteer work and co-participation by other organizations. The mere existence of the fund, and the fact that the money was being donated by a foreign entity, CIDA, to improve living conditions in their region, stimulated local organizations to commit and eventually release human and financial resources to support CIDA's actions. In that sense, CIDA's social fund was truly "seed money" that generated a great deal more benefits than the strict monetary value in the fund. Partner institutions were simply inspired by CIDA's willingness to invest in their region and felt compelled to become involved.

Table 6 : Actual project expenditures compared to pledged amounts at beginning of projects for Canadian and Brazilian partners, and CIDA funds broken down by administrative categories

	Pledged contributions from partners at beginning of project (April 2000) - all values are approximate					Actual contributions from partners at end of project (December 2004) - all values are approximate					Original and Revised CIDA Budget and Actual Project Expenditures - values are precise			
Line Item Breakdown	Lead Cdn Partner (April 2000)	Other Cdn Partners (April 2000)	Lead Braz Partner (April 2000)	Other Braz Partners (April 2000)	Total Partner contrib. (April 2000)	Lead Cdn Partner (Dec. 2004)	Other Cdn Partners (Dec. 2004)	Lead Braz Partner (Dec. 2004)	Other Braz Partners (Dec. 2004)	Total Partner contrib. (Dec. 2004)	Original CIDA budget (April 2000)	Revised CIDA budget (July 2002)	Actual CIDA expenditures (Dec. 2004)	Variance (Actual Expe. as % of Revised Budget)
GSC's personnel														
Project coordinator's salary & benefits	$135,000				$135,000	$400,000				$400,000	$120,000	$120,000	$154,001	128.33%
Technical staff salaries	$135,000				$135,000	$120,000				$120,000	$120,000	$120,000	$11,000	9.17%
Overheads and other administration costs	$131,000				$131,000	$392,680				$392,680				
Subtotal	**$401,000**				**$401,000**	**$912,680**				**$912,680**	**$240,000**	**$240,000**	**$165,001**	**68.75%**
Travel expenses														
GSC staff travel expenses											$130,000	$130,000	$111,052	85.42%
Canadian outside consultants travel expenses											$172,000	$172,000	$119,731	69.61%
Travel related to training Brazilians in Canada			$30,000	$30,000	$60,000			$40,000	$10,000	$50,000	$140,000	$140,000	$96,034	68.60%
Subtotal			**$30,000**	**$30,000**	**$60,000**			**$40,000**	**$10,000**	**$50,000**	**$442,000**	**$442,000**	**$326,794**	**73.94%**
Canadian Outside Consultants														
Contract costs (excluding travel)							$120,000			$120,000	$282,000	$282,000	$552,295	195.85%
Donation (equipment or cash)							$27,000			$27,000				
Airborne geophysical surveys			$250,000		$250,000			$225,370		$225,370	$250,000	$250,000	$225,370	90.15%
Subtotal			**$250,000**		**$250,000**		**$147,000**	**$225,370**		**$372,370**	**$532,000**	**$532,000**	**$777,665**	**146.18%**
Expenses in Brazil														
Special CIDA social fund (announced March 2002)												$205,000	$206,649	100.80%
Local consultants											$50,000	$50,000	$20,488	40.98%
Project administration			$237,000		$237,000			$1,000,000		$1,000,000				
Brazilian project personnel (salaries)			$1,758,100	$1,684,200	$3,442,300			$1,070,000	$467,000	$1,537,000				
Project activities (O & M)			$528,600	$345,900	$874,500			$315,000	$188,000	$503,000				
Project activities (capital)			$51,400	$360,200	$411,600			$120,000		$120,000				
Project activities (waterworks)				$1,543,900	$1,543,900			$100,000	$500,000	$600,000				
Subtotal			**$2,575,100**	**$3,934,200**	**$6,509,300**			**$2,605,000**	**$1,155,000**	**$3,760,000**	**$50,000**	**$255,000**	**$227,138**	**89.07%**
Other Project Expenditures														
Non-contracted services											$50,000	$50,000	$10,297	20.59%
Equipment rental, shipping, etc.											$40,000	$40,000	$23,391	58.48%
Communication and other justifiable expenses											$6,000	$6,000	$35,084	584.74%
Subtotal											**$96,000**	**$96,000**	**$68,773**	**71.64%**
Total	**$401,000**	**$0**	**$2,855,100**	**$3,964,200**	**$7,220,300**	**$912,680**	**$147,000**	**$2,870,370**	**$1,165,000**	**$5,095,050**	**$1,360,000**	**$1,565,000**	**$1,565,000**	**100.00%**

All values in $Can

1. In Microsoft Word, best viewed at 150% magnification
2. Contributing partners: Lead Canadian partner: GSC; lead Brazilian partner: CPRM; other Canadian partners: Sunmotor International & Waterloo Hydrogeologic Inc.; other Brazilian partners: UFC, UFPE, UFRN, UERN, SOHIDRA, CAGECE, COGERH, CAERN, FUNCEME, SERHID, CPRH, FUNDJ, UniSol, SEBRAE, ATOS, ESAM, Municipality of Irauçuba

Table 7 : Actual contributions by Canadian and Brazilian partners, and CIDA (per fiscal year) broken down by project activity

	Actual contribution from all partners at end of project (2000-2004) all values are in $Can and are approximate					Actual yearly and total CIDA contribution (2000-2004) all values are in $Can and are precise					
Breakdown per Activity	Lead Canadian Partner Apr 00 - Dec 04 Approximate	Other Canadian Partners Apr 00 - Dec 04 Approximate	Lead Brazilian Partners Apr 00 - Dec 04 Approximate	Other Brazilian Partners Apr 00 - Dec 04 Approximate	Total Partner Contribution Apr 00 - Dec 04 Approximate	Fiscal Year 2000 - 2001 Apr 1 - Mar 31 Actual	Fiscal Year 2001 - 2002 Apr 1 - Mar 31 Actual	Fiscal year 2002 - 2003 Apr 1 - Mar 31 Actual	Fiscal Year 2003 - 2004 Apr 1 - Mar 31 Actual	Fiscal Year 2004 - 2005 Apr 1 - Dec 31 Actual	Total CIDA Contribution 2000 - 2004 Actual
Administration/Management	**$792,680.00**		**$1,000,000.00**		**$1,792,680.00**	**$48,253.29**	**$66,510.59**	**$55,741.50**	**$28,335.77**	**$39,737.50**	**$238,578.65**
Technical Activities											
Ground Geophysics			$20,000.00	$30,000.00	$50,000.00	$47,688.93					$47,688.93
Airborne Geophysics	$65,000.00		$240,370.00		$305,370.00	$235,267.10	$2,500.00				$237,767.10
Hydrogeology			$200,000.00		$200,000.00						$0.00
Solar Energy		$25,000.00		$150,000.00	$175,000.00	$43,556.97	$12,230.69				$55,787.66
Remote Sensing/GIS	$55,000.00		$50,000.00	$5,000.00	$110,000.00	$23,562.43	$54,054.95	$24,184.02	$30,209.85	$10,000.00	$142,011.25
Groundwater Modeling				$75,000.00	$75,000.00		$16,425.93	$128,634.73	$25,471.63		$170,532.29
Groundwater Information System		$100,000.00	$750,000.00		$850,000.00			$98,769.78	$15,399.00		$114,168.78
Groundwater Salinity				$20,000.00	$20,000.00		$12,725.93				$12,725.93
Artificial Recharge					$0.00		$8,525.00			$4,500.00	$13,025.00
Groundwater Management Strategy			$350,000.00		$350,000.00				$17,404.61		$17,404.61
Ecological Studies				$250,000.00	$250,000.00						$0.00
Technical Activities Subtotal	**$120,000.00**	**$125,000.00**	**$1,610,370.00**	**$530,000.00**	**$2,385,370.00**	**$350,075.43**	**$106,462.50**	**$251,588.53**	**$88,485.09**	**$14,500.00**	**$811,111.55**
Social & Gender Program		**$2,000.00**	**$250,000.00**	**$625,000.00**	**$877,000.00**	**$62,343.00**	**$144,755.20**	**$112,403.69**	**$66,526.79**		**$386,028.68**
Special Events		**$20,000.00**	**$10,000.00**	**$10,000.00**	**$40,000.00**	**$65,328.28**	**$52,271.71**		**$11,681.13**		**$129,281.12**
TOTAL	**$912,680.00**	**$147,000.00**	**$2,870,370.00**	**$1,165,000.00**	**$5,095,050.00**	**$526,000.00**	**$370,000.00**	**$419,733.72**	**$195,028.78**	**$54,237.50**	**$1,565,000.00**

1. In Microsoft Word, best viewed at 150% magnification
2. Contributing partners: Lead Canadian partner: GSC; lead Brazilian partner: CPRM; other Canadian partners: Sunmotor International & Waterloo Hydrogeologic Inc.; other Brazilian partners: UFC, UFPE, UFRN, UERN, SOHIDRA, CAGECE, COGERH, CAERN, FUNCEME, SERHID, CPRH, FUNDJ, UniSol, SEBRAE, ATOS, ESAM, Municipality of Irauçuba

6. CHALLENGES AND LESSONS LEARNED

By all accounts, PROASNE was an exemplary project in the way it succeeded in bringing the social and the technical sides to work together towards a common goal; in assembling a large number of partners with very diverse interests and expertise; and in producing many remarkable and lasting results. There were many challenges, however, and in dealing with them, many useful lessons were learned.

6.1 Technology Transfer

PROASNE was essentially conceived as a Technology Transfer or Capacity Building project. However, it took some time to develop a technology transfer strategy in PROASNE that our Brazilian partners would find useful. Some said that the project never achieved it's full technology transfer objectives or, put in another way, the project never really met their technology transfer expectations.

As indicated in section 1.5, the most common form of technology transfer in PROASNE was through seminars, workshops and short courses delivered on-site in Brazil. Usually these lasted one week or less, and were either repeated in the different states or the partners from the different states would travel to a central location to take part in the event. Classroom sessions were often combined with field demonstrations.

The Canadian consultant rarely remained in Brazil for more than two weeks. Sessions would include audiovisual presentations by both the Canadians and the Brazilians. The Brazilian presentations showed the NE-Brazil context and the current state of knowledge in Brazil, whereas the Canadian presentations were more about the "new technologies" and how to apply them to resolve groundwater problems.

The events were always well attended usually by a mixed audience in terms of level of knowledge, which required spending a significant amount of time bringing everybody up to speed on the basic principles rather than spending all of the time transferring the "new technologies". This prevented instructors from delving deeply into the subjects and, of course, didn't sit well with the more specialized individuals in the audience, leaving their expectation largely unfulfilled[25].

[25] Despite the shortcomings, the Brazilians were generally satisfied with the technology transfer process in PROASNE as can be seen in the following workshop evaluation reports: Ground Geophysics, June 2000; Groundwater Modeling, June 2001; Remote Sensing, March 2004

To correct this situation, later workshops made provisions to bring the knowledge base of the participants to a common level by organizing “catch-up sessions” in the week preceding the arrival of the Canadians. This did resolve the problem to a certain extent, but not completely. The Brazilians would have preferred that the Canadian experts remained in Brazil much longer than one or two weeks; that the technologies be taught more in-depth, and that the instructors work more hands-on with them, using their data and finding solutions to their problems (rather than utilizing case histories that described similar situations in other parts of the world that the Canadians were more familiar with).

Overall, in transferring technology, PROASNE had to deal with the following constraints:

1. Costs – the longer the Canadians stayed in Brazil, the costlier their contracts;
2. The availability of specialists – few Canadians, whether from industry or GSC, could afford to be away from their home base for more than a few weeks at a time;
3. The language barrier – this was a major challenge in its own right (see following section); and
4. The unfamiliarity of the Canadian specialists with northeast Brazil making it difficult to address the problems directly without subjecting themselves to a lengthy learning process.

For the sessions conducted in the last year of the project, contractual arrangements were made so that the Canadian experts would remain in Brazil for longer periods; and the technology would be transferred to smaller audiences, making it more conducive for a hands-on approach. This greatly improved the situation and provided the project managers with a **valuable lesson** which can be stated as follows:

- **In transferring technology, it is important to target a well-defined audience, understand its needs, and take the time required to learn about their problems and search jointly for appropriate solutions.**

This is in lieu of the normal temptation to achieve more impact by maximizing the number of participants and by covering as much material as possible irregardless of whether it is relevant to the audience or not.

6.2 The Language Barrier

This challenge was already discussed in section 1.8 in trying to explain the variance between activities planned and implemented.

In the Northeast, it is very rare to come across Brazilians who understand English and still more rare to find Canadians in Canada who can speak Portuguese. This created difficulties in selecting Brazilian candidates to train in Canada and difficulties to identify Canadian specialists to go to Brazil. Simultaneous translation is available in Brazil and generally very good, but it is expensive (we paid US$1,000/day) and can only be used with large groups inside the classroom during courses and workshops.

The best alternative we found was to contract Canadian specialists who could speak Portuguese or Spanish even if this option limited our choices. We were fortunate that one of Canada's most reputed groundwater management firm, Waterloo Hydrogeologic Inc. (WHI), is run by a Brazilian, Dr. Nilson Guiguer, and has a large number of Brazilians amongst its staff. Dr. Guiguer was extremely keen to be involved in PROASNE, which also greatly facilitated matters[26].

WHI ended up with two major PROASNE contracts and a score of smaller ones, in addition to providing free advice and counselling throughout the project. In retrospect, we can say the WHI and its President, Dr. Nilson Guiguer, contributed a great deal to PROASNE's success. Contracts were also awarded to firms with staff who could deliver the technology in Spanish. This worked well in some cases[27], and not at all in others. It all depended on the speaker and on the effort he would make to deliver a well articulated and understandable presentation.

[26] WHI's interest in PROASNE is clearly stated in company publicity. See for example the May 2003 Newsletter. Other items describe their involvement in the project: see July 2002 and August 2002 Company Newsletters.

[27] This worked well with Infotierra based in Sherbrooke, Quebec. The Company won several PROASNE contracts, including one to train two UFRN personnel in Canada in 2001/2002. That training led to a Ph.D. degree being awarded to Ms. Anna Catarina Coriolano in 2003.

The **lesson learned** from our experience with language is:

- **In northeast Brazil, the language barrier is a serious impediment to the smooth transfer of technology[28]. Dealing with it adequately can make the difference between success and failure. One should not assume that speaking English slowly, or that "someone" will be there to translate, will solve the problem. The language issue has to be taken into account in the planning process.**

6.3 Formalizing partnerships and dealing with personnel changes

The greater the number of partners in a project, the greater will be the number of changes in personnel. People are assigned new responsibilities, or they retire, or they simply move on. This is true anywhere in the world, but in Brazil, certain events can trigger massive changes in personnel that affect the partner institutions all at once and leave their administrations in chaos for long periods. To compound the problem, these events are often accompanied by austerity measures like spending freezes.

The last Brazilian federal election, in October 2002, was such an event; things stopped performing normally at least six months prior to the vote, and remained chaotic at least six months after. During that one-year period, none of the partners, including CPRM, had any money to spend so that work on technical project activities was practically at a standstill. Interestingly, this event didn't affect work in the social and gender areas as much, because that program had it's own source of funds: the special social fund created by CIDA. If anything, it had the opposite effect; since no one had any money except PROASNE's social program, that program enjoyed a period of enhanced vigour as many of the social area partners turned towards it to keep busy.

An issue that was often a topic of discussion amongst project management team members is whether PROASNE should have formal agreements with all of its partners to lessen the impact of changes in the administrative personnel within the partner institutions. As it turned out, GSC and CPRM were the only PROASNE partner institutions to have a formal agreement[29] in place during the entire project. That

[28] This is not necessarily the case in other parts of Brazil. In a previous CIDA project, the author had no difficulty organizing technology transfer in English at CPRM headquarters in Rio de Janeiro and in other major centres.

[29] GSC and CPRM have an MOU in place since April 1995. This document, signed by the Director General of GSC and the President of CPRM formalizes the relations between the two institutions.

agreement may have prevented problems from occurring each time CPRM's senior management personnel changed[30] or when the Brazilian Project Manager was replaced, which happened three times during the life of the project. These changes at CPRM had no negative impact on the project as PROASNE enjoyed unreserved support from senior management throughout its existence, perhaps because there was a formal agreement in place.

However, no such formal agreements existed between PROASNE and the other partner institutions. For the most part, agreements were verbal and sealed with a handshake. Some involved senior level officers, but others, especially those that didn't include major commitment of funds, were done informally at middle management levels or below. On a few occasions, it was necessary to re-establish a relationship with a newly appointed management team at a partner institution, but this usually didn't involve more than a series of oral declarations and a round of abraços.

These informal partnerships generally functioned well and the verdict is still out on whether formal agreements are essential, just a good idea or unnecessary in multiple partnerships projects like PROASNE. Do they really help deal with changes in management? Do they make the partners stand more by their commitments? Do they help maintain motivation? Perhaps they do.

But from the point of view of the professional employee who wants to be involved in project activities, having a formal agreement with his/her institution is undisputedly a good idea because it legitimizes his/her participation and provides justification to his/her superiors to not assign him/her to other duties, to allow travel to attend project meetings, to allocate time to write reports and perform other project related tasks, etc. On the other hand, formalizing a partnership with an official agreement may introduce rigidity into what would otherwise be a flexible arrangement between individuals.

If we were to summarize our thoughts on the matter, this could be stated as follows:

- **Formalizing partnerships is always a good idea, but it is absolutely necessary between partners whose participation in the project is critical to achieving the desired outcomes and/or when there is a commitment to invest significant human or financial resources. When these conditions do not exist, informal partnerships can be established with the understanding that they will be formalized if the need arises.**

[30] PROASNE operated under three different senior administrations at CPRM

6.4 Transferring money and importing equipment

There are two Brazilian institutions that can guarantee headaches to any Project Manager: Brazilian Banks and Brazilian Customs.

6.4.1 Money transfers

For Canadians trying to pay for anything in Brazil, big or small, can be a frustrating experience unless it can be done with cash or by credit card. Direct bank transfers is, apparently, the best option, but it was not an option for us in PROASNE as the Canadian Government does not do bank transfers.

During the course of the project, it was necessary to pay for certain items by Canadian government issued cheques: e.g. our share of the airborne geophysical surveys: $225K; the 6-stand Canadian Pavilion at Fortaleza 2000: $17K; and the transfer of money for the Social Program: $20K per quarter. Smaller amounts were also paid by cheque: e.g. WHI's $2,000 donation to the community of Caraúbas (see Section 5.1 for that story).

Our experience is that the larger cheques issued to large institutions (e.g. CPRM) can usually be handled by the banks, but it takes a minimum of two months for the bank to process these items. Smaller cheques, especially those made out to individuals, are not generally processed by the banks; these amounts are best paid in cash[31]. When the two-months processing time is too long, as in the case of the $20K quarterly transfers for the social program, one can go through a broker. This was very convenient – it would have been very complicated to run the social program without it – and relatively inexpensive, but this service was set up through "private contacts" and may not be widely available.

The **lesson** drawn from these experiences is:

- **Whenever possible, pay for goods and services in cash in Brazil, even if the amounts involved appear to be too high for a cash transaction. Bear in**

[31] The project paid cash for certain items which should have normally been paid by cheque such as simultaneous translation ($2-$3K); in this particular case, the service provider – a small Fortaleza firm – accepted US currency, but this is not always the case. The $17K for the Fortaleza 2000 Canadian Pavilion ended up being paid cash also, after the Banco do Brazil lost the cheque sent to them by NRCan (they later found it and returned it to Canada).

mind that paying by credit card is not generally an option outside the retail outlets[32].

6.4.2 Dealing with Brazilian customs

Technology transfer projects, such as PROASNE, need to be able to temporarily import equipment in a country for the purpose of teaching, demonstrating or testing equipment as a means building the capacity of partner institutions. But in Brazil, this is complicated, especially if the equipment is bulky and likely to attract the attention of custom officers at the airport. When this happens, the outcome can range from "smooth sailing" with minimal problems, but more often, it means outright confiscation of the equipment with long delays and unanticipated costs for retrieval owing to complex bureaucratic procedures. Shipping the equipment ahead of time is not a solution either because there is no way of knowing how long it will take to retrieve it and how much it will cost[33].

After a series of bad experiences, involving PROASNE as well as the previous project on the Sustainable Development in the Minerals Sector – 1995 / 2000, some of which put entire missions in jeopardy, the importation of equipment became a major factor in deciding which technologies would be transferred within PROASNE. Thus activities involving geophysical and well logging techniques were literally abandoned as they required equipment to be imported from Canada.

Unfortunately, neither CPRM nor the Canadian Embassy seem to have any influence over Brazilian customs and were unable to expedite matters (although CPRM's relentless efforts to keep on top of the situation, saved the day on more than one occasion.)

We have no effective solution to propose on this matter other than to :

- **Avoid planning project activities that require equipment to be brought in from outside the country.**

[32] Trying to use a credit card to obtain cash advances (except in small quantities from ATMs), or changing currency or even travelers cheques in downtown banks can be a frustrating experience. These transactions are best done at airports.

[33] See section 5.1 for the story on importing solar panels for the experimental solar station built by PROASNE in Ceará, but bear in mind that these were not being imported temporarily, but rather were being donated to a community in need.

6.5 The need for flexibility

One key factor that enabled the PROASNE management team to accomplish as much as it did is that they were able to adjust the project to circumstances as they presented themselves. Despite the fact that CIDA has very elaborate and seemingly strict set of rules that govern the operation of its projects, we found that most CIDA officers, both in Gatineau and in Brasilia, who were involved with our project over the years, were very open to adjusting those rules as required for the good of the project.

Thus, PROASNE's request to **charge local expenses** to support the social and gender programs was quickly accepted by CIDA, which also provided extra funding for that purpose. Even though the request was well justified, it was still a major transgression of CIDA's operational guidelines. The Agency's flexibility in this case paid off immensely; without it, PROASNE's social and gender program would not have been nearly as successful as it was.

CIDA also showed flexibility by not insisting that the **original work plan** be strictly adhered to, for example, by allowing that money be spent on small community projects. These were not part of the original work plan, as defined in the project LFA, but turned out to be very important to meet the expectations of the communities and in building local support for the project.

Other areas where CIDA showed openness include allowing **non-conventional reporting methods** – the project reported on progress mostly on its web site rather than by producing semi-annual progress reports following a pre-established format[34] – and by not being overly strict about compliance with the **Canadian Environmental Assessment Act**, although this was not extensively tested because the project had few constructions in the CEAA sense. On this last point, however, it would be important in future projects in Brazil for CIDA and the Government of Canada to show flexibility in applying the CEAA because strict enforcement would severely limit the range of activities that could be carried out and would certainly frustrate our partners (see also pages 29 and 30 of Project Implementation Plan on the accompanying CD-ROM).

[34] Note that the Annual Project Progress Reports (APPR) and the Quarterly Financial Reports were produced in accordance with CIDA's schedule.

7. INTELLECTUAL PROPERTY

The only PROASNE product which has real or potential commercial value, and therefore has Intellectual Property implications is **the new SIAGAS groundwater information system.**

This product is made up of several software programs and modules. The intellectual property and access privileges are shared between CPRM and Waterloo Hydrogeologic Inc. as follows (as stated in the terms of the Agreement between Waterloo Hydrogeologic Inc, CPRM and GSC, for the development of this product):

Intellectual Property and access privileges

1. Data Entry Program (simplified version): property of CPRM for reproduction and free and unrestricted distribution;

2. Data Entry Program (full version): property of Waterloo Hydrogeologic Inc. and CPRM, for internal use, to be licensed to PROASNE participants;

3. Interpretation and Advanced Data Analysis Program: Property of Waterloo Hydrogeologic Inc. and will be licensed for the internal use of CPRM. PROASNE partner institutions with records in SIAGAS, and others who contribute significantly to the development of the database, will have limited access (to be determined by the parties on a case-by-case basis) to all or to some of the available tools of the Interpretation and Advanced Data Analysis Program.

4. Internet search module: property of CPRM; unrestricted access.

None of the other PROASNE products, including maps, reports, manuals, audio-visual material, methods, technology, know-how, etc. are deemed to have commercial value and, consequently, the corresponding intellectual property ownership was never established or discussed. However, should there be commercial exploitation of any of these products in the future, it will be assumed that the intellectual property ownership is shared between the Canadian and Brazilian partners involved in their creation, excluding the Government of Canada.

8. CANADIAN COMMERCIAL BENEFITS AND SPIN-OFFS

Although Canadian cooperation projects, such as PROASNE, are primarily aimed at improving equity and reducing poverty in the world, the Canadian Government and the Canadian taxpayers are interested in knowing to what extent their contribution to international aid benefits Canadians. Amongst the most important benefits to Canadians was the increase in knowledge and experience of Canadian participants in the project; the improvement of technologies that have or may ultimately be brought back to Canada to benefit Canadians; the enhancement of Canada's image and influence in the world; and the creation of commercial opportunities for Canadian companies and consultants.

Regarding commercial opportunities to companies and consultants derived from their participation in PROASNE, two sets of figures were compiled. The first is the value of all the contracts awarded by the project to Canadian companies and consultants; the second is the value of spin-off contracts that can be linked directly to private sector participation in the project. The latter figures are somewhat difficult to obtain as they require some probing for information that companies often don't give out voluntarily. In the present case, we were fortunate that some companies have come forward with the information and provided it in writing after we indicated to them that it was very important to us. Some of these statements can be found in Appendix E.

Table 8 gives for each fiscal year of the project, the value of all contracts given out to Canadian companies and consultants, as well as the value of spin-off sales of goods and services from written accounts provided by the companies. Only written accounts have been compiled for the spin-off column, and there may be more that have not been documented. Table 8 also provides data on the contribution of the Government of Canada for comparison purposes.

The figures show that about 60% of CIDA money was spent on private sector contracts[35], and that the documented total value of spin-off sales of goods and services ($1.50M) by companies is only slightly less than the total amount contributed by CIDA ($1.57M). In total, private sector returns have exceeded the Canadian Government contribution to the project by about $200K.

[35] In calculating this figure, $235.3K was subtracted from the $1,171.5 total value of contracts awarded, which corresponds to CPRM's share of the airborne geophysical contract paid to Fugro Airborne Surveys.

Table 8 : Canadian private sector returns from participating in PROASNE (project contracts and spin-offs) compared to total Canadian Government contribution

Government of Canada Contributions ($,000)				Private Sector Returns ($,000)					
FY2000-01				FY2000-01					
	Salaries	O&M	Contribution	Company	Description	Client	Project	Spin-Off	Returns
NRCan	198.9			Palacky Services	Consulting on Gender	PROASNE	2.6		
CIDA		526.0		Komex International	Ground Geophysics	PROASNE	37.2		
				Sunmotor International	Fortaleza 2000	PROASNE	5.8		
				Sunmotor International	Consulting on Solar	PROASNE	6.5		
				Sunmotor International	Solar station development	PROASNE	37.0		
				Fugro Airborne Surveys	Fortaleza 2000	PROASNE	5.8		
				Fugro Airborne Surveys	Airborne surveys	PROASNE/CPRM 50/50	450.7		
				Waterloo Hydrogeologic	Fortaleza 2000	PROASNE	5.8		
				MIR Télédétection	Fortaleza 2000	PROASNE	5.8		
				Bemex Consulting Intern.	Fortaleza 2000	PROASNE	7.4		
				Univ. Waterloo	Fortaleza 2000	PROASNE	5.8		
				CH2M Hill Canada Ltd	Fortaleza 2000	PROASNE	5.8		
				Univ. Victoria	Fortaleza 2000	PROASNE	5.8		
				Groundwater Services Int.	Fortaleza 2000	PROASNE	5.8		
				Gender Equality Inc.	Social coordination	PROASNE	40.5		
				Infotierra Ltd	Remote sensing	PROASNE	7.1		
TOTAL			724.9	TOTAL			635.4	0.0	635.4
FY2001-02				FY2001-02					
	Salaries	O&M	Contribution	Company	Description	Client	Project	Spin-Off	Returns
NRCan	201.6			Infotierra Ltd	Remote sensing	PROASNE	21.9		
CIDA		370.0		PCI Geomatics	Software	PROASNE	10.0		
				Waterloo Hydrogeologic	Consulting Modeling	PROASNE	11.5		
				Waterloo Hydrogeologic	Children's book	PROASNE	4.9		
				Univ Waterloo	Consulting geochemistry	PROASNE	12.8		
				CH2M Hill Canada Ltd	Consulting ASR	PROASNE	8.8		
				Sunmotor International	Solar station installation	PROASNE	9.4		
				Gender Equality Inc	Social coordination	PROASNE	66.8		
				Palacky Services	Interpretation	PROASNE	4.7		
				Conflict Mediation	Seminar	PROASNE	3.0		
				Brian Eddy	Consult Remote Sensing	PROASNE	4.5		
TOTAL			571.6	TOTAL			158.3	0.0	158.3
FY2002-03				FY2002-03					
	Salaries	O&M	Contribution	Company	Description	Client	Project	Spin-Off	Returns
NRCan	204.2			Waterloo Hydrogeologic	Tech Transfer Modeling	PROASNE	103.6		
CIDA		419.7		Waterloo Hydrogeologic	Database (SIAGAS)	PROASNE	84.6		
				Waterloo Hydrogeologic	Software	PROASNE	15.0		
				Gender Equality Inc.	Social coordination	PROASNE	52.4		
				Infotierra Ltd	Remote sensing	PROASNE	5.5		
				Fugro Airborne Surveys	Seminar	PROASNE	3.2		
				PCI Geomatics	DEM	PROASNE	1.6		
				Waterloo Hydrogeologic	Water Resources Evaluation, Consulting	Undisclosed Mining Company in Northern Chile		110.0	
				Waterloo Hydrogeologic	Capacity Building, Training	State Government, Rio Grande do Norte, Brazil		12.0	
				Waterloo Hydrogeologic	Groundwater Management System	Ministry of the Environment, Ontario		125.0	
				Sunmotor International	Solar Powered Pumping and Desalinization System for brine spill reclamation	Three major oil & gas companies in Alberta and Saskatchewan		84.2	
TOTAL			623.9	TOTAL			265.9	331.2	597.1
FY2003-04				FY2003-04					
	Salaries	O&M	Contribution	Company	Description	Client	Project	Spin-Off	Returns
NRCan	213.7			Gender Equality Ltd	Social coordination	PROASNE	15.3		
CIDA		195.0		Waterloo Hydrogeologic	Tech Transf Modeling	PROASNE	25.5		
				Waterloo Hydrogeologic	Database (SIAGAS)	PROASNE	15.4		
				Waterloo Hydrogeologic	PROASNE Brochure	PROASNE	11.3		
				Infotierra Ltd	Tech Trans Geoprocessing	PROASNE	30.4		
				Waterloo Hydrogeologic	Groundwater Management System	Federal Government, Republic of Lesotho		49.0	
				Waterloo Hydrogeologic	Water Well Tagging System (to design the system)	Ministry of the Environment, Ontario		62.0	
				Waterloo Hydrogeologic	Water Well Tagging System (to supply the tags)	Ministry of the Environment, Ontario		675.0	
				Waterloo Hydrogeologic	Water Quality Information System	Ministry of the Environment, Ontario		385.0	
TOTAL			408.7				97.9	1171.0	1268.9
FY2004-05				FY2004-05					
	Salaries	O&M	Contribution	Company	Description	Client	Project	Spin-Off	Returns
NRCan	94.3			Waterloo Hydrogeologic	Technical Advices	PROASNE	4.0		
CIDA		54.2		Infotierra Ltd	Tech Trans Geoprocessing	PROASNE	10.0		
TOTAL			148.5	TOTAL			14.0	0.0	14.0
Canadian Government Contribution				Returns to Canadian Companies and Consultants					
TOTAL	912.7	1564.9	2477.6	TOTAL			1171.5	1502.2	2673.7

Note: In Microsoft Word, this Table best viewed at 150% magnification