Final Report Rio Tapajós Projects
Date: 19 July 2004

Background/Summary

This is the final report as required under the contract between Greenstar Corporation (www.greenstar.org), Sandia National Labs (http://www.re.sandia.gov) for funding of the Rio Tapajós Project. Although this is the final report for the purposes of the contract with the funding agency, the implementation of the project is scheduled to last until December 2005. Greenstar Corporation, Acumen International and Projeto Saude e Alegria ("PSA") are committed to continue monitoring and reporting on the project, however this is out of scope of the USAID contract.

This project has delivered key information and communication technologies (ICT) that two isolated fluvial communities along the Rio Tapajós will use to help achieve their social and economic development objectives. The field installations included the construction of a new telecenters construction, installation of photovoltaic systems, personal computers and internet access in the communities of both Suruacá and Maguari. The project also included extensive technical, organizational and inter-disciplinary capacity development within the communities to utilize the technologies and manage the systems over the lifetime of the equipment.

The approach and the concepts applied in the projects were the result of an on-site evaluation conducted by Greenstar in July 2001, contacts between Greenstar and USAID/Brazil with the support of USAID's Global Bureau Office of Environment and Technology (USAID/G/ENV/EET) (www.usaid.gov) in Washington, D.C, and an in-depth planning visit to all sites by Greenstar, through it's subcontractor, Acumen International (www.acumenintl.org) in January and February 2003. Acumen International also paid two additional visits to the region in October 2003 and June 2004 to assist with project implementation, monitoring and evaluation. The core concept integrated into each project opportunity is based on the field-proven Greenstar model, which delivers a solar-powered community center that can rapidly and economically deliver electricity, computer technology, education and basic health care services along with comprehensive software resources in local language, to remote locations anywhere in the world.

Each community-based field installation includes a link to the internet, which also offers an opportunity to access to markets for local products, including native music, art, and photography as well as physical products manufactured by the local population. We also seek to have a lasting, constructive impact on local social, educational, health and economic activity by integrating the technology with a combination of existing and new development initiatives. The grassroots partner for these projects, PSA will maintain a continuing presence in each community, and will gather evidence of impacts.

Description of Project

Projeto Saúde E Alegria (Health & Happiness) (http://www.saudeealegria.org.br) (""PSA") is a well-established Brazilian NGO that has the geographical focus of its community based programs in the Amazon region. PSA has created an innovative use of video and community interaction that has proven to be effective for communicating information about preventative heath care practices in 31 river front villages. PSA is also in the process of assisting over 150 communities in the region with clean water systems and shortwave radio. A number of the communities with which PSA works have received solar power as part of the Government of Brazil PRODEEM (Energy Development Program for States and Municipalities) program.

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This project built upon the existing PRODEEM infrastructure by adding innovative technologies and related community services that are not presently embodied in the PRODEEM initiative.

Specifically, the project constructed computerized, internet-enabled Community Cultural Centers in two of communities (Suruacá and Maguari) thus creating an information technology platform which is being used to facilitate a range of social and economic development activities.

The youth of the community are playing a central a role in running the Community Cultural Center, hence acquiring skills that they will be able to apply later in life. While the project initially envisioned the communities' participation in the Greenstar Digital Culture Program (please see appendix), neither the communities nor PSA have currently agreed to this. If they eventually were to do so, digital videos produced by the community would constitute an array of commercial products that would establish a cash flow to support further community initiatives .
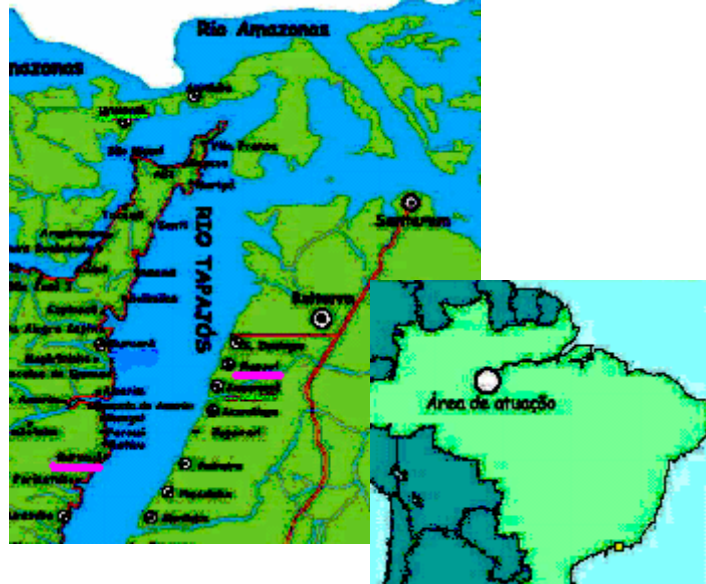
Each project involved the

- Construction of buildings to house the center and detached structures to house the PV equipment. In Suruacá, the community provided most of the most of the construction materials and labor used for construction. With the Maguari center, the Brazilian department responsible for managing the forest where the community is located, IBAMA, donated most of the wood used in the construction of the center and the community provided most of the labor used in construction.

Maguari Telecenter

- Installation of a 2 KW photo-voltaic system
- Installation of 3 desktop computers, a printer and a scanner. Two of the machines in each center use LINUX and one Windows XP Home Edition.
- Provision of a digital camera and MD player (which can be used to record music), as well as two years worth of disks and other supplies.
- A number of software programs have been installed on the machines, including but not limited to:

Windows PCs	**Linux PCs**
Microsoft Works	Typing Tutor
Sony Digital Camera transfer utilities and imaging editing	Open Office
Yahoo and MSN Instant Messenger (Chat/Video/Voice)	Chat
Adobe Acrobat Reader	e-mail
Internet Explorer and search (mostly through Google.com.br)	Internet Browser and search (mostly Google.com.br)

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e-mail via Hotmail

- The Brazilian Mission of USAID also supplied a box of mostly printed resources from various USAID projects for the communities to use.
- A wide variety of additional software, including educational titles and toolkits focused on education, health and micro-enterprise development will be deployed as the communities are ready (and as the materials are completed).

Suruacá Telecenter

The centers will become environmentally and socially sustainable for the long-term. PSA, Greenstar, Acumen International and the communities are currently working out plans for ensuring the economic sustainability of the center. More information on these efforts is available under the "results" section, below. The two systems will directly serve an estimated population of approximately 1270 people and an additional estimated 2000 people from neighboring communities. The systems will be integrated into the community's and PSA development programs, as well as be used as a tool to facilitate new development initiatives, such as potentially the Greenstar Digital Culture Program.

Results

The Suruacá center became operational in December 2003 and did not have internet access until January. The Maguari center was completed approximately two weeks before this report was written, during the second week of June, 2004. Although some limited training was begun in each location starting several months prior to inauguration of the centers, neither center has been operational long enough to have yet achieved its long-term goals of providing significant improvement to the social and economic welfare of the communities.

Summery of Key Dates for project

The following is an timetable of approximate dates various project milestones were completed

Milestone	Completion Date
Original research visit by Greenstar to the area and meetings with Saude e Alegria	7/2001
Original Contract Signed	1/15/03
Acumen International visit to Saude e Alegria and communities	1/23/03 – 2/4/03 and 4/13/03-4/15/03
Project Finalization Plan completed[1]	3/15/03
Agreement between PSA and Greenstar signed	7/18/03
First computer installed in Suruacá, Pre-inauguration, and training began	10/25/03
Acumen International visit to Saude e Alegria and communities	10/22/03-11/4/03
Completion of Suruacá Cultural Telecenter Building, and installation of computers and PV system. Inauguration of Suruacá Center	12/19/03
Installation of Internet access in both communities and PV system and first computer in Maguari. Training on computer began.	1/30/04

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[1] The Greenstar Digital Culture Marketing Plan was not added to the Project Finalization Plan for approximately another 6 weeks.

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Revised Contract Signed[2]	2/19/04
Inspection of PV systems installations by Aurelio Neto Souza	3/23-24/04
Completion of Maguari Cultural Telecenter	6/15/04
Inauguration of Maguari Cultural Telecenter[3]	6/26/04
Acumen International visit to Saude e Alegria and communities	6/17/04-6/27/04
Projected date when funding support ends	*12/31/2005*

Achievements

Despite the short time that the centers have been operational, the project has helped generate a number of achievements, including:

- Both communities were closely involved with the planning and construction of the centers. Suruacá supplied all wood used in the center by harvesting trees from areas of the forest over 7 km from the community, milling the lumber and transporting the lumber by Ox and by hand over difficult terrain. This was an impressive effort by the community. The wood used in Maguari was donated by the Brazilian department responsible for managing the forest where the community is located, IBAMA, Both communities provided most of the labor used in construction Both communities gained valuable project management experience from their close community involvement in the planning for the project, as well as their management of the construction. Also, the cost of each community telecenter building was approximately only US$5000 due primarily to the communities'/IBAMA's contributions of materials and labor.
- The project has been successful at providing three times the number of computers and electricity to power them then was originally envisioned in the plan. This was made possible through the donation of 4 used computers by a Rio de Janeiro NGO, Rede de Informacaoes para o Terceiro Setor (RITS) (www.rits.org.br) with which PSA established contact. It was possible to fund the extra power needed to operate the increased load due to the fortunate enrollment in a government program designed at "digital inclusion" (www.gesac.gov.br) . RITS identified this program and helped ensure the project's inclusion in it. Under the program, the government paid for all hardware, installation and access charges until at least the end of 2005.
- Community youth in both communities are playing a central role in operating the center. This process has not been without its challenges. For example, many in Suruacá wanted to use the center's photo-voltaic system to operate a TV which would have overtaxed the center's PV system. The center managers went to the community and the community leaders and helped negotiate a solution which prohibited the use of the telecenter's PV system but gave access to other sources of electricity to operate the TV many evenings. Through the management of the cultural telecenter, youth are learning skills which they will be able to apply later in life.
- Users in both communities have been quick to start using the computers. At least 15 individuals in Suruacá and 10 in Maguari have e-mail addresses and frequently access their e-mail. Many more have used the computers in some way. Much of the e-mail is exchanged to maintain new friendships between the two communities. As expected the most active users are youth, however a number of older users are also already using e-

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[2] The contract between Greenstar and Sandia was amended due to several factors, including PSAs decision not to pursue the Greenstar Digital Culture Program, a revision of the amount of funds Greenstar would contribute to the projects and a decision to limit the project to two installations in the Tapajós, rather then the multiple location, as originally envisioned. The due dates and schedules of deliverables were also amended due to the slip in the construction of Maguari.

[3] The completion of the Maguari Cultural Telecenter was delayed over six months due to IBAMAs delay in releasing wood for use in construction of the center. This delay resulted in approximately 3 month delay in the completion of the project from the date committed in the original contract between Greenstar and Sandia.

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mail and MSN Instant Messenger. Students in at least Suruacá are using Google to research topics for their school work. One obstacle to using Google has been many of the users' poor spelling. This has resulted in increased interest in users learning to spell correctly. All of the center's computers are typically constantly busy with a crowd of people around each computer.

- A wide range of users are already using the centers, at least in Suruacá. The most common users are youth; however some teachers, community leaders and other adults have also taken great initiative to learning how to use the equipment. During Acumen International's recent visit, 75 year old Dona Martinha was seen learning to type. To date, adult men seem to use the center the least.

- Considerable linkages already forming between Maguari and Suruacá. Each has different strengths which can share with the other community. Prior to the project, there had been little contact between the communities.

- Suruacá and Maguari have already used chat and web cam to resolve a misunderstanding they had. Maguari planned to charge Suruacá participants to their inauguration more money then most Suruacá residents could afford. Some bad feelings were developing because Suruacá didn't charge people from Maguari when they attended their inauguration. To resolve the misunderstanding, the two communities convened a teleconference and discussed the problem in "virtual face-to-face". In the past, they would have attempted to do this by radio or by catching a boat across the river and meeting face to face. The Radio would likely have been ineffective and there wasn't enough time to travel to meet face to face. Instead, the problem was resolved by chatting and web cam in time for members from Suruacá to leave for the inauguration.

- The differences in the patterns of learning between the two communities are quite interesting. On one hand users in Suruacá, the center in which become operational six months ago has taken a bit longer then Maguari to learn the technology, however once they learn how to use the technology, they seem to be able to apply it to practical problems more quickly. The slower pace in learning the technology in Suruacá can be attributed to it being more isolated then Maguari from the rest of Brazil. While many in the community do travel occasionally to Santarém and beyond, these visits are less frequent then in Maguari, which is closer and has bus service most days. Also, several people in Maguari already had some familiarity with using computers and were a valuable asset to others. On the other hand, Suruacá has so far demonstrated a greater ease at applying the technology to solve problems due most likely to stronger organizational and leadership skills in the community.

- At the inauguration of the center in Suruacá in early December, the Prefecture of Santarém (in which the community is located) committed to building a badly needed new school building to replace the existing building. The community had been pressuring the municipal government for some time for a new school and it appears as if the publicity of the telecenters helped induce the commitment. It also helped that the election for mayor is later this year. As of late June, 2004, the new school is approximately 75% completed and is due for completion by August.

- Under the direction of Aurelio Neto Souza, a PV specialist who was in Suruacá to evaluate the installation of the PV system, members of the community used the computer and other tools provided by this project to evaluate the feasibility of using micro-hydro. as a source of power for the community and surrounding areas. Several youth traveled to a small waterfalls 15 km from the community, took measurements, entered the data into a spreadsheet, plotted the data and took photos with the digital camera. As result of this analysis, the community concluded that it would probably be technically feasible to use this waterfall as a source of energy, however it's distance from the community would likely make the transmission of the power to the community and surrounding areas too expensive. Still, armed with solid empirical data, they have approached the local electricity utility company, Electro Norte to determine how the project might be completed. The activity not only produced very useful data which will assist the community in its efforts to move the project forward, but also produced skills which will be useful for solving other problems in the future.

- The lower floor of the telecenters in both communities is being used to augment community meeting space. In Suruacá, the space is being used as badly needed classroom space (it is not clear whether this practice will continue after the new school is finished).

Anticipated Future Results

As noted above, this report is being written only approximately 6 months after the completion of the Suruacá telecenters and two weeks after that of Maguari. At this stage a limited number of each community have a grasp of the technology. The project will continue for another approximately 18 months.

Identified Needs

The following are some specific problems which Suruacá has identified that it would like to address. These are only some of the initial "problems" which the community plans to address.

General Population
- Developing and preserving their culture
- Earn income for other development priorities
- Getting to know outside world and vice versa
- Learn English and Spanish in order to be more self-sufficient with the Internet and working with outside organizations and individuals
- Find a solution for supplying growing energy needs

 Teachers
- Biggest needs are improving spelling, grammar, mathematics educational.
- They also have some interest in math and physics for middle school.
- English.
- Find up to date data about local region for research projects. The data they now have access to is very old.
- They very much like idea of linking with other Amazon schools and orgs
- Accessing guides to TV Escola which are available on-line

Health
- They would like to start attending to the health needs of neighboring communities too
- Increased use of alternative medicines but they haven't figured how to pay for costs
- Anti drug Campaign which especially focuses on alcohol and cigarettes.
- AIDS – To date they have no course but want to keep it that way
- Vision (Exams, glasses and help people with nutrition since there is a link.)
- Hernias
- Snake venom kits- they need freezer for this.
- Some venereal diseases. Need to do more education.
- Some additional nutritional education needed
- Some interest in contraception, including education on men's role in reproductive health

Entrepreneur
- Women's group working with fruit, handicrafts
- Entrepreneur with Honey
- Very interested in Ecotourism but they want to study other people's problems and solutions before moving forward quickly.

- Raise Pork and more chickens
- Production and sale of local oils like Andiroba and oils from seeds
- Woodworking
- There is little opportunity to sell things within community however the following are some ideas for which their might be a market
  - Ice
  - Sewing
  - barber

While we anticipate Maguari will have some similar needs, we have not sat down with them as closely yet because they have had less experience becoming familiar with the actual technology.

Initiatives

Already started
- Rede Mocorongo newsletter – Both Maguari and Suruacá are already contributing to the newsletter that is produced by PSA. These contributions are expected to increase.
- Acumen International has visited and begun establishing personal links between a community in the Reserva Xixuau in southern Roraima state. NGO Associacao Amazonia (www.associacaoamazona.org) has been working with the community for ten years and the community has had internet access for two years. Xixuau, Suruacá and Maguari share many similar challenges.

Planned Initiatives:

General
- Build website and transfer more and more management responsibilities over to the communities
- PSA is already beginning to access list servers with telecenters list servers and networks such somos@telecentros. We will expand this and hope to build more links with Brazilian and especially Amazonian-based networks. One such network might be the LTNet, which as created with the assistance of the Academy for Educational Development in Washington, DC. This network hosts a number of monitored forums covering a range of topics in which communities from many parts of Brazil participate.
- Multifaceted initiative to educate others in Brazil about the realities of life and needs of communities in the Amazon has a stereo-type. This initiative will include
  - 1:1 communication via e-mail and chat
  - Website
  - Sharing their experience in a deeper fashion then simply music etc. The community has not committed to participating in the Greenstar Digital Culture Program (please see project summery above for some history about this), however there might still be some part of the program which meets the needs of the community and which Greenstar might be willing to commit incremental resources.
- Initiatives to preserve way of life which includes less focus on possessions and capitalism.
- We will explore whether it's feasible to connect a PC to TV in order to give presentations. We originally hoped to provide a projection system, however it had to be cut to conserve costs.

Education
- Identification and implementation of commercial software programs which address specific needs identified by the teachers. We plan to introduce a few titles at a time to see what works what doesn't.
- Establish links between other teachers in Brazil and especially the Amazon.

- Project-based learning – PSA and both communities are already beginning to participate in a program by the Instituto Ayrton Senna called Game Superacao. The purpose is to teach youth how to become active in their community to solve problems. This specific project doesn't use technology; however PSA will work with the two communities which have computers to utilize them in the project.
- One of the monitors in Suruacá, Telma, has committed to teaching all the teachers in the community how to use the equipment. All teachers committed to having e-mail accounts by the end of September and at least be able to log on and access their e-mail by this time.
- Acumen International will deliver an "educational toolkit" which will be a portal for educational resources relevant for the community.

Health
- Acumen International will deliver a "health toolkit" which will be a portal for health resources relevant for the community.
- Assist the community discover solutions to identified health problems in the community, including drugs (especially alcohol and cigarettes[4]) which especially focuses on alcohol and cigarettes, reproductive health/AIDS, Vision (Exams, glasses and help people with nutrition since there is a link.) , reduction of hernias
- Attracting vision health professionals to the community to provide regular care

Micro-enterprise
- Acumen International will deliver an "entrepreneurial toolkit" which will be a portal for entrepreneurial resources relevant for the community.
- Development of an Eco-tourism project. Acumen International and PSA will help put the community in touch with other communities which have such programs to learn more about risks, benefits and how to implement such a program.
- Work with existing entrepreneurial initiatives such as fruit, handicrafts and honey
- Identification of goods and services which members of the community can sell outside the community, such as Pork, more chickens, oils like Andiroba, oils from seeds and woodworking
- Identification and establishment of services and production of goods geared towards sale within the community and neighboring communities, such as:
  - ice
  - sewing
  - barber
- As noted previously, Maguari has more experience with entrepreneurial enterprises and linkages between the two communities will likely help both.

Evaluation

Until now we have not established many specific performance metrics, except for a set of in-depth set of interviews with the communities which established qualitative benchmarks. This was primarily because we did not feel that the communities had a very clear understanding of the potential impact of the technology and hence it was impossible for them to have significant input into setting specific objectives for the project. Now that many in the community have been using the technology for several months, SMART[5] objectives and evaluation criteria will be set. Some of these will likely include:

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[4] Reserva Xixuau has also identified this as a priority and the communities will likely work on finding solutions together.

[5] SMART stands for Specific, Measurable, Achievable, Relevant, Time-bound, These should be essential characteristics of any objective.

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- Number of people trained on technology
- Who has been using the technology and who have effectively been excluded?
- How the technology has been used
- Cost-effectiveness
- Amount of noxious emissions prevented

Sustainability

Sustainability of the project includes social, cultural, political, technological, as well as economic dimensions.

Social and Cultural:
1. Will be integrated with on-going work of PSA so they can help monitor and keep momentum
2. Many parts of community are already using it to help solve problems for which there were few tools previously. There is little chance that equipment will sit idle
3. A wide cross-section of both communities feel a great sense of ownership for the telecenters due to the participative role they played during planning, implementation and running the centers now. We feel confident that they will be very creative in finding solutions for maintaining them.

Political
1. Currently the Prefecture of Santarém, in which Suruacá is located, has shown little interest or capacity for supporting the Suruacá center. This is not surprising given that the Prefecture does not yet even have its own website. PSA and Suruacá have identified the Departments of Health and Education as two targets for soliciting support in such ways as supplies, political "support" and possibly even modest financial support.
2. Maguari has been more successful with the Prefecture of Maguari, where it is located. Both the existing Mayor and a leading candidate attended the center's inauguration. PSA and Suruacá have identified the Departments of Health and Education as two targets for soliciting support in such ways as supplies, political "support" and possibly even modest financial support. There Is also a strong potential that the Prefecture might agree to providing some services over the Internet.
3. The Brazilian Ministry of Communication did cover all costs for the acquisition and installation of the communications equipment and has committed to paying 100% of the access charges for approximately 24 more months. PSA and both communities will work to maintain this subsidy after that period, but will plan for contingencies, as well.

Technology
1. RITS ahs committed to continuing to support PSA and the communities support the Linux-based machines. Updates to all software currently installed on those machines, as well as the Open Office installed on the Windows Machines will be available free of charge.
2. Updates for the Windows XP Home Edition and some of the commercial software packages installed on the Windows machines will probably not be available free of charge; however we don't expect updates to be needed for a considerable time. Microsoft did donate licenses for the center to use of many Microsoft packages and we will not hesitate requesting for donations of updates if they are eventually required.
3. Although the communities are responsible for maintaining the machines and part of the training program involves training one or more individuals in each community to support their own equipment, resources from PSA will remain available for the community for the foreseeable future for more complicated problems. In addition, the community is learning how to solve problems for themselves and can access technical information available from manufactures, as well as arrange for equipment repairs themselves.

Economic
1. The program will be integrated with on-going work of PSA so it requires little incremental overhead once training and other start up phases complete.
2. Reoccurring costs have been kept to a minimum by using low cost printer and avoiding any access charges for communication. The primary economic costs for sustaining the program will be for the replacement of supplies, equipment and PV after the program funding ends in 2005.
3. PSA and the communities have identified local prefecture government agencies to lobby for some financial support, particularly for supplies used in order to fulfill the agencies' objectives, such as health and education.
4. RITS and PSA are working to identify potential sources of public funding and other support to help cover some costs.
5. The community will charge visitors to use their equipment. They already have a minimum of 150 visitors a year pass through the community and this will increase if ecotourism projects are started. This won't be enough to cover all their costs, but will be a start.
6. Suruacá is discussing internally how groups such as youth groups and women's' groups which are expected to benefit economically from the technology should be taxed.
7. In Maguari, already one entrepreneur has approached the community to request renting the center to teach computer classes.
8. Both communities are expected to offer some "nonessential" services, such as games and movies and might charge for these.

In order to ensure the economic sustainability of the project, the communities will need to combine a mixture of the measures above. All stakeholders have committed to establish a concrete plan for achieving economic sustainability well before the end of funding in 2005. The increased production of income using the techno logy will likely be a critical component of such a plan, since it is doubtful that economic sustainability of the telecenters can be achieved without it. As such, there will be a strong effort to develop private and/or community-owed enterprises which can help contribute to the support of the telecenters.

Lessons Learned

Many lessons have been learned from the project by various stakeholders, including:

• Scheduling
The installation of the equipment took somewhat longer then expected. Suruacá was delayed by approximately 6 weeks (more on this in the next bullet point) and Maguari took nearly size month longer then expected due to a delay in IBAMA's release of wood for use in the center. In retrospect, we should have realized the complexity of Suruacá's task in extracting wood from the forest and allowed more time for it. Ultimately all parties feel that it was worth waiting instead of purchasing wood from Santarém and having it shipped – even if we could have afforded it – since Suruacá, in particular, learned a lot from the exercise. In the case of Maguari and IBAMA, little could more have been done by PSA, Greenstar, Acumen International or the community to have sped up the process with IBAMA. Several times we considered purchasing the wood but there was not sufficient budget to do so. Also, we constantly expected approval any day. Perhaps the next time we gain a commitment from IBAMA or similar agencies, we should create a larger buffer in the schedule just in case. Even by IBAMA standards though, this delay was excessive, and could not have been foreseen.

• Size and Complexity of Suruacá Telecenter building
We made the mistake of setting a budget and letting the architect build to the budget, without closely reviewing the community's and project's needs. As result, the building was larger and more complex then was needed. The PSA project manager later attempted to simplify the building several times, but once the community had grown to expect the larger building, they were unwilling to make it smaller. They underestimated the amount of effort it would take to harvest,

cut and transport the lumber to the community and then the time it would take to build the center. They also over-estimated the number of people which they could count on to help. The amount of effort that the community made in completing their commitment on the center was exceptional, however. We believe that in retrospect, though, the community now wishes they would have made the center somewhat smaller and of a simpler design. This lesson was heeded by Maguari in the construction of their center. It is about 1/3 smaller, has no curved railings and a simple split-pitched roof, rather then the quarter-pitched roof used by Suruacá. It also doesn't include the attractive, but problematic[6] ventilator in the center.

- Confusion about Partner Roles
PSA and Acumen International had some conflicts over decisions about the Photo-voltaic system and computer systems. This confusion of roles occurred despite efforts to clearly identify each partners' role. As it turns out, it was fortuitous that both Acumen International and PSA were involved with planning ICT systems since PSA was successful in engaging RITS in the project. This resulted in gaining two more donated machines and free internet access for each center. Clearly each partner needed to play a role in the area, however many resources were needlessly spent by both organizations on duplicated and conflicting efforts. Acumen International believes that it would have been wise for PSA and Greenstar/Acumen International to have established specific activities which PSA would be "contracted" in exchange for a specific amount of funds. Instead we rather attempted to "share" the budget and many responsibilities.

- Use of trusted outside consultant to inspect the PV
In most Solar Energy projects in which Sandia National Labs is responsible, it typically plays a role in transferring capacities for the installation and management of PV systems. Our local partner for the project (PSA), however, had an established track record in installing and managing PV systems and so we felt that it would be a waste of resources to pay for a third party to travel to the communities to install the systems. Sandia, Greenstar and Acumen International did need to be certain that the systems were installed correctly, however, and hoped to use the project as an opportunity to transfer incremental technical skills to PSA. We recognized that it would have been prohibitively expensive to send Sandia to provide training to PSA and so we initially attempted to organize remote training over the telephone. This was not effective, however, due to communication challenges and because PSA felt the manner in which the training was conducted was condescending. The USAID mission in Brazil suggested we engaged a contractor which all parties had a high degree of confidence, Aurelio Neto Souza, to travel to the installation sites, evaluate the installations and make recommendations about these and other PV installations in the communities. This solution met our needs and also addressed PSA's objections, Although the exercise was someone costly (over $2400 for two days in the community plus a written report), all stakeholders involved feel the exercise was valuable.

- Three PCs in each center were necessary
Our initial plans called for the installation of only a single PC in each telecenter. It is clear that this would not have been enough to even minimally address the communities' needs. It is also clear even from early usage, that a single machine would have had so much demand that the wait for accessing that machine would have been very long. This, in turn, would likely have been a disincentive for many to attempt to undertake training. It is also very likely that had only one PC been available, there would have been excessive pressure to extend the working hours of the center. This would have over-taxed the PV system and led to early failure of the batteries. The current installation of three machines in each center allows for some scale in training users and seems to be an adequate number for the short-term. It is likely that demand will outgrow system availability in the medium and long-term, however unless a system for rationing time is implemented.

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[6] The ventilator was difficult to build and although it does an excellent job allowing for the circulation of air, it also lets in some water during downpours of rain. This problem is being addressed by adding some thatch in the opening.

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•Failure to establish SMART objectives and evaluation metrics

As explained previously, we did not establish SMART objectives and hence specific evaluation metrics earlier in the project because it was felt by some of the stakeholders that the communities would have been unable to fully understand what the technology can do and hence not be able to grasp what impact it could have. While this might have been partially true, in retrospect, Acumen International feels that the formulation of some preliminary objectives would have been possible and would have made it more possible to demonstrate specific progress at this point in the implementation of the project. We feel that this failure will not have material impact on the medium term or long term success of the project, however, if SMART objectives and specific metrics are identified within the next 4-5 months.

•Using a strong partner

Although we realized in theory that it would be important to find a strong local partner to help oversee and implement the project, the selection of Projeto Saude e Alegria was indeed a critical success factor. The following are some of the characteristics PSA possesses which assisted the project:

- They have been active in the region for many years and plan to continue to be for many more.
- They have a strong track record and are respected and trusted by the communities with which we worked
- Have strong capacity to manage infrastructure projects, as well as work with communities to help them fulfill their obligations
- There is a strong synergy between their mission and the use of technology.
- They possess considerable technical skills with ICT and Photo-voltaic systems
- The Manager PSA selected for the project was quite good, as well

•ICT Technology Selected

- Operating Systems – A mixture of operating systems were selected for use in the project. The new PC has Windows XP Home Edition and the two recycled machines have Linux. We feel that this will give us more flexibility to adjust to the needs of the community then if we had used the same operating system environment on all PCs. LINUX is free of charge to install and addresses philosophical concerns of some of the stakeholders about using proprietary software, such as Windows. The Windows environment, however allows a much wider range of software applications to be used. One example of the current limitation of using only Linux occurred when the first machine (which was LINUX) was installed in Suruacá. PSA had hoped to load some photos from the Sony Digital Camera but even after hours of effort, was unable to load the photos. This was because no device driver was available for the Sony camera. At the same time, users are currently using the machines mostly for web-browsing, e-mail, chat and learning to type and these applications are available on both platforms.
- Communication – The Brazilian Ministry of Communication's provision of KU-band satellite-based internet access was an important factor in us being able to afford to install three PCs in the center rather then just the single PCs which as originally planned and will greatly facilitate efforts to sustain the project economically over the long-term. One disadvantage to the satellite technology selected is a frequent delay between the download and upload of the signal which affects the quality of real-time voice transmission. During recent test chats between the two communities using voice, it was at times impossible for either party to understand the other.
- Laptop vs. Desktop – There was an extensive debate between stakeholders about whether to use laptops or desktops in the telecenters. Laptops consume much less power and so would have resulted in significant savings by reducing the required size of the PV system. On the other hand, the difficulty in finding qualified repair facilities for laptops in Santarém could have exposed the

communities to significant repair costs as the equipment wears out. For that reason, we agreed to use PCs. Acumen International strongly believes that laptops and flat screen monitors should be used in the future when equipment needs to be replaced or for future expansion, as long as the costs for supplying electricity remain high.

Challenges Still Faced

- It remains important for the communities not to attempt to undertake more projects then they have the resources to complete. Enthusiasm is currently high and members in both communities are interested in undertaking many projects, including some which involve the telecenters. They must prioritize their projects carefully.
- Already Suruacá has faced demands on the PV systems which would have resulted in overtaxing the system and causing premature failure. The batteries of other of their PV systems are currently showing signs of wear which was in some cases aggravated by overuse. The communities must continue to monitor and enforce use closely to avoid over-depleting the batteries.
- Spelling among users is poor which makes searches more difficult. This has increased interest in improving spelling skills.
- Many resources are in English or Spanish. Several key users in the community are interested in learning both languages well enough to use more areas of the Internet and to communicate with potential resources
- There is a big worry among teachers that they will end up having to pay for paper and supplies out of their own pockets. Funding for such use must be incorporated into any sustainability plan
- Energy needs in both communities is growing quickly and PV is probably too expensive to provide in larger and larger scale. Alternative solutions for meeting their increasing electricity requirements need to be found.
- 3 computers are not going to be enough for either community over the long-term, however the lack of availability energy will limit either the expansion of hours and/or the availability of more machines.
- Sustaining past next 18 months will be challenging to secure, as indicated above.

Replicating Project

PSA hopes to replicate the project in communities in the areas they serve using many of the methodologies and lessons learned from this project. The chief constraint at this time is electricity. They are currently working to secure funding for mini-hydro and a telecenters for Cachoeira de Aruã along the Arapiums River.

Recommendations

1. Incorporate more project-base learning methodology into the areas of education and community development, as well as integrate ICT into the process.
2. Increase focus on assisting the communities with income producing activities in order to:
   a. to help sustain the telecenters
   b. give the community increased independence meet other development requirements without relying on PSA and other partners
3. Clarify Objectives. PSA should work with the communities to set SMART objectives
4. Increase monitoring and evaluation of project by the communities. This will:
   a. Make it easier to attract on-going support for these communities and future projects by showing it's really working
   b. Community can ensure objectives are met if they are all clear what they are

      c. Make decisions to make require changes
      d. To provide information on the effectiveness and efficiency and to demonstrate that the activities have achieved their objectives
      e. To Provide inputs to the implantation of ongoing initiatives and to inform decision making processes
      f. To draw lessons on past and present activities with a view to learning why some achieved their objectives or unintended outcomes in order to plan future activities

5. Undertake a campaign to improve spelling skills by computer users in order to improve the ability of users to search for information on the Internet
6. Increase linkages with other communities in the Amazon in order to share ideas and practices

Appendix A-1

Sample Greenstar Digital Culture Program Agreement

Digital Culture Micro-Enterprise

Agreement Principles between Greenstar
And <<Name of Village, organization>>

<<Date>>
Please note that this document is only a draft and is for informational purposes only.
Most points are subject to negotiation

1. Greenstar seeks to establish and support development of small business in <<village>>, based on the traditional arts, music, dance, stories, legends, sculpture, tapestries, healing arts, photos, drawings and other traditional voices and imagery of the people. There is great value in preserving the legacy of these traditions, and Greenstar seeks to unlock this value in partnership with the people of <<village>>.

2. Greenstar's further purpose is to provide <<village>> with a voice to the world through the Internet, a witness to their wisdom and way of seeing the world, our environment, families and their meaning. We seek to involve and employ young people in expressing this voice, so that they will have an incentive to maintain a living connection to these priceless resources, which belong to all humanity. The people of <<village>> are the stewards of this heritage on behalf of everyone.

3. All recordings and documents of any kind will only be created with the expressed consent of the people, through their chosen leaders and representatives. Nothing will be released to the world without the people's permission, and nothing that is inappropriate or confidential will be recorded.

4. All the materials that Greenstar records, and all their edited forms, physical and digital packages and products, belong to the people of <<village>>. If they have any monetary value to the world, that value should be used to improve the daily lives and the future of the people. Greenstar will file appropriate copyright, music rights and other intellectual property registrations on behalf of the people of <<village>> for all materials with the correct legal institutions of the nation of <<country>>, the United States and the European Union.

5. Greenstar's business is to build a worldwide gallery of traditional arts, accessible to all the people of the world, based on a broad range of traditional cultures. To this end, Greenstar has invested its time, funds and materials in the West Bank, Jamaica, India, Ghana, South Africa, Tibet, Brazil and New Mexico, and will add to this priceless gallery over time. The assets of the people <<village>> will be added to this worldwide gallery and integrated with it, and will also be separately showcased.

6. Greenstar seeks an agency, marketing and distribution license for all the materials it records, for a period of five years. A phased royalty will be paid on a quarterly basis to the people of <<village>>, based on sales of products from <<village>>.

7. Greenstar typically invests approximately $50,000, either directly or through partners, in each village, in hardware, software, expenses, media production, post-production, packaging, marketing and promotion. This amount varies from site to site and we will document for the people of <<village>> how much has been invested.

8. The amount invested will be treated as an advance on royalties, and will be recouped by Greenstar as income is received at a rate of 40% of gross receipts. When the advance has been recouped, Greenstar will continue to receive a royalty of 25% of gross receipts for the balance of the five-year agreement.

9. Royalties will be paid in US currency or financial instrument required by the national government of the country in which <<village>> is located direct to the bank account designated by the people of <<village>> and its leaders in accordance with national income reporting requirements. Individual artists may choose to be paid for their performances as a share of these royalties. If this is the case, Greenstar will assist the village in arriving at the correct formula for distribution to individual artists. It is expected that at least 80% of the total funds received by the village will be used by the people as a whole, to improve their health, education, energy, business, transportation, communication, agriculture, water and other development needs, according to a plan developed by the people and their leaders.

10. Greenstar's proceeds from royalties will be used only to pay its operating expenses, satisfy its loan requirements, and to expand the worldwide Greenstar network by investing in more villages in the developing world. No individuals or businesses will receive profit distributions from this activity.

11. In recognition of the ongoing, increasing value of the digital culture contributed by the people of <<village>>, we will assign approximately 1% stock ownership in Greenstar to the village. The shares will belong to the village as long as they maintain their contract with Greenstar. This 1% is part of a pool of 20% total ownership in the company that Greenstar is assigning to all the villages in which it invests, with each village holding an equal proportionate share.

12. At the end of five years, the village will have the option either to renew its agency, marketing and distribution contract with Greenstar, to handle future digital culture business on its own, or to contract with another group to carry the business forward.

13. The obligation of the village is to provide access, for a period of five years, to the cultural resources of its people for Greenstar. This includes identifying artists, musicians, keepers of oral traditions, dancers and other representatives of the tradition to Greenstar, providing introductions and orientation, facilitating performances and festivals, responding to press requests for visits and interviews, participating in and approving editing and packaging, providing young people for training as filmmakers, music engineers, digital artists, Web designers, and other technical and creative skills. This process is conducted through "future building," and ideas developed by Greenstar which are further detailed on our web site.

14. All expenses of making recordings will be assumed solely by Greenstar, and required expenses and fees for the village to provide these services will be paid by Greenstar to individuals as tasks are performed.

15. No debt or obligation of any kind is owed by the people of <<village>> to Greenstar, other than as described in paragraph 12 above. All physical assets provided by Greenstar, including solar power equipment, computers, software, and physical structures belong to the village, and the village agrees only to use them responsibly to further the quality of life of the people. Ongoing usage, maintenance and repair costs are the responsibility of <<village>>.

16. The principles set forth in this document will be framed in a contractual agreement of appropriate form and signed by representatives of Greenstar and the people of <<village>>, before equipment and services are

provided. A simple form of this agreement will be posted throughout the village and the surrounding area, and a public meeting will be held in the village to which everyone is invited, to describe the agreement and its opportunity for <<village>>.

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Appendix A-2
Details about Computer and PV system hardware

Components of Photovoltaic System

Suruacá

Component	Quantity
PV Module KC80 (80 Wp, Kyocera)	25
Mounting hardware for 4x KC80	7
Solar Charge Controller C-40 40A/12Vdc	4
DVM display for C-40 Controller	4
Maintenance free battery 220 Ah/12 Vdc	12
Battery Temperature Sensor for controller	4
500W 12Vdc-115 Vac Sine Wave Inverter	2
Supervision and Control Board 12Vdc 120A	1
Cables and Installation Materials	1

Maguari

Component	Quantity
PV Module KC80 (80 Wp, Kyocera)	26
Mounting hardware for 4x KC80	7
Solar Charge Controller C-40 40A/24Vdc	2
DVM display for C-40 Controller	2
Maintenance free battery 220 Ah/12 Vdc	12
Battery Temperature Sensor for controller	2
1kW 24Vdc-120 Vac Sine Wave Inverter (PROSINE 1000/24/120)	1
Supervision and Control Board 24Vdc 120A	1
Cables and Installation Materials	1

Components of Computer Systems

Both communities

Component	Quantity
Dell Dimension 2400 Celeron 2.4 Hz (with CD-R)	2
Dell F551 15" Monitor	2
Dell mouse and keyboards	2
Windows XP Home Edition	2
Microsoft Works v 7.0	2
Norton Anti-Virus 2003	2
HP Scanner Model 2400c	2
HP Inkjet Printer 3550	2
Various cables	
Webcam Elgin model CVC-1300v	2
External Microphone	2
VITA external speakers	2
IBM PCs Celeron 300 Mz 256 MB memory with CR Rom (used donated) –	1

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IBM PCs Celeron 300 Mz 64 MB memory (later upgraded to 128 MB) with CD Rom - (used donated)	3
14" Monitors (IBM ??) – used and donated	4
Keyboards and mice – used and donated	4

Replacement cards and memory for donated IBM machines, including:

- Diamond Model Stealth III, S540 PCI Video Card,
- Trident, Modelo TVG8900D Vídeo Card,
- 2 20 Gb hard drives
- 2 40 Gb hard drives
- 4 128 Mb memory
- 2 Cristal PCI sound cards

Components of Communication System

Both communities

Details on the communication system were unavailable as of the date of this report, however it is know that the system is a bi-directional Ku-band satellite capable of a minimum of 40 kbps upload and 100 kbps download