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Energy Use and Options in the Protected Areas

Nasim Aziz, Khalequzzaman and Safiqur Rahman

The Rapid Rural Appraisal and Participatory Rural Appraisal reports completed just after inception of the Nishorgo effort (Mollah *et al*., 2004a-e) found that households bordering the Protected Areas (PAs) obtained their energy for cooking principally from fuel wood directly extracted from neighboring forest areas. In addition, the reports noted presence of brick fields bordering the two southern PAs – Chunati Wildlife Sanctuary (WS) and Teknaf Wildlife Sanctuary (GR). In multiple cases brick fields were located inside or adjacent to the PA for ease of access to fuel to fire the kilns. Fuelwood for the kilns was collected by local day laborers, typically women, children and unemployed men. In areas of Teknaf near the *Rohinga* camps[1], the *Rohinga* population figured prominently among the fuel wood providers to neighboring brick fields.

Available energy use statistics confirmed the predominant use of forests to supply fuel wood. An early study from 1981 showed that – at that time – 12 percent of fuel wood supply came from forests (Government of Bangladesh, 1985).

The Bangladesh Bureau of Statistics (BBS) data of 2004 from Cox's Bazar District – where 90 percent of household energy was derived from wood – captures the approximate behavior at the southern Nishorgo sites. In the two Districts in which the northern Nishorgo PAs were located (Hobiganj and Moulavibazar), more than 85 percent of household energy came from wood, bran or straw (see Fig. 1). A later (2007) household survey at Nishorgo sites confirmed the predominant use of wood as fuel for energy, across all PAs (see Fig. 2).

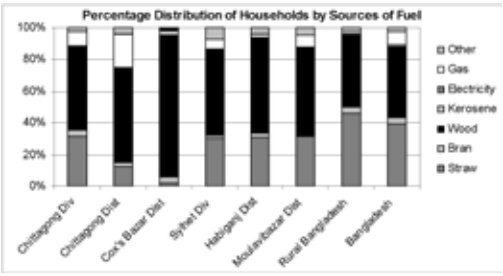

Figure 1. Percentage distribution of households by sources of fuel by Division and District (Source: BBS 2004)

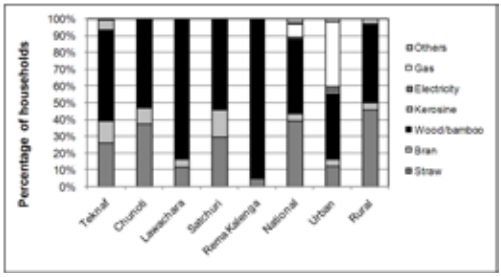

Figure 2. Percentage distribution of households by sources of fuel by Protected Area (Source: Hossain 2007)

In this context the Nishorgo team wanted to explore options for reducing the level of extraction of fuel wood from the PAs through use of alternative energy technologies. The purpose of this chapter is to review the process and approaches pursued by the Nishorgo team, identifying in the process the strategic adjustments that were made during implementation. The chapter closes by drawing a number of lessons learned.

[1] Camps of refugees of Rohingan origin displaced from nearby Myanmar and established in the early 1990s.

Starting Assumptions and Subsequent Adaptations

Technical Complexity and Partnership with GIZ in Strategy Development

Initially, the project team assumed that the priority should be introduction of fuel-efficient stoves throughout the target landscapes. The technology for fuel efficient stoves had been studied and refined by the Bangladesh Center for Scientific and Industrial Research (BCSIR), an organization generally recognized to have invented the first improved cooking stove in Bangladesh. A formal involvement of the BCSIR was not possible, for the bureaucratic reason that it would have required a revision in the project document to allow formal participation of another government institution.

Yet, recognizing the need to bring on better technical expertise than existed within the Nishorgo team, the Nishorgo Support Project looked for other experienced partners and found that the German Technical Co-operation (Deutsche Gesellschaft für Internationale Zusammenarbeit - GIZ) had been working with the Government and NGOs on energy issues, and possessed the necessary technical expertise. The GIZ project team for the Promotion of the Use of Renewable Energies (PURE) project agreed to carry out an assessment of the energy use pattern and the energy demand and supply situation of households, commercial and industrial enterprises. The study would target energy patterns around Chunati Wildlife Sanctuary and Teknaf Wildlife Sanctuary and provide recommendations on promoting improved efficiency of energy end-use devices and fuel switching options.

Prokaushali Sangsad Ltd (PSL) carried out the study for GIZ under the PURE project. This study "Appraisal of Patterns and Options for Change of Energy Use in and around Selected National Parks" (Prokaushali Sangsad Ltd 2005) validated the qualitative information obtained during initial Nishorgo investigations. It generated quantitative estimates of fuel wood used per household at the two southern PAs at 10 kg/day in the dry season and 14 kg/day in the rainy season. This amounted to a per capita use of 450 kg/person/year for dry season and 650 kg/person/year for rainy season. The study also explored and measured the numbers and energy use levels of small energy-intensive enterprises (restaurants and other food shops) as well as the numbers of larger residential consumers (*madrasa*[2] and schools in particular) and brick fields.

Almost 99 percent of the sample households (in total 357, 137 from Chunati WS and 220 from Teknaf GR) were found to use wood for cooking purposes in conjunction with other biomass fuel. In Chunati WS 65 percent of the households were found to collect biomass fuels from either the Wildlife Sanctuary or other nearby Reserve Forest lands, while 19 percent were found to collect fuel from trees grown in homesteads.

During the study PSL organized a three day "Energy Fair" at the Chunati site in March 2005, where a wide range of energy technologies, including solar cookers, solar lighting, biogas, and improved stoves were demonstrated. The fair was attended by an estimated 8,500 residents from the immediate surroundings of Chunati WS, most of them women. Results from

[2] Religious schools

the fair indicated that the improved stove was of the greatest interest to attendees. Taking this finding into account, the PURE team of GIZ began a subsequent phase of refining and testing the stove technology with households around the two southern PAs.

Visitors at the Energy Fair looking at various energy technologies. [Philip J. DeCosse]

The PURE team and the Nishorgo team had planned to introduce energy technologies in such a manner as it would create opportunities for entrepreneurship among inhabitants of the target areas. Training in the stove technologies assisted in identifying enterprising young men and women who might be involved in both extension of the technology and – for a small fee from recipients – installation of the stoves within households.

The Nishorgo team initially started expansion of its stoves via its implementing partner in that region (CODEC) to Forest User Group members (groups formed by the Nishorgo Support Project), as well as community patrol groups and other interested households. Demonstrations were conducted for a total of 500 households. The trainees received 200 Taka from the recipient for each stove they installed, while the material costs (around 350 taka for chimney, galvanized iron net and cap on the top of chimney) were financed by the Nishorgo Support Project.

During piloting, a number of important technical issues emerged which needed to be addressed. Although women appreciated the value of having smoke and heat taken out of the kitchen area through use of a chimney, they did not like the aluminum tubing used for that purpose, principally because its extreme heat created a danger for children in the kitchen area. Accordingly, a concrete chimney was used instead. Women also did not like the two large burner design, and preferred a three burner design with one small burner used principally for warming. These and other adaptations arose through the testing period.

By mid-2006, 300 stoves had been installed in the homes of residents in and around Chunati WS and Teknaf GR. Demonstration of improved stoves also started in the northern PAs. But the administrative cost of building awareness and increasing adoption rates was high to the Nishorgo Support Project. Despite GIZ support, Nishorgo team efforts were being drawn away from other empowerment activities to focus on this energy technology work.

The PURE team also recommended use of biogas plants, initially using livestock waste. But the dispersed nature of livestock ownership around all the pilot PAs meant that biogas plants using livestock waste would not be feasible. However, in light of the high human population density,

especially within large residential complexes such as *madrasa*, the study recommended pursuit of night soil based biogas plants.

Longer-term Partnership and Grameen Shakti

In light of the need for specialization in the expansion of access to alternative energy technologies, the Nishorgo team reached out to Grameen Shakti, a recognized social business organization with retail offices throughout the country and the explicit core objective of expanding energy efficient technologies. At the time the Nishorgo team initiated dialogue, Grameen Shakti was a partner organization of GIZ in disseminating improved stoves and biogas plants. Grameen Shakti had set an objective to sell one million improved stoves throughout the country in the subsequent year.

In April 2007, Nishorgo Support Project and Grameen Shakti, together with GIZ, signed a Memorandum of Understanding (MOU) under which Grameen Shakti would market and install improved stoves for households and biogas plants for residential madrasas around Nishorgo pilot PAs. Under the MOU, GIZ was to provide training on the technologies for the Grameen Shakti sales force, Nishorgo was to subsidize the cost of each stove, and Grameen Shakti was to allocate sufficient sales force to the areas around the five PAs. As necessary, Grameen Shakti would also provide microfinance, in particular for the installation of biogas plants. Finally, Grameen Shakti would promote growing Dhaincha (*Sesbania bispinosa*), a fast growing woody plant that can be raised around homesteads, for use in stoves.

Stove near Chunati WS in 2007. Note concrete chimney tube for exhaust. Danger to children in use of metal exhaust pipes, and easy access to concrete, brought on this adaptation. [Philip J. DeCosse]

View of preferred 3-hole design by 2008. [Nishorgo Support Project]

Under the MOU, it was agreed that stoves would be priced at 700 Taka, with customers paying 350 Taka, of which 200 Taka would go to the installer (typically a young person from a Nishorgo pilot area trained earlier by GIZ/PURE and the Nishorgo team), and 150 Taka would go to Grameen Shakti. Nishorgo would pay for the additional material (chimney, cap and iron net) worth 350 Taka as a subsidy. Grameen agreed to sell stoves to 2,000 households in the initial round.

The MOU included specific targets to establish two pilot biogas plants, the first at a large madrasa with 500 overnight residential students at Hnilla in Cox's Bazar District (just north of Teknaf GR), and the other on the west side of the Chunati WS.

By mid 2008, it had become clear that the commercial model attempted for expansion of household stoves through Grameen Shakti sales agents was not functioning as planned. Nishorgo Support Project staff found that Grameen Shakti sales agents were much less interested in sales of improved stoves, in part because the profit margins were so small and in part because of the hard work and technical finesse required in overseeing the construction of stoves within homesteads. It appeared that the Grameen Shakti salespersons preferred to focus on sales of higher cost items such as solar power products which entailed less physical labor and higher returns, and thus did not spend sufficient time with potential stove customers. Hence the number of improved stoves installed can be attributed to the effort by Nishorgo Support Project and GIZ (see following table).

Total Number of Sales of Improved Stoves and Biogas Plants Around Nishorgo PAs

Protected Area	Household	Institution
Lawachara NP	250	
Satchari NP	150	
Rema Kalenga WS	200	
Chunati WS	1,481	1 (700)
Teknaf GR	878	1 (800)
Modhupur NP[3]	1,156	
Total	4,115	

Note: number in parenthesis represents boarder of the institution.

Despite these limitations in the commercial promotion of improved stoves, a study at Chunati WS did indicate that households using these stoves used substantially less fuel wood, visited the forest PA less often to collect fuel wood, and were less involved in selling fuel wood than other households using traditional stoves (Roy 2007).

By early 2008 Nishorgo piloted a different approach for stove sales with the Mandi ethnic community at Modhupur NP. There, the entry point for technology development and sales was a locally known and respected indigenous NGO, headed by a leading woman within the community. The only participants in the process were local women. Within a few months after training, using this refined approach the trainees had gone on to sell and install more than 1,156 stoves at Modhupur. As Nishorgo ended, the optimal model for sustainable replication and sale of improved stoves had not yet been identified and additional work in refining the technology and improving the approach would be required.

The Grameen Shakti, GIZ and Nishorgo MOU on energy from 2007 worked much more effectively for biogas plants than it did for improved household stoves. Grameen Shakti had the necessary technical expertise in the design and establishment of biogas plants, and that expertise proved invaluable in the process of the two biogas plant contracts. The Nishorgo team

[2] A select number of co-management activities were added in Modhupur NP in 2008, including these stove opportunities. Modhupur NP was not one of the five original Nishorgo sites.

Nishorgo-supported stove in 2008. Smoke exhaust goes out by this time through the back wall. [Sirajul Hossain]

could not have built up this sort of technical expertise without unacceptably high costs.

The Al-Jamiatul Darussuna Madrasa biogas plant at Hnilla was inaugurated by the US Ambassador and local dignitaries in July 2008. The *madrasa* paid 50% of the costs of the biogas plant and two large commercial improved stoves. The madrasa at Hnilla and the *madrasa* at Banshkali – west of Chunati – claimed that their purchase of fuelwood (all coming from the two PAs) fell to 20% of levels prior to adoption of new technologies. (An image of the madrassah signboard installed during the work at Hnilla is included in the color section of this book.)

Partnering for Technology Change at Brick Fields

The Nishorgo team attempted three principle strategies for working to reduce the deleterious impact of the many brick fields located in and around the southern Nishorgo PAs. Nishorgo efforts to encourage enforcement of policy and legal controls, as well as efforts to support locally-led challenges to brick fields through CMOs, are reviewed in chapter 11. But a third avenue included efforts to introduce new brick kiln technologies to those brick fields involved.

The logic for action was a partnership attempted in 2006 and 2007 with a project being developed by the Ministry of Energy on brick field technology. A new Chinese technology was to be introduced through the project that would significantly reduce the energy costs per brick, and at the same time could only be operated using gas for firing. This UNDP-managed Global Environmental Facility (GEF) supported project for "Improving Kiln Efficiency in the Brick Making Industry" was to be replicated throughout the country.

With the Ministry of Energy, the GEF and UNDP the Nishorgo team aimed to improve efficiency of brickfields. In the end, the effort to steer those resources towards Nishorgo sites and forest PA issues was not successful, in important part because the Ministry of Energy was not in a position to openly admit that brickfield owners were widely using fuelwood for energy. Here, in 2003, a new brickfield becoming established on the north side of Teknaf Wildlife Sanctuary. [Philip J. DeCosse]

The Nishorgo team, with assistance from UNDP, worked to encourage the GEF and Ministry of Energy team to focus its efforts on brick fields located near Nishorgo PAs, so as to gain the double benefit of reduced energy consumption and improved forest conservation. But the possibility of a partnership was blocked as the Ministry of Energy was unwilling to admit officially that fuel wood was being

used in brick fields. If the core problem could not be admitted, then a common solution could not be developed either. By late 2007, efforts to engage on brick field technology through this project had been abandoned.

Lessons Learned

The following lessons were learned from the Nishorgo team's efforts to expand access to improved energy technology.

Selection of appropriate household stove technology, and expansion of its adoption, was driven principally by women. While this lesson should perhaps have been obvious from the start, it is nevertheless true that the Nishorgo team (led entirely by men) had not fully appreciated that decisions concerning cooking in the household would be driven by women, and that any interventions to affect change would need to be targeted appropriately. As the project progressed, the team recognized that women needed to be at the forefront of all aspects of spreading improved stoves, from social entry points, to training leaders, to salespersons, and to installers.

Adoption of improved stoves appears to have been driven as much by perceived health benefits as by cost savings for the households. When the project began, the Nishorgo team had assumed that households would consider adopting stoves to reduce the time and money spent in obtaining fuel. The design, and in particular the chimney, allowed households to use wood, hay and other biomass for fuel with financial benefit but also much reduced smoke within the kitchen area.

The Nishorgo team did not identify a specific business model that would be appropriate for broad-scale replication of appropriate energy technologies in and around PA sites. The Grameen Shakti business model that Nishorgo supported did not appear to be appropriate for the sale and installation of improved household stoves, but was better adapted to higher value transactions such as commercial stoves and biogas. Commercial stoves and biogas plants would appear, based on the experience of Nishorgo, to have greater potential for replication by private enterprise. Future work to spread such technologies should be preceded by further research and testing to design appropriate models.

The "public demonstration and fair" model for obtaining feedback on technology proved to be even more successful than expected. Demonstration of the energy technologies through the Energy Fair at Chunati WS allowed thousands of attendees to see the technologies themselves and provide feedback and comments. The outcome of the fair was particularly effective in orienting the energy priorities under Nishorgo.

The technical sophistication of identifying and adapting appropriate energy technologies was beyond the in-house capacity of the Nishorgo team, and could not have succeeded without skilled input from energy specialists. Future interventions should not underestimate the complexity of delivering appropriate energy efficient technology.

References

Bangladesh Bureau of Statistics (BBS). 2004. *Report of Sample Vital Registration System, 2002*. Dhaka: Bangladesh Bureau of Statistics.

Planning Commission. 1985. *Volume IV: Rural Energy and Biomass Supply*. Dhaka: Bangladesh Energy Planning Project of Planning Commission, Government of the People's Republic of Bangladesh.

Hossain, M.S. 2007. Socio-economic Field Survey at Nishorgo Pilot Sites. Dhaka: Nishorgo Support Project of the Forest Department.

Mollah, A.R. and D.K. Kundu. 2004a. Site-Level Field Appraisal for Protected Area Co-Management: Lawachara National Park. Dhaka: Nishorgo Support Project of the Forest Department.

Mollah, A.R. and D.K. Kundu. 2004b. Site-Level Field Appraisal for Protected Area Co-Management: Rema-Kalenga Wildlife Sanctuary. Dhaka: Nishorgo Support Project of the Forest Department.

Mollah, A.R., D.K. Kundu, and M.M. Rahaman. 2004a. Site-Level Field Appraisal for Protected Area Co-Management: Satchuri Reserve Forest. Dhaka: Nishorgo Support Project of the Forest Department.

Mollah, A.R., M.M. Rahaman, and M.S. Rahman. 2004b. Site-Level Field Appraisal for Protected Area Co-Management: Chunati Wildlife Sanctuary. Dhaka: Nishorgo Support Project of the Forest Department.

Mollah, A.R., M.M. Rahaman, and M.S. Rahman. 2004e. Site-Level Field Appraisal for Protected Area Co-Management: Teknaf Wildlife Sanctuary. Dhaka: Nishorgo Support Project of the Forest Department.

Prokaushali Sangsad Limited. 2005. Appraisal of Patterns and Options for Change of Energy Use in and around Selected National Parks. Dhaka: Nishorgo Support Project of the Forest Department and GIZ's Promotion and Use of Renewable Energies (PURE) Project.

Roy, B.C.S. 2007. Fuelwood, Alternative Energy and Forest User Groups in Chunati Wildlife Sanctuary. In *Connecting Communities and Conservation: Collaborative Management of Protected Areas in Bangladesh.* Ed. Fox, Jefferson, Bryan R. Bushley, Sugato Dutt, and Shimona A. Quazi, 209-226. Hawaii: East West Center of Honolulu and Dhaka: Nishorgo Support Project of Bangladesh Forest Department.

Sultana, R. 2007. Linking Fuelwood Collection and Community Livelihoods in Satchari National Park. In *Making Conservation Work: Linking Rural Livelihoods and Protected Area Management in Bangladesh*. Ed. Fox, Jefferson, Bryan R. Bushley, Sugato Dutt, and Shimona A. Quazi, 209-226. Hawaii: East West Center of Honolulu and Dhaka: Nishorgo Support Project of Bangladesh Forest Department.