

# Sustainable Development and Rural Education in Bhitarkanika

## Fuel and Firewood

As it stands, the villagers living in and around Bhitarkanika are dependent on mangrove leave litter, chopped down mangrove trees and biomass (largely in the form of cow patties) to provide the fuel for their fires and cooking. This represents a critical strain on the mangrove ecosystem because mangrove trees, while quick to colonize, are slow to grow. Even the collection of fallen leaves is a threat to the ecosystem because the ecosystem is largely driven by decomposers and detritivores, which in turn serve as food for crabs, shrimp, fish, and insects, which support a large population of birds, reptiles, mammals, and carnivorous fish.

There's also a human risk associated with traveling into the forests in order to collect firewood as well as the use of feces (handling can spread diseases/cause skin irritation). There are many dangers (not just crocodiles) present in the forest and one of them is the threat of arrest by forest officials and the subsequent stress on the community. Additionally, the need to utilize the forest against the stonewall the government seems to have (arbitrarily from the point of view of the locals) put up against the people doing their ancestors have been doing for generations has led to the growth of organized crime and violence against forestry officers.

Cooking with the wood itself also poses significant risk. Indoor air pollution causes death in children, chronic respiratory and back problems for women (who spend large amounts of time in front of the stove or carrying wood), and represents a malady that is easily solved with more efficient and cleaner cook stoves and chimneys. The disproportionate burden on women in this regard (considering that the women also fish for food and venture into the forest in search of wood or crabs, though the men do as well) presents an environmental justice concern as well as a signal to those who wish to intervene that women would be more open to reform.

The manufacture of improved cook stoves by the local community represents an entrepreneurial business that could secure the livelihoods of some, as has been demonstrated in Africa as well as Cambodia. Empowering women (or men) by showing them that they can better their own lives in this way, and introducing them to manufacturing, small business, and hopefully ways to invest and deal in the market (an ideal use of microcredit loans, for example) can both provide concrete good and help to rectify concerns of environmental justice.

Additionally, the creation of human capital and better understanding of markets allows people to view conservation in a different light, as an understanding of scarcity, trade-offs, and investments in the future are all critical to a complex and workable desire to conserve.

Biogas, while much more direct in supplying the energy that people need - namely cooking fuel, seems both dangerous, if not impossible in soil that is prone to flooding (something that must be examined in detail), and culturally inappropriate. In addition, it is not capable of sustainably supplying the amount of fuel required without further cutting of mangroves or utilization of valuable leaf material (the key food to many of the animals of a mangal ecosystem, upon which the people also depend for their livelihood). The gap between the amounts of biomass the people are capable of collecting and the amount that they need seems as though it must be filled by the forest (chemical alternatives that come at any cost to the people would not be favored because the forest is free). In terms of fuel generation, tree farms on already cleared land seem to be the best option to supplement the collection of hard biomass and could be used to create charcoal, which helps to reduce indoor air pollution, burns faster, and represents a form of livelihood for those that produce it.

Unfortunately, a shift in thinking is necessary to encourage the planting and farming of trees. Despite the hazards of braving the forest in search of wood, people seem unable to view the opportunity costs. Yes, it's hard work to plant your own trees (especially when trees seem so abundant, even if felling them is illegal), yet it's also hard work to trek through a mangrove swamp in search of wood. Additionally, many of the fast-growing firewood species do not grow in saline areas and the local people are often under the mistaken belief that other forms of trees cannot grow. Only nature can provide; it has done so for all time; and why should they change their ways, even if everyone would be better off in the long run? And understanding of the true opportunity costs, the ease of planting things themselves, and a real evaluation of the dangers, is a critical first step in the promotion of sustainable energy use.

Ofcourse it's also critical to make a distinction between the need for firewood for heating and cooking purposes and the use of electricity. While it's obviously possible to use electricity for portable heating units or for heating elements for stoves,

the electricity necessary for such things may not be available or culturally appropriate. Additionally, any sort of rural electricity provided will need to be paid for in currency (which it will be hard to persuade the people to do if they can gather firewood for free) and stoves or heating elements might be both dangerous (if the quality of the electricity is not very constant) and costly. This is not to say that the community does not stand much to gain from rural electrification, since it is a basic convenience and one of the ways by which development can be measured, as well as a necessary way to extend the workday in certain types of production.

While it is important that we consider electricity, it is equally important to realize the main source of energy consumption and the main demand for energy comes in the form of heating for cooking and warmth and therefore finding ways to make those services better and less polluting should be priority, and the costs of electrical heating and cooking should be examined if a biomass/biogas project is to tradeoff with attempts at bringing electricity to the community.

### Rural Electrification

While I am convinced that there are several viable schemes for rural electrification that could be put into place in the villages in and around Bhitarkanika, I'm unsure about the demand for electricity. The CCRC is connected to the grid, and while I personally would stress more environment-friendly, sustainable options such as microhydropower, wind, or biomass, I'm not entirely sure they would be the most cost effective, considering heavy government subsidies for grid extension, especially since it is clear that at least the CCRC is already being supplied with power.

However, microhydropower generators are preferable. River flow to the area is obviously abundant, though the mangroves themselves serve to decrease flow and increase sedimentation. Tidal flows seem to be a strong possibility, though it seems that the costs of microhydro are largely upfront fixed costs with the costs at the margins being next to nothing, making the generator more profitable the longer it is run. If it were dependent on tidal forces, the generator would not be able to run much of the time, and energy would have to be stored in batteries.

I am skeptical about the effectiveness of wind generators, which seem highly costly if not very unwise in an area prone to flooding and climatic events such as supercyclones. Until climate change insurance in the developing world becomes much more of a reality I would consider such an investment to be high risk.

The villagers do not watch TV (like a large part of the rural poor elsewhere) or listen to the radio. Their current life-style does not include activities that would be more productive if they had electricity at night, such as a craft industry. In fact, labour tends to be seasonal in the villages and there exists a large amount of masked-unemployment and what Lewis' model would seem to suggest would be a horizontal labour supply curve.

In essence, demand for electricity would have to be a backwards linking market. People must first develop the types of industries

that would benefit from electrification. Small cottage-industry type manufacturing of artisan goods, for example, could be done at night, demanding electricity for light.

Perhaps, there are some processing services that can only be done by machine that might prove productive once the appropriate crops were planted. May be some sort of cloth manufacturing or weaving of traditional mats like I saw in one of the villages near Gupti.

Hopefully, small-scale investments in technology could lead to the demand for electricity. Someone who invested in a computer, or a television, or radio, or even a cell phone that required power to charge could benefit by renting out the technology to fellow villagers. Additionally, survey equipment or other things that could be useful in village life could be productive. Ofcourse, this requires both an understanding of investments and a large risk undertaken by the investor, both things that are not conducive to backwards linkages.

Creating a market of consumers probably won't do much in order to increase the quality of village life. It might stimulate the desire for wage earnings in order to acquire certain technological benefits, but if the supply of labour remains horizontal and the labour itself highly unskilled, wages will remain low if not nonexistent. While the role of CCRC in demonstrating the benefits that could come along with technological development and how they might be brought to local villages, is critical; the creation of a large demand for television, for example, would only provide a sink for wages without the increase in quality of life associated with development and might produce even more dependency on the mangroves as a source of basic needs.

Unfortunately, without the production of alternate crops or different markets for manufactured goods, new sources of employment must depend on outside sources of cash inflow into the community, such as the provision of services to tourists and scientists traveling to the area.

### Ecotourism

Ecotourism has proved to be a booming business in Latin America, and apparently some parts of India. Costa Rica generates about sixty percent of its GDP from ecotourism and Brazil and other tropical countries have done the same. While the mangrove swamp is hardly the pristine beach of many of the pacific island paradises that attract a large amount of tourist vacationers, and will never be such, the possibilities for research and especially the unique marine life found in the area represent valuable resources.

The Olive Ridley Sea turtles provide an excellent example. Many tourists a year travel to similar sites in Mexico and Costa Rica in order to glimpse these magnificent creatures. If better promotions and accommodations could be developed in Bhitarkanika, this would represent a highly seasonal but important source of income for people. In Orissa at the mouth of the Rushikulya river, there is another nesting site for the turtles which attracts a considerable number of tourists and scientists looking to observe the turtles. Local advocacy groups and scientists have successfully trained the local villagers of

the area as ecotourism guides to the many visitors that journey there to observe the turtle nesting. The people have also been instrumental in tagging and performing basic scientific monitoring of the turtles and their habitat. Because the turtles are shown to have an economic value to the people, they are both more concerned with their well-being and with conservation of a valuable local natural resource.

Dependency on a single source of income leaves the community vulnerable to market shocks, especially if the goods that they trade represents a luxury one (in this case, tourism) to those who purchase it, something that would be cut back in times of crisis, and thus be valuable to shocks in multiple markets.

While it would be highly beneficial for people to find a diverse set of incomes, I believe that ecotourism will most likely have to be the first step. Export of goods and services requires good transportation as well as advertising to the outside, improvements that would come with increased traffic to the area in a response to ecotourism. People could also begin to manufacture local goods that might be promoted by tourism, if a market could be created.

Another external source of income would be the location of an outside company in the area, which seems unlikely, considering the proximity to a natural reserve. And any small-scale local business using the villages as its consumer base would most likely not serve to increase the level of cash inflow into the community. Regardless large or small enterprise, that markets to people outside of the community and does not bring outsiders, it would require a better transportation network and rural connectivity.

## Research

Another possible source of income for the people is training in scientific survey and ecological field methods. There is still very little known about mangrove ecosystems and the ecological composition of the forest itself. Unfortunately, its distance from comfortable accommodations/necessary laboratory equipment, the threat of the crocodiles, and the lack of public promotion/awareness, have resulted in a disproportionate amount of studies and interest compared to the ecological significance of the area.

In floral diversity alone, Bhitarkanika hosts an impressive array of species. This is not even taking into account the fact that so little is known about mangrove ecosystems and their role in the overall biosphere. The large population of migratory birds (between two and three hundred) make Bhitarkanika a Ramsar site, and thus critical in worldwide conservation efforts. It also hosts the aforementioned Olive Ridley Sea Turtles and serves as a sanctuary for estuarine crocodiles (who make use of the forest even more dangerous to the villagers, though they contribute to local fishstocks by reducing the populations of their predators).

It is clear that this area is ripe for study. Local peoples (who already know the forest and venture there) could be instrumental in the gather of data if they were educated in ways to take samples or do counts and monitoring of tree species, for example. Research could directly benefit the people as well.

Many commercial fish stocks spawn in the mangrove swamps and a better understanding of their development can enhance both aquaculture and offshore fishing. Also, scientists interested in mangrove species salt tolerance and UV toleration can help the people to better understand alternative crops capable of growth in the saline soil and perhaps provide valuable hybrids that the people could tend experimentally. A better understanding of the ecology of the area could also help the fishermen to harvest fish, crabs, and prawn sustainably, which would increase their overall crop, perhaps even producing surplus that could be sold on the market, should they have access to it.

Those studying animal husbandry and aquaculture techniques could profit from learning about the way fish spawn in their natural habitat and monitoring of the local ecosystem, and experiments in aquaculture could provide a sustainable source of foodstuffs that do not require the depletion of the forest (or risky travel within it) and a possible export, if greater transportation could be secured.

**One of the multiple roles of the CCRC is to attract these scientists to the area, encourage research, encourage employment of the local peoples and utilization of their skills, making the conservation of nature and natural capital a valuable resource to them. The interaction between those in academia that possess answers to tough rural questions (and perhaps the solutions if they set their minds to it) and the local stakeholders who could benefit immensely from that knowledge is critical and simple knowledge of the area and willingness to take risks in exploring that area represents an untapped monetary resource, should scientific institutions or government agencies be will to pay even modest sums for these skills which are being underutilized in the present.**

## Population Control and Women's Education

One of the easiest ways to reduce poverty is to decrease the number of poor people. Unfortunately, cultural traditions about the discussion of sex make such things difficult. Though there are population control program underway in the government, even one directed at the poor, the local people are continuing to reproduce at a much greater rate than is seen in the cities, and very little is being done to assess why.

Perhaps, it is a problem with the person disseminating the information. Is it appropriate for someone who is urban and perhaps perceived as being upper class to come to a poor village and encourage population control measures? Of what gender should that person be? Will the discussion of such matters make it impossible for the people to take this person seriously when they address other vital concerns such as conservation or sustainable energy?

May be it is simply lack of knowledge directed at the right people at the right time. Perhaps if women were educated before their marriage, they would be better prepared to start things off right, and perhaps their confidence in performing marital duties could

increase and environmental justice be served in a way. And what about already married women? There is the overwhelming and undeniable demographic trend that the more education women receive, the less children they tend to have, which has led to decreasing if not zero or negative population growth in many developed countries. And yet the women in these coastal villages (as well as the men) have little, if any, formal education.

Still, there must be women who would like to have fewer children, especially since poor nutrition during pregnancy, pollution, and the hard work that they must also endure, makes pregnancy an increased risk, and decreases life expectancy. It is a natural trait to want to regulate and control pregnancy, if it is possible. Even ensuring that a woman is not pregnant during the busy harvest season or that she doesn't give birth during the monsoon or the end of the dry season where the environmental and bacteriological conditions make childbirth much more risky.

Simple education about natural birth controls, such as timing according to monthly cycles, alternative forms of pleasure and coitus interrupts, even the use of local foodstuffs that might decrease fertility without other adverse health effects, could help both to empower women and to put the breaks on population growth. This is virtually cost-free, and confers a huge benefit, both to local populations, the environment and the country as a whole.

Other options such as the dissemination of condoms or birth control pills might be too technical, culturally inappropriate, or expensive (as they most likely could not be done for free), though education about such options, and assistance in acquiring supplies if they desire, certainly represent ways to benefit the population.

Even government sterilization programs that offer monetary returns for those that are willing to limit the number of children they have, are falling prey to bad education and myths of health problems.

While general basic education for women would most likely be the most permanent and generally desirable (especially because it's not coercive) way to halt population growth, education about what methods can be used and awareness and promotion of existing government programs could be invaluable.

## Basic Education

Some schools apparently do exist in the area, though the local children do not attend them regularly and are not put under much pressure to do so by their parents.

One of the easiest things that could be done would be to ensure that the children went to school or somehow promote them attending school to their families. Despite to obvious poverty of the area in terms of health and general development, the people do not appear starving, as they are capable of living of the forest when it is required. The children are not necessarily needed to fish or tend to animals for all of the day.

One of the most innovative government programs to do this is PROGRESA in Mexico. Designed by a team of economists, this is a demand-side approach to development instead of a supply-

side approach. Supply-side programs focus on providing people with handouts or subsidizing certain things, or creating government programs that the people are not in touch with, which tend to disincentivise individual action or even make people dependent on handouts/welfare. What PROGRESA does is to put more money and decision making power in the hands of the people. It's targeted at women and functions a little like microcredit.

The woman of the family is presented with a small sum of money, which she must spend towards education, health care, nutritional supplements, or clothing for the children. Obviously a good deal of monitoring is required for this to be successful, even if women do generally try to spend the money in a way that's best for their children. Thus families have encouraged their children to be educated. The program has been astonishingly successful.

While it is obviously far outside the scope of the CCRC to undertake this kind of aid program alliances with local banks or microcredit financing institutions might produce a similar structure.

**The CCRC could serve as a location for education programs about investments, health care, and conservation, which could perhaps serve as a form of insurance to credit agencies that the people were at least educated before receiving the loans, and help to insure a captive audience for the goals of the CCRC and a hook to raise awareness.**

**Another way to increase education is through the children themselves. Children's minds function like sponges. They like to learn. They like to draw or color as it is seen when visiting the CCRC. They want to know about the world around them, especially if the answers they receive make sense and help them to make useful predictions about the world around them.**

**Children have a certain sense of wonder and openness that is universal and can survive into adulthood if well cultivated. One of the easiest things the CCRC can do to foster community involvement and development is to light that spark in the minds of the children -- give them a taste of learning and make them hunger for more. Let them ask questions and show them that the answers are out there for them to find if they are willing to ask.**

Schools are often very far from the villages, and children may not themselves want to or be able to walk, and the amount of time spent going in between could prove to be a significant cost to the productivity of the family. While it is the government's responsibility to provide adequate schooling and within and appropriate distance, the CCRC could facilitate perhaps by providing transportation (if donations for such a thing could be found), which might also provide the livelihood of the driver.

## Rural Connectivity

### Television/Radio

While there's obviously educational/development/connectivity value in television, and much more in radio, these things require electrical services and might in fact create a market of consumers without any increase income, thus shifting the monetary income away from investments that might increase productivity and make people more self-sufficient and less dependent on the forest. Obviously, such conveniences cannot be denied, but as they do little to establish two-way linkages between people, they should probably not be priority. Nonetheless, the educational value of some television/radio programs and the desire for affluence they might create are things to consider once the community has gotten over the huge hump of rural electricity.

### Telephones

Initially, I was skeptical about rural telephone networks. I wondered who people would call if their business did not require exports or contacts in far off places and most of their friends and family lived in the same village. It was pointed out to me that many daughters leave their family and move to different villages when they marry and are often out of contact.

Telephones would thus serve to link villages (and any village innovations), promote communication and desire for transportation between them (creating a demand for improved road networks) and serve to empower women, who would otherwise be isolated from their family in an unfamiliar setting.

Also, simply the desire for increased communication networks and the social nature of having a local telephone, feeling more connected to the outside world, and rallying together in order to make the demand on the government that it should provide, could all serve to empower the community.

### Transportation

While the road system in the area is rough and not particularly well maintained, a striking number of people seem to own motorbikes. Transportation between villages seems to be less problematic than in other areas around the world, due to the presence of motorbikes and a road network. What is of greater concern is the transportation of large items or goods between places (the road is wide enough for trucks, but not in good enough condition to make the journey necessarily worthwhile) and the cart attached to a motorbike method does not appear prevalent, if it is at all possibly. Cars are not owned by the villagers and appear to be relatively rare and the quality of the road makes travel by car bouncy and seemingly inferior to travel by bike. Buses connect well into the rural area, but not to the villages near Bhitarkanika and people must either walk or come by bike. Still there are small shops selling commercial items and candy and some of the villagers, when they do earn money do travel into the city to enjoy a nice meal or the like.

The people are aware of the modern world around them, not completely isolated, which supposedly only 'increases their miseries.' Some things are more mysterious, like the uses of computers or the daily presence of a television or movie

theaters. But people travel to Bhitarkanika via the road, motorbikes are well known, and telephone services and even major cities can be reached without going to extraordinary lengths.

There is, however, little demand for an increased transportation system, as the people are able to travel if they please, and as of right now, have few goods to export or import. It seems to be a problem of whether or not we are putting the cart before the horse in trying to either increase the demand for a better road network through the creation of industries that need it, or if we should hope that a better transportation network will make the creation of such industries easier and thus encourage people to utilize them.

While ecotourism might create a demand for a better road network, I'm not sure that it will ever be sufficient enough to warrant improvements. What seems more important is the type of traffic that occurs along the road -- whether or not trucks are willing to supply the area, and whether or not the people have developed the urban links to demand their services in order to market their goods.

### Investment Schemes

What is necessary at the moment, is an increase in the monetary supply to the people so that they might simply have the legal tender with which to purchase the goods that they need. Unfortunately, little cash flow, little understanding of a labour market, or indeed traded goods, means that people, when they do receive money, are less likely to want to save or invest.

Microcredit loans have proven to be very effective elsewhere in India and in other developing nations. The premise is very simple -- loan someone, especially women, a very small amount of money in order to undertake small innovative entrepreneurial activities. This capital might be enough to buy a material like a tool that might make farming more efficient and create a greater crop yield to pay back the loan. May be invest in a kiln for the production of charcoal, good bamboo to make huts so that the forest does not have to be chopped down each year, some fabric, or the basic tools to create handicrafts and local artistry. Shrimp for aquaculture or seedlings can also be purchased, or a small solar light or radio that could be rented to others. There are many applications of small investments. What has been found is that these loans are empowering, represent small risk to the financier, and are generally paid off.

**While the CCRC can only work to facilitate connection between financiers and the local people, it has a vital role to play in simply educating people about investments and returns, which can also provide people with a critical understanding of some of the basic modes of thought that are so important in conservation biology.**

***"If I don't eat all five fish now, but let two of them live and reproduce, I will get infinite number of fish in the future instead of just five."***

## Disaster Relief

After the Super-cyclone in 1999, the coastal peoples (who were hit hard) received a valuable lesson both in the uncertainty of nature and the certainty of government food provision.

Prone to floods and droughts and severe weather conditions, India represents a country with a relatively good level of food-security. While overall conditions of poverty and development may be high on the agenda, politicians can receive far less political capital (and risk far less if policies are executed poorly) by dealing with concerns such as rural development or education than they can from high-profile disaster relief and food security. While no one can argue that disaster relief is a bad thing, nor that food security should not be a priority, situations of disaster in rural areas do present a conundrum.

The local people hope that there will be another super-cyclone. Houses can be rebuilt (and generally are at the end of every rainy season anyhow) and there are centers to protect against flooding. While there's undoubtedly large human costs (and I find it hard to believe that if given a choice, some would choose a super-cyclone) people can also see the benefit of government handouts.

This perhaps signifies a dangerous trend. Like many critics of the so-called 'welfare state' in America, or especially more socialist-leaning countries, people working with the local public are beginning to see the true face of human nature that people will not work unless they have to.

## Market Failure and Mindsets

I think that an overly critical attitude, such as the prevalent idea that the rural people have something wrong with their thinking, or are lazy, have a 'sickness of mind,' or are somehow worse than the more urban and upwardly mobile, is counterproductive, if not outright dangerous. In cities, people are forced to work to sustain their livelihood, or become beggars. They cannot fall back on subsistence off the land if they fail to manage money and investments wisely. Such 'sink or swim' situations produce a culture with a worth ethic and competition among individuals to not be the ones that fall through the cracks leads to innovations and hard work.

I do not for a second believe that the rural people living in the villages around Bhitarkanika are any more lazy than the rest of us, or that they lack the capacity to work hard (because they do, at a subsistence level). What is at fault is an economic failure. Prices are more than just arbitrary conversions between goods. They are an honest evaluation of how much something is worth in terms of costs and benefits. Prices are measures of the opportunity costs. If I spend my five dollars on a movie ticket, I can't spend it to buy bread. How many loaves of bread am I willing to forgo in order to see a movie? If a loaf costs a dollar, then the answer is five. The same can be said of goods and services. People are willing to pay a large portion of their income in taxes, for example, for the services that the government provides. They forgo money to spend on bread or movie tickets or investments in order to receive such services

as protection in the judicial system from breach or contract, police security, road networks, and the stability of the market itself, through the printing of legal tender. Some might even argue that these services are worth more than we actually pay because they are perquisites for many other economic functions.

**The environment itself provides vital services such as sunlight, water purification, nutrient cycling, energy in the form of fossil fuels and biomass, temperature and weather control, and food-sources. And all of these things come to us for free. In areas where misuse of the environment directly trades off with things that are valuable to human beings, a cost can be evaluated.**

**People are willing to pay to stop polluters or decrease exploitation of natural resources by a small few if it means that they will have to endure either the discomfort of pollution or a decrease in their own livelihoods because of environmental degradation.**

In remote areas such as Bhitarkanika, however, these tradeoffs are neither immediately felt (they may require a threshold level of environmental degradation or overexploitation) nor are they necessarily recognized. The fisherman who has to work an extra hour to gain enough fish to make a worthwhile process due to declining fish stocks as a result of overexploitation of the spawning ground by the local peoples (who pay nothing for this service) will not be able to sue or put political pressure on the people the way people would be able to make a company feel the cost of polluting their local river would. The effects are too far removed in time and space to effect the individual fisherman, and an unclear understanding of how much exploitation is too much, or will hurt the local people's catch in the future make it hard for the cost to be evaluated.

But there is undoubtedly a cost.

The mangroves protect the people from the harmful effects of cyclones, tsunamis, crocodiles, and flooding. They help to build up soil and stop coastal erosion as well as providing a safety net and food security. They are critical to many commercial fish species and the valuable ecosystems of coral reefs and present the people with the possibility of diversification through ecotourism services.

*If nature were to charge for these services, the people would undoubtedly not be able to pay, and the market would force them to search for alternative ways to find their livelihood. Many would migrate. There would be pressure to find better education and new markets and to innovate, because they would be living under the same 'sink or swim' pressures that urban dwellers face when they must pay for their land and food and light.*

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