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To Offset or Not to Offset: US Power Utility Offsets CO_2 Emissions By Financing Reduced Impact Logging in Malaysia

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"You get used to having people's jaws drop and (them) saying 'What are you doing?' Normally, people think I am crazy for about ten minutes or so, and then it starts to make sense...It beats sitting around and waiting for regulations to be imposed on us."

— Peter Calvert, Principal Fuel Planner, New England Electric Systems. Reported in *Boston Business Journal*, 24 August 1992.

Timber Production in Sabah, Malaysia

Situated on the northern tip of the South China Sea island of Borneo, Sabah is Malaysia's second-largest state, with a population of more than 1.7 million. About 63 percent of its 7.36 million hectares are covered with forests. For nearly 25 years, the state's main source of income has been timber from a 100-year, one million acre forest concession operated by the Innoprise Corporation Sdn Bhd (ICSB), the investment branch of Yayasan Sabah (Sabah Foundation) and a quasi-public corporation.

Established by the Sabah Legislative Assembly in 1966 the foundation's mission is to improve the standard of living of native Sabahans through economic and social programs. But a successful timber industry has meant years of destructive logging practices in the rain forests of Sabah, damaging the surrounding ecosystem and threatening the regenerative ability of the forests. With traditional, capital intensive logging techniques, the harvesting of just a dozen trees from a hectare of land destroys up to half of the other trees in the area, while bulldozers crush precious topsoil underneath their wheels.

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In 1984, aware of its competing obligations to the economic well-being of the citizens of Sabah and the sustainability and ecology of the forest, ICSB developed a forest management plan for the next five decades. The plan had two aims: "(i) maintaining, in perpetuity, a productive resource base for the production of timber and other forest produce where economically justified, and (ii) conservation of biodiversity and protection of the environment."

The next decade brought increasing national and international pressure from groups concerned about the alarming rate of destruction of tropical rain forests and the increasing amounts of carbon being released into the atmosphere by uncontrolled logging. Concerned about the prospects of sanctions and international boycotts of tropical timber, ICSB began to consider more effective and benign methods of forest management. But the foundation did not have the technology or expertise to invest in long-term reforestation or management techniques. Nor could it secure a local financial commitment. Developing countries, more concerned about improving the standard of living of their citizens and dealing with more immediate problems of local pollution place a very high discount rate on the future. Both the threat of global warming and the idea of long-term forestry management extend far into the future.

Although the Sabah Foundation has a 100-year concession on their land extending from 1970, with such a high discount rate, a concession this long may be meaningless. The present value of harvests several decades into the future dwindles to zero. Developing countries see a much higher opportunity cost in terms of foregone current benefits. Because of this, global warming has thus far been of greatest concern to wealthier, developed nations, which have more money to spend on environmental protection and already have many local pollution and standard of living issues under control.

In addition, developing countries see the threats of tropical timber boycotts by developed nations as somewhat hypocritical, in light of massive temperate deforestation in the past and the fact that industrialized nations are responsible for the majority of CO_2 emissions globally.

Power Generation in New England, USA

On the other side of the globe, in Westborough, Massachusetts, New England Electric System (NEES) was facing similar environmental pressure. Rising international concern about global climate change and greenhouse gases had focused attention on

major emitters in industrialized countries, specifically their carbon dioxide (CO_2) emissions. In the United States, utilities annually emit more than 1 billion tons of carbon dioxide, a third of all US emissions of the gas, which is responsible for about 50% of the greenhouse problem.

Besides increasing pressure from non-governmental organizations, citizens and other nations, the utilities also foresaw pressure from the US government, which had agreed at the United Nations Conference on Environment and Development in Rio to reduce its carbon dioxide emissions to 1990 levels by the year 2000. NEES pledged to reduce its CO_2 emissions by 20 percent by the year 2000.

Despite this pledge, when NEES began to consider carbon reduction in 1991, utilities were still faced with a lack of federal guidelines and regulations on carbon. Although programs of reductions in sulfur dioxide and nitrous oxide emissions at NEES plants were "clearly due to federal mandates, in terms of carbon dioxide mitigation, there's no federal incentive, no federal laws that relate to carbon dioxide reductions," said Thomas E. Sullivan, senior forester at NEES.

Freezing emissions would mean reduced profits, while switching fuels would mean large cost increases. Increasingly it looked like the nation was headed toward some sort of carbon charge. Several states had already instituted carbon penalties and carbon taxes had been proposed on a national level.

In the face of this uncertainty, NEES needed some sort of preemptive action, both to enhance its public image and to serve as a buffer or offset against any future regulations or taxes. Since carbon dioxide cannot be scrubbed from a plant's smokestacks, traditionally the only options were to switch fuels or conserve energy by reducing demand and output. But these methods alone would not have allowed the company to make the reductions foreseen as necessary while still maintaining profits and expanding to meet demand from future growth. They needed another option.

Forests as Carbon Sinks

One developing field was forestry projects designed to offset CO_2 emissions. Although tree planting projects had been around for years to offset the destructive effects of timber harvesting around the world, using trees as carbon sinks was a relatively new idea. Through photosynthesis, trees take in carbon from the atmosphere, providing an effective storage place for the gas. But they may also release carbon when burned or cut down and left to decay. The trick is to carefully manage both the planting and harvesting of trees to maximize their carbon storage capabilities.

The potential of forestry projects is enormous, according to Ken Richards, an economist who is working with the US Department of Energy (DOE) to develop federal guidelines for carbon offsets. "We could get major reductions out of forestry relatively inexpensively," he said, adding that the US "could stabilize net emissions just on forestry."

Although carbon taxes and offset regulations had yet to be implemented in the early 1990s, utilities had seen the writing on the wall. Discussion of carbon offsets had been continuing in the US Congress for several years, since the 1990 introduction of a bill concerning carbon dioxide offsets and efficiency by Representatives Jim Cooper (D-Tennessee) and Mike Synar (D-Oklahoma). Based on research by Dan Dudek of the Environmental Defense Fund, the bill would have required all major new sources of carbon dioxide to invest in offsets of their emissions. Although the bill was "extremely vague, it did stir lots of discussion and interest," Richards said. After the bill's introduction, the US Forest Service and Department of Energy found themselves "scrambling" to answer questions from frantic utilities about costs and implications. A complex economic analysis by DOE determined that "almost all of it would be done by tree planting in the US," Richards noted.

The bill was defeated, but the following year a proposed amendment to the National Energy Policy Act suggested voluntary offsets and contained a clause that said reported emissions reductions could be used as credit against any future required emissions reductions.

This too was watered down for legal and political reasons in Congress, and the final result was a statement that, while the government wouldn't make any promises about credit for offsets, it would establish a reporting system. Although "there's no statement in the language of the act about why we're doing this reporting system," Richards believes the implication is that one day there might be credit.

Pre-emptive Strike

In November 1991, New England Electric System released an environmental initiative called NEESPLAN 3 in which the company publicized a number of environmental and emissions reductions goals. The initiative generated tremendous response with people from all over the world calling to sell conservation projects to the company.

Among these responses were over 100 proposed projects related to forestry. "We had planting projects, preservation projects, ways

of securing a parcel of rain forest somewhere and preventing it from being logged," Sullivan said. There were even proposals to hire armed guards to patrol forest land.

Although in the United States there is currently no "bank" for carbon savings and no way to gain credit for carbon offset projects, it is a very real possibility for the future. "Right now the United States is attempting to meet a leveling of greenhouse gas emissions at the level of 1990 by the year 2000," Sullivan stated. "We're supposed to meet that goal purely with domestic actions. After the year 2000 there will be discussions about international projects."

Nevertheless, NEES made the decision to invest in a forestry project with an eye toward research and development, trying to get a head start on something they might need to do one day. According to Sullivan, NEES is "trying to stimulate the development of a market for a commodity that has no value in anticipation that someday it may have a value."

Richards noted that another important impetus for such experimental projects is public relations. "They like to be able to say, 'hey, we're doing these things.' What they're really wanting is to look good to the public," he said, adding that the companies are "also hoping to learn something and become the best at it, develop a comparative advantage."

NEES' main goal in implementing a carbon offset forestry project was to try it and prove that such a program could be implemented and that carbon savings could be measured and verified. At that time, however, there was very little precedent to guide them in their decision as to what sort of project to undertake.

"There was only at the time one other project that had really been touted as a carbon project," Sullivan recalled, referring to a tree planting and preservation project sponsored by Arlington, Virginia-based Applied Energy Systems (AES). Beginning in 1988, AES invested $2 million in a project designed to plant 52 million trees on 385 square miles in Guatemala over a period of 10 years. The carbon sequestered by those trees will offset the 15 million tons of carbon that will be released by the company's Montville, Connecticut plant in its 40-year life.

But tree planting was only one among many proposals offered to NEES. The company studied them all, seeking the most cost-efficient, promising investment. "We needed a good project that could be reliably done at a cheap price, be measurable and expandable and be credible to regulators," Sullivan said.

Credibility to regulators who were then developing reporting guidelines was crucial. "The more effort you put in, the more cred-

ible your report is," Richards noted. "If you think that down the line Congress might be handing out rewards, you might want a more credible effort."

Seeking a Partner

The company needed a partner with a large land base that would be willing to invest in a long-term, expandable project. NEES also sought a business deal. The company was relatively new to this arena and found "a tremendous amount of networking between private companies and philanthropic organizations," Sullivan said. "But we're a business. We were inclined toward a straight business deal. We weren't confident in the philanthropic, non-profit milieu, didn't see how anything ever got quantified."

Nevertheless, Sullivan observed, "there's nothing inherently difficult about a private company dealing with the public sector as long as the public sector is willing to work on a business level. And there's nothing wrong with the public sector doing services for the private sector that the private sector is willing to pay for."

So as 1992 began, NEES had to decide among several different options for forestry carbon offset investments. Among their choices were tree planting projects both in the United States and abroad, preservation projects that would prohibit logging on a purchased or protected plot of forest, or some sort of conservation logging technique to reduce the damage of uncontrolled logging.

NEES weighed the pros and cons of preservation projects, which would take a plot of forest out of commission; plantation forests, which would plant fast-growing young seedlings on non-forest land, and conservation logging methods, which would continue harvests but aim to reduce the secondary damages to remaining trees and soil.

Preservation projects had a certain appeal to Sullivan. They would be certain to conserve carbon and protect ecosystems and biodiversity in the purchased and protected areas of the forest. Nevertheless, he was unsure about their credibility as effective carbon offsets, which is what NEES was seeking. "If you buy a chunk of forest, do you assume all would be cut down? Do you assume half would be cut down? And what have you done with the displaced demand? All you've done is shifted demand to some other location, to the neighboring forest...There's lots of good reasons for preservation to be done, but it doesn't come out well on carbon saving."

Plantation forestry had its positive aspects: easing up demand on increasingly inaccessible and damaged forest lands, providing a ready source of timber and conserving carbon all at once. But tree planting also has drawbacks. With a plantation forest, "the return is very slow and will oftentimes be very difficult to demonstrate," Sullivan said. "If you plant trees, you might have a negative impact on carbon for five years; it won't accrue for five to 10 years." In addition, fast-growing tree plantations with short harvesting cycles may deplete the nutrients in valuable topsoil.

There may also be some unwelcome secondary effects of tree plantations. "If you plant ten million acres of trees, there's nothing to say that somebody else won't look at it and think of it as competition," Richards argued. This might lead other foresters to step up harvests or even to abandon replanting efforts, he added.

A final option was conservation logging techniques that would lessen the impact of timber harvesting. Although this method does not slow the use of timber — in fact it encourages continued harvesting — it does increase the efficiency and effectiveness of logging by reducing auxiliary destruction and encouraging more sensible and careful management and protection of the remaining forest.

With such logging techniques, "the carbon savings are immediate," Sullivan said. Another benefit is the relative ease of selling it to developing nations. Preservation projects may be unattractive to these countries, which may see such projects as buying up their land and prohibiting development. And tree plantations take up more land that could be used for other purposes. But controlled logging allows timber companies to continue harvesting and development, albeit in a more efficient, cost-effective and benign manner.

At the same time ICSB and NEES were trying to figure out how to solve their problems, Don Jones was looking for a few missing pieces of his own puzzle in Los Angeles. Jones is the founder of COPEC, a carbon brokerage that gets its name from "the vision of coping with global change and cooperation between economic and ecological interests." For several years, Jones had been investigating methods of forest management and controlled logging, and had eventually come to Dr. Francis Putz, a University of Florida botanist. Putz suggested that rather than invest in plantation forests, a more natural and effective form of management might be to reduce the damage caused by uncontrolled and destructive logging techniques. Although much had been written about the idea, it had yet to be implemented in a full-scale reduced-impact logging project. "We needed an entity large enough and willing enough to do this project on their land," Jones said.

He also needed funding and sought a non-traditional donor. Rather than see forests in the classic way as just economic units or so many board square feet per hectare, Jones asked himself, "What are the functions of trees?" His answer: To sequester carbon. "And who would be interested in paying for increased carbon sequestration?" he wondered.

Reduced-Impact Logging

Jones and Putz brought together scholarship from all over the world to develop a theory of reduced-impact logging (RIL), changing harvesting techniques to minimize auxiliary damage to the forest. Among the many functions of forests are regulating floods and droughts, controlling soil erosion and downstream sedimentation, preventing weather damage, storing ground water and encouraging biodiversity. Modern logging techniques damage not only remaining trees, but also soil and waterways, threatening the delicate balance of the forest ecosystem.

"In a tropical rain forest, the fortune of the forest is not the trees, it's the topsoil," Jones said. Dragging trees through the forest destroys undergrowth and exposes soil to erosion, washing away protective cover and surface soil which contains buried dormant seeds. Heavy bulldozers rolling through the forest cause soil compaction, which means slower root penetration, increased erosion, less water entrapment and nutrient loss. And the machinery leaves debris behind that may increase the chance of destructive fires and clog up streams. The bulldozer "is an inappropriate way of handling logs if you want to save the forest," Jones said. "It's not a very discrete instrument."

Trees that escape harvest are still threatened by present-day, capital- intensive logging. Dense concentrations of liana climber vines, as many as 2,000 per hectare, bind together many of the trees in Sabah, and one harvested tree can pull several others down with it. In addition to destroying excess tress, this widens the portion of open canopy, exposing the soil and young vegetation to increased solar radiation. Careless logging also threatens vulnerable seedlings, slowing growth rates and prolonging the time between harvests. In one survey of Sabah forests, 59.5% of seedlings survived in undisturbed land while only 13.7% remained in recently logged land.

Reduced-impact-logging addresses many of these problems through carefully managed and controlled harvesting techniques (see Box 1). While the volume of harvested timber remains the same, damage to remaining trees and the forest ecosystem is reduced by about half. One hectare of tropical rain forest contains about 348 tons of carbon. With current logging methods, in

the process of harvesting 8-15 trees containing 22 tons of carbon, 50% of the remaining trees are damaged and about 40% of the soil area is crushed by bulldozers, releasing a total of 95 tons of carbon. Putz has estimated savings of 36 tons of carbon/ha with reduced-impact logging methods (see Table 1). At about $135/ha to implement the program, this means a cost of carbon sequestration of only about $3.75/ton, half as much as tree plantations (see Box 2 for comparative costs).

Box 1
Reduced-Impact Logging Methods

- **Climber Cutting** Nine to 12 months before harvesting, workers cut woody liana vines, which may be as dense as 2,000 per hectare. The vines, which connect trees from crown to crown, can cause felled trees to drag others down with them.
- **Mapping the Forests** The entire area to be harvested is mapped out to identify trees for felling, road and skid trail sites, and log collection points to minimize damage to the forest.
- **Careful Planning and Building of Roads and Skid Trails** All roadways and trails are marked and built to minimize steep slopes and stream crossings, which can cause increased erosion and sedimentation.
- **Directional Felling** Trees are cut so that they fall toward skid trails and away from potential crop trees. Although this is not exact, most trees offer a range of options for a skilled feller over about 90 degrees of arc.
- **Minimal Use of Bulldozers** Careful pre-felling planning and skid trail mapping helps to minimize the amount of time that destructive bulldozers and other heavy machinery are operating in the forest.
- **Riparian Reserves** Buffer strips are left along waterways to prevent sedimentation which may harm fisheries and irrigation.
- **Landings Ripped Up** After harvesting, log landings, or collection points, are ripped up to reduce soil compaction. The area is then sown with a new cover crop to minimize erosion.
- **Skid Trail Draining** When the loggers leave a harvested area, they remove all obstructions from streams and oversee the draining of skid trails.

Source: ICSB Public Affairs Division ("Your Electricity Bills Could Help Save Tropical Forests.")

Table 1. Estimated Carbon Pools for Dipterocarp Forests in Sabah, Malaysia Prior to and Two Years After Logging, Under Conventional and Reduced Impact Logging Techniques

Carbon Pools (tons carbon/ha)	Pre-Logging	2 Years Post-Logging (CVN)	2 Years Logging (RIL)	Carbon Saved (RIL - CVN)
Above Ground Biomass	200	93	128	35
Root Biomass	50	23	32	9
Soil Carbon	70	63	67	4
Other Necromass	88	52	40	-12
Total Carbon	**348**	**231**	**267**	**36**

CVN = Conventional Logging
RIL = Reduced Impact Logging
Source: Putz and Pinard, 1993.

Other advantages of RIL over tree plantations include immediate carbon sequestration benefits, higher use of native species, a lower fire risk and less soil erosion. It also enhances future benefits of the forest by retaining more undamaged trees for future harvests and saves money by reducing bulldozer use and diesel fuel expenditures.

Politically, RIL is beneficial for logging companies, which can now promote their products as "green," gaining market acceptance in nations concerned with climate change or biodiversity loss, thus avoiding boycotts of tropical timber. Perhaps most importantly, it promotes global sharing of the costs of carbon sequestration and is attractive to developing countries, which feel they should not have to bear the full costs of forest management when it is industrialized countries which emit the most CO_2.

Joint NEES and ICSB Implementation: Carbon Offsets for RIL Funding

In early 1992, Clive Marsh, principal forest officer at ICSB, telephoned Don Jones in Los Angeles. Jones agreed that COPEC would serve as an agent for ICSB in seeking a source of funding for forest management. He decided to focus on utilities, because

they "are comfortable with a long planning cycle," a necessity for long-term forestry projects.

At about this time, Jones read about NEESPLAN 3 and submitted a number of proposals to Sullivan and his colleagues that "ran the gamut from straight preservation to rehabilitation with native species to this new beast, reduced-impact logging." NEES eventually chose Jones' Sabah proposal for a number of economic, business and practical reasons. The company liked the immediate, measurable carbon sequestration benefits of RIL, Sullivan said. And "we wound up in Malaysia because they had a million hectare concession and seemed like good business partners," he added.

NEES and ICSB signed a three-year contract on 1 August 1992 to implement a trial RIL project at an estimated cost to NEES of $452,000. It is considered a purely commercial transaction between the two, and not a government deal. The funds channeled through ICSB are used directly in the forestry project and do not need to pass through the public sector bureaucracy. Among the provisions are training and consultancy in conjunction with the Queensland (Australia) Forest Service, pre-felling planning, climber cutting of linea vines, skid-trail planning, directional felling and minimization of bulldozer use (for further details, see Project Description in Appendix I).

Box 2
Costs of Carbon Saving Methods

- Reduced-impact logging: $2-3/ton
- Plantation forests: $8-15/ton
- Fuel Switching: $15 /ton
- CO_2 reduction "at the stack" by New England Power: $50-60/year/ton*
- Threatened carbon tax: $22-28/ton
- Average MC of emissions reduction in developed countries: $28/ton (low estimate)

Sources: ICSB Public Affairs; T. Panayotou and P. S. Ashton.
*T. Sullivan, New England Power, quoted in *San Diego Union-Tribune*, 9 February 1994.

Although NEES is ostensibly paying for the implementation of new logging techniques, their true purchase is of much more value to them. RIL harvesting is intended to "reduce the impact to living biomass by 50 percent," Sullivan said. This reduced destruction "can be measured and if you convert it to carbon dioxide, that's basically what we're buying." In this respect the project is the first of its kind. "The idea of reducing the impact of forestry has probably been around since the first tree was cut down," Sullivan said. But reducing the destruction with the express intent of saving carbon "is unique."

The three-year plan, which covers 1,415 hectares, began with 430 sustainably harvested hectares in 1993 and will continue on the remaining 985 in 1994. But the Sabah Foundation harvests about 10,000 hectares annually, Sullivan said, noting that a goal of the project is to eventually "work up to that full 10,000 hectares per year."

There is still no formal system for getting credit for carbon offsets in the United States, particularly those done overseas. "The only activity that we're willing to go out on a limb for, that we'll give data on carbon saving potential is tree planting on agricultural land in the United States," Richards said. "That's the only activity that I'm confident is uniform enough and that we have enough information on."

Nevertheless, NEES is hoping that one day tropical timber offsets will be worth the investment. "We're trying to do research and development," Sullivan said. "There's no certainty that this product will ever have a value."

A three-year cost of $450,000 "is not a lot to invest in the face of potentially costly requirements coming down the line," Richards said. "And it makes them much more credible."

The project is monitored by an independent three-person audit committee, which includes Putz and representatives from the Rain Forest Alliance and the Forest Research Institute of Malaysia. The committee uses a baseline of biomass carbon after typical logging techniques on adjacent forest land to compare carbon levels after RIL (see Box 3). Every six months, the committee meets to determine whether the project is complying with its implementation guidelines based on logging practices in Queensland, Australia.

Box 3
Environmental Auditing

The environmental auditors compare areas logged following reduced-impact logging guidelines with areas logged conventionally in terms of:

- Quality of carbon retained
- The rates at which logging residues decompose
- The rates at which regenerating forests sequester carbon
- Changes in soil organic matter content

Source: Putz and Pinard, 1993.

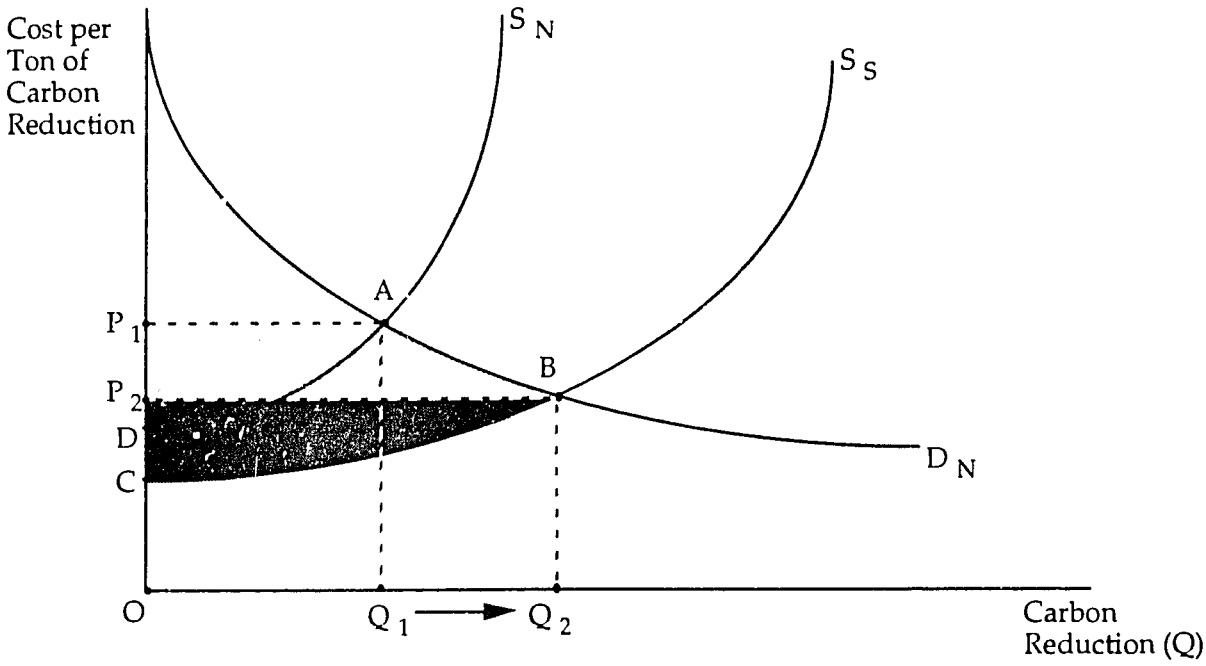
Preliminary Results and Potential Benefits

Preliminary results show that RIL can lower damage to remaining trees by about 30 to 40 percent, leaving only 15 percent of the residual stand damaged. The estimated cost of carbon savings from the Sabah project after the training and research are completed is about \$3/ton for carbon and \$1-2/ton for CO_2 (1 ton C = 3.67 tons CO_2). "That's about as cheap as you can get," Sullivan said. And so far, "the working relationship has been superb," he added.

With the apparent success of the project, Sullivan said, NEES feels it has achieved its first goal: demonstrating that such projects were possible. "We have proven to federal regulators that it is reliable, measurable and credible, even thought there's no value yet in that offset," he said. The company is now working on expansion of offset projects and is actively seeking similar partnerships.

Carbon offsets through improved forest management promise many potential benefits for both the private partners, ICSB and NEES, and their respective countries, Malaysia (the state of Sabah in particular) the the united States (New England states in particular). The Global Community also benefits. In principle, all these entities can achieve more of their objectives whether private profits, CO2 reduction, sustainable forest management, or economic development) at lower cost with offsets than without them, as shown in Figure 1 and detailed in Box 4.

Figure 1. Carbon Offsets: Benefit Sharing Between North and South



D_N = North's demand for carbon reduction

S_N = supply function of carbon reduction in the North

S_S = supply function of carbon reduction in the South

P_1ABP_2 = increase in North's consumer surplus due to lower-cost carbon offsets in South

P_1BC = South's producer surplus due to carbon offsets with North (South also gains consumer surplus from improving local environment at lower cost, e.g., sustainable forestry, watershed rehabilitation, wildlife protection, etc.)

P_1AD (or P_1AEP_2) = lost producer surplus in the North due to carbon offsets in South

Q_1Q_2 = additional carbon reduction made possible due to joint implementation of carbon offsets between North and South

Private-Public Partnership Questioned

The Sabah Forestry Department considers these carbon offset projects (NEP and FACE) as purely commercial transactions between the funding agencies and Innoprise. The arrangements are not on a firm to government agency or government to government basis, of which Sabah Forestry Department could have been involved directly. As of now, the only involvement by the Forestry Department is in monitoring the number of logs being harvested. The Forestry Department has its own set of Forest Management Plans and harvesting guidelines and the RIL technique is only one part of the plan.

Recognizing the uniqueness of the project, some government officials believe that these projects should be conducted on a government to government level if they are to be considered sustainable. Presently, the agreement is between two private concerns in which the government has been a bystander. State government officials pointed out that the ultimate success and sustainability of the project depends on government support, the more so in Sabah Initial negotiations should have been by the state government or its agency the Forest Department because it is felt they are the authority in the state, and recognized by the federal government as such. Innoprise is just a licensee, and there are Forest Management Plan Guidelines that licensees have to adhere to, including projects of this kind. The private sector should recognize the authority of the public sector as far as management of the state's resources is concerned. Certain government guidelines have to be integrated into guidelines formed by Innoprise and where there are duplications or contradictions, guidelines provided by the government should be adopted.

Obstacles Ahead

In the United States, while the government registers carbon offsets by US firms in foreign lands, it does not yet allow credit against such carbon reductions. But even if the United States eventually allows credit for carbon offset projects in other nations, the "biggest obstacle we will have to face is recognition on the international level on the political side," Sullivan noted. "It's very easy to execute on a business level, but getting a project like this through political hurdles will be more difficult."

One barrier will be those people and groups, including some officials in Malaysia, who say industrialized utilities are imposing their own environmental values and beliefs on developing countries and

using offsets as a cheap way to force others to meet reductions requirements while ignoring their responsibilities to mitigate emissions at home. "There's a certain audience out there that thinks they can classify this as carbon imperialism," Sullivan said. "But our answer is: both parties are willing parties. We're not going over there with guns to make people save trees, we're going over with money."

NEES is also pursuing aggressive conservation strategies at home, including projects on wind energy and biomass energy generation that uses sewage as a renewable fuel. "We've never said the only way we're going to reduce is through offsets," Sullivan said. "This should just be a component." Or, as Clive Marsh, who heads environmental and scientific programs for Innoprise, says, "Any offset overseas must be icing on the cake," compared with shifts in power generation throughout the world.[1]

"I think [developing countries] would be opposed to US folks coming in and taking land out of productivity, outbidding them for timber stands," Richards said. But with this project, the Malaysians are not being asked to harvest less, "just differently. And NEES is willing to pay them for the difference in costs," he said. "That's got to look pretty good to them." But some environmentalists object to "rewarding" or subsidizing large lumber companies for their destructive logging practices. To this, both the Innoprise management and the Sabah government respond that since far more carbon dioxide emissions originate in the industrial world, timber producers should not have to absorb the costs of reduced-impact logging by themselves.[2] Hence, joint implementation of carbon offsets makes good sense." Right? "Wrong," answers Ralph Cavanaugh, a lawyer with the US-based Natural Resources Defense Council, calling such projects "fig leaves" for much more serious pollution problems in the United States and abroad.[3] So the fundamental question remains, "To offset or not to offset?" [See Box 5 for proposed Criteria for "Successful" Carbon-Offset Forestry Projects, and Appendix II for a summary description of Forestry Carbon Projects elsewhere.

[1] *The San Diego Union-Tribune*, 9 February 1994.
[2] Ibid.
[3] Ibid.

Box 5
Criteria for Successful Carbon-Offset Forestry Projects

- **Credibility** Is it likely that the project will be able to affect global carbon emissions in a given time period? The more complex the linkage between a form of forestry management and its impact on carbon, the less credible a project.

- **Reliability** What have been the experiences and results of similar projects worldwide? What is the background and expertise of the project proponents? What is the social, economic and political state of the country where the forestry project will be implemented? If a setting lacks stability, it is more difficult to guarantee the safety of researchers or an investment.

- **Measurability** How easily can claimed levels of carbon sequestration be measured? Can these measurements be verified? By whom?

- **Cost-effectiveness** How does this method of carbon sequestration compare to alternative mechanisms for controlling net CO_2 emissions? The true costs and benefits of any project must take into account credibility, reliability and verifiability.

- **Expandability and reproducibility** Are there opportunities to expand the scope of a successful project both cost-effectively and in a timely manner? Does the project have potential for implementation in other nations or other climate zones?

- **Opportunity** Is there a window of opportunity for this project at this time? Are there potential windfall benefits available within a short period of time?

Source: Dixon et al, 1993.

Box 4
Benefit Sharing from Carbon Offsets

Innoprise Corporation/Sabah Foundation

- Funding and expertise in reduced impact logging (enrichment planting in the case of FACE)
- Funds for staff training and facility improvement.
- Funding of research and development needs.
- Funds channeled through Innoprise are utilized directly and need not go through bureaucratic processes as in the public sector.
- Customer goodwill and international recognition as an environmentally sound enterprise.
- Long-term harvesting cost savings.
- Long-term sustainable timber harvesting.
- Pro-active conservation efforts that pre-empt local and global environmental group pressures, including import boycotts against the company's timber exports.

Sabah/Malaysia

- Enhanced sustainability of national forests, with increased future benefits (higher net present value).
- Pre-empted pressures for timber import restrictions or boycotts by importing countries.
- Enhanced local environmental benefits, such as watershed protection, reduced runoff and sedimentation of waterbodies, reduced biodiversity loss, improved wildlife habitats, and favorable microclimatic effects.
- Enhanced international image and influence in global environmental negotiations.

New England Electric System (NEES)

- Buffer or offset against future regulations, or carbon taxes.
- Proof for regulators that a program of carbon offsets across borders could be implemented and carbon savings could be measured and verified thereby pre-empting more stringent regulations at home (or globally), and enlarging the set of available options for meeting CO_2 emission reductions.
- Cost savings in attaining a given CO_2 reduction than through fuel switching or electricity price increase alone (estimated cost of CO_2 reduction through carbon offsets $2-3 /ton, compared with $50-60/ton "at the stack," or a threatened tax of $22-28 ton).
- Enhanced public image ("look good to the public")
- "Learning something and becoming best at it, developing a competitive advantage." (K. Richards, US Department of Energy)

New England/United States

- Lower cost CO_2 emission reductions and hence avoidance of power cost increases that would reduce producer surplus, and/or power price increases that would reduce consumer surplus. Social welfare is higher with carbon offsets than without them, given the US commitment to reduce CO2 emissions to 1990 levels by the year 2000.
- Avoidance of the need for stringent regulations in the future that would have negative impacts on economic activity.

Global Community

- Attainment of global greenhouse gas reductions at lower cost than otherwise, and hence easier compliance; able to achieve more reductions with fewer resources.
- Enhanced conservation and sustainability of tropical forests with associated biodiversity benefits.
- Enhanced international cooperation.
- Incentives for private to private sector financial and technology transfers between North and South without resource bureaucratic delays.

Questions For Discussion

1. *In what ways does your country, or others with which you are familiar, try to integrate the seemingly competing obligations of improving the economic welfare of their people and the conservation of the environment?*

2. *What does your country see as its most pressing environmental problems? Is global climate change among them?*

3. *What do you think about the legitimacy of threatened tropical timber boycotts on the part of industrialized nations?*

4. *Is your country a signatory nation to the Framework Convention on Climate Change signed at the United Nations Conference on Environment and Development in June 1992? What is your national plan for meeting the goals of carbon dioxide reduction in the framework?*

5. *Are there any forestry projects currently underway in your nation that are specifically designed as offsets of carbon dioxide emissions, either domestically or elsewhere?*

6. *Were NEES' reasons for investing in a forestry project legitimate? Were their goals realistic? Was it just a publicity stunt?*

7. *What are the pros and cons of each type of forestry management — preservation, tree plantation, conservation logging — in terms of the criteria listed in Box 2?*

8. *Do you think reduced-impact logging could work in your country's timber industry?*

9. *What do you see as the potential obstacles — political, economic, logistical — for implementing such a program?*

10. *Who gains and who loses with such a forestry management program? Do you think it is a fair arrangement?*

11. *Is it legitimate to offset carbon emissions from the North with forestry management in the South? Are industrialized countries using such projects as an excuse to avoid responsibilities for conservation and energy savings at home?*

12. *What do you think of the charge of "carbon imperialism"?*

13. *What alternatives can you think of for meeting the same objectives (of improved forest management and CO_2 emission reduction)?*

14. *Under what conditions are carbon offsets, such as that of New England Power's with the Sabah Foundation, an economically inferior solution to SO_2 reduction compared with alternatives such as economic restructuring of the power sector and/or technological innovation?*

15. *To offset or not to offset? Under what conditions?*

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Appendix I

Project Name: New England Electric System (NEES) Carbon Offset Pilot Project Reduced Impact Logging in Malaysia

Category: Forest Management Practices

Greenhouse Gases Addressed: CO_2 and Methane

Firms (U.S. & Foreign) and Key Technical Contacts:

Principals:

New England Power Company (NEP)

Rakyat Berjaya SDN. BHD. (RBJ)

Other Participants:

The Forest Research Institute of Malaysia
(Environmental Audit Committee member)

Department of Primary Industries, Queensland, Australia
(Foresters from Queensland are the technical consultants advising RBJ on how to develop and implement reduced impact logging guidelines.)

The Rainforest Alliance
(Environmental Audit Committee)

Dr. Francis E. Putz, Professor of Botany, University of Florida
(Environmental Audit Committee member and Principal Investigator for carbon research project)

Domestic Requirements/Motivations:

NEP, in anticipation of possible domestic and international initiatives related to greenhouse gases, is conducting pilot projects to research the mitigation of CO_2 and methane emissions through forest management projects.

Foreign Requirements:

The contractual arrangement is direct between NEP and RBJ. RBJ is a subsidiary of Innoprise Corporation SDN.BHD., the parastatal commercial enterprise owned by Yayasan Sabah, the Sabah Foundation. Foundation income supports many social programs within the state of Sabah. No commercial barriers were encountered in executing this agreement. NEP does not own any real or intellectual property. Under the NEP-RBJ contract, NEP has exclusive rights to any greenhouse gas offsets credits that result from the improved logging practices in the project area. Under the contract, NEP also has "right of first refusal" for expanded application of the improved logging techniques within the RBJ concession area - 970,000 hectares. RBJ harvests approximately 20,000 hectares per year - a rate that could be maintained for several decades.

Project Duration:

The NEP-RBJ contract was signed in August, 1992. Preliminary phases of the project began immediately thereafter. The Environmental Audit Committee (EAC) met in Sabah in November, 1992. Development of harvesting guidelines and training has been completed. Harvesting, using the guidelines, begins in mid-July, 1993 and continues through mid-1994. The pilot phase will be complete by July, 1995, following completion of the carbon study.

Greenhouse Gas Reduction:

Pilot project reductions are estimated to be 300,000 to 600,000 tons of CO_2. The reduced impact logging techniques' effects are expected to be maintained on the pilot project area for at least 40 years, as land within the concession area is not inhabited nor is it expected to be. Human population pressure for conversion of forest to agriculture is minimal in Sabah. The project baseline is biomass carbon after harvesting under normal conditions versus carbon levels following harvesting under reduced impact logging guidelines.

Monitoring/Verification:

NEP's pilot project is rooted in methods to: 1) monitor compliance with project guidelines for improving harvesting practices, and 2) measure the carbon contained in forest biomass under historic versus new reduced impact practices. Level of product harvested remains the same in both instances.

The Environmental Audit Committee will audit compliance with harvesting guidelines. Members of the EAC are identified above. A separate carbon research project will assess carbon benefits. The carbon project is led by Dr. Putz.

Budget:

Pilot project budget is $450,000 in direct contract costs, plus up to $150,000 for monitoring and research costs. One of the project's objectives is to determine the actual cost for implementing improved harvesting techniques. The estimated cost of the pilot program is $1 per ton of carbon dioxide offset.

Other Environmental Benefits:

NEP and RBJ anticipate there will be substantial benefits to wildlife habitat, biodiversity, soil erosion control and water quality from the reduced impact logging methods. Many researchers have contacted RBJ to do studies assessing these ancillary benefits in the pilot project area.

Project Description:

New England Power Company (NEP) has begun a pilot forest management project in Sabah, Malaysia. The project is just one component of a comprehensive corporate program aimed improve the environment while controlling costs. One goal of the program is to significantly reduce various types of air emissions, including reducing net CO_2 emissions 20% from 1990 levels by the year 2000.

NEP has entered into an agreement with Rakyat Berjaya SDN. BHD., a Malaysian forest products company that holds a 100 year concession on 970,000 hectares, to implement Reduced Impact Logging (RIL) techniques on 1400 hectares. Presently, in the process of harvesting as few as 10 to 15 trees per hectare, as much 50 to 100 tons of carbon per hectare may be emitted due to destructive logging practices. Trees literally tied together by vines are felled in random directions and extracted by bulldozers breaking and uprooting as many as 50% of the remaining trees and crushing up to 40% of the land area. It is estimated that logging damage can be reduced by as much as 50% through pre-cutting vines, directional felling and planned extraction of timber on properly constructed and utilized skid trails.

RBJ foresters and contract loggers will develop guidelines and procedures for implementation of RIL techniques in consultation with forest management experts from Queensland. On site training will be followed by implementation on the 1400 hectares.

Implementation of RIL techniques will be monitored by an Environmental Audit Committee comprised of three organizations/individuals. The Rainforest Alliance is the auditor chosen by NEP, the Forest Research Institute of Malaysia was chosen by RBJ and Dr. Francis E. Putz, a professor at the University of Florida, was chosen as the joint auditor.

Quantification of the carbon savings will be carried out through a research effort involving Dr. Putz, graduate students, and Malaysain field personnel. This research will involve gathering data on above and below ground biomass in areas logged using normal logging practices and areas where RIL techniques have been implemented. The estimated cost of the pilot project is about $1 per ton of CO_2 offset.

Appendix II: Attributes of Forest Sector

Project Location	Ecuador	Guatemala	Malaysia	Malaysia	Paraguay	Russia	U.S.A. Oregon	U.S.A. Utah
Principal Sponsor	GEF	AES Thames	NEES	FACE	AES Barbers Point	Tenaska	PacifiCorp	PacifiCorp
Project	Forestation/ Forest Protection	Sustainable Agroforestry	Sustainable Forestry	Reforestation	Preservation/ Sustainable Agroforestry	Forestation	Sustainable Forestry	Urban Tree Planting
Total Costs	—	14×10^6	$450,000	1.3×10^6	$2 \text{ to } 5 \times 10^6$	$500,000 to ?	$100,000 yr^{-1}	$100,000 yr^{-1}
Utility Contribution	—	2×10^6	$450,000	1.3×10^6	2×10^6	$500,000 to ?	$100,000 yr^{-1}	$100,000 yr^{-1}
Other Participants	Durini Group	CARE, Guatemala Government	Rain Forest, Alliance, COPEC	Innoprise	Nature Conservancy, FMB Foundation	—	Oregon Department of Forestry	TreeUtah
C Sequestered (tons)	375,000	$15.5 \text{ to } 58 \times 10^6$	300,000 to 600,000	—	13.1×10^6	500,000 to ?	64,750 tons yr^{-1}	N/A
Project Size (ha)	6,000	52×10^6	1,400	—	56,800	20,000 to ?	140	1,000 trees
$ tons C Sequestered	$3 to $4	$9 overall $1 AES	less than $2	—	$1.5	$1 to $2	$5	$15 to $30
Project Duration (yr)	—	10	10	—	30	25	65[1]	50[2]
Local Benefits	Foster local forest management, preserve forests.	Promote soil and biomass conservation, develop sustainable forestry groups to protect, plant, and manage trees, establish a fund to promote continuing agroforestry activities.	Train local inhabitants in sustainble logging activities, preserve non-harvested trees, improve water quality, maintain biodiversity, reduce soil erosion.	Enrichment planting; promote biomass and soil conservation, landscape protection.	Create a watershed, promote biodiverstiy, create sustainable agroforestry opportunities for inhabitants, promote recreation and ecotourism opportunities.	Habitat improvement; Soil and water conservation and transition to regional market economy.	Assist landowners in productive land management activities.	Reduce cooling and heating needs of the community, contribute to the aesthetics of the area.

[1] The duration of the project is unknown. However, trees planted cannot be harvested for 65 years.

[2] The duration of the project is unknown. However, PacifiCorp estimated that strategically positioned trees could substantailly reduce cooling load needs over the course of 50 years, thereby offsetting fossil fuel emissions.

Source: R.K. Dixon, et al., 1993.