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HOW WELL DOES BRAZIL'S ENVIRONMENTAL LAW WORK IN PRACTICE? ENVIRONMENTAL IMPACT
ASSESSMENT AND THE CASE OF THE ITAPIRANGA PRIVATE SUSTAINABLE LOGGING PLAN

Evaldice Eve*
Institute of Latin American Studies (ILAS)
School of Advanced Studies (SAS)
University of London
31 Tavistock Square
London WC1H 9HA, U.K.

Francisco A. Arguelles
Ministério Público do Estado do Amazonas
Promotoria de Justiça Especializada na Defesa do Meio Ambiente
e Patrimônio Histórico (PRODEMAPH)
Rua Celetra II, no. 7, Conjunto dos Secretarios, Adrianopolis,
69000-000 Manaus, Amazonas, Brazil

Philip M. Fearnside
National Institute for Research in the Amazon (INPA)
C.P. 478
69011-970 Manaus, Amazonas, Brazil

* Author to whom correspondence should be addressed.

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ABSTRACT

The Itapiranga Sustainable Logging Plan provides an example of how Brazil's licensing system functions for logging companies in the state of Amazonas. Two questions need to be dealt with: "How sustainable can logging in the Amazon be?" and "What, and how effective, are existing legal mechanisms to deal with logging projects?" The Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS, known as the RIMA in Brazil), present relatively detailed accounts of biodiversity and the need to adopt conservation strategies to protect it. However, social and health impacts are only superficially addressed. The economic sustainability of the operation over multiple cycles is not demonstrated. The multidisciplinary teams responsible for the EIA and EIS (RIMA) reports are hired by the project proponent, an arrangement inherently carrying the risk of biasing the result. Logging reduces biodiversity, releases greenhouse gases and inflicts social and health costs. These impacts reduce the ability of Amazonian forests to provide environmental services and to supply food and livelihood security to local populations. The reports inflate positive effects such as employment: the estimated number of jobs was cut by more than half in a revision made after the EIA and EIS (RIMA) had been approved. Not only do the reports need to be more realistic in assessing both positive and negative consequences of proposed projects, but better means are needed to ensure that promised mitigatory measures are enforced in practice. Many of the lessons that can be drawn from the Itapiranga Plan are not unique to logging projects, and apply to licensing of development activities generally in Brazil and elsewhere.

INTRODUCTION

Logging in Amazonia

Logging is an ever-increasing economic activity in the Brazilian Amazon region, as it has been for the last two decades. The rate of logging in the Brazilian Amazon is expected to increase very greatly in the medium-term future, firstly because of the considerable size of the timber resource when compared with other tropical forests, and, secondly, because Asian forests, which are being used first because of their superior timber quality, will soon have been consumed (MMA 1996). Brazil's share of the wood volume in the international timber trade was only 8% as of 1995 (Higuchi 1997, pp. 18, 28). Greater investments in Amazonian logging are likely as Asian forests dwindle. Although the Asian financial crisis that began in 1998 has delayed investments, it is expected that US\$ 600 million will be invested in the near future to exploit over 1.2 million ha of forested land in Brazilian Amazonia, the price of which has fallen to a record low (Gonçalves 1998, p. 88). Since 1993, export demand for Brazilian timber varied inversely with the supply offered by the rest of the world, particularly Asia, resulting in the expectation that pressure on Amazonian forests will increase dramatically in the near future (Angelo 1998, p. 107).

Most logging in Brazilian Amazonia is in the states of Pará and Mato Grosso, where logs come mainly from terra firme (upland) forests and are transported by road to sawmills, and from there to markets or ports. In the state of Amazonas, however, timber harvesting has, until recently, been concentrated in the várzea (white-water floodplain), especially in the Alto Solimões (Upper Amazon River), Madeira River, Itacoatiara and Tefé areas. Some loggers use traditional manual methods, while others use heavy machinery. Both groups tend to focus on a few species that are well-known in national and international markets. Timber exploitation is now reaching more terra firme areas, due to increased road infrastructure.

Major sawmills in Itacoatiara, such as Gethal and Braspor, have traditionally obtained logs from unmanaged sources, but now have proposals for forest management areas. The most significant existing operation of this type is that of Mil Madeireira Itacoatiara, Ltda., which has been underway since 1994. In July 1997 Mil Madeireira received certification from the Smartwood Program of the Rainforest Alliance (an agent accredited by the Forest Stewardship Council); this is the only logging operation so certified in Brazilian Amazonia as of 1999, although one other company (Gethal) has an application for certification pending for part of its operation. Mil Madeireira appears to be atypical because of the idealistic motivation of its owners (mainly Swiss doctors and lawyers). Investment has already exceeded US\$ 27 million, making it unlikely that it would take place if undertaken strictly for maximum financial gain. However, the experience gained can be expected to make future ventures much more cost-effective. Precious Woods, the parent company of Mil Madeireira, is seeking to purchase at least 250,000 ha of forest for management in Pará. Nevertheless, fundamental inconsistencies between financial decision-making criteria and growth rates of tropical trees must be faced by all projects aimed at sustainable management of timber (Fearnside 1989).

Logging has, in the past, proceeded without regard for its long-term effects on the forest or local people, and has been destructive (e.g., Uhl and Vieira 1989, Uhl and others 1991, Veríssimo and others 1995). "Sustainable logging" is viewed as an alternative to this, which can guarantee forest conservation and aid in the struggle against global warming. This latter hope would be justified if timber extracted from the forest is used for wood products that sequester carbon over long time scales, without reducing the forest's capability to cycle carbon out of the atmosphere into the same types of timber, thus yielding similar harvests repeatedly (Dumont 1973). However, large emissions occur from decay of logging slash, sawmill waste and trees inadvertently killed during logging operations; these emissions can result in a net global warming impact (rather than a benefit), particularly if any value is given to time, as by applying a discount rate to carbon (Fearnside 1995). As compared to logging practiced without constraints on damaging practices, reduction of logging damage can have significant carbon benefits at moderate cost (Barreto and others 1998, Johns and others 1996, Pinard and Putz 1996, Putz and Pinard 1993).

It is very important to understand what tools are available to aid in avoiding environmental and social impacts--too often we hear ill-informed assertions that, for example, Brazilian environmental legislation is "not worth the paper it's printed on." In fact this hard-won legislation is evolving rapidly, both in enactment and in interpretation, and already represents a crucial bridgehead in attempts to promote conservation and sustainability of forest resources. Two questions need to be dealt with: "How sustainable can logging in the Amazon be?" and "What, and how effective, are existing legal mechanisms to deal with logging projects?" The special problems of applying environmental legislation to logging activities obtain throughout Brazilian Amazonia. Many of the same problems are faced by other tropical countries trying to regulate "sustainable harvesting" (Venezuela provides a good example: Lozada and Arends 1998).

The Itapiranga Project is a typical non-idealistically motivated undertaking. This large project, covering 96,000 ha (almost all of which is primary rainforest) is owned by Joair Marcondes Pereira of Maringá, in Brazil's southern state of Paraná. This was the second forest management project to

pass through the public hearing stage of the approval process (the first was Mil Madeireira, with 75,000 ha of terra firme forest in an 80,000-ha property in Itacoatiara and Silves counties); three additional similar projects have since passed this stage: APLUB (a 29,787-ha project in várzea forest in Carauari county), Braspor-II (a 48,000-ha project in terra firme forest in Itapiranga, Silves and Rio Preto da Eva counties) and Gethal (areas originally totalling 21,000 ha, predominantly in terra firme forest, in Manicoré and Novo Aripuanã counties) (Ecojus Ambiental 1998; Gethal Amazonas S/A 1998).

The Itapiranga Project will be examined in some detail in the present paper in order to extract lessons for improving the review and licensing process for logging projects throughout the region. Given the speed with which logging activity is expanding at present, this improvement should be an urgent priority. The present paper discusses legal licensing procedures for logging operations in the Brazilian Amazon, including the Environmental Impact Study (EIA) (Estudo de Impacto Ambiental) and an Environmental Impact Statement (EIS), known in Brazil as the RIMA (Relatório de Impactos Ambientais: Report of Environmental Impacts) (see glossary).⁽¹⁾

Baselines of Reasonable Expectations

An important issue in regulating the environmental and social impacts of development projects is the question of a baseline against which the proponent's responsibilities are judged. If one assumes that all existing social problems in the surrounding area must be solved by project proponents, then any proposal becomes untenable. On the other hand, if one simply assumes that "the sea of misery is vast and undrainable," then project proponents bear no responsibility for contributing to resolution of social problems in the area. We write from the perspective that development projects should, at the least, not cause any net increase in such problems, have benefits that fully compensate for whatever negative impacts are caused, and furthermore, should make some contribution to improving social services such as health care and education. As no standard exists on such baselines, either in Brazil or more generally, other interpretations are possible.

A second type of baseline concerns the level of reasonable expectations for an EIA, EIS (RIMA), and Forestry Management Plan in terms of information provided and its uncertainty. Amazonian operations often have uncertainty concerning both what they will be doing 20 or 30 years in the future and what the long-term profit streams will be. We take the position that a sustainable logging operation is fundamentally different from an industrial operation such as an automobile factory. While a firm like General Motors may someday decide to convert its factories to something other than automobiles, and may do so without any environmental damage as a necessary result, the same is not true of logging. A sustainable logging operation is supposed to be sustainable in the long term in order to maintain the forest's ability to provide environmental services; continuation of the management operation is seen as a guarantee that the forest will not be cleared. Some calculation of expected long-term harvests and financial viability is therefore needed, even if associated uncertainty is necessarily great.

A baseline of expectations also applies to the public hearing. Public hearings need to be held at locations accessible to disadvantaged stakeholders. Considerable effort is required to assure that a sufficient number of such "non-experts" actually come.

Forest Management in the Context of Amazonian Land Use

Land-use decisions in Amazonia often involve many considerations other than the stream of expected financial returns from sale of products to be harvested. Best known is the case of cattle pasture that occupies most of the deforested land in the region. The advance of pastures is not well explained by returns from selling beef, but rather by such factors as fiscal incentives, land speculation and the establishment of land tenure (see Fearnside 1987, 1999, Hecht and others 1988). By the same token, interest in gaining approval of forest management projects may be driven by ulterior motives. These must be understood if the licensing system is to be effective in minimizing social and environmental impacts, including those that may be provoked beyond the boundaries of proposed management projects.

One potential ulterior rationale would be to gain approval of a project as a means of having land classified as "productive" by the National Institute for Colonization and Agrarian Reform (INCRA), thus assuring that the land will not be expropriated to settle landless farmers, and also reducing the probability that landless squatters would invade the area on their own initiative. Even though this part of the Amazon region has the least pressure from landless peasants, such as those organized by the Landless People's Movement (Movimento dos Sem Terra: MST), about 30 km of road frontage on the Estrada da Várzea (AM-363 Road) was invaded by squatters in approximately 1989 and subsequently exchanged for an area of equal dimensions (about 20,000 ha) of government land elsewhere. The owner of Fazenda Itapiranga has held the property since 1971 without initiating development activities, and might eventually lose title to it if forestry management or some other activity were not initiated.

A second ulterior rationale that is sometimes suggested is that the management plan would allow the owner to escape or reduce the Rural Territorial Tax (ITR). However, the management plan apparently does not confer any advantage in this regard. Brazil's recent rural tax law (Federal Law no. 9393 of 19 December 1996) does not levy tax on forested land provided it is registered as a "legal reserve;" timber management is permitted within the "legal reserve." Land owners can increase the "legal reserve" above the 50% minimum of the area of a property required by Brazil's Forestry Code, and thereby escape the tax on all land under forestry management. The part declared as a "legal reserve" is legally registered (averbado), including geographical coordinates of its perimeter, and cannot later be revoked. In the first 19 months following the November 1997 tax law, only one property (APLUB, in Coari) of the 61 projects approved by that time had applied to have its "legal reserve" expanded to avoid the tax. The slow response of older (already approved) projects might be partially explained by lack of information about the opportunity among property owners. The passage of time will make this a test of the sincerity of sustainable logging proponents: one might reasonably doubt the intentions of those who prefer to continue paying the tax and thereby have the option of abandoning their management plans and converting the land to other uses. Of projects approved since the opportunity to escape tax was offered, one company (Gethal) has legally registered 95% of the area of its Madeira River holdings. The Itapiranga Project, however, only registered the required 50% minimum of its land area, thereby opting to pay higher taxes in return for the option to later renege on its forestry management plan.⁽²⁾

The speculative value of an approved logging operation could provide a third ulterior motive. An approved Forestry Management Plan, EIA or EIS (RIMA) can be sold to another operator with or without the title to the land on which the management would be carried out. In the case of Itapiranga, the owner has

reportedly approached at least two major sawmills in Itacoatiara offering to sell the property with the approved EIA, EIS (RIMA) and Management Plan. The price asked is higher than normal for large blocks of forest. Even if a premium price were not obtained as a result of having the EIA, EIS (RIMA) and management plan, these documents may well increase the chances of finding a buyer. Sawmills in need of legal sources of timber may find it cheaper to buy an already approved project than to get approval for their own operations. At Itapiranga the total cost (not including the land) of drafting the EIA, EIS (RIMA) and Management Plan, plus paying for the public hearing and fees to the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) and the Institute for Environmental Protection in the state of Amazonas (IPAAM), was approximately R\$ 5/ha (US\$ 3/ha). The possibility of selling the project has important implications for the promises that are made along the way to approval: even if the original owner has every intention of managing forest in perpetuity and providing a variety of benefits to the local population, firms that buy the operation at a later date may have other policies. A strong temptation is set in place to promise anything that might speed approval of the plan, regardless of real intentions.

A fourth possible ulterior motive is that the operation could serve as a front to launder illegally harvested wood from elsewhere in the region. Sawmills buying logs from third parties, who often bring logs from indigenous areas and other locations where logging is not permitted, have, in the past, been able to declare these logs to IBAMA inspectors as having come from permitted areas, such as approved management projects, land authorized for deforestation, and land destined for flooding by hydroelectric dams. Authorizations for deforestation have been a major loophole for legalizing this timber. It has been much cheaper and bureaucratically simpler to get permission to deforest an area (allowing marketing of about 80 m³ of wood per ha authorized) than it is to get a forest management plan approved (allowing marketing of about 30 m³ per ha of harvest). However, IBAMA may tighten the system to keep deforestation permits from being used in this way. In addition, it is more difficult to secure deforestation authorization for very large areas, and "legalization" of larger volumes of wood is usually done by (illegal) repeated use of the same deforestation authorization permit for individual truckloads of wood. In addition, this kind of permit is less plausible for wood being transported in rafts of logs on the region's rivers, since most authorized clearings lack river access.

FOREST MANAGEMENT AND LICENSING

Brazil's 1988 Federal Constitution is the main instrument for environmental protection. Section 225 establishes basic measures for control of environmentally degrading activities and clearly states that the Amazon rainforest is part of the national patrimony, and utilization of its natural resources should be carried out under conditions which ensure its conservation. The decision as to whether a project needs to undertake an EIA is based on assessment of the project's scale, location, and expectation of adverse effects. The 1988 Federal Constitution and the Amazonas State Constitution mandate assessment of environmental impacts prior to licensing in the case of logging activities, and National Council of the Environment (CONAMA) Resolution 001 of 23 January 1986 establishes the basic criteria for implementation of EIAs as an instrument of the National Policy for the Environment.⁽³⁾

According to the records of the Technical Division (DITEC) of the Manaus office of IBAMA, from 1996 to June 1998 a total of 114 management plan applications were submitted; of these, 31 were rejected, 20 were being held

pending solution of irregularities, and 6 were still being assessed. A total of 57 other projects had their initial Forestry Management Plans approved, of which 33 were licensed for the 1997-1998 harvest, 10 were rejected, and 14 were still being assessed (IBAMA 1998). In Brazil's 5,000,000 Legal Amazon region as a whole, there are 865 Forestry Management Plans currently authorized by IBAMA, plus 1127 that have been suspended and 814 that have been cancelled for not respecting legislation (Cotton and Romine 1999, p. 8).

Table 1 displays the size and location of proposed logging projects in the state of Amazonas (DITEC 1998). In 1996-1997, 10,193 ha were authorized for harvesting; this area increased to 11,259 ha in 1997-1998.

[Table 1 here]

IBAMA required the EIA and EIS (RIMA) until 28 September 1998, when decree 2788 ended the federal requirement for these, and ordered assessment of environmental impacts instead be incorporated into the Forestry Management Plan (Plano de Manejo Florestal) required by IBAMA. However, the head of IPAAM has announced that the state government will continue to require the EIA and EIS (RIMA) for logging operations (Amazonas em Tempo 3 October 1998). In Amazonas, State Law no. 2416/96 requires logging proposals covering an area of 2000 ha or more to present an EIA and EIS (RIMA).⁽⁴⁾

Planned large logging projects in central Amazonas for which the EIA, EIS (RIMA) and IBAMA Forestry Management Plan were approved in 1997-1998 total 155,675 ha or 1557 km². The number of projects that request the Harvesting License (licença de exploração) from IBAMA in any given year is less than the number with approved Management Plans. The number of licenses in the state of Amazonas fell from 36 in 1997-1998 to 26 in 1998-1999, presumably as a result of the requirement that came into effect for the 1998-1999 harvesting year that the coupe (talhão), or the area to be harvested, have a 100% inventory with mapping of tree locations and tagging of trees. Within the 25 firms licensed for harvesting in 1998-1999 (excluding Mil Madeireira, which is atypical as will be explained below), the average volume of wood per hectare authorized for cutting fell by more than a factor of three, from 71 m³/ha to 21 m³/ha as compared to the first year of harvesting authorized for each firm (Malvino Salvador personal communication 1999). This clearly indicates the massive scale of fraudulent claims in the past: companies routinely overestimated the volume of timber in areas to be harvested and then sold the approved volume of wood (most of which was taken either from other locations within the property or from unauthorized sources elsewhere).

The new regulations require georeferencing the corners of the annual coupe, within which tree locations are mapped on a grid. Theoretically, a system of safeguards will prevent log laundering. Effective in 1998, a requirement has been instated that a numbered tag be nailed to the stump of each tree harvested (the same tag that is supposed to be affixed to the tree when it is selected for harvest is to be moved to the stump when it is cut). IBAMA inspectors can, theoretically, choose to check a sample of trees that the harvesting plan says should have been cut. It would therefore be possible to discover if a management plan was being used as a front for logs coming from elsewhere, as the trees that had supposedly been cut would still be in the forest.

ITAPIRANGA SUSTAINABLE LOGGING PLAN
Planned Operations

The Itapiranga Sustainable Logging Plan was approved on 23 August 1998 by DITEC. Advisory input had been given by a newly created Forestry Technical Board (Câmara Técnica de Floresta), which was instituted by an IBAMA Administrative Ruling (Portaria No. 39/98 of 6 April 1998). This multidisciplinary committee has representatives from local universities, research institutes, environmental agencies and non-governmental organizations (NGOs). The technical board was created to ensure sustainable forest management in the face of increasing pressure on forestry resources. Management plans for logging projects now have to be reviewed by this committee in the last stage of the licensing process. The Itapiranga Project still must obtain a Harvesting License from IBAMA for the first year's cut before logging can begin. In May 1999 the project informed IBAMA that it hopes to complete its harvesting plan in 1999 and begin logging in 2000.

The project is located in the municipalities (counties) of Itapiranga and Silves, in the 'Médio Amazonas' (Middle Amazon) region. The project lies between the Estrada da Várzea (AM-363) and the Uatumã River, near the town of Itapiranga, 105 km by road from Itacoatiara (or 55 km in a straight line) (Figure 1).

[Figure 1 here]

Both the EIA and the EIS (RIMA) (RCB 1997a,b) and the original Management Plan (*Selva Madeireira* 1997) stated that a 25-year cutting cycle would be applied. This violated Administrative Ruling no. 48 of 10 June 1995 (article 5), which requires a minimum cycle length of 30 years for forest management projects approved after that date. The proponent agreed to increase the cutting cycle to 30 years as a condition for the 23 August 1998 approval of the plan by DITEC, and submitted an addendum containing this and other modifications requested by the Forestry Technical Board (CTF 1998).

The original management plan called for dividing the total area into sub-areas. These were to be of 3610 ha each under the original (25-year cycle) plan, and were reduced to 3008 ha under the current 30-year cycle plan (*Selva Madeireira* 1998).⁽⁵⁾ The expected annual timber harvest was originally estimated at 94,849 m³, and was reduced to 67,945 m³ when revised to a 30-yr harvest cycle in the addendum to the plan (*Selva Madeireira* 1998). Prior to each year's cut, an inventory is to be made in the selected block to identify and mark trees to be logged, and seed-bearing trees to be left for future recruitment. All commercial trees are to be recorded and divided into four use categories: a) trees for immediate logging, b) trees left as seed bearers, c) trees left for future logging, and d) trees to be killed by poison ring-girdling (defective and damaged trees). What proportion of trees will be girdled, and whether some individuals of non-commercial species will also be girdled is not mentioned (RCB 1997a, p. 122).

Next, the operational team will be responsible for choosing locations of roads and access tracks for machinery and personnel. The road system includes the following categories: a) permanent roads to allow access by logging trucks throughout the project lifetime, b) secondary and temporary roads to give truck access to the sub-areas for annual coupes, c) access tracks for skidders, and d) log-dragging tracks to allow temporary access by tractors. Finally, the logging operation will take place.

No sawmill is planned; the operation would presumably sell its production to existing sawmills elsewhere, probably in Itacoatiara. Mention of the destination to which harvested logs would be transported is conspicuously

missing from the original documents (RCB 1997a,b; Selva Madeireira 1997). This would appear to be vital information for assessing project impact. Curiously, the Management Plan (Selva Madeireira 1997, p. 38) gives a cost estimate for the timber freight on board (FOB) at the mill without mentioning the location, distance or means of transport to the mill. Logs from some of the annual coupes will be transported by road, while those from others will be transported by river. The addendum to the plan presents cost calculations with Itacoatiara as the destination (Selva Madeireira 1998).

Prospects for Sustainability

The sample for the timber inventory that was done as part of the Forestry Management Plan totals 81.5 ha (RCB 1997a, p. 110), or almost the required 0.1%-intensity of 92.5 ha. The species with the largest volumes expected to be harvested are: cupiúba (Goupia glabra), amapá (Brosimum spp.), angelim-vermelho (Hymenolobium excelsum), louro preto (Licaria spp. and Ocotea spp.) and tauari-vermelho (Couratari spp.) (RCB 1997b, p. 18). The proposal emphasizes that the large number of individuals in size classes too small to harvest means that there will be sufficient in-growth into harvestable size classes to ensure sufficient wood, presumably through several cycles.

No calculations of volumes in subsequent harvests are given. One factor inherent to all "sustainable logging" operations is that the first harvest is inevitably more generous than subsequent ones because large individuals that have been growing for centuries are there for the taking, whereas in subsequent cycles only growth for which the forest manager has patiently waited will be harvestable. Harvesting wood volume that is inherited in large trees can be spread over the first few cycles rather than being entirely removed in the first, but this free stock of wood will nevertheless come to an end, forcing the operation to depend solely on growth of trees under its care.

Factors counteracting the loss of large trees are: 1) many large trees are hollow, making the boon they represent less than one might suppose, 2) by favoring the growth of commercially valuable species, the wood volume increment of these species can increase substantially over what it would be in unmanaged forest (Magnussen and others 1999), and 3) the smaller-diameter trees that will be harvested in future cycles will have less losses due to hollow trunks. On the other hand, the percentage of sawmill waste will increase as the diameter of trunks being sawn decreases. How these different factors will balance requires quantitative estimates, which are apparently lacking. Passing the transition from the first to subsequent cycles is the critical test of any timber management system; information is not presented to show that the operation would continue to be profitable after this inevitable change.

For a project to be sustainable it must provide a continuous stream of income that justifies both initial investment and operating costs. The EIA and EIS (RIMA) do not require financial information, but Decree no. 2788 of 28 September 1998 requires demonstrating such sustained financial viability as part of the Management Plan submitted to IBAMA. While the previous decree (no. 1282 of 19 October 1994) also required demonstrating financial viability, we could find no such demonstration in the plan (Selva Madeireira 1997), and what information is supplied betrays a surprising lack of thought to questions of financial viability.⁽⁶⁾ The addendum to the Management Plan calculates that for the first year of operation there will be an after-tax return of 31.4%, not counting land purchase and licensing costs (Selva Madeireira 1998).

The EIA gives the number of trees expected to remain after harvesting (RCB 1997a, p. 121). The estimate appears to have been derived by subtracting harvested and ring-girdled individuals from the original stock, thereby ignoring the unintentional loss of trees that are inevitably killed either by being hit when harvested trees are felled or by the effects of moving machinery and logs through the forest.

The project plans call for creating a 9600-ha environmental conservation unit to be located in the Caribe River region. This reserve is presented as the project's most important mitigation measure and is intended to maintain the stability of the local river ecosystem and ensure availability of wild resources as food security for the local population.

Additional Measures to Increase Sustainability

Although not required by explicit regulations, a number of additional measures could improve the probability of sustainability; these have been adopted by Mil Madeireira but are not planned in the Itapiranga Project. They include selection of harvestable trees by first mapping all individuals at least 30 cm diameter at breast height (DBH), after which selecting trees to be harvested and choosing the location of logging tracks are done using an optimization routine in a geographical information system (GIS). At Itapiranga, selection will be done on the spot by field staff in the forest. Another measure to increase assurance of proper extraction (required, for example, for certification) would be fixing tags on all logs (as well as on stumps, for which tagging is already required by current IBAMA regulations); this would allow tracking and verifying of the "chain of custody" at all stages in the extraction and milling processes.

Johns (1997, pp. 168-178) provides a useful review of other potentially advantageous measures. These include creation of scattered reserves of totally protected area, in addition to a single large one, and research to identify keystone tree species for special protection. Erosion can be minimized by techniques such as skidding logs uphill and placing cross-blocks on abandoned skid tracks. The effectiveness of many impact-reducing measures depends heavily on the training and supervision of logging crews to assure that directional felling is used to best advantage, and that all movement of logs and machinery is actually done following pre-planned routings.

EIA AND PUBLIC CONSULTATION: THE THEORY The Requirements of an EIA and EIS (RIMA)

An EIA should, in theory, be done according to terms of reference presented by the environmental agency (IBAMA 1995), using and presenting a clear methodology by which assessment of possible impacts was carried out, and resulting in mitigation measures and recommendations detailed in the EIS (RIMA). The first stage of an EIA should involve an adequate understanding of the project in question. This must include the land and its physical transformation; type and quality of resources used (water, minerals, energy); generation, treatment and disposal of waste; potential for accidents or other hazards, labor requirements (size, duration, source and skills); provision of services by the developer (housing, transport); services required from local businesses; and flow of social activities, demand for services, community participation, and community conflicts (Glasson 1995).

An environmental health impact assessment is part of the EIA and EIS (RIMA). This is to identify possible health hazards resulting from a project

and involves an assessment of the extent of increase of exposure to infections or pathogenic agents. Such assessments must start by screening to choose environmental health parameters (EH factors) of recognized health significance. Epidemiological studies provide the most important means of assessing these impacts (Giroult 1988).

Social assessment is carried out as part of the assessment of socio-economic effects. Its fundamental purpose is to determine what difference a particular proposed project will make. One major concern is whether the effects will be transitory or long-lasting. Determining effects of a proposed project requires comparison of future conditions with and without the proposed project (Branch and others 1984).

Several barriers to public consideration of social impacts in the planning process are evident: some people feel that understanding of social impacts requires only common sense; others that social impact cannot be measured, and therefore should be ignored; still others believe that social impact always deals with costs, not benefits, and as such is always used to slow down or stop development projects. Social assessment is responsible for analyzing the relationship between the project characteristics and the changes that the project will cause for each community in terms of people, jobs, income, resources, and public health. It is also responsible for analysis of people's expectations, perceptions and responses to these changes.

Public Consultation within the EIA and EIS (RIMA) Process

The Public Ministry (Ministério Público) is a body whose powers and responsibilities derive from Brazil's 1988 constitution, which made the Public Ministry independent from the three civil branches of the state--executive, legislative and judiciary. It has wide-ranging powers to react to complaints or initiate actions, and carry out investigations to bring cases under criminal or civil law against any body, including the government itself. The Public Ministry is sometimes described as an ombudsperson, but in view of its considerable powers and ability to take initiatives, this seems inadequate. A closer precedent would be the censoriat of classical China, which had both direct access to the throne and the right of inquisition (Needham 1979).

The Public Ministry carries out investigations and public civil suits in order to protect public and social patrimony and the environment, among other collective interests. The Public Ministry is equipped with a number of prosecutors' offices specializing in environmental issues. In the EIA process it has the power to request public hearings and, through a Public Civil Suit, to stop operation of large projects until the EIA and EIS (RIMA) have been completed. A number of suits have been brought against the government for absence or inadequacy of EIA and EIS (RIMA) reports for development projects such as roads and hydroelectric power plants (Milare 1994).

In 1987 the place of public participation in the EIA process was established by Resolution 009/87, which states that a public hearing (audiência pública) should be held when requested by the civil body, by the Public Ministry, or by at least 50 people (IBAMA 1995). Since 1996 the Public Ministry of Amazonas always requires a public hearing in the case of logging projects due to their high potential for environmental degradation. This provides an opportunity for all parties concerned (project proponent, affected population and relevant authorities) to get a better understanding of the project, express their views, expectations and associated risk perceptions, and be part of the decision-making process.

EIA AND PUBLIC CONSULTATION: THE PRACTICE

The EIA Report

Environmental impact assessment. The Itapiranga EIA presents lists of species believed to be present in the area, including those that are officially designated as endangered or threatened, and points out the need to protect certain species in order to guarantee long-term forest conservation. The account is quite detailed compared to other parts of the report. The report emphasizes the role of the black spider monkey (*Ateles paniscus*), a species that feeds on fruits and plays an important part in seed dispersal and thus, fauna-flora dynamics. In fact, this animal is the only seed dispersal agent for tree species such as *Trichilia* spp. (Meliaceae), *Ecclinusa* spp. (Sapotaceae) and the economically valuable *Miconia guianensis* (Olacaceae) and *Brosimum parinarioides* (Moraceae) (RCB 1997a, p. 72). The EIA pointed out that spider monkeys are listed as an endangered species (RCB 1997a, p. 46). When hunting pressure is high, spider monkeys are one of the first species to disappear (Bodmer 1994; Peres 1996). Although not mentioned, the faunal survey was done in the dry season (T.V. Barnett personal communication 1999). This could help explain why the survey team failed to observe spider monkeys directly, as these monkeys are much more easily seen in the rainy season when they are feeding on forest fruits that are abundant at that time (van Roosmalen 1985). The EIA does not state how long the consultants spent in the field, an omission that also applies to all other sections of the report. In fact, all field work was done in less than one week (T.V. Barrett personal communication 1999). Most information on fauna presumed to be present at the site comes from existing surveys elsewhere in central Amazonia, such as the Biological Dynamics of Forest Fragments Project that has been studying forests north of Manaus for the past 20 years in a joint effort of the National Institute for Research in the Amazon (INPA) and the Smithsonian Institution.

Socio-Economic Impact Assessment. The Itapiranga Project's assessment of socio-economic impacts on the directly affected population raises a number of questions. The assessment was carried out in two areas. The first was the area considered to be directly affected by the project (área de maior influência direta), defined as the area close to the project site, encompassing four communities: Sagrado Coração de Jesus and Anebá (located on the AM-363 road), and Cesaréa and São Francisco communities (located along the Uatumã River). Data were collected here via questionnaires (sample size 54).

The second area was the area of influence (área de abrangência), defined as the area directly benefiting from implementation via promotion of employment opportunities and increased local income. This area was taken to be coincident with Itapiranga county, about which a secondary source (IBGE 1991) was used for information.

In the area directly affected (the area from which population will be not displaced), 76% of the respondents reported having migrated to the region seeking land for agriculture, but the range of settlement periods is reported in only four categories (<3, 3-5, 5-10 and >10 years). Apart from apparent arithmetic errors in some of the reported data, the choice of such a low limit for the upper residence time category means that we cannot know whether a long-term settled population exists (RCB 1997a, pp. 64-65). The populations of São Francisco and Cesaréa reported longer settlement periods (36%). Only 5% of the respondents reported having land ownership (RCB 1997a, p. 70). No mitigation measures were mentioned to deal with the land insecurity situation.

For education, the survey showed that a majority of school age children do not attend. The worst situation was found among children living in Sagrado Coração de Jesus and Anebá, where non-attendance was 94% (RCB 1997a, p. 73). Provision of services and financial contributions to existing school development programs are often used as a means of mitigating social impacts of projects, but was not suggested in the present case.

The EIA acknowledges that people from these communities and the town of Itapiranga depend on subsistence agriculture and extractivism (of fruits, medicinal plants, fish and game), and that game meat is clearly a source of protein during the wet season (6 mo.) when fish catches are lower. The report also concludes, without presenting any evidence, that extractivism makes no significant contribution to local incomes (RCB 1997a, p. 78). This contradicts findings of previous studies carried out in similar areas at other sites in central Amazonia, which found an average contribution of wild resources to cash income of 36% and an even greater contribution to subsistence (Eve 1995).⁽⁷⁾

Subsistence hunting is particularly important during the wet season as a source of food security and is permitted by Brazilian legislation (in contrast to market hunting). Loss of this food source is an inevitable consequence of the necessary prohibition of hunting in the management area. In addition, local residents are unlikely to be permitted continued access to wild plant foods. These foods, especially from indigenous trees, have good nutritional value and are sought after by the local population as a tasty component of the daily diet. They are important sources of energy and vitamins--especially vitamin A (Eve 1987).

Preventing hunting is an issue both for minimizing environmental impacts and assuring its silvicultural sustainability. Greatly increased hunting pressure is associated with logging camps in tropical forests, and because substantial animal populations are needed to perform seed-dispersal functions, this link to hunting has been identified as a major doubt regarding the long-term productivity of "sustainable" logging operations around the world (Robinson and others 1999). The EIA proposes to prohibit hunting by workers and to raise their consciousness through environmental education. Additional measures that might help would include heavily penalizing any transport of wild meat in company vehicles, prohibiting guns, and assuring an adequate supply of non-game meat to the logging camps.

IPAAM requested an addendum to the EIA and EIS (RIMA) with clarification of a number of points, including plans for mitigation and compensation of socio-economic impacts (IPAAM 1997). The proponent's response to the IPAAM queries included the following provisions for socio-economic impacts: a commitment to buy manioc flour and other products from the local communities, giving priority to local residents when hiring workers, and holding meetings with local communities (RCB 1997c).

The villages of Cesaréa and São Francisco are religious communities located just outside the project boundaries alongside the Uatumã River near the mouth of the Caribe River (Cesaréa is Protestant and São Francisco is Catholic). Villagers reside in the communities and commute by canoe to their agricultural plots in the Caribe River Reserve. In June 1999 the son of the owner of Fazenda Itapiranga informed the villagers that they are now forbidden to enter the Caribe River except to harvest their manioc plots, which are to be abandoned when the current crop is finished in about one year's time. No hunting, fishing or cutting of wood, thatch or other products is to be done. According to villagers interviewed the day after this announcement, no form of

compensation or other assistance was offered, residents being referred to the mayor of Itapiranga for any claims they might have.

Health Impact Assessment. Malaria is endemic in the Uatumã River area, where Itapiranga is located. Rivers in the area are transparent and acid (RCB 1997a, p. 16). Epidemiological indicators for the 1994-1996 period show a 250% increase in the absolute number of malaria cases for Silves, Itapiranga and Uatumã River areas. The project site is the area where incidence of leishmaniasis (Leishmania guyanensis) is the highest in the state (RCB 1997a, pp. 82-83). According to records of the Sanitary District of Itacoatiara, from 1993 to 1996 an average of 158 cases per year of leishmaniasis were reported (RCB 1997a, p. 83). This was confirmed by the survey carried out in the affected area: of 28 respondents, 17 reported malaria and 5 reported leishmaniasis as major health problems.

With a view to investigating whether project implementation would increase demands on local health services, the EIA team conducted a survey of the usage of health service facilities. Silves health services were used as the reference based on the project site (i.e., the corner near Sagrado Coração de Jesus—not the first areas to be logged) being closer to Silves than to Itapiranga or Itacoatiara. Of 28 respondents (14 from Caribe River communities and 14 from the Uatumã River), 17 reported using Itapiranga health services and only one reported using Silves health services. The conclusion drawn from this was that project implementation would not increase demands for health services in Silves (RCB 1997a, p. 79). We find this to be a non sequitur in the absence of an offer to aid health services.

The real problem is that control of diseases such as malaria and leishmaniasis in endemic areas is, to date, a losing battle, and deforestation is part of the problem. The state health care system in rural areas often lacks funds, equipment and medication; and personnel are poorly paid. Health service facilities in Silves were considered adequate by the EIA on the basis of planned capacity, which would seem to be a poor substitute for reality. Silves has a population of 6409 (1996 census: RCB 1997a, p. 66) and a state health superintendency (SUSAM) health unit that provides eight beds, one general practice doctor, one dentist, one nurse, one biochemist and 34 general service support staff.

The risk of an increase in malaria and leishmaniasis associated with implementation was conceded in the EIA conclusions (RCB 1997b, p. 86). However, neither the original EIA (RCB 1997b) nor the addendum (RCB 1997c) contain cost estimates or suggestions that the project proponent should provide financial support to minimize negative health effects on the local population. However, in the addendum the proponent offered to set up a first-aid post at the project that would also attend the local population, and to pay for use of public health services by project workers at a rate set by the government's Single Health System (SUS). Implementation of mitigation measures to deal with negative health impacts (malaria case detection, treatment and spraying) proposed in the original EIA depends on an as-yet nonexistent agreement to be reached between the project and the National Health Foundation (Fundação Nacional de Saude) (RCB 1997a, p. 131). It is not clear whether the first-aid post described in the addendum is a replacement for, or is additional to, this plan, since most other mitigatory measures listed in the EIA are repeated in the addendum.

The Public Hearing. The public hearing was held in the city of Itacoatiara, instead of in the affected towns of Silves and Itapiranga. This choice

resulted in only a very limited participation by the population directly affected. The hearing was attended by the mayor of Itacoatiara and by members (vereadores) of the city councils of Itacoatiara and Itapiranga, local civil servants, logging company employees and one community leader from one of the affected areas. No objection to the project was voiced. However, the Public Ministry raised a number of queries (Table 2)

[Table 2 here]

Comments at the public hearing were largely limited to physical impacts of the project; negative social and health impacts were hardly considered. In the Brazilian Amazon these impacts have been major drawbacks of past development projects (e.g., Fearnside nd). Why, then, are socio-economic and health impacts ignored?

The only socio-economic information presented was that given by the project developers, who stressed employment generation as an expected positive socio-economic impact. The 152 jobs the project claimed to provide might well have been viewed as less than sufficient to compensate for the project's negative socio-economic impacts. Such a conclusion would have been even more likely had more realistic estimates of employment benefits been presented. The employment estimate presented at the public hearing proved to be inflated by more than a factor of two: the number of jobs fell from 152 to 65 when the project proponents subsequently provided IBAMA with revised figures in its addendum to the Management Plan (Selva Madeireira 1998). Other items presented in the original plan were also grossly overstated (see note 5). The report does not explain how the employment estimates were derived (legally, the report must have "clarity" regarding the methods by which all numbers are derived). Even the revised lower numbers may be inflated, as some of the employment implied to be permanent is undoubtedly only temporary in nature. Depending on the location of the coupe to be harvested in any given year, logs would be transported either by truck or by barge. The boat crews listed as employees would therefore only be needed for a fraction of the logging cycle.

This provides a dramatic example of how proponents of development projects can promise virtually anything at a public hearing, and do something entirely different later. The number of jobs offered is likely to be a key factor in the public's reception of a proposed project, yet the Itapiranga project cut this number to less than half after the EIA and EIS (RIMA) had been approved. In any event, obtaining a positive reception from the affected communities is largely optional from the point of view of development proponents, as the law only requires that a public hearing be held, not that those who attend be convinced that the project is beneficial. The content of the public hearing can have some influence on project approval or on mitigatory requirements if the state environmental agency (IPAAM) chooses to take this information into account in approving the EIA and EIS (RIMA) documents. In the state of Amazonas, the results of public hearings are, in fact, currently being taken into account. The public hearing is one of the items IPAAM is legally required to consider when it licenses a project. Theoretically, the Environmental Crimes Law (Federal Law no. 9605 of 12 February 1998: Lei de Crimes Ambientais) could result in punishment of agency staff if it could be shown that problems raised at a public hearing were ignored in approving a project, resulting in subsequent impacts. However, this theoretical possibility has yet to be tested in practice. By law, minutes of the public hearing are filed at IPAAM.

QUALITY AND OBJECTIVITY OF THE EIA AND EIS (RIMA)

According to the Public Ministry, the quality of EIA and EIS (RIMA) submissions has improved in the last few years, particularly regarding description of biodiversity, the need to preserve particular species and the role of flora and fauna in ensuring long-term sustainability. The Itapiranga Project is no exception. It is said that the quality of an EIA can be measured by the quality of its EIS (Fortlodge 1990). In spite of this improvement in assessing biological impacts, the EIA and EIS (RIMA) fail to fulfill their intended functions in other areas.

The Itapiranga Project would result in a number of costs that will not show up on the project's balance sheet, but will instead be incurred by others. Some of these costs will be felt locally, and others further afield; some are recognized in the EIA report and others are not. For example, a major impact of logging is its net contribution to global warming (Fearnside 1995, 1996). Avoiding emissions of greenhouse gases represents a major environmental service of forest, together with such other services as maintaining biodiversity and maintaining the regional water cycle. The value of environmental services from Amazonian forests is very substantial (Fearnside 1997).

Biodiversity loss generally results from logging in tropical forests, although this has so far fallen short of causing extinctions traceable to logging impacts (Johns 1997). However, the amount of research on biodiversity impacts of tropical logging is still minimal. One factor contributing to losses of fauna is the effect of logging roads. Any hunting that takes place despite company prohibitions will also have this effect. Due to the large number of plant and animal species with localized distributions, impacts on diversity can be great when even quite small areas are cleared or disturbed (Orlans and others 1995, p. 340). Such losses of biodiversity should be counted as a cost, albeit one that is still poorly quantified.

The economic viability of a project such as this depends heavily on the scale at which questions are asked. Viability from a broader economic standpoint applies to different scales, corresponding to different locations of the system boundary one uses to define the system of which one is asking "is the Itapiranga Project economically profitable for this system?" When the system boundary is drawn tightly around only the logging company itself, the answer may be "yes." As the boundary widens, ever more costs are included in the calculation, so that the scale at which project profitability is lowest is the global scale which, unfortunately, is also the scale at which it is most difficult to do anything to prevent damage. At intermediate scales, however, there may be scope for rational self-interest to operate.

The EIA is carried out by private companies hired by the project proponent. These companies and their consultants are almost never (including in this case) paid in full until project approval is granted by licensing agencies. The companies and their consultants are therefore unlikely to work independently of the proponent. It has been argued that this linkage should be broken by interposing a public body between the proponents and EIA consultants so that the proponent would pay for the work, but no longer appoint the team (e.g., Fearnside and Barbosa 1996a).

The onus is on local governmental agencies to assess the quality of the EIA and EIS (RIMA) during the process of licensing: the Environmental Crimes Law now makes it more difficult for government employees to turn a blind eye on inadequate licensing applications, and for the proponent to get away with environmental degradation, as both would now risk prison or a fine.

The introduction of environmental law and legal processes to deal with development projects in Brazil is a great gain. Under the environmental crimes law, proponents may even lay themselves open to legal proceedings on the basis of practices that compromise the objectivity of the EIA (Eve and Eve 1998). Because of the recentness of the 12 February 1998 environmental crimes law, such cases have not yet been tested.

Although both the EIA and EIS (RIMA) constantly imply that there will be further harvests following the first cycle (Why else leave seed-bearing trees, or practice poison girdling, or use the words "cycle" or "sustainable," for example?), we could not find any explicit mention of or commitment to any further life for the project after the first cycle. However, the problem is much deeper than the absence of such statements in the reports. Project proponents would undoubtedly be happy to add as many affirmations of their commitment to long-term management as one might want, and would probably like nothing better than to have a boiler-plate format of "correct" statements to include in any EIA or EIS (RIMA) in order to assure approval. Environmental documents are routinely generated in this way by consulting firms, simply substituting names, places and other details from one project to the next (Fearnside and Barbosa 1996b). What is more difficult is to strengthen the system such that promises in the EIA, EIS (RIMA), public hearing and Forestry Management Plan are kept in practice.

CONCLUSIONS

Recent changes may help to increase the rigor of the licensing process for sustainable logging projects in Brazil's state of Amazonas. These include the Public Ministry's insistence on public hearings, creation of a Forestry Technical Board to review management plans, and enactment of the Environmental Crimes Law. Nevertheless, the example of the Itapiranga Sustainable Logging Plan suggests that the overall quality of the EIA and EIS (RIMA) documents submitted for licensing of logging projects is still poor. Benefits of the project are exaggerated: the 152 jobs claimed in the EIA and EIS (RIMA) were reduced to 65 when the Forestry Technical Board pressed the proponent for more realistic financial calculations after the EIA and EIS (RIMA) had been approved. The negative environmental, social and health impacts are not trivial and the mitigation measures suggested are not always adequate. The Itapiranga Project documents invite skepticism as to the proponent's intent to manage the project sustainably--especially due to the EIA and EIS (RIMA) reports' silence on the subject of logging cycles after the first one and the project having opted to pay higher taxes rather than relinquish the option to cancel the management plan at a future date.

Questions remain as to whether sustainable logging can be a viable development option for Amazonia and its people, given severe difficulties posed by economic forces represented by the monetary discount rate, and whether the loss of biodiversity and the social and health costs imposed by logging operations put at risk the conservation of the Amazon rainforest as a source of livelihood security and environmental services. Any proposal for sustainable development for the region needs to be based on a critical and comprehensive assessment of its costs and benefits. This remains a major challenge yet to be met by those who propose logging as a basis for development in Amazonia.

NOTES

(1) The EIA, in effect, passes through two stages. The first is a document (e.g., RCB 1997a) that is subjected to a critique by the state environmental

agency (IPAAM). The criticisms are then taken into consideration in drafting a shorter document (e.g., RCB 1997b), which includes the mitigatory measures that constitute the EIS (RIMA). The second document does not replace the first, and the information in both must be taken into consideration by IPAAM to judge a proposal for licensing.

(2) Forestry Management Plans can be cancelled, allowing the forest to be cleared for other land uses. Cancellation requires payment of a "reforestation" fee, currently R\$ 8/m³ (US\$ 5/m³), based on the volume of wood extracted. This fee can be waived if the company agrees to continue to apply silvicultural treatments to the already harvested areas of forest.

(3) Forest exploitation in Brazil is controlled by Federal Law no. 4771 of 15 September 1965 (the Forestry Code: Código Florestal) and Decree no. 1282 of 19 October 1994. State Law no. 2416 of 22 August 1996 establishes basic requirements for licensing applications for all types of forest exploitation. Forest exploitation is also controlled by Federal Law no. 5197 of 3 January 1967 (which deals with protection of fauna), IBAMA Administrative Ruling no. 1532/89 (which establishes the list of animals at risk of extinction), and Administrative Ruling no. 114/95 (which deals with forest replacement).

(4) One way that the law can be evaded is for companies to submit several logging applications for licensing for areas less than 2000 ha. Examples (Table 1) of continuous properties that were subdivided include those of Aparecido Albergoni and Manoel Gomes Carvalho. In the case of Empresa Juthay, which made six independent applications for logging during the 1997-1998 period, the properties are spread along the Juruá River and so would require separate EIA and EIS (RIMA) reports if each had been larger than 2000 ha; however, the fact that the areas proposed for management are all just under the minimum limit may not be coincidental.

(5) The Forestry Management Plan even left open the possibility of reducing the cutting cycle, stating that "the cutting cycle will be evaluated with the passage of time, and may be modified" (Selva Madeireira 1997, p. 21). The plan suggested that cutting may be accelerated after the first cycle: "we do not consider the initial cut to be a definitive factor: it is only a starting point, which may be modified in the future. Scheduling the second cut can only be done after completing diagnostic inventories that will be done after the first one" (p. 35). The plan hinted that the cycle might be reduced to as little as 10 years--as in the case of the Abufari I plan in the Purus River Basin, drawn up by the same consulting firm (Selva Madeireira 1997, p. 35). It should be noted that reducing the length of the cycle would violate regulations currently in effect.

(6) The equipment list includes 10 bulldozers and 10 skidders in the original management plan (an investment of approximately US\$ 5 million). This is much more equipment than other similar-sized operations (such as Mil Madeireira) have. On the other hand, the list omits such necessary items as forwarders for loading logs and logging trucks to carry the logs to a sawmill. A revised equipment list submitted to IBAMA as an addendum to the Management Plan (at the request of the Forestry Technical Board) calls for only three bulldozers, three skidders and one truck (the first areas to be harvested will have access by water). Project documents do not state whether the extraction and transport of logs will be done by the proponent, or whether these will be subcontracted to third parties. Lack of specification of the mill location also affects the reliability of financial assumptions.

(7) The transition from traditional Amazonian subsistence activities to integration into Brazil's national cash economy is often extremely disadvantageous to local residents, as has been extensively documented by Wesche and Bruneau (1990) for the transformations accompanying the arrival of major sawmills in Itacoatiara. The discovery of natural gas in Silves in 1999 (Patricia 1999) is likely to dwarf the effects of the Itapiranga project in transforming the life of this area.

GLOSSARY

CONAMA: Conselho Nacional do Meio Ambiente (National Council of the Environment)

CTF: Câmara Técnica de Floresta (Forestry Technical Board)

DITEC: Divisão Técnica (Technical Division [of IBAMA])

EIA: Estudo de Impacto Ambiental (Environmental Impact Study = Environmental Impact Assessment)

EIS: Environmental Impact Statement (known as the RIMA in Brazil, see below)

IBAMA: Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of the Environment and Renewable Natural Resources)

INCRA: Instituto Nacional de Colonização e Reforma Agrária (National Institute of Colonization and Agrarian Reform)

INPA: Instituto Nacional de Pesquisas da Amazônia (National Institute for Research in the Amazon)

IPAAM: Instituto de Proteção Ambiental do Amazonas (Environmental Protection Institute of Amazonas)

RIMA: Relatório de Impactos Ambientais (Report of Environmental Impacts) (see EIS)

SUS: Sistema Único de Saúde (Single Health System)

SUSAM: Superintendência da Saúde do Amazonas (Superintendency of Health of Amazonas)

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Figure Legend

Figure 1. Fazenda Itapiranga and locations mentioned in the text.

Table 1. Proposed Logging Projects in the State of Amazonas.

Project Proponent	District (County)	Area to be managed (ha)
Agropalm I & C de Alimentos	Atalaia do Norte	31,000
America Agro-Florestal	Lábrea	1,997
Edoel José Ferreira Alves I	Lábrea	8,700
Edoel José Ferreira Alves II	Pauini	5,400
Edoel José Ferreira Alves III	Eirunepé	27,000
Edoel José Ferreira Alves IV	Ipixuna	6,200
Aparecido Albergoni	Lábrea	1,950
Aparecido Albergoni	Lábrea	1,988
Braspor I	Itacoatiara	5,750
Carolina	Tapauá	7,800
Manoel Gomes de Carvalho I	Eirunepé	1,950
Manoel Gomes de Carvalho II	Eirunepé	1,980
Nelcindo Monteiro de Carvalho	Coari	3,628
CIM--Compania Ind. de Madeiras	Beruri	5,000
COMPENSA-Madeiras Compensadas Agro-Industrial	Tefé	4,794
COMPENSA	Tefé	4,754
COMPENSA	Tefé	3,778
COMPENSA	Tefé	2,781
Valdenor Campos da Costa	Manicoré	4,300
Empresa Juthay	Jutaí	1,950
Empresa Juthay	Jutaí	1,950
Empresa Juthay	Jutaí	1,900
Empresa Juthay	Jutaí	1,900
Empresa Juthay	Jutaí	1,400
Empresa Juthay	Jutaí	1,200
Estaleiro Noé	Tefé	1,220
EXTRAMAR	Humaitá	3,600
FLOJARI--Associação Florestal do Vale do Javari	Atalaia do Norte	4,000
Gethal Amazonas	Manicoré	39,000
Gethal Amazonas	Carauari	25,000
Gethal Amazonas	Manicoré & Novo Aripuanã	10,400
Gethal Amazonas	Humaitá	8,400
Gethal Amazonas	Manicoré	7,300
Gethal Amazonas II	Lábrea	2,500
Gethal Amazonas	Itacoatiara	1,972
Pedro Gonçalves Filho	Jutaí	670
Imperatriz Comércio de Madeira	Carauari	5,900
Seiki Furuia Isamu	Lábrea	5,600
Orivan Antonio Lira	Fonte Boa	1,999
Raimundo Gomes Lobo	Carauari	13,000
Arquimedes Ernesto Longo	Lábrea	1,893
Eloy das Neves Lopes	Tapauá	4,300
Madeireira Cunha	Humaitá	550
Madeireira Sul Amazonense	Manicoré	5,416
MADER--Madeireira Entre Rios	Humaitá	8,100

Maginco Compensados	Carauari	7,200
Maracacuera Florestal I	Codajás	4,100
Maracacuera Florestal II	Itamarati	25,000
Honorato Fernandes de Melo Filho	Fonte Boa	2,234
Honorato Fernandes de Melo Filho	Benjamin Constant	1,350
Honorato Fernandes de Melo Filho	Jutaí	824
Mil Madeireira	Itacoatiara	50,000
Edno Tadeu Cavalcante Monteiro	Ipixuna	18,500
Waldemar Oliveira Moraes Neto	Carauari	8,680
Theodor Nagel	Tapauá	6,400
Cezar Augusto Henriques das Neves	Novo Aripuanã	2,300
Cezar Augusto Henriques das Neves	Coari	4,970
Elizeu Menezes de Oliveira	Anori	2,500
Agro-madeiral Parintins	Parintins	2,000
Francisco Belmino Pontes	Canutama	4,200
Francisco Belmino Pontes	Lábrea	1,336
Raimundo Robson de Sá	Coari	380
Salobro Agropastoril	Boca de Acre	8,000
Salobro Agroindustrial	Boca de Acre	7,200
Agro-industrial Santa Rosa	Barreirinha	1,690
Clovis da Silva Santos	Fonte Boa	1,234
Raimundo Nonato Souza dos Santos	Tapauá	4,754
Raimundo Nonato Souza dos Santos	Fonte Boa	1,750
Scheffer do Itaxi	Lábrea	4,780
Seringal São Salvador	Envira	1,990
Serraria Santa Lucia	Lábrea	1,470
Nede Freire da Silva	Anori	1,100
Raimundo Batista da Silva	Canutama	26,000
Raimundo Batista da Silva	Lábrea	4,974
Francisco Togo Soares	St. Antonio de Iça	5,000
Francisco Togo Soares	St. Antonio de Iça	940
Francisco Togo Soares III	Ipixuna	10,000
Universo Madeireira, Navegação & Agropecuária	Humaitá	7,800
Ormondo Cabral de Vasconcelos	Maraã	840
Wagner da Amazonia	Beruri	30,500
Total		553,866

Table 2: Issues Raised by the Public Ministry at the Public Hearing.

a) The report contains contradictory information concerning the distribution of wood volume among trees in the different diameter classes.* The questions of sample size, structure and randomization for inventoried plots are, in general, not dealt with satisfactorily. Some guarantee is needed that selection of plots for inventory is genuinely random--such as selection of their locations by an independent body. The best hope for improvements in forest inventory practice may derive from financial interests of the taxation authority in accurate estimates of value and, hence, probable revenue.

b) The stock selected for logging--i.e., marketable species with DBH over 50 cm, which represents 3% of the total stock according to the EIA--does not avoid the possibility of harming too many seed-bearing trees during the logging process.

c) Two species of high economic value, cupiúba (Goupia glabra) and louro gamela (Ocotea rubra), are concentrated in a few areas, rather than being homogeneously distributed. This increases the risk of losing these species.

d) The EIA did not mention if the fieldwork on water resources covering the Caribe, Sanabani and Itabani rivers was carried out in the wet or dry season.**

e) The EIA carried out did not take into account adverse impacts of transporting logs directly by river. This affects navigation, causes accidents to boats and affects communities living along the rivers.

f) Flora: The report presents contradictory information about the management of hollow, twisted and old trees. One section mentions that hollow trees are to be used for bridges and natural pipes, while another suggests the need to leave hollow trees standing because of their role as homes for vertebrates and invertebrates responsible for dispersal of seeds and control of insect populations potentially damaging to trees.

g) Biodiversity: It was made clear that genetic losses are unavoidable. However, no estimate was given of the probable number of species extinctions that the project would cause.

h) Risk of fire: Logging increases the risk of fire due to the substantial accumulation of potentially combustible dead biomass.

i) No provisions were made to protect three fragile vegetation types (igapó, inundated caatinga and campina) that are easily damaged by human action.

j) Fauna: An environmental conservation program targeted at employees was mentioned, the idea being to raise consciousness regarding need for protection of animals (such as spider monkeys). However, no details were given.

k) Conservation: The main biodiversity protection commitment was the creation of Caribe River conservation unit. However, no clear formal public commitment was made by the project proponent to follow recommendations proposed by the multidisciplinary team nor to monitor and maintain the conservation unit once it had been created.

* RCB 1997a, pp. 43-44.

** This information is important to the claim not to cause any significant impact on water resources (RCB 1997a, pp. 14-16). In fact the survey was done at the beginning of the dry season (L. C. M. Joels personal communication 1998).

