

## **NON-SUSTAINABLE DEVELOPMENT: THE ECONOMICS OF LOGGING FOR PLYWOOD IN INDONESIA<sup>1</sup>**

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**ABSTRACT** Unprecedented concern for the fate of the world's tropical rainforests has been promoted during the past decade. Food and Agriculture Organisation assessments of world forest resources have indicated an average annual deforestation during the 1980s of 15.4 million hectares or a compound rate of deforestation of 0.8 per cent. This suggests that little, if any, progress has been made in sustainable management of natural old growth forests. The relevant issue of concern in this paper is that in Indonesia, with particular reference to the timber industry, there is neither environmental nor economic sustainability. From either an anthropocentric perspective which is fundamentally human centred, or a biocentric view which is ecologically focused, tropical rainforests are disappearing to the detriment of all species and the earth's ecological integrity in general. This paper argues from an anthropocentric-economic world view that the tropical rainforests in Indonesia have been used inefficiently and contrary to distributive justice. Because of this, it is not necessary to show that a biocentric world view or ecological perspective is being violated because unless the tropical timber is at the very least utilised efficiently, it should remain untouched by any other criteria. Until tropical rainforests are used for the benefit of those who most need developmental assistance in a technically and allocatively efficient manner, any argument between different world views or methodological perspectives is premature.

### **1. INTRODUCTION**

The United Nations Conference on Environment and Development in 1992 reflected unprecedented concern for the fate of the world's forests. The Food and Agriculture Organisation has undertaken periodic assessments of the world's forest resources, the first of which was nearly 50 years ago in 1946 and the last in 1990 (FAO, 1991a). Average annual deforestation during the 1980s was determined to be 15.4 million hectares or a compound rate of deforestation of 0.8 per cent (FAO, 1991a). Little, if any, progress seems to have been made in the sustainable management of natural old growth forests. If the issue spawned by these facts was a debate of development vs. the environment the parameters of this paper would be more complex than is the case. The issue of concern is that Indonesia, with

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particular reference to the timber industry, practices neither environmental nor economic sustainability. The more interesting debate of how much environment must be degraded for how much development has not yet been reached.

The Indonesian timber industry, particularly the plywood industry, has been characterised by environmental degradation with little consequential economic development by criteria such as allocative and technical efficiency or distributive justice. The importance of this point for everyone interested in environmental protection and economic development is reflected in a recent report by Pronk and Haq (1992). It was found, subject to the obvious data limitations expected, that between the top and bottom 20th percentiles of the world population, the ratio of per capita incomes is 150:1, and that most poor people live in areas of high biodiversity and fragile ecosystems. Therefore, if one of these areas (such as an old growth rainforest in Indonesia) is to be degraded, the poor people living therein will become worse off unless specific attention is directed to the necessary economic trade-offs with the specific interests of the poor inhabitants. It is at this point that debate usually ensues between those with anthropocentric and biocentric world views.

With reference to the analysis and management of sustainability, two positions of optimality, with very different ethical parameters, are of concern. First, the anthropocentric optimum, in which the rule is to expand the scale of output, i.e., grow, to the point at which the marginal benefit to human beings of additional physical capital is just equal to the marginal cost to human beings of sacrificed natural capital. For purposes of analysis, the intrinsic value of all other species and their habitats is assumed to be zero. Most economists, either explicitly or implicitly take this position. Second, the biocentric optimum, wherein other species and their habitats are preserved beyond the point necessary to avoid ecological collapse, out of a recognition that other species have intrinsic value independent of their instrumental value to human beings (Holdren *et al.*, 1995). Except for a small but increasing number of economists, largely self-trained and working within the new sub-discipline of ecological economics, the biocentric perspective is normally deemed too difficult to handle within economics. Economists tend to receive little or no training in the physical and natural sciences. Few explore the natural world on their own or appreciate the extreme sensitivity of organisms - including those upon which humanity depends for food, materials, pharmaceuticals, and free ecosystem services - to seemingly small changes in environmental conditions (Redclift, 1993; Colander and Klamer, 1987). This paper is concerned unapologetically with the anthropocentric optimum, a more limited version of sustainability. This is not due to any disagreement with the biocentric world view, but is based on the premise that to reveal anthropocentric non-optimal utilisation of resources is to tacitly suggest that any sacrifice of a biocentric optimality is malapropos.

## **2. NON-SUSTAINABLE DEVELOPMENT?**

Given the above two overviews of sustainability constructed within different parameters, there are also, in a more orthodox fashion, three different concepts of sustainability often referred to in the literature, being distinguished as economic,

ecological and socio-cultural (Munasinghe, 1993). Consonant with the position taken above, this paper is only concerned with the concept of economic sustainability. Once again it is emphasised that the alternative concepts are not rejected, but it is presumed that if it can be shown that non-optimality exists in anthropocentric-economic terms, then violation of either the ecological or socio-cultural concepts of sustainability is unjustified.

The economic approach to sustainability is based on the Hicks-Lindahl concept of the maximum flow of income that could be generated while at least maintaining the stock of assets (or capital) which yield these benefits. Problems of interpretation arise in identifying the kinds of capital to be maintained and their substitutability, as well as in valuing assets. Issues of uncertainty, irreversibility and catastrophic collapse pose additional difficulties (Pearce and Turner, 1990). Preserving a tropical forest involves direct costs of preservation, in terms of establishing a protected area, paying forestry officers to protect and maintain the area and compensating surrounding local communities for losses incurred (for instance, no longer being allowed to gather fuelwood). Development options, such as the use of the forest for commercial timber exploitation and of the converted forest land and resources for agriculture, mining and hydroelectricity, are sacrificed if preservation is chosen. Such costs are easily identifiable as they often comprise marketable outputs and income sacrificed (e.g., timber revenue, agricultural outputs, mineral wealth, hydroelectricity, etc.) (Barbier, 1993). Governments usually consider both the direct costs plus the foregone development benefits of preservation. The same approach should be taken in evaluating development options of the forest. These may include both the loss of important environmental functions (e.g., watershed protection, micro-climate maintenance) and resources (e.g, commercial hardwoods, non-timber products, wildlife). It is often the case that governments or private entrepreneurs will consider these questions extraneous to the more important questions of foreign exchange and profitability.

Ecologically sustainable management focuses on biophysical systems and refers to that management which ensures that the level of genetic diversity and the evolutionary potential of all species communities and ecosystems are maintained (Hagen, 1992). Threshold values exist for the diversity of species within an ecosystem. If any one population in an ecosystem falls below its critical threshold level, the self-organization of the whole is altered. The integrity of an ecosystem is measured by its ability to maintain its self-organisation through the selection of an optimum operating point along the same thermodynamic path - that is, without undergoing the irreversible change that occurs from switching paths. Economic activity that imposes unsustainable levels of stress on the natural environment often generates negative feedback effects given the nonlinearity of ecosystem interaction (Munasinghe and McNeely, 1995).

The sociocultural concept of sustainability seeks to maintain the stability of social and cultural systems, including the reduction of destructive conflicts. Cultural extinction has been recognised as a problem: "it is a terrible irony that as formal development reaches more deeply into rainforests, deserts, and other isolated environments, it tends to destroy the only cultures that have proved able to thrive in

these environments" (WCED, 1987). Both intragenerational equity, especially the elimination of poverty, and intergenerational equity, involving the rights of future generations, are important aspects of this approach.

In 1985, Indonesia banned the export, though not the felling, of raw logs and rattan. Initially, government officials justified the ban on environmental grounds. Contrarily, negotiators for the European Community argued that the ban contradicted Article 1 of the General Agreement on Tariffs and Trade (GATT) because the "supply of raw materials was being restricted by Indonesia so as to promote the manufacture of value-added products", such as furniture, previously made in Japan and Europe (Brookfield *et al.*, 1995; Bown, 1990). The confrontation also produced a strong reaction from environmentalists and developmentalists which was incorrect on two counts. First, there was the general reaction that GATT was improperly weakening the ability of countries to preserve their own natural resources by removing them from trade. While there was an initial reduction in the extent of logging, which the environmentalists used to make their case, logging for purposes of domestic use by the plywood industry then increased. Second, the argument was made that less-developed countries should be permitted to preserve their raw materials for purposes of development-enhancing, value-added production. This did take place in Indonesia, given evidence by the extremely rapid increase in plywood production for domestic consumption and export. However, the production of plywood on an immense scale over a very short period of time was accomplished through government protection of the owners of capital and large vertically-integrated conglomerates from competition, an inefficient utilisation of timber for plywood and sawmill output, and a transfer of significant economic rent and economic power to the private owners of capital in the industry. Therefore, the tension between development and environment groups with the European Community was totally misplaced. The Indonesian Government and the plywood industry was neither acting in the spirit nor practice of sustainable economic development by any criteria of optimality (Barbier *et al.*, 1993). The moral of the story is that both environmentalists and 'third-worlders' must be more discriminating before applying ethical formulas without circumspection. In this instance, they were acting in the interests of those who exploit both the environment and their fellow humans - the timber barons of Indonesia.

The situation was often portrayed by environmental groups as analogous to the dispute between Japanese timber mills and the United States government in 1990, over a ban on logging in the ancient forests of the northwestern United States (Dayton, 1990). The Japanese also used Article 1 under the GATT Agreement to argue against the ban. The ban on logging in this instance, largely restructured during the Clinton Administration, was designed to protect the habitat of threatened species, unlike the Indonesian Government's categorical intention of promoting a foreign-exchange earning plywood industry. Article XX of GATT does allow some scope for the use of trade interventions for environmental objectives provided that such interventions do not "constitute a means of arbitrary or unjustified discrimination between countries where the same conditions prevail or a disguised restriction on international trade". Sub-article XX(b) allows for trade measures



undertaken "to protect human, animal or plant life or health".

A comparison of these two cases shows the need for wariness on the part of lobby groups of all political persuasions when taking a position that presumes the unmitigated priority of the ecological over the economic. Byron and Quintos (1988) argue convincingly that the log export ban policies of Southeast Asian countries like Indonesia "were not primarily intended to promote or achieve conservation of the tropical rainforests" (Byron and Quintos, 1988, pp. 428-429). Rather: "All the evidence suggests that the producing countries' motivation for restricting exports and stimulating processing was to earn more, and more stable, foreign exchange and create jobs - any conservation or price-increasing effects were just coincidental". Byron and Quintos also reveal that Indonesia planned to "virtually double" the rate of logging, and that it would be much harder to decrease logging at some future date given that the wood supply reduction would deny locally owned mills rather than importing countries. On this basis, they argue, accelerated industrialisation of forest sectors could result in significant increases in forest logging, as opposed to less.

### **3. INDONESIAN RAINFORESTS AND TIMBER PRODUCTION**

Southeast Asia currently accounts for around 20 per cent of the world's tropical moist forest. The vast majority of these forests are concentrated in Indonesia, Papua New Guinea, Malaysia, the Philippines and Brunei. Indonesia alone accounts for over 50 per cent of the region's tropical moist forests and more than 10 per cent of the world's total (Barbier, 1993) (see Table 1). All of Sumatra and most of Kalimantan in Indonesia have been identified as one of the major fourteen deforestation zones or 'tropical hotspots' in work completed under the auspices of the Joint Research Centre of the European Commission and National Aeronautical and Space Agency of the United States (Myers, 1993)<sup>2</sup>.

Tropical forests can be seen as a form of 'natural' capital. That is, they have the potential to contribute to the long-run economic productivity and welfare of tropical forest countries. An optimal strategy (in anthropocentric-economic terms) for a developing country would be to 'draw down' its stock of tropical forests to finance economic development by reinvesting the proceeds in other assets that are expected to yield a higher economic return. Any decision to preserve a tropical forest implies an opportunity cost in terms of foregoing the chance to invest in alternative income-yielding assets, such as human-made capital (Barbier, 1993). The difficulty is that as far as Indonesia is concerned, it is not known whether it is worth 'holding on' to the tropical forest as an economic asset because very little work has been done taking into account the potential economic benefits from the natural forest resources. As a result, decisions are biased towards converting or depleting the tropical forest due to the underlying assumption that the foregone benefits of maintaining the forest

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<sup>2</sup> The other areas are Southern Mexico, Central America, Colombian Choco, Western Amazonia, Southern and Eastern Amazonia in Brazil, Northern Bolivia, Eastern Nigeria and Southwestern Cameroon, Madagascar, Eastern Myanmar, Northern and Northeastern Thailand, Vietnam, Eastern Malaysia, and Philippines. All of these areas are undergoing intensive and widespread deforestation at a rate of 4 per cent or more per year.

**Table 1.** Tropical Deforestation

Area	Total Forest Area (million ha)	Annual Deforestation (‘000 ha)	Percent of Annual Deforestation to Total Area
Southeast Asia insular	167.3	1707	1.02
Indonesia	108.6	1315	1.21
Papua New Guinea	33.5	22	0.06
Malaysia	18.4	255	1.38
Philippines	6.5	110	1.69
Brunei	0.3	5	1.66
Southeast Asia Mainland	39.3	346	0.88
Myanmar	31.2	102	0.32
Thailand	8.1	244	3.01
<b>Total Southeast Asia</b>	<b>206.6</b>	<b>2053</b>	<b>0.99</b>
Amazonia	613.6	4129	0.67
Central Africa	167.1	325	0.19
Other regions	58.4	1900	3.25
<b>World Total</b>	<b>1045.7</b>	<b>8480</b>	<b>0.81</b>

(Schmidt 1990, cited in Barbier 1993, p. 216)

are negligible.

In orthodox textbook economics the Hartwick-Solow rule states that reinvestment of rents derived from the intertemporally efficient use of exhaustible natural resources in reproducible (and hence non-exhaustible) capital will secure a constant stream of consumption over time (Solow, 1986; Hartwick, 1977). Similarly, basic economic renewable resource theory suggests that, for slow growing resources such as tropical forests, it may, under certain conditions, be more economically optimal to harvest the resource as quickly and efficiently as possible and reinvest the rents in other assets whose value will increase much faster. Equally, if the harvesting costs are low, or the value of a harvested unit is high, then the resource may not be worth holding on to today (Clark, 1976).

Admittedly, the Hartwick-Solow rule is forged with heroic assumptions. It assumes that there is sufficient substitutability between reproducible and natural capital over time such that they effectively comprise a single homogeneous stock (thus, for example, coagulating plywood mills and old growth forests together). Moreover, the above rule assumes that all economic values are known and reflected in the prices of resources, markets are undistorted, resource extraction is efficient and rents are reinvested in other assets in the economy (none of which, of course, is necessarily true). To reiterate, even given the purity of assumptions within a conceptual framework limited to economic aspects, the transformation of old growth forests to plywood in Indonesia does not pass the test of sustainability. Hence, there is no necessity wasting time arguing the validity of one conceptual framework over another (economic vs. ecological and socio-cultural, or biocentric vs. anthropocentric). The economic and anthropocentric tests fail of their own accord.

If tropical deforestation is an economic problem, it is because important values are lost, some irreversibly, when closed forests are opened up, degraded or cleared.

Each choice, to leave it standing in its natural state or to exploit it selectively for timber or non-timber forest products or to clear-cut it entirely so the land can be converted to another use, has implications in terms of values gained and lost. In Indonesia, the foregone cost in terms of timber rentals from converting primary and secondary forest land is calculated at US\$625-750 million per year. With logging damage and fire accounting for additional costs of US\$70 million, this would represent losses of around US\$800 million per annum. The inclusion of foregone non-timber forest products, such as essential oils, honey, wildlife products, resins, bamboos, fruits and nuts, would raise this cost to US\$1 billion per annum (Barbier, 1993).

Further, the total cost of the depreciation of the forest stock would include not just the cost of conversion but also the cost of timber extraction and forest degradation. Another study estimates this total cost for Indonesia to be around US\$3.1 billion in 1982, or approximately 4 per cent of gross domestic product (Repetto and Gillis, 1988). As calculated, this estimate must be considered a lower bound, as it does not include the value of the loss of forest protection functions (e.g., watershed protection, micro-climatic maintenance, carbon sequestration) and of biodiversity (Pearce, 1990).

## **4. PLYWOOD PRODUCTION**

### **4.1 Early Years, 1960-1985**

In the early 1960s timber products made up approximately one per cent of the value of Indonesia's exports (Dixon, 1991). It wasn't until the settling in of the Soeharto regime in 1967, that large scale forest exploitation began in Indonesia with the logging and exporting of logs.

In the four years leading up to 1971, the value of timber exports as a percentage of Indonesia's total exports increased to 8 per cent. Manning (1971, p. 30) noted that "almost all the increase in production has been exported in log form from the outer islands; and a very high proportion has been absorbed by Japan... production has been concentrated in a very few areas, especially East Kalimantan". In fact, Japan's rapid growth in demand for tropical hardwood was a "key market factor behind Indonesia's log boom". Log production had increased in Indonesia from 10.8 million cubic metres in 1970 to 27 million cubic metres in 1978. The value of exports increased from US\$168 million in 1971 up to US\$1.97 billion in 1979. There were only 2 plywood mills in 1973 producing 9 000 cubic metres of plywood. By 1979 there were 21 mills (Parsons, 1982; Hunter, 1984).

By 1972, concern was being raised by a number of Indonesian authorities that there was a need for the "forest investor (many of whom were earning gross profits of 30-40 per cent) to pay 'full-economic rent'" (Koehler, 1972, p. 108). As an incentive, new investors were "generally exempted from payment of corporation and dividend taxes for a period of 5 years", so in the earlier 1970s the revenue from these sources was negligible (Manning, 1971). By the mid-1970s there was disillusionment over tax evasion by logging companies and insufficient domestic

employment being generated in the timber industry (Lindsay, 1989). These facts legitimated the 'nationalist' concern that the logs being exported were being processed in Northeast Asia and, subsequently re-exported to North America and Western Europe. This increasing dissatisfaction with the role of primary commodity exporters, exacerbated by erratic log prices, tax evasion by multi-national concessionaires and inadequate employment initiated a total review of government policy.

In 1978, the Indonesian government doubled the export tax on logs from 10 to 20 per cent, ostensibly for "... the development of domestic timber processing facilities, thereby increasing the value added of wood exports as well as raising tax revenues and foreign exchange earnings. Increased employment, combined with marginal productivity improvements associated with increased capital/labour ratios, may also have been anticipated" (Lindsay, 1989, p. 111). Plywood and sawnwood exports increased by 250 per cent and 60 per cent respectively between 1978 and 1980.

The government remained dissatisfied with the rate of development of timber processing facilities and introduced stricter policy measures including, in 1979, a new export tax of 5 per cent on sawn timber exports and, in April 1979, a log export control policy which was progressively tightened (Hurst, 1990; Lindsay, 1989; Hunter, 1984). From 21 plywood mills in 1979, the number had grown to 56 in production by 1984, 63 under construction and another 52 under application, with a total capacity of 8.3 million cubic metres annually (Hunter, 1984). Between 1981 and 1986, the six year average growth in plywood was 72 per cent per annum (Lindsay, 1989). 1982 was also the year that Indonesia became the world's largest exporter of plywood, ahead of South Korea, China and Malaysia.

The government's choice of plywood mills as the core of the wood industry was based on factors such as the higher added-values of plywood (compared to logs and sawn timber), the steadily increasing demand both domestically and internationally for plywood, and the relatively higher number of jobs created by the plywood industry compared to the sawn timber sector (Soedjarwo, 1981). The primary aim of log export bans was, and continues generally to be, to try and increase export revenues, whilst creating employment and industrial development. Schwarz (1992) cites the World Bank as saying, with respect to Indonesian Government controls of forestry-related products, that the controls "... were introduced to encourage greater domestic value-added, but were subsequently, and wrongly, also justified as policies to ensure sustainable forest management".

The structure of the forestry sector changed dramatically from the late 1970s to the mid-1980s. The most prominent of these changes was the transformation from a predominantly log export industry to one with virtually no exporting of logs, but a dramatically increased domestic wood processing sector, dominated by an export-oriented plywood industry. By 1985 this plywood industry was estimated to consume 11.54 million cubic metres of logs out of the 23.5 million cubic metres total

log production for that year (Parthama and Vincent, 1992).<sup>3</sup> Although logging rates did temporarily decline in the early 1980s, the transformation of the forestry sector in the longer-term involved an increase in total log production from 24.86 million m<sup>3</sup> in 1979 up to 36.23 million m<sup>3</sup> in 1987 (Parthama and Vincent, 1992).<sup>4</sup>

By the early 1980s the export tax structure created effective rates of protection of 222 per cent for plywood manufacturing. The drop in export revenue to the government from diverting log exports was not compensated by any gain in value-added in sawmilling, resulting in a loss of US\$15 per cubic metre at world prices. Over 1981-84, this net loss in export earnings amounted to US\$2.9-3.4 billion or approximately US\$725-850 million annually. Additional losses were also incurred through selling plywood below production cost, calculated at US\$956 million over the 1981-84 period (Fitzgerald, 1986). There is evidence that Indonesia's plywood industry had "consistently generated negative value added, eg., logs which could have been exported for \$200 have been converted, at considerable expense, to plywood that was sold onto world markets for \$150" (Byron and Quintos, 1988, p. 430).

This subsidisation of inefficiency has instigated the creation of inefficient processing operations and expanded capacity, with further implications for the rate of timber extraction and forest management. For every cubic metre of Indonesian plywood produced, 15 per cent more trees had to be cut relative to plymills elsewhere in Asia that would have normally processed Indonesian log exports (Barbier *et al.* 1993; Gillis, 1988). Gillis points out that the average f.o.b. value of logs in 1983 was just under US\$100 per cubic metre, while the f.o.b. value of plywood was about \$250 per cubic metre. However, "because of low rates of recovery, the value in roundwood equivalent, of plywood exports was but \$109. This means that each cubic metre of logs, with an export value of \$100 in 1983, had a value as plywood of \$109" (p.71). By processing the log into plywood however, the exporter saved \$20 in log export taxes. "Taxes saved by plywood firms were 222 per cent of the value of additional domestic value-added created by plywood processing. This is the relevant measure of the protection afforded on domestic value added to plywood mills by the Indonesian export tax structure. This allowed Indonesian plywood firms to have labour and capital structure costs that were almost 2.2 times higher than plywood mills buying Indonesian logs in Korea, Japan, and Taiwan, and still remain profitable...The Indonesian government became in effect a major investor in the domestic plywood industry without receiving equity shares"

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<sup>3</sup> Hunter (1984) estimated the total log production for 1985 to be between 26.2 and 29.53 million cubic metres, while the log consumption for plywood production was between 12.4 and 14.27 million cubic metres.

<sup>4</sup> The annual total log production figures provided by the Industry Department for the years 1984 to 1986 varied significantly from the corresponding figures provided by the Forestry Department, which were much lower. For example, in 1985 the Forestry Department figure was 14,552,000 m<sup>3</sup>, 40 per cent lower than the Industry Department's figure of 24,277,000 m<sup>3</sup> (Potter, 1991). Barbier *et al.* (1995, p. 417) observed: "there has always been a discrepancy between officially reported harvesting levels and rates based on processing industry output".



(Gillis, 1988, p. 70).

Although the switch to value-added processing of timber initially slowed down the rate of timber extraction, as mentioned above, the inefficiencies and rapidly expanding capacity of domestic processing actually increased the rate of deforestation over both the medium and long-term. Barbier (1987) points out that, in fact, much of the reported decline in log production over the initial period 1979-82 can be attributed to depressed world prices for all timber products, and therefore was not necessarily attributable to less exploitation because of increased processing activities. Thus, protection given to Indonesian mills not only increased rather than reduced total log demand, but the gross operational inefficiencies also ensured that millions more logs may have been harvested than if a more efficient policy to boost domestic processing capabilities had been implemented.

## **4.2 Years of Maturation**

In 1985 world plywood production had reached 45 million cubic metres, peaking in 1988 at 52 million cubic metres before falling back to 48 million in 1993. World exports of plywood went from 18 to 35 per cent of total production (FAO, 1995). During the same time period Indonesia produced 5.9 million cubic metres of plywood in 1985, 80 per cent of which was exported, and 9.1 million cubic metres in 1993, of which 8.9 million was exported. Therefore, Indonesia's exports of plywood in 1993 made up over half of the world's total (FAO, 1995; CIC, 1993; IBDC, 1994).

Although the number of plywood mills has grown from 21 in 1979 with a total capacity of 1.809 million cubic metres, to 127 with a capacity of 11.683 million cubic metres annually,<sup>5</sup> it is expected that plywood production will remain relatively constant until the turn of the century. Domestic consumption continues to increase, officially amounting to about 20 per cent of Indonesian production<sup>6</sup> (CIC, 1993; IBDC, 1994).

An interesting point of contention arises at this point. Two thirds of Japanese plymills had shut down by 1986, while only 8 of Taiwan's previous 100 plywood mills remained in operation by that same year. According to Menz and Krutilla (1987) the worldwide economic recession in 1981-82, and the reduction in log exports from Indonesia, which by the late 1970s had become the world's largest log supplier, also played an important role. Discussing Singapore, Taiwan, Japan and South Korea, all previously major log importing countries, they explain:

"Most plywood mills in these countries were established in the early 1960s with their production geared specifically to tropical hardwood logs of large diameter, mainly from Indonesia. Faced with radical reduction in the availability of hardwood logs, and prohibitively high retooling costs, most of the production capacity of the plywood industries of Singapore, Taiwan, and South Korea shut down between 1980

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<sup>5</sup> Figures actually vary, depending on the source from 127 to 140 mills.

<sup>6</sup> The Government of Indonesia has prohibited imports of plywood, so all current domestic consumption and exports come from Indonesian producers.

and 1985. Only one mill of an original 46 has survived in Singapore's plywood industry, 8 of 100 in South Korea, and 8 of 60 in Taiwan" (Menz and Krutilla, 1987, p. 14).

Alternatively, with hindsight, it may be more accurate to state that the Indonesian expansion "was accompanied by and facilitated by the planned and voluntary contraction of what the (newly industrialising countries) saw as a sunset industry" (Byron and Quintos, 1988, p. 430).

In October, 1989 the Indonesian government once again increased the export tax on sawntimber, initially set in 1979, by substantial amounts. These taxes ranged from US\$250 to US\$2,400 per cubic metre (Barbier *et al.*, 1995). The rhetoric of justification was environmentally put "to guarantee forest conservation" (Potter, 1991, p. 207). It was the small regional sawmills that the export taxes hit hardest. This included some 2,200 mills, employing about 200,000 people, which produced over half of Indonesia's sawntimber production (Potter, 1991). Barbier *et al.* (1995, p. 420) assert that the reason for the export tax rise was "to prohibit exports and shift processing to plywood. A secondary objective has been to eliminate marginal sawmills, leaving only the competitive ones operational, thus improving overall industrial efficiency".

The imposition of a tax on sawnwood exports does not appear to have instigated a major shift of processing capacity to plywood - at least not in the one-period duration of the simulation model developed by Barbier *et al.* (1993). Only at extremely high rates of taxation will this occur, thereby having a modest impact on deforestation. The inability of the policy to increase plywood output in the short term means that log extraction may decline. However, as noted above, the economic costs (and lost development potential) particularly in terms of lost foreign exchange earnings of a prohibitive sawnwood export tax are severe. Moreover, a policy which is 'successful' over the long run in shifting processing to plywood production would also lead one to expect log demand, and thus deforestation rates, to be revived.

One significant aspect of the logging industry in Indonesia, existing since its rapid expansion from the late 1960s to the present, is the low level of resource rent appropriated from the logging industry by the Indonesian government (Manning, 1971; Koehler, 1972; Ruzicka, 1979; Repetto, 1987; Gillis, 1988; Lindsay, 1989; WALHI and YLBHI, 1992; Parthama and Vincent, 1992; World Bank, 1994; and World Bank, 1995). Low rent appropriation has important implications for equity issues and the redistribution of benefits that can be accrued from the forest resources. The rapid expansion of plywood output and generation of value-added production seems impressive only because of the failure to count everything. Any effort to develop timber resources involves a redistribution of rights to use the forest. The local users are never included in the equation to capture significant portions of the forest rents. Hence, conflicts at all levels, local, regional and national, largely involve issues of income distribution. Governmental authorities and the local people usually lose assets, while the forest industry, often controlled by powerful interests, typically captures them (Goldman, 1993).

There are also crucial consequences for efficient use of the forest resource, patterns of forest-based industrialisation and long term economic and ecological

impacts. Gillis (1988) found that for 1980 through to 1983, potential rents available from log export operations were higher than rents available from sawntimber or plywood production. Moreover, these rents from plywood production were negative. "As long as plywood recovery rates remain low, most of the 140 odd plymills will swallow timber rents as sure as black holes do nearby celestial bodies" (Gillis, 1988, p. 91). Government policies, designed to provide incentives to invest in plywood production caused a reduction in the resource rent that was available for capture leading to net social costs.

Vincent and Binkley (cited in Barbier *et al.*, 1994) argue that stumpage prices (the prices of harvested logs at the stand) have a crucial role to play in the interrelated dynamics of timber reserve depletion and processing expansion, particularly in facilitating the transition of the forest sector from dependence on old growth to secondary growth forests and in coordinating processing capacity with timber stocks. In most developing countries, stumpage prices tend to be administratively determined rather than set by the market, thus understating stumpage values and failing to reflect increasing scarcity as old growth forests are depleted. A number of economic and environmental distortions result, as has been the case in Indonesia: old growth forests are depleted too rapidly; forest land is inappropriately cleared for agriculture or other uses; inadequate and inappropriate investment is made in second growth forests; inefficient processing facilities are installed; and decisions on log and lumber trade policies are inefficient, encouraging unsustainable management practices. While the confidence in the market process, expressed by Vincent and Brinkley, for delivering efficient forest resource allocation outcomes is quite overstated, public policy can fail to deliver efficient resource use, as can the market fail to deliver distributive justice.

Given the gross inefficiencies created by protection in the plywood sector, the industry is now in a precarious long-run position. Price elasticities of substitution are very high for plywood. This means that if logs are priced competitively domestically, and these increases are passed on to importers of plywood, quantity-demanded will decline and revenue will be lost. Because of its large timber resource base, its abundant labour supply and its policy of restricting log exports, Indonesia has been able to expand its processing capacity, production and exports fairly quickly by undercutting prices and taking over import markets where substitution between different product sources appears to be high. The most significant impact of an increase in the price of Indonesian wood product exports is that foreign consumers will look for other sources of supply in Southeast Asia and the Pacific (Thompson, 1992). This reflects a very high elasticity of substitution by source of origin. Some substitution of temperate wood products for tropical wood products also occurs, but to a much lesser degree and substitution away from timber products altogether is negligible. The total long-run impact of a one per cent increase in the price of Indonesian hardwood exports is a 12 per cent decline in quantity demanded in Europe, a 7.6 per cent decline in Japan and a 4.3 per cent reduction in the United States (Barbier *et al.*, 1993).

On the supply side it is important to note that the plywood industry has been strongly warned not to exceed an annual capacity of 10 million cubic metres through

the rest of this decade, or real shortages of timber will exist shortly after the turn of the century (FAO, 1991b). Brookfield *et al.* (1995) cites commercial newsletters which indicate that shortages of timber supply to plywood factories have already been increasingly reported since 1991.

## 5. INTERNAL STRUCTURE OF THE INDUSTRY

Compared to the 1970s era of log exports in which foreign companies and joint ventures played an important role in the forestry development, the role of foreign companies in the expansion of Indonesia's plywood industry has been minimal. In 1982, when 61 plywood mills were in operation, there were 6 foreign joint ventures either about to be opened, or already operational, and only 9 of the 521 forest concessions existing at the time were held by foreign companies (Parsons, 1982; Gillis, 1988). As of 1994, "only 16 per cent of the wood processing plants" in Indonesia were joint ventures (Dauvergne, 1994, p. 513).

A high degree of vertical integration exists between logging operations and the plywood output. All but seven of the plywood producers are supplied by logs from forest concessions they owned themselves (CIC, 1993, p. 44). This contributes to price distortions which undervalue virgin hardwood. In fact, there is so much vertical consolidation in the forestry industry that several industrialists practising intra-firm pricing compose a quasi-cartel. Their determination of log prices reflects neither the scarcity value of tropical logs nor the externalities involved in their exploitation (WALHI and YLBHI, 1992).

Conglomerates are a significant feature of the Indonesian forestry industry. There were at least *twenty-one conglomerates holding Indonesian forest concessions of 350,000 hectares or more in 1991* (CIC, 1993). Barito Pacific had the largest area of 3.5 million hectares, Djanjanti had 2.7 million hectares, and five other conglomerates had over a million hectares each. The total area owned by the top twenty-one conglomerates was 21.2 million hectares. In 1994 the top ten conglomerates in the plywood industry had a production capacity equal to 53.2 per cent of the country's total (IBDC, 1994). Barito Pacific's plywood capacity alone has grown to 1.6 million cubic metres annually, which represents 14.2 per cent of the country's capacity.

The influence of the more powerful conglomerates has the potential for corruption and other institutional power dynamics. Robison (1986, p. 112) describes the organisation of political activity:

"within patron-client structures, which are mechanisms not for securing the adoption and implementation of particular policies but for gaining access to the distribution of benefices. The cement of such groups is not the common economic or social interests of those in the network but the personal relationships between patrons and clients, which in turn are built upon the effectiveness of the network as a mechanism for securing and distributing benefices".

Bob Hasan, the owner of the Barito Pacific conglomerate, is certainly among the well connected. He has had a close association with Soeharto since the 1950s,

experiencing his rapid rise along with Soeharto (Robison, 1986). "A close examination of Apkindo (the forestry producers association) indicates the inseparable connection between military, politics and forestry management in Indonesia" (Dauvergne 1994, p. 513). The World Bank has also referred more obliquely, to the points made by Robinson and Dauvergne (World Bank, 1995).

Schwarz (1992, p. 36) writes: "Hasan is unquestionably the strongest player in setting Indonesia's forestry policies. ....Hasan chairs the umbrella trade association of forestry producers as well as specific chambers that set policy for plywood companies, sawntimber mills and others. Hasan tightly controls Apkindo and has tremendous power over Indonesia's forests" and in turn Apkindo has virtually "complete control over the actions of individual mills" (Dauvergne, 1994, p. 514). All Indonesian plywood producers are required to obtain approval from Apkindo for all international transactions. They must use the shipping service Apkindo has chosen (Karana Shipping Lines), and the insurance company chosen by Apkindo (Tugu Mandiri Insurance Company) to insure their cargo (Munthe and Hindryati, 1995). Finally, producers must now ship their plywood to the specific distributors in the importing country that Apkindo has appointed rather than to the importers themselves.

In return for these unrequested services, Apkindo levies each plywood producer US\$48.09 per cubic metre of exported plywood for a wood shipment fee, promotion, aerial photography, distributor's commission, and a further 8 per cent of total export value for insurance (Hindryati, 1995). This increases the cost burden on plywood producers significantly. It is not clear where all the revenue goes: "Apkindo has never explained exactly how it uses the money", says one senior executive, "everybody is afraid to ask" (Pudyantu, 1995, p. 33).

## **6. FUTURE PROSPECTS**

The value of Indonesian plywood exports fell by 8.44 per cent in the January-October period of 1994 compared to the corresponding period of 1993. The fall was even more drastic for the April 1994 to February 1995 period and in East Kalimantan "hundreds of thousands of cubic metres of plywood are piled up in warehouses because companies cannot export them or sell them domestically" (Munthe and Hindryati, 1995, pp. 5-6; Munthe, 1995, p. 12). The Director of the Centre of Strategic and International Studies (a think tank based in Jakarta) Hadi Soesastro proposes that "the decline in demand for Indonesia's plywood is mainly due to the emergence of newer, cheaper suppliers from other countries" (Munthe and Hindryati, 1995, p. 6).

When examining the future prospects of the Indonesian plywood industry a number of important issues must be considered. Will there be sufficient log resources to support the industry? Will the domestic plywood industry be able to compete competitively with the other sectors of the native forestry industry? Will Indonesian plywood producers remain internationally competitive in terms of price and quality of product? Finally, to what extent will plywood products be replaced by other products in the future? The potential impacts of environmental pressures



on tropical rainforest based industries remains crucial.

The World Bank has observed that poor logging practices, combined with inefficiencies in the wood processing industries, waste timber resources equivalent to a third of the harvest. Including estimates of illegal logging, the rate of timber extraction from Indonesia's natural forests exceeds the assumed rate of regeneration, calling into question the long-term supply of logs for domestic production (World Bank, 1994). In 1995 the World Bank was even bolder: "At current rates of exploitation and with today's inefficient logging and industry practices, suppliers of commercially sized logs will come into short supply by the year 2010 or earlier" (World Bank, 1995, p. xiv). It has also been noted that 'secondary' forests lack high-valued timber (Adjers *et al.*, 1995).

Internationally, the industry has performed reasonably well only because of the huge subsidies received from the government. Price competition will continue to intensify in the future, and new producer countries are entering the market. It will prove difficult for Indonesian producers to remain competitive given the current low level of efficiency and declining resource. The quality of product will to some extent depend on the quality of the ongoing log supply from the native forests.

Price factors are crucial in the consideration of the potential for substitution of plywood by other products. Generally, with time, new products are developed to compete with established commodities on price and in particular market niches. Particle board and medium density fibreboard can substitute for plywood over a range of uses, and in general they are cheaper. Ongoing development and improvement of wood-based panel products will likely see plywood markets being significantly eroded in the future. It is clear that as natural tropical timber becomes more scarce, and/or as more sustainable extraction methods are employed the price will increase. Eventually this will disadvantage native forest plywood producers against producers of plywood or other wood-based panel products which use plantation-based wood resource. Japan has already stated that it intends to "convert to more rapidly grown temperate softwood species, 30 per cent by 1996, instead of tropical species for plywood production" (Sellers, 1994).

Domestic consumption of plywood products is becoming quite significant. The volume of plywood and blockboard projected to be consumed locally in 1996 was 4.367 million cubic metres (CIC, 1993). Given the current government restrictions on the import of plywood (and presumably other wood-based panel products as well), the Indonesian producers have a captive and growing domestic market at least in the short-term (until tariffs and import restrictions are lifted). Because of this plywood production is now projected to remain constant until 1999 (IBDC, 1994). That however, seems like a very unlikely prospect and more likely that the plywood industry is on the verge of a collapse. It is, of course, hard to predict the exact timing of such events but there is less doubt that there will, at the very least, be a significant contraction in Indonesian plywood exports in the future.

## 7. CONCLUSION

Where production occurs, and where profits are accumulated geographically,

must be less important than criteria of technical and allocative efficiency or distributive justice. Is the 'natural capital' of the earth being used wisely and efficiently; and when it is used, are those who most require the attributes of economic development being assisted? Sustainable development necessitates that attention be directed to both issues. In the case of the plywood industry in Indonesia, neither technical and allocative efficiency nor distributive justice has resulted.

The liquidation of natural forest for timber results in irreversible losses. This includes the destruction of what was formerly a perpetual stream of income from nonwood forest products for millions of people, typically cultural minorities for whom tropical forests have been a traditional abode. Cash income is lost, as well as materials for shelter and food in the form of meat, nuts, fruits, and fibres. The tangible immediate costs to poor forest dwellers extend well beyond these losses, including costs of increased erosion, greater difficulties in river transportation, forest fires and flooding that follows in the wake of deforestation. Employment gains for poor unskilled labourers in logging and timber processing are extremely limited. Very substantial economic rents have been destroyed by commercial undertakings in natural forests; and rents that were not destroyed, given government policies, accrued to the wealthy rather than the poor (Gillis, 1991). If the process by which this liquidation has occurred has no economic justification except some misguided notion of nationalism, then the ecological and socio-cultural costs are unmerited.

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