LEEC PAPER DP 93-02

Policy Issues and Options Concerning Linkages Between the Tropical Timber Trade and Sustainable Forest Management

EDWARD B. BARBIER

IIED
INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

LONDON ENVIRONMENTAL ECONOMICS CENTRE

Policy Issues and Options Concerning Linkages Between the Tropical Timber Trade and Sustainable Forest Management

Edward B. Barbier

London Environmental Economic Centre

Discussion Paper

DP 93-02

June 1993

Paper prepared for the 1993 Market Discussion on the LEEC Report *The Economic Linkages Between the International Trade in Tropical Timber and the Sustainable Management of Tropical Forests*, ITTO Activity (PCM(XI)/4), 14th Session of the International Tropical Timber Council in Kuala Lumpur, 12-13 May 1993.

London Environmental Economics Centre

This Centre was established in 1988 and operates as the Economic Programme of the International Institute for Environment and Development (IIED). Its aims are the furtherance of policy relevant research in the field of environmental and natural resource economics, particularly in the context of developing countries.

The Authors

Dr Barbier is Director of the London Environmental Economics Centre

Contact Address

Edward Barbier may be contacted at:

London Environmental Economics Centre
IIED
3 Endsleigh Street
London
WC1H ODD

Tel: 071 388 2117
Fax: 071 388 2826

Policy Issues and Options Concerning Linkages Between the Tropical Timber Trade and Sustainable Forest Management

Introduction

The following paper is based on the final report for the Activity (PCM(XI)/4) *The Economic Linkages Between the International Trade in Tropical Timber and the Sustainable Management of Tropical Forests* (Barbier *et al.* 1993). The report examines the extent to which the tropical timber trade and policies, compared to other factors, affect tropical deforestation and timber-related forest degradation. The report also analyzes the potential role that interventions in the international tropical timber trade may have in promoting efficient and sustainable resource use in the forestry sector. It is the latter findings that are the subject of this briefing paper.

Evidence on the linkages between the tropical deforestation, timber production and the timber trade suggests that the trade is not a major source of tropical deforestation. Not only is the conversion of forests to other uses such as agriculture a more significant factor, but an increasing proportion of tropical timber harvested in producer countries is for domestic consumption and does not enter international trade. For example, only 17% of total non-coniferous tropical roundwood production is used for industrial purposes. Of this, only 31% is exported in round or product form. Therefore, only 6% of total tropical non-coniferous roundwood production enters the international trade.

Thus the volume of tropical timber production that actually enters the trade is small and declining. As tropical timber resources are depleted and domestic consumption of timber products increases in producer countries, log prices are expected to rise and exports fall. However, increased exploitation of temperate timber resources, and possibly substitution by other wood and non-wood products, will keep the prices of tropical hardwood products down. Profit margins of tropical log processors will be squeezed, and export markets difficult to expand. Thus the main link between deforestation and the tropical timber trade may be the impact of increasing scarcity of tropical timber resources, and thus tropical hardwood logs, on production and exports.

Nevertheless, there is genuine cause for concern over the excessive exploitation and rapid depletion of tropical production forests in many regions, including the indirect impacts of 'unsustainable' harvesting practices on the loss of non-timber forest values and the incentives to convert forest land to other uses (e.g. agriculture, livestock ranching). However, a more significant impact may be the role of 'unsustainable' timber production in opening up forest areas to subsequent agricultural encroachment and deforestation. These effects do not necessarily in themselves support strong statements about the relationship between timber production for the trade and tropical deforestation. As noted above, only a small proportion

of tropical logs produced enters the trade directly, and in the future declining log exports are expected to be only partially offset by increased product exports.

On the other hand, the timber trade can lead to greater net returns for forestry investments and sustainable management of production forests, making this option more attractive than alternative uses of forest land such as agriculture. Unfortunately, in many producer countries the widespread prevalence of market and policy failures have distorted the incentives for sustainable management. Failures in concession and pricing systems have produced counter-productive incentives that lead to the 'mining' of production forests. Domestic market and policy failures have also had a major influence on the conversion of forest land to agriculture and other uses.

Thus the key factor in reducing timber-related tropical deforestation is ensuring proper economic *incentives* for efficient and sustainable management of tropical production forests. Appropriate forest management policies and regulations within producer countries ought to provide these incentives so that the *long run* income-generating potential of harvesting timber is maximized, and any significant external environmental costs associated with timber harvesting are 'internalized'. *The starting point for ITTO's Target 2000 is therefore to tackle the problem at its source by urging producer countries to improve forest sector policies.*

Current trade policy distortions in producer and consumer countries have, if anything, exacerbated the problems created by poor forestry policy and regulations in tropical forest countries. Although log export restrictions in producer countries have stimulated growth and employment in domestic processing, they have led to serious problems of processing over-capacity and inefficiency. To the extent that this is the case, log prices are artificially depressed and recovery rates fall, thus increasing pressure on timber resources. Although import tariffs on tropical forest products are generally low and declining in major developed consumer markets, non-tariff barriers may be significant and increasing. Restrictions on imports depress the global demand for tropical timber products and can feed back to reduce stumpage values in producer countries, thus discouraging the incentives for more efficient processing and better forest management. Moreover, producer countries will continue to argue that they need to compensate their domestic processing through subsidies and export restrictions.

In short, restrictions in trade are not helping to reduce timber-related deforestation in developing countries. In contrast, by adding value to forestry operations, the trade in tropical timber products *could* act as an incentive to sustainable production forest management - provided that the appropriate domestic forest management policies and regulations are also implemented by producer countries. Unfortunately, many proposed trade policy interventions to 'save the tropical forests' - such as bans, taxes and quantitative restrictions - may actually work to *restrict* the trade in tropical timber products. Such interventions may reduce rather than increase the incentives for sustainable timber management - and may actually increase overall tropical deforestation. A summary of timber

trade policy options, and their advantages and disadvantages in promoting sustainable tropical forest management is provided in Table 1.

A more detailed assessment of trade policy options is summarized in the following sections. The policy options are grouped into three main categories: (i) do nothing; (ii) measures to alter the pattern of tropical timber trade; and, (iii) measures to raise revenues for sustainable forest management.

Do Nothing

The option of 'doing nothing', i.e. allowing existing tropical timber trade policies to remain as they are today *and* not implementing addition policy interventions to affect trade patterns and/or the incentives for sustainable forest management, should always be considered a serious policy choice. For example, 'doing nothing' would be the appropriate policy choice if tropical deforestation was not perceived to be an economic problem. 'Doing nothing' would also be attractive if other policy options - i.e. 'doing something' - appear ineffective or undesirable, or if the costs of these options outweigh the benefits.

Another obvious attraction of the 'do nothing' option is that it does not present any administrative and institutional obstacles for consumer and producer countries, which would clearly not be the case for any new trade policy initiative. Similarly, no new support mechanisms, such as certification, enforcement, side payments and sanctions, would have to be devised.

However, given current trends in timber trade and tropical deforestation, and above all, given that sustainable management of production forests is still not widespread in tropical forest countries, 'doing nothing' is not considered an attractive policy option. In particular, this option is unlikely to lead to greater trade-related incentives for sustainable management of tropical production forests.

Measures to Alter the Pattern of Trade

Policy interventions that would alter the pattern of tropical timber trade significantly include: i) trade liberalization; ii) trade bans; iii) quantitative restrictions; iv) trade taxes; and, v) trade subsidies. Each of these policy options are assessed briefly in turn.

Trade Liberalization

As export restrictions imposed recently by tropical timber producing countries have not really been adopted to reduce timber-related deforestation, short-term impacts on deforestation have been minimal. The expansion in processing capacity and the problems with inefficiencies and over-capacity may have, if anything, exacerbated timber-related

Table 1 Timber Trade Policy Options to Promote Sustainable Tropical Forest Management

POLICY OPTIONS	ADVANTAGES	DISADVANTAGES
Trade Restraint: Import and export bans, quotas, tariffs and non-tariff barriers are used to restrict or regulate trade in forest products. Policy options include: export bans or preferential taxes to encourage value-added processing; selective import bans; punitive tariffs on "un-sustainably produced" timber; limits on trade in endangered tree species; national import quotas based on estimates of sustainable timber yield.	• Relatively simple to administer and enforce (less so for selective restraints). • Tariffs and taxes can raise revenue for government. • Selective import restraints may encourage improved forest management, by penalizing "unsustainably produced" products in export markets. • Selective export restraints may stimulate value-added processing and boost employment in producer countries.	• May be considered discriminatory and protectionist. • Potential trade diversion to export markets which impose fewer environmental or other restraints. • Limited impact due to small scale of international trade in tropical timber. • Decrease in export prices may reduce economic returns to timber production and thus undermine incentives for investment in forest management. • Inefficient wood recovery in protected processing industry may imply increased log use and deforestion.
Trade Stimulus: Tropical timber importers have reduced tariffs under agreements to liberalize trade (eg. the GATT), but some quotas and non-tariff barriers remain. Producer countries call for removal of import barriers, especially on higher processed products. Others suggest selective trade liberalization or targeted subsidies to promote trade in "sustainably produced" timber and/or to compensate producers for the higher costs of sustainable forest management.	• Relatively simple to administer and enforce (less so for selective stimulus). • Consistent with the aims of global trade negotiations (eg. the GATT). • Increased export prices may enhance economic incentives to invest in production forest management. • Selective liberalization or subsidies for "sustainably produced" products may influence industry or governments to adopt better management practices.	• May stimulate unsustainable logging if not supported by appropriate domestic forestry policies (eg. royalty and concession terms). • Liberalization may not effect prices due to competition from temperate timber and non-timber substitutes. • Subsidies for "sustainably produced" products may be costly and ineffective if not strictly targeted.
Revenue Mechanisms: International financial assistance is required to support moves towards sustainable management of tropical production forests. Proposals include re-direction of existing trade revenues, eg. tax relief in consumer countries linked to increased royalties in producer countries; incremental trade taxes to finance forest management; and additional funding from external sources (eg. development assistance, compensatory transfers, forest offsets).	• Additional revenue may defray the costs of adopting sustainable management or expanding set-asides. • Increased revenues may help to finance government forest service activities or technology transfer. • Increased royalties may reduce over-harvesting and improve wood recovery rates in processing.	• May be considered discriminatory and protectionist. • Additional taxes may distort trade patterns. • Consumer country governments may be reluctant to relinquish tax revenue raised on the trade or to provide additional financial transfers to producers. • Administration and monitoring of funding mechanisms may be contentious. • International agreement to new financial transfer mechanisms may be difficult to negotiate.
Product Differentiation: Many trade policy options require a means to distinguish between "sustainably" and "unsustainably" produced timber. Proposals include product labelling, in some cases combined with certification of compliance with sustainability criteria. Certification may apply to forest compartments or to entire nations, or some intermediate level.	• Certification may identify forest operators, regions or nations adopting "sustainable" management practices, offering competitive advantage or ensuring eligibility for statutory preferences. • Labelling may enable traders and consumers to choose between more or less "sustainably" produced timber products.	• Certification may be costly, especially at a forest concession or firm level. • Competing labelling and certification schemes may confuse both producers and consumers. • Schemes may be resisted or ignored if they are considered intrusive, biased or unreliable.

deforestation over the medium and long term. However, this does not imply that the removal of these export restrictions will automatically lead to an increase in the incentives for sustainable forest management. The available evidence suggests that trade liberalization could in fact *increase* the pressure on the resource base, *unless well-enforced sustainable forest management policies and regulations are also implemented.*

Existing import barriers to tropical timber products in developed market economies do depress demand for these products somewhat. The main problem appears to be *tariff escalation* - the tendency for import tariffs to rise with the degree of processing of the product. Any tariff reduction by developed market economies would most likely lead to more trade *creation* rather than trade *diversion*, with almost all new trade created for developing countries involving markets in the EEC, Japan and the United States. However, it is also not clear that timber-producing countries would be the main beneficiaries from the additional trade created. Newly industrializing countries (NICs) that have no or negligible production forests, such as Taiwan, South Korea and Singapore, currently have a greater comparative advantage in more advanced processed products, such as plywood and veneer. Thus current tariff barriers may be discriminating more against the NICs rather than the timber-producing countries.

Non-tariff barriers facing tropical timber products in developed market economies are much more significant than tariff barriers. However, it is very difficult to determine the effects of non-tariff barriers on the trade, and consequently, what impact their removal might have. Similarly, although the Generalized System of Preferences (GSP) may reduce tariffs for developing countries, the tariff quota/ceiling system operated by the EEC and Japan effectively imposes quantitative restrictions on key imported tropical timber products, notably plywood. Removal of this specific quota system, as proposed in the recent GATT negotiations, would probably have more of an impact on the trade in tropical timber products than a general 'trade liberalization' through tariff reduction.

In addition, the tariff and other import barriers in developing countries for timber products are generally much higher than those in developed market economies. For example, some major exporting regions (e.g. Indonesia and Peninsular Malaysia) completely ban the import of timber products. Complete liberalization of the trade would mean the removal of these import barriers as well, and by no means would it be certain that there would be a net gain for these exporters.[1]

As part of the LEEC study, a trade liberalization policy simulation was conducted to examine the implications of a 10% across the board reduction in 'transfer costs', i.e. the difference between export prices and import prices, as a proxy for the removal of both tariff and non-tariff barriers to tropical timber products. The simulation also included the complete

[1] Malaysia and Indonesia have been using their export and import restrictions as a means to increase their market power, notably to capture larger shares of the international non-coniferous plywood market. Most likely, complete trade liberalization would undermine this monopoly position.

removal of log export bans from Malaysia West (includes Peninsular Malaysia), Indonesia, the Philippines, Papua New Guinea and West Africa.[2] The main results indicate that:

- The reduction of tariffs and the elimination of bans increases global demand for tropical hardwoods, with significant producer log price increases of about 20%.

- Consumer countries also benefit, as the increased availability of tropical timber logs internationally causes a significant decline in the prices of imported logs.

- However, as the tropical timber producing countries have little comparative advantage in processing, they also lose some of their processing capacity to their major importers.

- As a result, there is a major shift in the pattern and distribution of tropical timber product exports from the major Asian exporting regions, i.e. more log and less plywood exports. The exception is Malaysia West, which becomes a substantial log importer in order to expand plywood exports.[3]

Thus the policy scenario suggests that trade liberalization would most likely produce significant gains for importing countries, particularly those with log processing capacity. The impacts on tropical timber exporting countries are more mixed. In the policy scenario, the rise in producer log price increases could act as important incentives for sustainable timber management - but the scenario assumes that by the year 2005 *policies promoting sustainable harvest levels are in place* in Indonesia and Malaysia. Without such policies, higher prices could conceivably lead to increased 'mining' of remaining commercial timber reserves in those countries.

However, general trade liberalization for tropical timber products may simply not be politically realistic in the current global trade climate. Getting exporting and importing countries to agree to such wide-sweeping reductions in existing tropical timber trade restrictions would be a very tall order. For example, GATT negotiations for removing just one import restriction - the EEC plywood quota system - failed to obtain agreement on specific actions. Exporting countries would also be extremely reluctant to remove export restrictions on logs, particularly if it would mean loss of processing capacity to importing countries.

---

[2] The policy simulation was conducted using the the Center for International Trade of Forest Products (CINTRAFOR) Global Trade Model (CGTM) for forest products, which is included in Annex K of Barbier *et al.* (1993).

[3] This reflects the imminent depletion of commercial inventory in the region, forcing Malaysia West to import logs to supply its processing industry.

In sum, complete removal of all export and import restrictions on the tropical timber trade is simply not feasible, and in any case, may not be environmentally desirable unless accompanied by improved forestry policies and regulations. For example, the extent of non-tariff barriers and their impacts on the trade is simply not well understood. However, even eliminating the more 'visible' quantitative restrictions and tariffs across all countries is probably not realistic either. Both importing and exporting countries will most likely continue to employ trade restrictions as part of their national strategies for forest-based industrialization and protection of domestic industries. Thus the 'political will' for a general liberalization of the tropical timber trade may simply not be there.

A more realistic approach would be to promote selective 'trade liberalization' steps:

- Encouraging importing countries to revise policies that clearly discriminate against tropical timber exporters, such as the tariff quota/ceiling system of EEC and Japan for non-coniferous plywood exports. For example, exporting countries that show demonstrable progress towards achieving Target 2000 of sustainable timber management could be allowed exemption from the quota penalties of such systems. The same principle could be applied to other tariff and non-tariff barriers operated by developed market economies on a case by case basis.

- Encouraging exporting countries to review the impacts of their trade restriction policies on sustainable timber management, in particular the extent to which trade restrictions exacerbate problems caused by poor domestic forestry regulations and policies. Such trade restrictions should only be continued if: i) they do not appear to be contributing to greater timber-related deforestation; and, ii) if the exporting country demonstrates progress towards achieving Target 2000 of sustainable timber management, most notably by implementing well-enforced sustainable forest management policies and regulations.

Tropical Timber Trade Bans

Pressures from environmental groups and consumer-led boycotts in developed market economies are leading to serious consideration of a *complete* ban on the import or all tropical timber products, or at least a *selective* ban on those products that are not 'sustainably produced'. However, despite their popular appeal, the use of such bans would not be appropriate for encouraging sustainable management in tropical timber exporting countries. There are several reasons for this.

First, producer countries argue, with some justification, that a ban on tropical timber products is *discriminatory*; i.e. similar rules do not apply to the temperate timber trade. It is unlikely that they would allow such a policy option to be sanctioned by any multilateral forum. As will be discussed below, without the cooperation of producer countries, an import ban would most likely be *arbitrary* and *unworkable*.

To extend the ban to include both tropical and temperate product trade would be even more unfeasible. Those developed market economies that produce temperate timber also tend to be the most under pressure from environmental groups to instigate a tropical timber import ban. Given that the global temperate market is much larger and highly competitive, the governments in these countries would probably resist hurting the prospects of their own forest industries by extending the ban to cover all timber product trade.

More importantly, there is substantial evidence suggesting that an import ban on tropical timber products would be *ineffective* in reducing either tropical deforestation or the trade in 'unsustainable' timber - and may be even *counter-productive*. Timber production is not the major cause of tropical deforestation. Not all (and a declining share) of the tropical timber produced is for export and an increasing share of tropical timber exports is being absorbed in South-South trade. This would suggest that, in response to a tropical timber ban imposed by current importers, major tropical timber exporters (e.g. in Southeast Asia) may be able to divert some timber supplies to domestic consumption, or to newly emerging export markets, fairly easily. For those tropical forest countries where timber exports are not significant, and are not a major factor in deforestation (e.g. Latin America), a ban may have little impact on timber management or overall deforestation.

In fact, to the extent that a tropical timber import ban does affect the export of tropical timber products substantially, it would have little impact on the economic *incentives* for sustainable management at the concession level, and may actually encourage poor management practices. Domestic and market policy failures in tropical forest countries affect the 'internalization' of the user and environmental costs of timber harvesting by concessionaires. Major policy changes in the forestry sector will be required to address these issues, yet by imposing trade bans importing countries may reduce their *political leverage* in influencing policy makers in producing nations.

Although in the short run a trade ban may reduce pressure on tropical forests through lower production for the trade, in the medium and long run a ban is likely to have a detrimental impact. By eliminating the gains from trade, a ban on tropical timber imports would decrease the value derived from timber production and thus actually reduce the incentives for tropical forest countries to maintain permanent production forests. Faced by declining export prospects and earnings from tropical timber products, developing countries may decide to convert more forests to alternative uses, notably agriculture. Thus the effect of the ban may be to reduce log production and exports, but may actually increase overall tropical deforestation in the medium and long term.

As part of the LEEC study the effects of a total import ban on a major tropical timber producer, Indonesia, were simulated.[4] According to the results of the analysis, an import ban would have a devastating impact on Indonesia's forest industry in the short term (see

[4] See Annex I in Barbier *et al.* (1993).

Table 2). Although there would be significant diversion of plywood and sawnwood exports to domestic consumption, this would be insufficient to compensate for the loss of exports. Net production in both processing industries would fall. Given its export orientation, the plywood industry would be particularly hurt - reducing its output by over 40%. Net production losses in the sawnwood industry would be closer to 10%. The overall effect is to lower domestic log demand in the short term by around 25-30%.

The policy scenario is of course assuming that the import ban is 100% effective. It is unlikely that all importers of Indonesia's tropical timber products - many of which are also newly industrializing or producer countries with processing capacities - would go along with a Western-imposed ban. In any case, one would expect that over the longer term there would be some diversion of Indonesian plywood and sawnwood exports to either new import markets or existing markets that prove to be less stringent in applying the ban (e.g. other developing or newly industrializing countries).[5]

The long-term implications of an import ban on tropical deforestation are also not encouraging. Even if the ban is 100% effective in the short term, any reduction in tropical deforestation resulting from lower levels of timber harvesting is likely to be short-lived. A total import ban would cause a major diversion of Indonesian timber products to meet domestic demand. Although in the short term net production of wood products, and thus log demand, would fall, this situation would not necessarily be sustained over the long run. Even if this is not the case, the ban may be ineffective in permanently reducing tropical deforestation because: i) timber production is not the main source of deforestation in Indonesia; and, ii) as the value of holding on to the forest for timber production decreases the incentives to convert more of the resource to alternative uses such as agriculture will increase.[6]

Many of the problems associated with a *complete* import ban on tropical timber products would also apply to a *selective* import ban on 'unsustainably' produced timber alone. A selective import ban would also fail to provide the appropriate economic incentives for sustainable management at the forest level, and may also be counter-productive, for the similar reasons outlined above for a complete ban, namely:

- *Diversion of trade to other markets* (domestic, export markets without bans, etc.). If these markets are for lower value products, producer countries may need to supply higher volumes of tropical timber to generate substantial earnings, thus leading to more pressure on timber resources.

---

[5] These effects cannot be captured explictily in the model.

[6] For further discussion, see Barbier (1993), Constantino (1990), Vincent (1990) and Annex I in Barbier *et al.* (1993).

Table 2. Indonesia - Timber Trade and Tropical Deforestation Simulation Model

Policy Scenario - Import Ban and Revenue Raising Taxes (% Change over Base Case)

Key Variables	Total Import Ban a/	1% Revenue Raising Import Tax b/	5% Revenue Raising Import Tax d/
1. Prices (Rp/m^3)			
Log border-equivalent price (unit value)	--	- 0.17%	- 0.82%
Sawnwood export price (unit value)	--	- 0.11%	- 0.54%
Plywood export price (unit value)	--	- 0.21%	- 1.03%
2. Quantities ('000 m^3)			
Log production	- 28.33%	- 0.04%	- 0.19%
Log domestic consumption	- 27.37%	- 0.04%	- 0.18%
Sawnwood production	- 10.64%	- 0.03%	- 0.14%
Sawnwood exports	- 100.00%	- 0.23%	- 1.12%
Sawnwood domestic consumption	30.01%	0.06%	0.30%
Plywood production	- 43.84%	- 0.04%	- 0.22%
Plywood exports	- 100.00%	- 0.10%	- 0.51%
Plywood domestic consumption	214.51%	0.23%	1.12%
3. Deforestation (km^2)			
Total forest area	--	0.00% c/	0.01%
Annual rate of deforestation	--	- 0.41%	- 0.72%

Notes: a/ Large price changes were used deliberately to constrain sawnwood and plywood exports to zero in this simulation and therefore are no longer endogenously generated by the model. Also, the functional form of the deforestation equation and its estimation using regional panel data imply that the large changes in log production associated with the import ban scenario cannot be used to predict reliablely the effects on forest cover and deforestation. Thus both price and deforestation effects are eliminated from this policy scenario simulation.

b/ A total of US$23.1 million (1980 prices) in revenue would be raised, with US$5.8 million and US$17.3 million from Indonesian sawnwood and plywood exports respectively.

c/ A negligible increase over the base case forest cover of 53 sq km.

d/ A total of US$113.9 million (1980 prices) in revenue would be raised, with US$28.5 million and US$85.4 million from Indonesian sawnwood and plywood exports respectively.

Source: Annex I in Barbier *et al.* (1993).

- *Lower political leverage of importing countries* to influence forestry policies in producer countries.

- *Little positive reinforcement of the incentives for sustainable management.* Selective bans would have an immediate impact on a country's ability to derive value from timber production, and would act as a disincentive in the medium and long term to maintaining tropical forests for timber production, as opposed to conversion to agriculture and other uses.

- *Generate incentives to circumvent the ban.* There is generally high elasticity of substitution for tropical timber products from different sources of origin, particularly for higher valued products such as plywood.[7] Thus producer countries would gain significantly if they could 'pass off' their 'unsustainably' produced timber as 'sustainably' produced.

Moreover, selective bans have the additional complication of the need for a *non-arbitrary* and *workable* international certification process to distinguish 'sustainably' versus 'unsustainably' produced tropical timber products.[8] Given the lack of data on forest inventories and offtake levels, such certification would be extremely difficult to establish in the near future without the cooperation of producer countries. However, there is little incentive for producer countries to participate in this process if it leads to an import ban on their products. Without this data, a selective ban could not possibly succeed. In addition, an effective monitoring and evaluation system would be required to enforce a selective import ban. No such mechanism currently exists or is likely to be implemented in the next few years. Again, cooperation by producer countries, which would be fundamental to the success of the verification system, is unlikely to be forthcoming. Finally, a selective trade ban is unlikely to be acceptable in the international political arena - particularly as producer countries will dismiss it as *discriminatory*.

Quantitative Restrictions

To some extent quantitative restrictions are similar to trade bans, but usually take a less severe form. However, a 100% restriction on the quantity of trade is effectively the same as a complete ban on all international trade in tropical timber. Thus, to a large extent, many of the problems associated with tropical timber trade bans also apply to quantitative restrictions.

Two quantitative restrictions are worth briefly examining: i) quotas targeted to specific product categories, such as timber products derived from endangered species; and, ii) quotas conditional on the level of sustainable offtake of specific species.

---

[7] Evidence on these elasticities is presented in Section 4 of Barbier et al. (1993).

[8] As a number of trade policy options require a similar process in order to be effectively implemented, we the issue of *certification* is discussed separately below.

At the 8th Conference of Parties to the Convention on International Trade in Endangered Species (CITES), several tropical timber species were proposed for the Appendix I and II list of CITES (ITTC 1992b). Species given an Appendix I listing are effectively banned from commercial trade, or only authorized "in exceptional circumstances". Species listed on Appendix II are subject to strict regulation "in order to avoid utilization incompatible with their survival". Of the species proposed for listing at the meeting, *Intsia spp* (merabu), *Gonystylus bancanus* (ramin), *Swietenia spp* (mahogany) and *Pericopsis elata* (afarmosia) are internationally traded in significant volumes, including by producer countries that are members of ITTO. Not surprisingly, these proposals - which were put forward mainly by representatives of developed market economies at the Conference - were strongly opposed by the producer countries affected.

Studies of previous attempts by CITES to use quantitative restrictions and bans to regulate the trade in endangered species suggest that this approach has not been an effective means of control to date (Barbier *et al.* 1990; Burgess 1992). Problems of monitoring and enforcement are exacerbated when the producer countries affected either oppose this approach or do not receive adequate incentive (i.e. compensation) to participate. For example, at the 8th CITES Conference, Ghana and Cameroon opposed the proposed Appendix II listing of afarmosia, and subsequently informed the Conference that the timber trade was outside the scope of their countries' CITES managing authorities (ITTC 1992b). The lack of compliance by producer countries undermines the effectiveness of such policy options.

Similar problems of incentives for management, enforcement and monitoring will exist for any import quotas based on the level of 'sustainable' offtake of specific species that are imposed without the cooperation of tropical timber producing countries. For such a policy to be workable from the outset, cooperation from producer countries in determining the scientific and trade data necessary for establishing quotas for sustainable offtake and exports will be essential.

It might be possible to establish a more comprehensive trade mechanism that establishes sustainable offtake export quotas for those species that are endangered, thus offering an incentive to both consumers and producers to accept a controlled legal trade and to enforce it. A properly constructed trade mechanism for each endangered species, using economic instruments such taxes and subsidies to manage trade where appropriate, could be designed to enable sufficient profits from the trade to be channelled back into producer states to encourage management efforts, and to support improved monitoring of harvesting and export activities (Burgess 1992). However, full acceptance of and adherence to any such mechanism by affected producer countries are essential to its success in terms of promoting compliance with export regulations and on cooperation between exporters and regulating agencies.

In sum, the use of quantitative restrictions to regulate the trade in tropical timber products can suffer many of the same problems associated with complete and selective trade bans.

Although banning or controlling the trade in specific timber species may be a necessary short term response if the species are endangered, more effective and innovative long terms solution for management of the trade are required. A more comprehensive trade mechanism that establishes sustainable offtake export quotas for endangered tropical timber species would offer a better incentive to both importers and exporters to accept a controlled legal trade and to enforce it.[9]

Trade Taxes

An international trade tax would be a powerful means of increasing the costs associated with trading tropical timber products. Such a tax could be implemented at either the exporting or the importing end of the international tropical timber trade. In order for this tax to be effective in achieving a reduction in the amount of tropical timber products traded, it would have to be sufficiently high enough to stimulate producers and consumers to change their patterns of resource use. However, where the tax is implemented will effect the extent to which the costs of the tax is passed on to the producers or the consumers.

An international trade tax on tropical timber products suffers from the same sort of problems of implementation and effectiveness as faced by trade bans and quantitative restrictions (see above).

First, it is unlikely that tropical timber exporting countries would endorse an international tax that would discriminate against tropical timber products. As noted, that these countries have employed their own export taxes on selective products (e.g. log exports, and more recently sawnwood exports). However, the main purpose of such policies has not been to *reduce the overall trade* in tropical timber products, or for that matter timber-related tropical deforestation, but to *change the pattern* of their tropical timber exports to higher valued products - thus stimulating wood-based processing industries.

Second, a tropical timber trade tax would in any case probably be *ineffective* in reducing timber-related tropical deforestation - for the same reasons outlined above in the discussion of trade bans. In the short run, producer countries may increase their volumes of exports to maintain their level of foreign exchange earnings. Most likely, an overall trade tax might *reduce the incentives* for sustainable timber management, as the tax would lower the net returns from production and trade. As a result, the tax may actually prove to be *counter-productive* by encouraging the conversion of permanent production forests and any remaining 'virgin' forest areas to alternative uses in the long run.

It is often argued that some of these problems associated with an indiscriminately applied tax on all tropical timber products could be avoided by a tax imposed selectively on 'unsustainably' produced tropical timber products. For example, selective import duties on

[9] As an encouraging sign, at the 8th Conference, the ITTO representative noted and welcomed the call made by several (government) Parties for increased cooperation between CITES and ITTO (ITTC 1992b).

tropical timber products could be applied, but sustainably produced timber could be allowed in importing markets duty free. However, as argued in the case of selective bans and quantitative restrictions, there are obvious problems of certification, monitoring and enforcement that need to be sorted out - along with the political feasibility of such an approach. The issue of certification is an important one, and is discussed in more detail below.

The economic impact of an import tax on tropical timber was analyzed in a policy simulation for the LEEC study (see Annex K in Barbier *et al.* 1993). The policy scenario simulates the tax by assuming a 10% increase in the 'transfer cost' of products reaching destination countries. The results suggest that:

- Some product exports are expected to be driven out by competition with domestic supplies.

- Log prices in consumer countries rise but fall in producer countries. As a consequence, most consumer countries reduce their imports of tropical timber logs.

- With such a large impact on log imports for their processing industries, consuming country demand for processed products results in a small increase in tropical plywood exports, at least initially. However, as this import demand slackens and as log scarcity in producer countries becomes binding, tropical plywood exports fall significantly after 1995.

- All tropical hardwood suppliers suffer a decline in production, at least initially. Indonesian production declines up to 2 mn m^3 compared to base case projections. However, the declines are not permanent in all regions. For example, Malaysia East (includes Sabah and Sarawak) experiences an initial decline of 4 mn m^3, but its log production generally exceeds the base case scenario after 1995.

- The net effect of log production declines in producing countries, distortions in trade patterns and falling producer prices for tropical timber harvesting will be less motivation to manage production forests sustainably, as well reduced revenue to finance these investments.

In sum, a trade tax on tropical timber products would not be an effective means of encouraging sustainable production forest management, and may even be a disincentive for sustainable management.

Trade Subsidies

Unlike a tax, a trade subsidy essentially reduces the costs associated with the trade and encourages higher levels of trade in tropical timber products. It is argued that a subsidy could be used on differentiated products that are traded internationally to alter patterns of

trade. For example, a subsidy could be levied on 'sustainably produced' tropical timber in order to encourage the trade in products produced from this timber than from unsustainably managed tropical forests.

The rationale for a trade subsidy applied to sustainably managed timber usually rests on the arguments that:

- sustainable management of production forests will in most instances add to the cost of logging; and,

- prices at the consumer end of the trade chain are not be high enough to create enough value at the forest end of the chain to create the incentives for sustainable management, or if prices are high enough at the consumer end then the international distribution system of the net returns leaves too little at the forest level to encourage sustainable forest management.

These issues were recently discussed at an ITTO workshop on trade-related incentives held in Melbourne (ITTC 1992d). The report of the Melbourne Workshop argued that only "if the trade is not and cannot be capable of financing sustainable management in both the revenue generation and distribution aspects should the matter of incentives based on subsidization come into the reckoning". However, the Workshop also concluded that there is currently very little empirical verification that the above arguments are correct. The only indisputable fact is that "for industrial timber production to be sustainable, harvesting must have a very low impact".

For the LEEC study, the implications of sustainable management restrictions were examined, using the policy simulation model of Indonesia (see Annex I in Barbier *et al.* 1993). A surprising result of the analysis is that, even if increases in logging costs of 25 and 50% are assumed, the resulting impacts on the rest of Indonesia's forestry sector, including its processing industries and production, seem to be much less (see Table 3). In particular, Indonesia's sawnwood and plywood exports appear to be the least affected by the increased harvest costs, which would suggest that external demand factors exert an important counter-acting influence. The impacts of the increased harvesting costs would presumably be less severe if sustainable management is 'phased in' over a number of years. In contrast, there appears to be some direct reduction in timber-related deforestation, but even this may be outweighed by the improvement in forest management and protection resulting from qualitative changes in timber stand management practices and ownership. The Indonesian example would suggest that the need for a trade subsidy is less serious than many believe.

A major problem is that a subsidy for 'sustainably' produced timber exports could easily become a disguised means of trade promotion. International competitors would insist on verification that this policy is subsidizing sustainably managed timber only and that the additional costs of producing this timber justifies such a subsidy. This would again require careful and internationally agreed monitoring, enforcement and certification procedures. In

Table 3. Indonesia - Timber Trade and Tropical Deforestation Simulation Model

Policy Scenario - Sustainable Timber Management (% Change over Base Case)

Key Variables	25% Rise in Harvest Costs	50% Rise in Harvest Costs
1. Prices (Rp/m³)		
Log border-equivalent price (unit value)	41.59%	83.06%
Sawnwood export price (unit value)	4.04%	8.09%
Plywood export price (unit value)	2.86%	5.72%
2. Quantities ('000 m³)		
Log production	- 0.94%	- 1.87%
Log domestic consumption	- 1.37%	- 2.73%
Sawnwood production	- 1.89%	- 3.77%
Sawnwood exports	- 1.03%	- 2.05%
Sawnwood domestic consumption	- 2.28%	- 4.55%
Plywood production	- 0.87%	- 1.73%
Plywood exports	- 0.38%	- 0.75%
Plywood domestic consumption	- 3.12%	- 6.24%
3. Deforestation (km²)		
Total forest area	0.02%	0.04%
Annual rate of deforestation	- 2.28%	- 4.23%

Source: Annex I in Barbier *et al.* (1993).

addition, as the Indonesian example illustrates, it is not all that clear that increased harvesting costs put exporting timber-processing industries at a competitive disadvantage. Thus simply because harvesting costs may increase as a result of sustainable management practices does not necessarily justify the use of trade subsidies for exported tropical timber products. In addition, trade subsidies may in fact encourage *inefficient* resource use and have a detrimental impact on the forest base.

In sum, trade subsidies ought to be a last resort, and in any case, are "no substitute for forest-related incentives" (ITTC 1992d). If the problem is one of increasing the net returns and incentives at the forest management level for sustainable production, then priority should be given to correcting domestic market and policy failures in producer countries that discriminate against such management practices. Existing trade policies in those countries that exacerbate 'unsustainable' and inefficient management should also be reviewed and corrected. Progress toward sustainable management should come first before any consideration of trade or production subsidies be entertained.

However, to the extent that additional revenue needs to gained from the tropical timber trade or through non-trade related sources to improve the incentives for sustainable management of production forests, then mechanisms to raise this revenue ought to be explored. This issue is discussed next, focussing on the extent to which each revenue-raising measure can be used to complement the forest-related incentives for sustainable management.

Measures to Raise Revenues for Sustainable Forest Management

The main rationale for providing financing for assisting tropical forest countries in moving towards sustainable forest management is that there is an important principle of *international compensation* at stake. There are essentially three reasons for this argument:

- It is often claimed that timber exporting countries receive an insufficient share of the returns from tropical timber product exports - at least to incur the additional harvesting costs and other economic impacts of sustainable timber management.

- Implementation of the forestry policies and regulations required to ensure the proper enforcement and monitoring of sustainable management of production forests will impose substantial additional costs on producer countries that they will find difficult to afford.

- To the extent that all nations benefit from the global external benefits resulting from sustainable management of large tracts of tropical forest lands, then the international community should compensate producing nations for the loss of potential income that they would incur by reducing tropical deforestation, timber sales and conversion of forest land to other uses.

As noted in the discussion of trade subsidies, the first point is difficult to substantiate. As will be discussed further below, the issue may be less to do with whether the unequal distribution of revenues along the chain of trade *reduces the incentives* for sustainable management of the forest level but whether any excess revenues along the chain can be tapped for *additional funds* to assist sustainable management of tropical production forests.

The second and third points are much more relevant to the argument for international compensation. It is now generally accepted, as well as enshrined in the Forest Principles of the 1992 UNCED Conference, that *compensating* tropical forest countries for their role in maintaining a resource that has value on a *global level* is a fundamental basis for multilateral policy action. However, the second and third points also suggest that compensation is needed by tropical timber producing countries for the income they may forego in protecting their forests and for the additional costs incurred in implementing sustainable management practices for their production forests. This has to be demonstrated empirically.

A policy simulation for the LEEC study was conducted to indicate the additional economic impacts to tropical forest countries of 'setting aside' some of their forest resource base (see Annex K in Barbier *et al.* 1993). Essentially, this was simulated by a reduced timber supply scenario where the inventory of commercial tropical hardwood resources is reduced by 10% - which is equivalent to land being taken out of product forests and permanently protected. The result is that severe shortages in log production and higher sawlog prices are experienced in tropical forest regions, notably in Malaysia and Indonesia. The model indicates that such reductions in supply would result in a loss of wealth for tropical timber producing countries. Over the long run, permanent set asides would mean that the remaining production forest inventory could not support as high a level of sustainable harvest as under base case projections.

There are also indications that the additional costs required to implement sustainable forestry management policies and regulations are significant. Drawing on the work by Poore *et al.* (1989), a rough assessment of the resources needed by producer countries to attain sustainability by the year 2000 was conducted on behalf of ITTO (Ferguson and Muñoz-Reyes Navarro 1992). The estimates are shown in Table 4. Although preliminary and very approximate, they show that an additional US$ 330.1 mn is required each year in order to assist producer countries of ITTO in attaining the Year 2000 Target. Moreover, at best the estimates are an indication of only the minimum financing required.

Sizable though this figure may seem, it is less than the estimated amount required for sustainable management of *all* tropical forest resources. For example, Agenda 21 of the UN Conference on Environment and Development (UNCED) has estimated that international financing of over US$ 1.5 bn annually will be required by tropical forest countries to reduce

Table 4 **Estimates of the Resources Needed by Producer Countries to Attain Sustainability by the Year 2000**

Policy Actions Needed	Resources Needed (US$ Million/year)		
	Existing *	Additional	Total
Securing the Permanent Forest Estate	**60.2**	**191.3**	**251.5**
Mapping	0.0	6.0	6.0
Inventories	7.3	28.2	36.5
Production and consumption	2.1	5.0	7.1
Land use planning	0.8	19.3	20.2
Policy and legislation	50.0	132.8	182.1
Implementing Sustainable Forest Management	**84.0**	**108.5**	**192.5**
Demonstration forests	4.0	26.0	30.0
Implementation (mid-range)	80.0	82.5	162.5
Improving Resource Utilization	**1.0**	**13.0**	**14.0**
Trials and missions	1.0	13.0	14.0
Improving the Social and Political Environment	**0.0**	**8.1**	**8.1**
Social sciences	0.0	4.4	4.4
Political and consumer awareness	0.0	3.7	3.7
Strategy Plans and Progress Reports	**4.0**	**9.2**	**13.2**
Total	**149.2**	**330.1**	**479.3**

Notes: * Existing resources are estimates of producer country expenditures based on the current status of activities undertaken, including those using external funding.

Source: ITTC (1992) based on Ferguson and Muñoz-Reyes Navarro (1992).

deforestation (ITTC 1992c).[10] Using these two estimates as the broad 'bounds' on the type of financing required, we suggest that additional funds required by producer countries to implement sustainable management of their tropical forest resource to be in the range of *US$ 0.3 to 1.5 bn annually.*

Although these figures would suggest the need for additional financial assistance for producer countries, the real issue is whether the financing ought to be raised from the tropical timber trade or from other sources. There are essentially three policy options available: i) re-direction of existing revenue from the trade; ii) appropriation of additional revenue from the trade; and iii) additional funding from sources external to the trade. Although these policy options are not necessarily mutually exclusive, they will be assessed in turn.

Appropriating Existing Revenue from the Trade

A recent study for ITTO conducted by the Oxford Forestry Institute (OFI) has argued the case for a *tax transfer* of revenue from the trade between consumer and producer countries (OFI 1991). The main rationale behind the transfer is that:

- Revenues from stumpage (royalties) and other taxes accruing to producer country governments from tropical timber production and trade are often low in relation to the consumer value of products; i.e., producer country governments capture a low proportion of the total economic rent earned through the trade.

- Revenues from taxes on imported tropical timber products accruing to consumer governments, such as value-added tax (VAT), are relatively large.

- Consequently, a relatively modest reduction in the rate of taxation at the consumer end of the chain would allow a reasonably large increase in the stumpage value of the resource *without* affecting the end price of the resource.

Table 5 illustrates how the tax transfer might work. In the current scenario, producer country governments are assumed to collect a royalty of US$ 9 per m^3, and consumer country governments impose a VAT on final products of 15%. However, in the tax transfer scenario, VAT could be reduced to 7.5% and the royalty increased to US$ 30 per m^3 - and the final price would be left unchanged. Depending on the product, tax revenues of the consumer country governments would fall by 13-18%. These losses are offset by important incentives:

[10] The proposed international financing is for, specifically, sustaining the multiple roles and functions of all types of forests, forest lands and woodlands (US$ 860 mn p.a.) enhancement of the protection, sustainable management and conservation of all forests, the greening of degraded areas through forest rehabilitation, afforestation, reforestation and other rehabilitation measures (US$ 460 mn p.a.); and promoting efficient utilization and assessment to recover the full valuation of the goods and services provided by forests, forest lands and woodlands (US$ 230 mn p.a.).

Table 5 Affects of a Tax Transfer on the Distribution of Value Added in the Timber Trade

	SHARE OF TOTAL VALUE (%)					
LOG EXPORTS a/	**Current**		**Tax transfer**		**Change relative to current share (%)**	
Producer country	9.2%		11.1%		21%	
operating cost		5.7%		5.8%		3%
profits		0.9%		1.1%		19%
gov't revenue		2.6%		4.2%		59%
Consumer country	90.8%		88.9%		-2%	
operating cost		40.1%		41.3%		3%
profits		26.2%		27.5%		5%
gov't revenue		24.5%		20.1%		-18%
Totals	100.0%		100.0%			
		100.0%		100.0%		
TIMBER EXPORTS b/	**Current**		**Tax transfer**		**Change relative to current share (%)**	
Producer country	10.5%		12.6%		19%	
operating cost		7.5%		7.7%		3%
profits		1.0%		1.2%		20%
gov't revenue		2.0%		3.6%		82%
Consumer country	89.5%		87.4%		-2%	
operating cost		40.4%		41.5%		3%
profits		24.1%		25.1%		4%
gov't revenue		25.1%		20.8%		-17%
Totals	100.0%		100.0%			
		100.0%		100.0%		
PRODUCT EXPORTS b/	**Current**		**Tax transfer**		**Change relative to current share (%)**	
Producer country	35.3%		37.1%		5%	
operating cost		20.1%		19.3%		-4%
profits		8.4%		9.0%		7%
gov't revenue		6.9%		8.8%		29%
Consumer country	64.7%		62.9%		-3%	
operating cost		19.3%		19.8%		2%
profits		22.2%		22.8%		3%
gov't revenue		23.2%		20.2%		-13%
Totals	100.0%		100.0%			
		100.1%		100.0%		

Notes: a/ Tropical logs exported by producer countries and all processing in consumer countries.
b/ Primary processing of timber in producer countries and secondary processing in consumer countries.
c/ Export of final product with all processing done in the producer country.

Source: Based on Figures 4.1, 4.2 and 4.3 in OFI (1991).

- Due to the increased royalties, producer country government revenues rise dramatically, by 29-82%, which would provide additional resources for sustainable management expenditures (see Table 4).

- The increased royalty would also raise the sale price of logs within producer countries, which could help to control over-exploitation of timber and inefficient use of logs in processing.

- Despite the increase in the price of logs, within the forestry sector of producer countries profits would still rise modestly. A slight rise in profits from the trade would also occur in the consumer countries.

In short, the main implications of a tax transfer would be to change significantly the *distribution* of economic rents from the timber trade as an incentive for sustainable management in producer countries. The main advantage would be that additional funds for this purpose could be raised *with little or no* effect on final product prices. As indicated in Table 6, just under US$ 1.5 bn in additional funds could be raised by producer countries through this means - closer to the 'upper bound' of the estimate financing for sustainable management required by these countries.

However, consumer countries are likely to be concerned about the fiscal and political implications of a tax transfer scheme. First, as Table 6 shows, consumer country governments would have to forego over US$ 3.6 bn in tax revenues from the trade - more than 2.5 times what producer country governments gain in increased revenues. This implies a substantial net loss in revenue 'captured' from the trade. Second, exempting tropical timber products from VAT or other taxes could prove politically problematic in that it could set the precedent for other goods being exempted from taxes on 'environmental' grounds. Forest industries in temperate forest countries and their governments could also press for similar treatment on the same grounds - the need for additional investment for sustainable management or for compensation for past investment.

Finally, consumer countries would insist on an internationally agreed monitoring and enforcement system that would ensure that: i) producer countries did respond by raising royalty fees; and ii) the additional revenue raised was spent on sustainable forest management expenditures. On the other hand, producer countries would consider too much external supervision to be 'interference' with their internal affairs and sovereign rights over their resource base. Carefully negotiated bilateral and multilateral agreements would be necessary to avoid confrontations and to make the system workable.

One possible variant on the tax transfer scheme would be a *revenue transfer* scheme. Rather than lower their VAT or other taxes on the tropical timber trade, consumer country governments could instead transfer directly some proportion, or all, of the revenue raised through these taxes to producer countries. Although the consumer country governments would still forego substantial revenues, they could ensure more direct control, and thus

Table 6 Revenue Transfers Available from Value Added in the Tropical Timber Trade, 1990
(US$ mn)

	Log Exports	Sawnwood Exports	Processed Product Exports	Total
FOB Export Value a/	2,280	2,150	4,150	8,580
Final End Use Value b/	46,588	29,189	12,858	88,635
Tax Transfer Scenario c/				
Consumer Country				
Current government revenue	11,414	7,326	2,983	21,724
Post-transfer revenue	9,364	6,071	2,597	18,033
Revenue lost/transferred	2,050	1,255	386	3,691
Producer Country				
Current government revenue	1,211	584	887	2,682
Post-transfer revenue	1,957	1,051	1,132	4,139
Revenue gained/transferred	745	467	244	1,457

Notes:
a/ Based on Bourke (1992).
b/ Based on ratios of FOB value to final product value in OFI (1991).
c/ Based on Table 5

leverage, over the allocation of funds to sustainable management. In addition, consumer country governments would most likely have to forego *less* revenue if it were directly transferred to producer countries to help them meet their US$ 0.3-1.5 bn target then under the tax transfer scheme (see Table 6). As indicated in the table, due to 'leakages' to other sectors in the tropical timber trade, a tax transfer scheme would require consumer country governments to forego around 2.5 times more tax revenue in order to allow producer country governments to achieve their target.

However, a revenue transfer scheme would still require an internationally agreed monitoring and enforcement system. Producer country governments would probably be more concerned about the direct control and conditions that consumer country governments could assert over a revenue transfer scheme. Producers would insist on full involvement in the establishment, implementation and monitoring of any such scheme.

In sum, both revenue and tax transfer schemes are similar means of appropriating existing funds from the tropical timber trade for sustainable management. Both have the attraction that they would allow substantial funds to be raised for producer country investments in sustainable forest management *without* affecting product prices significantly. However, consumer countries are more likely to favour a revenue transfer scheme, whereas producers may prefer the tax transfer scheme. Both would require international cooperation and agreement over monitoring and enforcement procedures.

Appropriating Additional Revenue from the Trade

In recent years there has been renewed interest in the use of trade instruments in appropriating additional tax revenue from the trade for sustainable forest management. One study by the Netherlands Economic Institute (NEI) has indicated that a 1-3% surcharge on the tropical timber imports of the EEC, Japan and USA would raise approximately US$ 31.4 to 94.1 mn with little additional distortionary effects (NEI 1989). If endorsed by a multilateral forum such as the ITTO, the import surcharge would be within GATT rules through sub-article XX(h). A differentiated surcharge could also be imposed so that imports of processed tropical hardwood products face less discrimination than logs, thus reducing existing distortions from escalating tariffs. The funds raised would most likely be transferred to the ITTO for distribution, possibly through specific projects and programmes. Other forms of collecting additional funds were found by the study to be less desirable.

For example, imposition of an export levy by producing countries themselves has the advantage of directly addressing the forest management systems of those countries, but presents obvious problems of monitoring and evaluating success in achieving sustainable management. If the funds were transferred to ITTO, transaction costs could be high, the same rate would need to be implemented in all producer countries simultaneously, and less funds would be raised than through an import surcharge. A parafiscal tax on all timber sold in consumer countries has the advantages of taxing all kinds of timber equally, including non-tropical products, and of generating large revenues at a low rate of taxation. However,

such a tax has complications for external trade policies (e.g. temperate forest countries could claim unfair discrimination) and 'harmonization' of internal tax rates within trading blocs (e.g. the EEC's Internal Market Strategy). Finally, a voluntary surcharge collected by the tropical timber trade itself could raise funds transferrable to ITTO without requiring additional national legislation. Unfortunately, compliance and effectiveness may be diminished because of the current overcapacity and low net profit margins faced by many international traders and wood processing industries; the lack of effective control measures to ensure collection with equal efficiency in all consumer countries; and, the possibility of entry and exit by traders in the industry to avoid payment (NEI 1989).

Buongiorno and Manurung (1992) also examine the scope for a 5% revenue-raising import levy on tropical timber by the Union pour le Commerce des Bois Tropicaux (UCBT) of the EEC. The results indicate that tropical timber exporters would lose around US$ 44.8 mn in trade earnings, with Indonesia and Malaysia suffering the worst, but importing countries would earn US$ 87.7 mn in additional revenues. Thus, if the funds raised by the tax were rebated to exporting countries, they could be made better off by over US$ 40 mn. Moreover, a tax by UCBT countries would have little effect on total world trade of tropical timber products. The model shows that tropical timber exporting countries would compensate for any declines in imports by UCBT countries through increasing exports to non-UCBT countries.

One of the major concerns of producer countries is that any revenue-raising import surcharge, even at very low levels, would be distortionary. In particular, if the tax was levied by all importers, then there could be a more significant impact on total world trade of tropical timber products. Moreover, such a tax would provide unfair protection to temperate forest based industries of the developed market economies. For example, Buongiorno and Manurung suggest that producer countries may prefer a tax on exports rather than an import surcharge by UCBT countries. This would give producers more direct control over the proceeds of the tax. In addition, an export tax would affect all import market rather than just one, thus spreading the costs of sustainable management to all producers and consumers.

To examine the impacts of an import surcharge on the export markets of a producer country, the LEEC study conducted two policy scenarios involving a 1 and 5% surcharge respectively on Indonesia's timber trade (see Table 2, second and third columns). In the case of a 1% surcharge, a total of US$ 23.1 mn (1980 prices) in revenue would be raised, with US$ 5.8 mn and US$ 17.3 mn from Indonesian sawnwood and plywood exports respectively. For the 5% surcharge, a total of US$ 113.9 mn (1980 prices) in revenue would be raised, with US$ 28.5 mn and US$ 85.4 mn from Indonesian sawnwood and plywood exports respectively. When compared to the revenue estimates from the NEI (1989) study, the above figures suggest that, in the case of Indonesia, applying the import surcharge to plywood would significantly raise the total amount of financing appropriated.

The results from the policy simulation also confirm that a small import surcharge would have very little distortionary effects on Indonesia's timber product flows and prices. There would

also be a negligible direct impact on deforestation. However, around the 5% level, the impacts of the surcharge on exports in particular would become more noticeable. Thus from the standpoint of minimizing additional distortionary effects, the policy scenario confirms that an import surcharge of less than 5% would be optimal.

A more pertinent issue is whether it is worth imposing an import surcharge to raise revenue for sustainable management of tropical forests. In the simulation model, the same result, and thus the same amount of revenue, could be achieved if Indonesia raised the money for its own "sustainable management" initiatives by imposing a revenue-raising export surcharge of 1-5%.

In sum, the imposition of an export levy by producing counties themselves has the advantage of directly addressing the forest management systems of these countries, as well as avoiding the transaction costs involved in international transfers, but prevents obvious problems of monitoring and evaluating success in achieving sustainable management. The counter-argument is that an import surcharge not only has problems of transaction costs and administration, but that it is also possibly discriminatory if it is limited only to the *tropical* timber trade. Moreover, the import surcharge-cum-international transfer mechanism would still require the cooperation of producer countries, as well as raise similar problems of monitoring and evaluation of progress towards sustainable management and expenditures.

Finally, there is the issue of whether the amount of funds raised through any trade surcharge would be adequate for the task, and whether it would be more appropriate avenue for raising additional large-scale funding *outside* the timber trade altogether. The studies undertaken so far suggest that the amount of *net* funds raised from a trade surcharge of 1-5% may fall short of the approximate target of US$ 0.3-1.5 bn required annually by producer countries as additional resources for sustainable management of their forest resources.

Additional Funding Sources External to the Trade

There is also a strong rationale for additional funds to be made available to producer countries for sustainable forest management from sources outside of the tropical timber trade. Comprehensive international agreements, targeted financial aid flows and compensation mechanisms to deal with the overall problem of tropical deforestation may ultimately eliminate the need to consider intervention in the timber trade. Given that commercial logging is not the primary cause of tropical deforestation, such approaches would avoid unnecessary, and possibly inappropriate, discrimination against the timber trade. On the other hand, a comprehensive tropical forest agreement seems much more difficult to negotiate and raises its own problems of workability and effectiveness.[11]

[11] See Barrett (1990) for a general discussion of the difficulties involved in securing international environmental agreements.

It is unlikely in this economic climate that a concerted international effort to increase substantially bilateral or multilateral aid flows for sustainable production forest management would be successful, given the rapidly diminishing aid budgets of the developed economies. Nevertheless, there still remains the possibility of designing new sources of financial assistance that are separate from existing developing country aid budgets. The Forestry Principles are effectively a stepping stone in that direction, and international commitments through the Tropical Forestry Action Plan (TFAP) and Global Environmental Facility (GEF) continue to reinforce the global interest in forestry and biodiversity protection. The case could be made for more comprehensive international agreements to raise revenues for sustainable management of tropical forests, including production forests. The main focal points of such agreements should be the development of alternative revenue-raising mechanisms other than trade interventions or reliance on existing aid budgets.

For example, Amelung (1991) argues the case for the establishment of an international rain forest fund, as proposed by UNEP, in order to avoid free-riding among non-tropical countries. Similar arguments are put forward by Sedjo, Bowes and Wiseman (1991), although their preference is for the establishment of a global system of marketable forest protection and management obligations (FPMOs). Over the long term, international negotiations leading towards an agreement for new revenue-raising mechanisms for sustainable management of tropical forests, including production forests, could be the most effective and equitable means for reducing global tropical deforestation. Although such negotiations are difficult and arduous, they may be the best hope of ensuring a global commitment to control tropical deforestation, as well as the sustainable management of production forests.

Certification

Many of the trade policy options discussed above were concerned with using some form of certification as a means to distinguish between 'sustainably' and 'unsustainably' produced tropical timber products. A comprehensive and internationally agreed certification scheme therefore seems to be a *necessary complement* to trade policy options for sustainable forest management.

However, the term *certification* has been used variously to mean:

- *Product labelling* - labelling all products that include tropical wood with a label indicating whether or not it is sustainably produced.

- *Concession certification* - certifying all the timber produced by a specific concession to be 'sustainably produced'.[12]

[12] A close alternative to concession certification would be company certification.

- *Country certification* - certifying all timber products from a country that can prove it has begun complying with ITTO's Year 2000 Target and its sustainable management guidelines.

Mandatory product labelling - even if it is internationally agreed - is the most difficult of the certification procedures to implement and verify. Given the vast array of tropical timber products traded, and the degree of processing involved in producing final products, it will be extremely difficult to set up a workable product labelling scheme that will be internationally verifiable. It is made more problematic by the fact that the end uses of tropical timber are often not discrete products, but components of products and composites, as well as basic structures, fixtures and fittings. The real danger is that any such scheme of product labelling will essentially work as a powerful non-tariff barrier to discriminate against the import of tropical timber in general. This will particularly be the case if it is implemented unilaterally or on a piecemeal basis, i.e. by individual importers or by selective trading blocs. As argued above, further restrictions on the trade in tropical timber products will not be effective in reducing tropical deforestation, and in fact may accelerate it.

Concession certification essentially involves: i) assessment of a forest concession in terms of compliance with sustainable management guidelines; ii) monitoring of actual forestry practices in the concession, including volumes sold and destination, up to the retail level; and, iii) ensuring that each product produced with timber from that concession has appropriate certification to verify its origin. In theory, the concession certification approach appears to offer the best means of guaranteeing that the tropical timber trade is committed to securing timber from only 'sustainably' managed sources. It has the possible attraction to traders and timber companies of earning 'brand recognition' for buying timber supplies from sustainably managed concessions. Promotion of this fact could be an important 'selling point' as part of the promotion of tropical timber products in consumer markets - much like current campaigns to sell 'organically grown' and 'environmentally friendly' products. These positive features of concession (or company) certification suggest that there are excellent incentives for 'sustainably managed' concessions and companies to promote their products through a voluntary labelling scheme. A group of countries, and even their host producer countries, may even develop a common 'voluntary' labelling scheme. Such efforts are essentially elements of a good marketing and export promotion strategy. However, in contrast, it will be difficult to make a comprehensive and internationally agreed concession certification scheme, that is mandatorily imposed on all concessionaires of a producer country, workable and effective.

First, there are extremely high costs of monitoring, enforcement and verification. Such a scheme would therefore require substantial funding on an international level. More importantly, concession certification would add substantially to the additional financing already required to implement sustainable forest management. As discussed above, the questions of who pays these additional costs, how the money ought to be raised, and how to implement such a mechanism are not easy to resolve - especially when not all concessionaires in producer countries may be willing to accept a mandatory scheme.

Second, producer countries and companies may object to detailed monitoring of all aspects of their forest industry production, from harvesting to processing to trade. It is unlikely that a team of visiting international inspectors would be able to monitor the 'wood chain' starting at the concession level in all producer countries on their own. In-country inspectors (such as in the CITES system) would probably be also required, but there will inevitably be conflicts over their level and source of funding and over their degree of autonomy.

Third, concession or company certification in itself does not involve support for forest management administration and services of producer countries. If anything, a comprehensive mandatory scheme may impose additional costs on forest departments. Unless adequate compensation is provided, the incentives to support or enforce the scheme by forest personnel may be lacking.

Fourth, concession-level monitoring also requires close monitoring of products at the retail end of the trade. For consumer products made solely from one type of wood from a single source, verification would be fairly straightforward. However, for composite products, products containing one or more different tropical timber components, or for tropical timber used as part of basic structures, fixtures and fittings, the process will be more difficult. The additional costs incurred in acquiring tropical timber with the appropriate certification may make discourage its use compared to alternative materials in end use markets. Again, it is possible that such a certification scheme will: i) act as a restriction on trade and use of tropical timber for many final end uses; and ii) increase the incentives to find 'loopholes' or cheat the scheme (e.g. obtaining similar timber from 'unverified' sources in the same country; concessions 're-selling' timber from other sources; forging of certificates).

Given the difficulties with product labelling and concession certification, the most appropriate scheme at least initially would be *country certification*. The main point of such a scheme would be to ensure that a producer country is *implementing policies, regulations and management plans that ensure substantial progress towards the Year 2000 Target*. In return, the tropical timber products of that country will be certified as coming from a 'Target 2000' country, which should give them easier access to import markets in developed economies (GHK/HDH/VDH 1992).

There are several reasons why country certification may be more effective and workable:

- Certification at the country level will be less costly and more easy to implement compared to other certification schemes. Periodic inspection tours by an internationally certified teams, monitoring at custom ports, reviews of forest policy and management plans would probably be sufficient for such a scheme to be effective.

- Producer countries would find country certification more politically acceptable, provided that:

i) under international auspices producer countries could help determine the certification scheme as well as any verification process;

ii) the certificate of origin could then be issued by the exporting country, or companies authorized by that country;

iii) as it is effectively a *national* sustainable management plan that is being certified, it would be up to the producer country to address adequately the problems posed by production from conversion forests, plantations, re-afforestation and so forth, but once this plan is internationally verified, *all* timber products from *all* types of forests in the country would be certified;

iv) development of a national sustainable management forest policy and land use plan would in turn support efforts by companies and concessionaires to develop more sustainable forest management practices, which they may then chose to promote voluntarily through product labelling;

v) it would be up to producer country to ensure compliance with the sustainable management plan, and in cooperation with 'independent inspection', the relevant forest authorities would have primary responsibility for monitoring operations at the concession and industry level; and,

vi) in exchange for adopting the scheme and being certified, an exporting country would hope to receive improved access to international markets for their 'sustainably managed' products, and hopefully, international financial assistance to implement their sustainable management plans. This would provide an incentive for producer countries to adopt this policy approach.

- Consumer countries may also find country certification more feasible to implement as:

i) under international auspices, such as ITTO, consumer countries could help determine the certification scheme as well as any verification process;

ii) individual timber trade products would not have to be certified - all trade products from a certified country could be safely imported, and any inspection could be conducted as routine port of entry (i.e. customs) procedures;

iii) consumer countries would be assured that country certification would require a policy commitment by producer country governments to manage their production forests sustainably under the ITTO guidelines and Target 2000, viable national plans to implement this policy, and a mandate to correct domestic market and policy failures that encourage timber-related deforestation; and,

iii) it would be easier to target bilateral and multilateral financial assistance for sustainable forest management - i.e. such flows could now be conditional on producer countries complying with the certification scheme.

In sum, an internationally agreed certification scheme ought to be used as a means to facilitate trade in sustainably produced tropical timber - not as a means to restrict trade. Mandatory product labelling and concession certification are too cumbersome and restrictive to assist trade-related incentives for sustainable management, and may also fail to gain adequate producer country cooperation. On the other hand, country certification would require the active participation and verification of producer countries. Moreover, a country certification scheme may also support efforts by companies and concessionaires to develop more sustainable forest management practices, which they may then chose to promote voluntarily through product labelling. In exchange, producer countries could qualify for additional financial assistance to implement sustainable management plans, as well as be assured of better market access for their exports.

Conclusions

This paper has provided a brief assessment of the various trade policy options analyzed in the LEEC study (Barbier *et al.* 1993). A summary of the timber trade policy options, and their advantages and disadvantages in promoting sustainable tropical forest management, is provided in Table 1.

The general conclusion is that additional tropical timber trade policies do have a role in fostering *trade-related incentives* for sustainable management. Trade policies will be the most effective if:

- they are employed in conjunction with and complement improved domestic policies and regulations for sustainable forest management within producer countries;

- they improve rather than restrict access to import markets for tropical timber products so as to ensure maximum value added for sustainably produced tropical timber exports; and,

- they assist producer countries in obtaining the additional financial resources required to implement comprehensive national plans for sustainable management of tropical production forests.

More specifically, the main conclusions of the assessment of trade policy options are:

- There is very little evidence to suggest that the option of 'doing nothing' will encourage greater trade-related incentives for sustainable management of tropical

production forests, or is the appropriate response given current trends in tropical deforestation and trade.

- The problem with restrictive trade policy interventions, such as bans, taxes and quantitative restrictions, is that if they are applied indiscriminately across all tropical timber products, they will reduce rather than increase the incentives for sustainable timber management - and may prove actually to increase overall tropical deforestation. 'Selective' interventions, such as those that distinguish between 'sustainably' and 'unsustainably' produced timber, would also work to restrict trade and thus should also be avoided.

- Banning or controlling the trade in specific timber species may be a necessary short term response if the species are endangered, but more effective and innovative long terms solution for management of the trade are required. A more comprehensive trade mechanism that establishes sustainable offtake export quotas for endangered tropical timber species would offer a better incentive to both importers and exporters to accept a controlled legal trade and to enforce it.

- Trade subsidies to support sustainable management goals would also probably be distortionary and could lead to problems of disguised protectionism and encourage inefficiency in the forest sector. Progress toward sustainable management in producer countries should come first before any consideration of trade or production subsidies.

- General liberalization of the trade in tropical timber products is probably not feasible. However, producer countries that show demonstrable progress towards achieving Target 2000 could be allowed better access to importing markets through the removal of specific tariff and non-tariff barriers on a case-by-case basis. Similarly, in demonstrating compliance with Target 2000, producer countries should be asked to review the implications of their own tropical timber export policies and restrictions for both timber-related tropical deforestation and international markets.

- However, there is evidence that producer countries will require additional financing of around US$ 0.3 to 1.5 bn annually to implement sustainable management plans for their tropical forests, including production forests. Moreover, the international community led by the developed market economies ought to provide this assistance, given the global values attributed to tropical forests. In the current economic and political climate, new forms of assistance other than traditional bilateral and multilateral aid flows will probably be required.

- A *revenue-raising surcharge* could be levied at either the exporting or importing end of the trade. Trade distortions would be minimized if the surcharge was kept to under 5% of the value of the trade. Unfortunately, the net funds raised may be well below the annual target of US$ 0.3-1.5 bn. However, the trade should not be

expected to pick up the total tab for financing sustainable management of tropical forests, but rather make a contribution towards it.

- If additional revenue were to be raised from the trade, the distribution of existing funds appropriated by consumer country governments, either through a *tax* or *revenue* transfer, would be feasible. Consumer countries would probably prefer the latter, and producer countries the former.

- In the medium and long term, more comprehensive mechanisms and international agreements for raising revenue *external* to the trade to combat the *overall* problem of tropical deforestation will have to be examined. Possible mechanisms include the establishment of a tropical forest fund or a global system of marketable forest protection and management obligations.

- Finally, any promotion of trade-related incentives for sustainable management will have to consider an appropriate *certification* scheme. Product labelling and concession or company certification are too cumbersome and restrictive to assist trade-related incentives for sustainable management, and may also fail to gain adequate producer country cooperation. On the other hand, country certification would require the active participation and verification of producer countries and satisfy consumer demand for a sustainably managed supply of timber products. In exchange, producer countries could qualify for additional financial assistance to implement sustainable management plans, as well as be assured of better market access for their exports.

References

Amelung, T. 1991. "Tropical Deforestation as an International Economic Problem." Paper presented at the Egon-Sohmen Foundation Conference on Economic Evolution and Environmental Concerns, Linz, Austria, 30-31 August.

Barbier, E.B. 1993. "Economic Aspects of Tropical Deforestation in South East Asia." Forthcoming in *Global Ecology and Biogeographical Letters*, 3.

Barbier, E.B., Burgess, J.C., Bishop, J.T., Aylward, B.A., and Bann, C. 1993. *The Economic Linkages Between the International Trade in Tropical Timber and the Sustainable Management of Tropical Forests*. Final Report: ITTO Activity PCM(XI)/4. Yokohoma: International Tropical Timber Organization.

Barbier, E.B., Burgess, J.C., Swanson, T.M. and Pearce, D.W. 1990. *Elephants, Economics and Ivory*. London: Earthscan Publications.

Barrett, S. 1990. "The Problem of Global Environmental Protection." *Oxford Review of Economic Policy* 6(1):68-79.

Buongiorno, J. and Manurung, T. 1992. "Predicted Effects of an Import Tax in the European Community on the International Trade of Tropical Timbers." *mimeo*. Madison, Wisconsin: Department of Forestry, University of Wisconsin.

Burgess, J.C. 1992. *The Impact of Wildlife Trade on Endangered Species*. LEEC Discussion Paper 92-02. London: London Environmental Economics Centre.

Constantino, L.F. 1990. *On the Efficiency of Indonesia's Sawmilling and Plymilling Industries*. Jakarta: D.G. of Forest Utilization, Ministry of Forestry, Government of Indonesia and FAO.

Ferguson, I.S. and Muñoz-Reyes Navarro, J. 1992. "Working Document for ITTO Expert Panel on Resources Needed by Producer Countries to Achieve Sustainable Management by the Year 2000." Yokohoma: ITTO.

Gewerkschaft Holz und Kunststoff (GHK), Central Federation of German Timber and Plastics Processing Industries (HDH) and German Timber Importers Federation (VDH) 1992. *Joint Decleration on the Protection of Tropical Forests*. Bonn: GHK/HDH/VDH.

International Tropical Timber Council (ITTC) 1992a. *Report From the Expert Panel on Estimation of Resources Needed by Producer Countries to Attain Sustainability by the Year 2000*. ITTC(XII)/7 Rev.1, 10th Session, Yaoundé, Cameroon, 6-14 May.

International Tropical Timber Council (ITTC) 1992b. *Report on the Eigth Committee of Parties to the Convention on International Trade in Endangered Species, Kyoto, 1-13 March 1992*. PCM(X)/7, 10th Session, Yaoundé, Cameroon, 6-14 May.

International Tropical Timber Council (ITTC) 1992c. *Report on Preparations for the 1992 United Nations Conference on Environment and Development*. ITTC(XII)/8, 10th Session, Yaoundé, Cameroon, 6-14 May.

International Tropical Timber Council (ITTC) 1992d. *Report Submitted to the International Tropical Timber Council on the "Workshop on Issues Related to Incentives to Promote Sustainable Development of Tropical Forests through Trade."* PCM(X)/4, 10th Session, Yaoundé, Cameroon, 6-14 May.

Netherlands Economic Institute (NEI) 1989. *An Import Surcharge on the Import of Tropical Timber in the European Community: An Evaluation* . Rotterdam: NEI.

Oxford Forestry Institute (OFI) in association with the Timber Research and Development Association (TRADA) 1991. *Incentives in Producer and Consumer Countries to Promote Sustainable Development of Tropical Forests*. ITTO Pre-Project Report, PCM, PCF, PCI(IV)/1/Rev. 3. Oxford: OFI.

Poore, D., Burgess, P., Palmer, J., Rietbergen, S., and Synnott, T. 1989. *No Timber Without Trees: Sustainability in the Tropical Forest*. London: Earthscan Publications.

Sedjo, R.A., Bowes, M. and Wiseman, C. 1991. *Toward a Worldwide System of Tradeable Forest Protection and Management Obligations*. Discussion Paper ENR 91-16. Washington DC: Energy and Natural Resources Division, Resources for the Future.

Vincent, J.R. 1990. "Don't Boycott Tropical Timber." *Journal of Forestry* 88(4):56.

DISCUSSION PAPERS

LEEC Discussion Papers examine a wide range of issues in environmental economics, including theoretical questions as well as applications, case studies and policy analysis. They are directed mainly at academics and researchers. Discussion Papers may be purchased for £3.50 each unless otherwise stated.

DP 88-01 September 1988	David W. Pearce, Edward B. Barbier and Anil Markandya **Environmental Economics and Decision Making in Sub-Saharan Africa**
DP 88-02 October 1988	Edward B. Barbier **Sustainable Agriculture and the Resource Poor: Policy Issues and Options**
DP 88-03 November 1988	David W. Pearce, Edward B. Barbier and Anil Markandya **Sustainable Development and Cost Benefit Analysis**
DP 89-01 January 1989	Edward B. Barbier and Anil Markandya **The Conditions for Achieving Environmentally Sustainable Development**
DP 89-02 February 1989	Nicholas Michael and David W. Pearce **Cost Benefit Analysis and Land Reclamation: A Case Study**
DP 89-03 March 1989	Douglas Southgate **Efficient Management of Biologically Diverse Tropical Forests**
DP 89-04 May 1989	Timothy Swanson **A Proposal for the Reform of the African Elephant Ivory Trade** (£4.00)
DP 89-05 June 1989	Edward B. Barbier and Joanne Burgess **The Demand For African Elephant Ivory**
DP 89-06 June 1989	Scott Barrett **Deforestation, Biological Conservation, and the Optimal Provision of Wildlife Reserves**
DP 89-07 July 1989	Scott Barrett **On The Overgrazing Problem**
DP 89-08 July 1989	Scott Barrett **Optimal Soil Conservation and the Reform of Agricultural Pricing Policies**
DP 89-09 October 1989	Douglas Southgate, Rodrigo Sierra and Lawrence Brown **The Causes of Tropical Deforestation Ecuador: A Statistical Analysis**
DP 89-11 November 1989	Charles Perrings, Alison Gilbert, David W. Pearce and Anne Harrison **Natural Resource Accounts for Botswana: Environmental Accounting for a Natural Resource-Based Economy**
DP 89-12 November 1989	Gardner Brown Jr. and Wes Henry **The Economic Value of Elephants**
DP 89-13 December 1989	Charles Perrings **Industrial Growth, Rural Income and the Sustainability of Agriculture in the Dual Economy**

DP 90-01
March 1990
R. Kerry Turner and David W. Pearce
The Ethical Foundations of Sustainable Economic Development

DP 90-02
May 1990
Anil Markandya
Environmental Costs and Power Systems Planning

DP 90-03
June 1990
Edward B. Barbier
The Economics of Controlling Degradation: Rehabilitating Gum Arabic Systems in Sudan

DP 90-04
October 1990
Charles Perrings
Stress, Shock and the Sustainability of Optimal Resource Utilization in a Stochastic Environment

DP 90-05
October 1990
Edward B. Barbier, Joanne C. Burgess and David W. Pearce
Slowing Global Warming: Options for Greenhouse Gas Substitution

DP 90-06
November 1990
David W. Pearce
An Economic Approach to Saving the Tropical Forests

DP 91-01
January 1991
Douglas Southgate
Tropical Deforestation and Agricultural Development in Latin America

DP 91-02
April 1991
Edward B. Barbier, William M. Adams and Kevin Kimmage
Economic Valuation of Wetland Benefits: The Hadejia-Jama'are Floodplain, Nigeria

DP 91-03
May 1991
Timothy M. Swanson
Wildlife Utilisation as an Instrument for Natural Habitat Conservation: A Survey of the Literature and of the Issues

DP 91-04
June 1991
Gregor Büchner, Joanne C Burgess, Victoria C Drake, Tom Gameson and David Hanrahan
Gender, Environmental Degradation and Development: The Extent of the Problem

DP 91-05
July 1991
Edward B. Barbier
The Role of Smallholder Producer Prices in Land Degradation: The Case of Malawi

DP 91-06
November 1991
Anil Markandya and Charles Perrings
Resource Accounting for Sustainable Development: A Review of Basic Concepts, Recent Debate and Future Needs

DP 91-07
November 1991
Edward B. Barbier
Environmental Management and Development in the South: Prerequisites for Sustainable Development

DP 92 -01
June 1991
Edward B. Barbier, Joanne C. Burgess, Bruce A. Aylward and Joshua Bishop
Timber Trade, Trade Policies and Environmental Degradation

DP 92-02
June 1992
Joanne C. Burgess
Impact of Wildlife Trade on Endangered Species

DP 92-03
June 1992
Joanne C. Burgess
Economic Analysis of the Causes of Tropical Deforestation

DP 92-04
October 1992
Edward B. Barbier
Valuing Environmental Functions: Tropical Wetlands

DP 92-05 November 1992	Bruce A. Aylward and Edward B. Barbier **What is Biodiversity Worth to a Developing Country? Capturing the Pharmaceutical Value of Species Information**
DP 93-01 April 1993	Edward B Barbier, Joanne C Burgess, Nancy Bockstael and Ivar Strand **The Timber Trade and Tropical Deforestation in Indonesia**
DP 93-02 June 1993	Edward B Barbier **Policy Issues and Options Concerning Linkages Between the Tropical Timber Trade and Sustainable Forest Management**

GATEKEEPER SERIES

The LEEC Gatekeeper Series highlights key topics in the field of environmental and resource economics. Each paper reviews a selected issue of contemporary importance and draws preliminary conclusions of relevance to development activities. References are provided to important sources and background materials. The Swedish International Development Authority (SIDA) funds the series, which is aimed especially at the field staff, researchers and decision-makers of SIDA and other development agencies. All Gatekeepers are priced £2.50 unless otherwise stated.

GK 89-01 June 1989	David W. Pearce **Sustainable Development: an Economic Perspective**
GK 89-02 August 1989	Edward B. Barbier **The Economic Value of Ecosystems: 1 - Tropical Wetlands**
GK 89-03 October 1989	David W. Pearce **The Polluter Pays Principle**
GK 89-04 November 1989	Joanne C. Burgess **Economics of Controlling the Trade in Endangered Species: The African Elephant**
GK 90-01 March 1990	Edward B. Barbier **Natural Resource Degradation Policy, Economics and Management**
GK 91-01 January 1991	Edward B. Barbier **The Economic Value of Ecosystems: 2 - Tropical Forests**
GK 91-02 May 1991	Joshua Bishop, Bruce A. Aylward and Edward B. Barbier, **Guidelines for Applying Environmental Economics in Developing Countries**
GK 91-03 June 1991	Bruce A. Aylward **The Economic Value of Ecosystems: 3 - Biological Diversity**
GK 91-04 May 1991	David W. Pearce **Afforestation and the Greenhouse Effect: The Economics of Fixing Carbon by Growing Trees**
GK 92-01 March 1992	Joshua Bishop **Economic Analysis of Soil Degradation**
GK 92-02 September 1992	Edward B. Barbier **The Nature of Economic Instruments: A Brief Overview**
GK 92-03 October 1992	James P. G. Spurgeon and Bruce A. Aylward **The Economic Value of Ecosystems: 4 - Coral Reefs**
GK 92-04 December 1992	Douglas Southgate **The Rationality of Land Degradation in Latin America: Some Lessons from the Ecuadorian Andes**

LONDON ENVIRONMENTAL ECONOMICS CENTRE

BOOKS

Edward B. Barbier
Economics, Natural-Resource Scarcity and Development: Conventional and Alternative Views, Earthscan, London, 1989 (paperback £17.50)

The history of environmental and resource economics is reviewed; then using insights from environmentalism, ecology and thermodynamics, Barbier begins the construction of a new economic approach to the use of natural resources, particularly to the problem of environmental degradation. With examples from the global greenhouse effect, Amazonian deforestation and upland degradation on Java, Barbier develops a major theoretical advance and shows how it can be applied. This book breaks new ground in the search for an economics of sustainable development.

David W. Pearce, Anil Markandya and Edward B. Barbier
Blueprint for a Green Economy, Earthscan, London, 1989 (paperback £8.95)

This book was initially prepared as a report to the Department of Environment, as part of the response by the government of the United Kingdom to the Brundtland Report, *Our Common Future*. The government stated that: '...the UK fully intends to continue building on this approach (environmental improvement) and further to develop policies consistent with the concept of sustainable development.' The book attempts to assist that process.

Edward B. Barbier, Joanne C. Burgess, Timothy M. Swanson and David W. Pearce
Elephants, Economics and Ivory, Earthscan, London, 1990 (paperback £10.95)

The dramatic decline in elephant numbers in most of Africa has been largely attributed to the illegal harvesting of ivory. The recent decision to ban all trade in ivory is intended to save the elephant. This book examines the ivory trade, its regulation and its implications for elephant management from an economic perspective. The authors' preferred option is for a very limited trade in ivory, designed to maintain the incentive for sustainable management in the southern African countries and to encourage other countries to follow suit.

Gordon R. Conway and Edward B. Barbier
After the Green Revolution: Sustainable Agriculture for Development, Earthscan Pub. Ltd., London, 1990 (paperback £10.95)

The Green Revolution has successfully improved agricultural productivity in many parts of the developing world. But these successes may be limited to specific favourable agro-ecological and economic conditions. This book discusses how more sustainable and equitable forms of agricultural development need to be promoted. The key is developing appropriate techniques and participatory approaches at the local level, advocating complementary policy reforms at the national level and working within the constraints imposed by the international economic system.

David W. Pearce, Edward B. Barbier and Anil Markandya
Sustainable Development: Economics and Environment in the Third World, London and Earthscan Pub. Ltd., London, 1990 (paperback £11.95)

The authors elaborate on the concept of sustainable development and illustrate how environmental economics can be applied to the developing world. Beginning with an overview of the concept of sustainable development, the authors indicate its implications for discounting and economic appraisal. Case studies on natural resource economics and management issues are drawn from Indonesia, Sudan, Botswana, Nepal and the Amazon.

David W. Pearce, Edward B. Barbier, Anil Markandya, Scott Barrett, R. Kerry Turner and Timothy M. Swanson
Blueprint 2: Greening the World Economy, Earthscan Pub. Ltd., London, 1991 (paperback £8.95)

Following the success of *Blueprint for a Green Economy*, LEEC has turned its attention to global environmental threats. The book reviews the role of economics in analyzing global resources such as climate, ozone and biodiversity, and considers economic policy options to address such problems as global climate change, ozone depletion and tropical deforestation.

E.B. Barbier and T.M Swanson (eds.)
Economics for the Wilds: Wildlife Wildlands, Diversity and Development, Earthscan Pub. Ltd., London, 1992 (paperback £12.95).

This collection of essays addresses the key issues of the economic role of natural habitat and wildlife utilization in development. The book argues that this role is significant, and composes such benefits as wildlife and wildland products, ecotourism, community-based wildlife development, environmental services and the conservation of biodiversity.

Copies of publications listed above may be obtained from the bookshop at IIED. Please use the order form below, and send to:

Marilyn John
Publications Department
IIED
3 Endsleigh Street
London WC1H 0DD, UK
Tel: 071-388 2117
Fax: 071-388 2826
Telex: 261681 EASCAN G

Please add £1.00 post and packing per publication. Orders over £20.00 in value will be sent post free **(UK only)**.

Overseas customers: please do not send payment with your order; you will receive a *pro forma* invoice once the cost of dispatching your order has been calculated.

Publications Department
IIED, 3 Endsleigh Street
London WC1H 0DD

PUBLICATIONS ORDER FORM

Name: _____

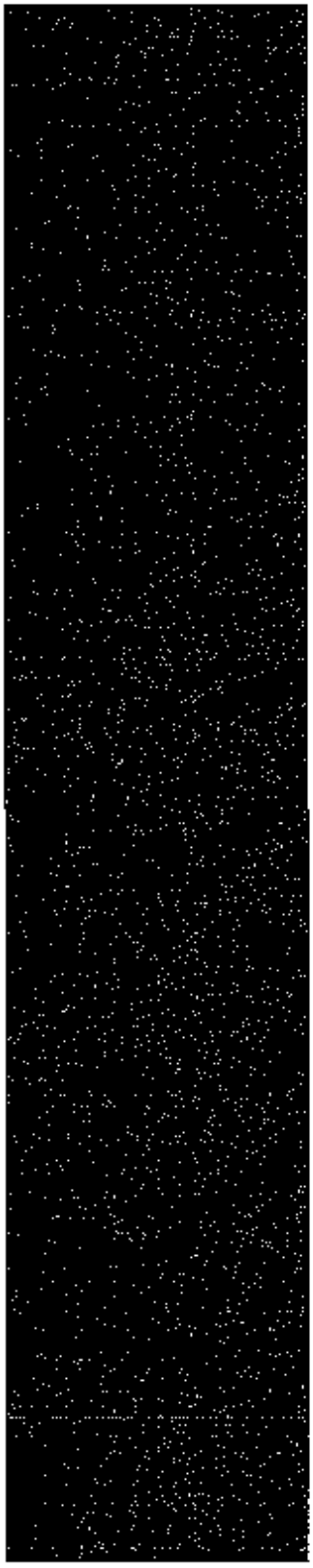
Address: _____

_____

_____

Reference/Title	Price	Quantity

Payment enclosed: £ _____



IIED

INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

LONDON ENVIRONMENTAL ECONOMICS CENTRE

The London Environmental Economics Centre (LEEC) was established in 1988 and operates as the economics programme of the International Institute for Environment and Development (IIED). LEEC's aim is the furtherance of policy relevant research in the field of environmental and natural resource economics, particularly in the context of developing countries.

LEEC has as its main objectives:

- Research into problems of environment and development from an economic standpoint;
- Dissemination of research and state of the art environmental economics through publication, public and professional address and specialist conferences;
- Advice and consultancy on specific issues of environmental policy.

3 Endsleigh Street, London WC1H 0DD, UK, tel: 071-388 2117