Natural Resource Subsidies, Trade and Environment: The Cases of Forests and Fisheries – Full Text

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ABSTRACT
As tariffs have been reduced by successive multilateral trade liberalization agreements, subsidies have emerged as a major issue in international trade policy. And as environmental concerns have been linked with trade issues, it has increasingly been recognized that subsidies can have significant environmental implications. In the past year, the issue of subsidies and the environment has been included in the work plans of the World Trade Organization's Committee on Trade and the Environment, the U.N. Commission on Sustainable Development's Intergovernmental Panel on Forests, and the Asia-Pacific Economic Cooperation (APEC) forum.

Subsidization of natural resource production and use is an acute environmental problem. It remains to be seen, however, whether states will take any meaningful action. Two major obstacles to the creation of an international regime on natural resource subsidies are political resistance to and lack

of clarity about what constitutes a subsidy.

This paper is in three parts. Part I presents a conceptual framework for understanding subsidies in the natural resource sector. Part II marshals the evidence that such subsidies harm the environment, focusing on the forest and fisheries sectors as case studies. Part III examines the ways in which natural resource subisidies are being treated in various international fora, including APEC, and proposes ways to integrate the issue into APEC's work program.

I. THE CONCEPTUAL FRAMEWORK

- The Economic Concept of "Subsidy"

The most useful definition of subsidy for the purpose of this analysis is the one that best illuminates the relationships among governments, markets and the environment. Various legal definitions of subsidy, which are responsive to the politics of national and international trade, fail to make these links. The economic concept of subsidy, on the other hand, is directly related to the central environmental principle of full-cost pricing. So it is a logical point of departure for a conceptual framework for considering natural resource subsidies as a problem in trade and environment policy.

The economic concept of subsidy is derived from the assumption that the market allocates resources more effectively than any other mechanism, and that a government payment to the producer of a particular good reduces the private cost of the good so that it no longer reflects id social cost -- the output that must be foregone in order to make the good. The result is a distortion in the resource-allocating function of the domestic market.(1)

The assumption that the social cost of a good should be reflected in its price is also the basis in economic theory for opposing export subsidies: subsidies allow the natural advantages possessed by one country to be offset by an artificial advantage created by another. And since subsidies distort relative international trade prices that would have been determined otherwise by the principle of comparative advantage, they also reduce the advantages of specialization in international trade.(2)

As an economic concept, therefore, a subsidy may be defined as "a government-directed, market-distorting intervention which decreases the cost of producing a specific good or service, or increase the price which may be charged for it."(3) It should be noted that this strictly economic definition of subsidy omits one element that international and national trade law has used to distinguish a subsidy from other government interventions: that the intervention benefits a single industry or small group of linked industries rather than a wide range of industries. Thus the provision of water or hydroelectric power at below-market prices because of government pricing policies would not be a subsidy under international trade law if it benefits a number of industries.

This requirement for specificity helps to define the field of action to which trade law should be addressed. But it is irrelevant to the relationship between government resource-allocating interventions, the market and the environment. The economic conception of subsidies keeps us focused primarily on the market-distorting and, in many cases, environmentally destructive, impacts of resource-allocating government interventions benefiting an industry or industries. An intervention that may otherwise appear to be justified by its benefits to society as a whole -- such as highway programs, for example -- also distort markets for energy and transportation technologies. Defining subsidies in strictly economic terms, therefore, ensures that significant government practices affecting markets and the environment are not excluded from the discussion of trade and environment policy.

In the past, trade specialists have tended to define a subsidy narrowly as the direct provision of a financial benefit to an industry by means of a fiscal measure: either a government expenditure or an explicit exemption from taxation, also called a "tax expenditure."(4) And the discussion of subsidies is still hobbled by uncertainty over the scope of the concept. A 1996 OECD publication suggests that it is still unsettled whether the definition of a subsidy should be confined to "cash payments" by governments or could include "indirect forms of support."(5)

But the logical implication of an economic definition of a subsidy is that any intervention that alters the price of the good artificially should be recognized as a subsidy. And as the discussion of subsidies has become more sophisticated, it has increasingly been recognized that a subsidy can be provided by means of a wide range of trade-distorting policy instruments, most of which operate indirectly by altering price signals rather than through fiscal measures.(6)

Among these policy instruments are trade-restricting measures. For example, import tariffs or non-tariff barriers can be used to assure greater demand for domestically produced goods, or export restrictions can be used to lower the prices for inputs into domestically produced goods. So this conceptual framework begins with a definition of subsidy that includes within its scope any governmental intervention that has the effect of altering the cost of production and thus affecting the price of a good.

Implicit Subsidies: Failure to Internalize Environmental Costs

The concept of an implicit subsidy is closely related to the economic concept of subsidy. An implicit subsidy arises when the production of good creates a negative "eternality" -- a cost imposed on society by a good or activity which is not fully reflected in the market price, because those affected are not involved in the market transaction.(7) Thus, some of the true costs of the good's production and consumption are not borne by the producer, who receives a subsidy from those who do bear those costs.(8)

The price of a good sold under these conditions is artificially low, and the market is distorted. An implicit subsidy could be viewed as the result of a failure by government to carry out normal regulation of the industry to ensure that the costs of externalities are not imposed on society but are borne by the industry responsible. From an economic standpoint, the difference between the failure of a government to impose the internalization of environmental costs on industry and a government's reduction of the cost of production through an overt intervention is less important than the similarity between the two situations. Both practices distort markets by causing the private costs of products to diverge from social costs.

Multilateral bodies have rejected any trade response to the problem of implicit subsidy, but it is clear that, if the externalities associated with production of a good that is exported are large enough, they can distort international trade. Most of the economists and government specialists convened by the OECD in 1995 to discuss subsidies and the environment agreed that the failure to reflect environmental costs in market prices does indeed constitute an implicit subsidy, even though they did not regard it as a high priority in terms of subsidy reform policy.(9) Whatever the difficulties in devising a response to it, the concept of non-internalization of environmental externalities as an implicit subsidy is particularly relevant to the consideration of natural resources subsidies.

Natural Resource Subsidies

Governments play a very significant role in determining what costs are borne by companies that

extract or harvest natural resources. And because governments are so deeply involved, natural resources are more heavily subsidized than manufacturing and processing industries that export. They are almost always priced at less than the marginal cost of their production to society.

Natural resources are subsidized directly by government budgetary and tax measures, indirectly by trade and other policy instruments that alter price signals, and implicitly by allowing producers not to internalize the costs of externalities associated with the production process or to include in the price the opportunity cost of immediate consumption.

Natural resource industries are frequently the object of very substantial budgetary subsidies. In the 1980s, the fossil fuel industry in the United States could count on annual appropriations and tax deductions in support of oil and gas exploration estimated at $40 billion annually.(10) The coal industries of major coal-producing OECD countries were provided direct producer subsidies which amounted to a large percentage of coal import prices: 80 percent in Belgium, 66 percent in West Germany, 42 percent in United Kingdom and 90 percent in Japan.(11) The cost of Germany's budgetary support to protect its coal industry from imports has risen from $3 billion in 1982 to $7.1 billion in 1995.(12)

Fisheries industries in most OECD countries have benefited from a wide variety of direct government subsidy schemes since the 1950s, especially generous credits for modernization of fishing fleets. And in the United States and Europe, agricultural production is subsidized in large part by price supports for the final products through direct payments.(13)

But indirect subsidies through trade and other interventions are also pervasive in certain sectors, such as forests, water and agriculture. In the European Union, agriculture is subsidized in part through protective import tariffs on commodities to ensure that EU farmers can charge higher prices in their home markets. And coal industries are given import protection that allows higher domestic prices of coal than would otherwise be the case.(14) In developing countries, the main form of agricultural subsidy has been the input subsidy -- the provision of inputs, especially pesticides and fertilizer, at artificially low costs through favorable exchange rates and import tariffs, as well as low-interest credit.(15) Export restrictions have also been used to lower the price of natural resources domestically, in order to subsidize companies using the resource as an input for processed goods for export. This method of subsidy has affected the production and use of timber, fish, natural gas and carbon black, among other natural resources.(16)

Another form of indirect "natural resource subsidy" occurs when a government permits private businesses to remove a natural resource from the public domain at a price below its full market value. The value of a natural resource that is not attributed to any cost of production (including the cost of attracting the necessary investment) but to the strength of market demand is often called "economic rent".(17) It may difficult to define precisely what the economic rent is for a unit of a given natural resource, because of uncertainties about future markets and other factors. Nevertheless, the full economic rent available for any natural resource that is extracted from publicly-owned land or waters should accrue to the state. This value can be captured fully by a government through its taxes, fees or charges on the extraction or harvesting of the resource.

If the state does not capture the full economic rent on the sale of natural resource rights to private companies, it is transferring financial resources to the company just as much as if it provided a tax concession or an outright grant. Natural resource subsidy by selling either the resource or the right to exploit it at a price below its full market value is a central problem in the management of timber, water, mining and grazing land. For example, in the United States users of irrigation water that belongs to the federal government are charged less than 10 percent of the federal costs associated with the water project.(18) The annual cost of these below-cost charges on irrigation water for

surplus crops alone has been estimated at $830 million.(19)

A final form of natural resource subsidy is the implicit subsidy that occurs when the prices of natural resources do not reflect the full social costs of the resource, thus introducing potentially serious market distortions. To allocate resources efficiently the price of a natural resource should account for the three distinct components of its cost: the direct costs of extraction, harvesting or use; the "user cost", or benefits foregone by society by consuming the resource rather than leaving it for future consumption -- and any environmental externalities associated with its extraction and use.(20)

Whenever a natural resource industry fails to include all the social costs of producing the resource, and not just the costs of extraction, in its price, the production and sale of the resource receives an implicit subsidy. The subsidy is provided, however, not by government, but by society as a whole and by future generations. To reduce or eliminate such implicit subsidies of natural resources, governments may choose either to regulate the industry's method of extraction or harvesting directly or to regulate the market by altering the price of the resource. It can promulgate and enforce a system of rules or standards for exploiting the resource that minimize environmental damage in the process of extraction or production of a commodity, or it can levy sufficient taxes or charges on the resource to raise the price to the best approximation of social costs and reduce the level of consumption and production to a socially optimal level.(21)

The "User-Pays Principle" of resource pricing, which asserts that the environmental costs associated with the exploitation and use of a resource should be included in the price, was first introduced as a policy guideline in the OECD in 1987. The OECD adopted the use of resource pricing as a norm for natural resource management with a particular application to water, forest and land resources, in a 1991 OECD Ministerial Communiqu?.(22)

The most appropriate policy mechanism for eliminating an implicit subsidy depends, however, on the economics and environmental consequences of the natural resource sector in question. Setting the "shadow price" for a resource -- one that reflects accurately marginal social costs rather than marginal private/individual costs -- can be difficult, especially if data on externalities are incomplete. And in some cases, that shadow price may be so high that a direct regulatory approach is more appropriate.(23)

Natural Resource Subsidies and Environmental Degradation

By reducing the price of a natural resource below the marginal cost to society, subsidies can have far-reaching impacts on both investment and consumption patterns, which in turn can accelerate environmental degradation. The various distortions in resource allocation caused by natural resource subsidies degrade the environment through one or more of five distinct intermediary processes. Three of these are investment-related. They affect the environment through the investment decisions of industry, based on the distorted price signals created by subsidies. One effect is on government capacity to enforce environmentally sound production methods and otherwise promote sustainable production methods, and the final method operates through consumer decisions. Most natural resource subsidies affect the environment through more than one of these effects.

The five effects of natural resource subsidies are as follows:

1. The overcapitalization effect:
Subsidies to natural resource industries draw more investment into that natural resource sector than would have been made in an undistorted market. The result is more land devoted to agricultural use, more fishing boats, more coal mining and more processing plants using logs. Agricultural subsidies in OECD countries have increased the area under production at the expense of forests and wetlands.(24) In the United States, agricultural subsidies, primarily in the form of subsidized irrigation and flood control works have increased sugar production, despite its inefficiency, and threatens to drain what remains of the Florida Everglades.(25) The tax incentives offered to cattle ranching in Brazil and Costa Rica resulted in many more ranches cut out of the rainforest in both countries.(26) The net result of capital being attracted to these natural resource industries by price-distorting government interventions is the loss of biological diversity as well as ecosystem functions associated with forest and wetlands.

2. The technology effect:
Another investment-related effect of natural resource subsidies is that make it more attractive to an industry to use technologies that have greater impact on the environment than alternative technologies, either because they harvest renewable resources more efficiently or are more pollution-intensive or otherwise disrupt environmental services. Coal subsidies make it cheaper in relation to alternative energy technologies, including renewable energy, and thus contribute to air pollution and climate change. Agricultural subsidies provide incentives for farmers to increase massively their use of pesticides and fertilizers in order to increase their yields.(27) Subsidies of larger fishing boats with greater horsepower and more efficient gear have helped create the highly efficient mechanized fishing fleets that have depleted marine fisheries worldwide.

The environmental effects of agricultural subsidies worldwide, the costs of which have been estimated at $9 billion annually -- 5-10 percent of the total value of crops produced -- are largely related to the technology effect.(28) Major environmental impacts of the agricultural intensification triggered by agricultural subsidies include the pollution and contamination of soil, water, air and food from agricultural chemicals, illness from excessive pesticide use, and acid deposition from fertilizer.

3. The resource inefficiency effect:
By artificially depressing the prices of natural resources, subsidies remove the incentive for efficient use of resources by industries that process the resources or use it as an input, or by consumers. When water prices do not reflect the actual value of the resource, farmers use far more water than they need for a given harvest, water-intensive crops are grown in water-short regions and irrigation works are not kept in good working order.(29) Providing cheap logs and fish to processing industries reduces the incentive to make processing more efficient. And the impact of subsidized energy supplies on global climate change could be considerable. The World Bank estimates that elimination of energy subsidies alone could create sufficient energy efficiency gains to cut greenhouse gas emissions worldwide by as much 7 percent.(30) And one study concluded that Russia could cut its carbon dioxide emissions by 38 percent simply by eliminating all energy subsidies by 2010.(31)

4. The overconsumption effect
Subsidies to natural resource industries result in lower prices for the resources and lead to overconsumption of the good. If coal subsidies were eliminated, it would have the effect of reducing demand for coal worldwide, with consequent reductions in both sulphur and carbon emissions.(32) The overconsumption effect is even more pronounced if implicit subsidies are included in the calculation. The combination of explicit and implicit subsidies to the fisheries sector have lowered fish prices and resulted in greater consumption than would have been the case in an undistorted market, which in turn leads to overfishing. And if logging companies and processing

industries in key tropical forest countries had to pay full social costs for access to raw logs, the price of timber and wood products would increase, reducing consumption of processed wood products and lower rates of harvest. Even the failure to capture full economic rents on logging concessions can have the effect of encouraging higher rates of harvesting, lowering the price of the logs and increasing consumption.

5. The public resource deprivation effect:
Natural resource subsidies that involve selling resources from the public domain cheaply deprive the state of financial resources that could have been used to enforce laws and regulations protecting natural resources and to promote their sustainable management. This effect occurs, for example, when the state is unable to recover capital, operation and maintenance costs on irrigation water because it is made available to farmers at a fraction of its real cost. One of the consequences of such irrigation water subsidies is that the state does not have the financial resources to protect watersheds adequately or to maintain the irrigation system.(33)

Similarly, low stumpage fees on logging concessions weaken the ability of the state to regulate the logging industry generally, resulting in greater abuses of concessions, and logging beyond officially authorized concessions. And when developing countries sell the right to exploit their fisheries to foreign fishing fleets for very little, they forfeit millions of dollars that could be used in part to increase their capacity for monitoring fishing vessels operating in their territorial waters to ensure that they do not overexploit the resource. Finally, developing countries that subsidize energy at a cost of more than $230 billion annually -- more than four times the total world volume of official development assistance -- are deprived themselves of resources that could be used to invest in a transition to a more sustainable energy system.(34)

II. TWO CASE STUDIES: FORESTS AND FISHERIES

A. Subsidies in the Forest Sector

Direct subsidies appear to be less important in the timber and wood products sector than indirect subsidies. Two kinds of such indirect subsidies stand out in particular: failure to capture full economic rents on logging concessions and protectionist trade policies that have the effect of underpricing raw logs as an input into processed wood products for export. Implicit subsidies are also pervasive in the sector.

1. Failure to capture full economic rents
The failure to capture full economic rents on logging concessions is a major source of subsidy for the timber industry and, depending on the structure of the forest products sector, for exporters of wood products. Stumpage fees on logging concessions in many timber-producing countries have failed to capture most of the economic rent from the extraction of timber. Many countries, including leading exporters of logs and wood products, have captured less than half of the stumpage value of the timber in their systems of taxes and charges on logging and log exports, according to a number of case studies.

Estimates of the proportion of economic rents captured by timber producing countries vary in the methodologies used to calculate the total economic rents available for capture. Some studies, for example, treat export duties as captured resource rent, while others do not.(36) And some data may have to be estimated based on a range of assumptions. So there may be a range of estimates of the proportion of timber rents captured by the government for a particular economy. A recent World Bank study, for example, estimated that Indonesia captured between 20 and 33 percent of economic rents from timber concessions in 1993; and Malaysia between 35 and 53 percent in 1991(Figure 1).

While crude, such data provide a glimpse of how deep and pervasive is the failure of governments to capture economic rents.

Stumpage fees that do not reflect the full market value of the timber being sold have a distorting effect on markets by making timber cheaper to cut than would have been the case with adequate stumpage fees. Thus low stumpage fees have an overcapitalization effect, as some proportion of the capital attracted to timber concessions by low stumpage fees would otherwise flow elsewhere. Studies of Malaysia and Ghana have shown how low stumpage rates had the effect of directing investment into logging natural forests rather than into plantations and encouraged over-expansion of domestic processing industries.(37)

Where harvest levels are a function of market forces, low stumpage fees encourage both higher levels of harvesting and higher levels of consumption of wood products. The overconsumption effect occurs because some trees in any given concession, which would otherwise be unprofitable to cut because of the costs involved, will become profitable at the lower marginal cost created by stumpage fees that fail to reflect the full market value.(38)

This effect has been documented by empirical studies of the relationship between stumpage fees and softwood lumber supply.

One study of stumpage prices for three species of softwood in U.S. National Forest land in 1980 found that for every one percent increase or decrease in the stumpage price, the supply of softwood lumber had increased or decreased by 0.20 percent, and that a 20 percent increase in stumpage prices was associated with a 14 percent increase in the price of sawlogs.(39)

Another important impact of low rent capture on forests, however, operates through the public resource deprivation effect. By transferring most of the rents to the private sector, governments deprive the state of significant resources that could be used to protect forests through strict enforcement of logging concession requirements and projects that promote sustainable management of forests. It is often argued by timber-producing countries that they cannot afford the additional costs required for programs to monitor and protect forests unless the prices of timber and processed wood products on the world market can be increased. But if those countries were to capture the full economic rents from timber concessions, they would have sufficient resources to reduce illegal logging and administer additional programs to address other causes of deforestation.

For example, if Indonesia had captured the same percentage of the market value of its timber resources in 1990 as it did from the exploitation of its oil resources (85 percent), it would have had an additional $1.9-2.5 billion -- between 40 and 50 percent of the annual total of Indonesian borrowing for all purposes.(40) Similarly, if state governments in Malaysia had captured the rents on logging that were actually captured by loggers from 1966 to 1989 and invested the money in an account earning 10 percent interest, they would have accumulated an additional $90 billion by 1990.(41) And if the Philippines had collected the full value of timber rents in 1987, it would have generated more than $250 million in timber revenues, or nearly six times the $39 million that it actually collected.(42) Even if most of the additional timber rents collected were to be spent elsewhere, these vast increases in government revenues should benefit the sustainable management of forests.

Low stumpage fees also can distort international trade. They permit the export of timber at prices lower than those on timber from countries where producers must pay the full economic rent on the timber they cut. The U.S.-Canada softwood case, first initiated in 1982 and only recently settled for the second time, has been the major international trade dispute revolving around rent capture. The effect of low stumpage fees of increasing timber supply and thus reducing the prices of softwood

lumber exports from Canada was a central element in the determination by the U.S. Commerce Department that the Canadian stumpage fee system represented a subsidy to the Canadian softwood lumber industry that had materially injured U.S. softwood lumber producers.(43)

2. Log export restrictions

A relatively long list of timber-producing countries have restricted or banned exports of raw logs or semi-processed logs in an effort to stimulate value-added processing for export and thus increase foreign exchange.(44) These trade restrictions depress domestic log prices compared with international prices, and provide cheap raw logs to the domestic wood processing industry. The subsidized wood processing industry is then able to export wood products at artificially low prices, which may help the industry to capture foreign markets from producers that are not similarly subsidized. Thus log export restrictions have the potential for major distortions of international trade in wood products.

Indonesia's log export restrictions have had a significant impact on Indonesian forests as well as international markets for tropical wood products. The first phase of the log export restriction policy was a system of log export quotas that were phased in the early 1980s. Then an outright log export ban was imposed in 1985, which was replaced, under pressure from the United States, by the use of prohibitively high export taxes on raw logs.(45)

These restrictions reduced the price of domestically consumed raw logs to about 50 percent of the world market price for raw logs.(46) This provided an effective rate of protection to Indonesian plywood manufacturers estimated at 222 percent.(47) The subsidization of plywood companies created major distortions in the global tropical timber market, as exports of low-priced Indonesian plywood flooded Japan and Korea, putting domestic producers out of business.(48) The percentage of total Japanese consumption of plywood coming from imports increased from 1.9 percent in 1984, just before the introduction of Indonesia's log ban, to 44 percent by 1993. And over 90 percent of those imports came from Indonesia.(49) And Korea, which was importing only 1.6 percent of the plywood it consumed in 1984, was importing 56 percent of it by 1993, of which Indonesia accounted for 98 percent.(50)

Some environmentalists have argued that log export bans might help curb deforestation in log-exporting countries.(51) There has been no definitive study of the environmental impacts of log export restrictions. However, both economic analysis and case studies of Malaysia, Ghana and Indonesia suggest that their main effect has been to encourage overcapacity and maintain inefficiency in the wood processing industry, both of which increase the pressure on forests.(52)

In the Indonesian case, after log export restrictions were phased in, the vast increase in sawmills and in plywood mills (from 20 in 1980 to 96, with an additional 61 under construction or approved, in 1984) required an annual harvest 50 percent higher than when log exports were at their peak only a few years earlier. (53) By 1990, log export restrictions had created a milling capacity (54.9 million cubic meters of logs per year) that far exceeded the Indonesia government's estimate of maximum sustainable timber yield (22 million cubic meters of logs annually). (54) In Peninsular Malaysia, a policy of restricting log exports to promote downstream processing also led to overcapacity in wood processing industries, although the impact on rates of harvesting has not been studied. Similarly, Ghana's log export restrictions created 27 percent more capacity in wood processing than the estimated timber yield would support, posing the danger of pressures for overharvesting. (55)

The inefficiency effect of log export restrictions is also confirmed by the Indonesian and Malaysian experiences. For every cubic meter of Indonesian plywood produced, 15 to 20 percent more trees had to be cut than would have been the case had the logs been processed by the most efficient Asian milling plants. (56) According to one World Bank estimate, about 10 percent of Indonesia's annual

harvest is wasted because of log export restrictions. (57)Similarly, Peninsular Malaysia's highly protected wood processing industry used 5 to 15 percent more logs per unit of production than log-importing countries, because they lacked the incentive to economize on log intake. (58)

3. Failure to internalize externalities

The prices of raw logs in the timber market take into account only the producer's costs of labor and capital in extracting or harvesting the resource; they fail to reflect the environmental externalities associated with the production process and use, or the user costs -- i.e., the opportunity costs to society -- of the consumption of the resource. These prices represent an implicit subsidy to the timber and wood products industries which have profound environmental consequences.

Since there appear to be ample non-wood substitutes for many of the end-uses of timber, (59) demand for wood products would be lower if not for various forms of subsidy, including the implicit subsidy through non-internalization of environmental externalities by the timber industry. And higher consumption of wood products has contributed not only to a higher rate of forest loss but to several kinds of environmental degradation that have accompanied it. Although implicit subsidy of timber prices is not the cause of deforestation and its attendant ills, it has accelerated it significantly.

Timber extraction can be carried out sustainably, that is, without irreversibly reducing the potential of the forest to produce timber or to carry out its ecosystem functions. (60) But commercial logging as currently practiced involves practices that seriously degrade the forests remaining when logging is finished, especially carving large logging roads through the forest and using large mechanized equipment to haul the cut timber out of the forest. (61)Furthermore, many governments allow far more timber to be cut than is sustainable in terms of the regeneration of the forests. (62) One study concluded that it cannot be demonstrated conclusively that any natural tropical forest anywhere is being managed sustainably. (63)

The social costs of commercial logging are compounded by the fact that it is linked in many tropical forest countries with the main cause of deforestation: the conversation of forests to agricultural land by smallholders. In Southeast Asia, the Ivory Coast, Ghana, the Brazilian Amazon logging roads have opened previously inaccessible forests to smallholders and often even attracted them with logging jobs. (64) A complete accounting of the social costs associate with timber extraction, therefore, must take into account the environmental consequences of the broader pattern of deforestation.

Those consequences include the loss of a significant proportion of the species found on the earth, including genetic materials that will be needed to provide disease and pest resistance for food crops and to create new drugs; the release of carbon dioxide into the atmosphere accounting for an estimated one-fourth of all greenhouse gas releases, and the decline or destruction of forest ecosystem functions -- notably the regulation of climate and hydrological systems. (65)

The consequences of lost ecosystem functions are the most direct and measurable impacts of deforestation. Evidence from India and Southeast Asia shows that the failure of forests to absorb tropical rains increases runoff, resulting in the reduction of topsoil on agricultural lands, the siltation of dams and irrigation systems and damage to agricultural crops, and the destruction of entire villages by flash floods and mudslides on denuded hillsides. There is abundant evidence that deforestation causes both more intense rainfall during the rainy season, thus increasing the costs of runoff, and longer periods of drought, reducing water quantity and quality for industrial, recreational and domestic uses. In the worst case, it can cause the desertification of productive land. Deforestation also increases sedimentation of rivers and coasts and causes pollution of rivers with diesel fuel, drastically reducing fish catch. (66)

Estimating the monetary costs to society of the direct and indirect environmental consequences of timber extraction in a particular country requires a major research effort, and it has not been done systematically anywhere. (67) But it is clear that the social costs that are not reflected in the prices of raw logs in trade are economically significant. The disparity between the timber and wood product prices in the market and prices that reflected the full social costs of production would be very large in many cases. Although the social costs from logging are lower in temperate and boreal countries, some disparity between market prices and actual costs to society from environmental externalities would certainly be found in those countries as well.

B. Subsidies to the Marine Fisheries Sector

The marine fisheries sector has been shaped by government subsidies in recent decades far more than the forestry sector has, and the environmental impacts of those subsidies may be even more serious. The role of subsidies has been conditioned by a larger structural characteristic of the marine fisheries industry: the "common property resource" or "open access" regime in which it operates. In this regime a fishing company has no effective property rights, and they compete for shares of the same stocks of fish. This common property resource regime creates a "tragedy of the commons": fishing companies rationally calculate that any fish they leave in the water will be caught by someone else, so they have an incentive to "mine" the resource as rapidly as possible, without regard to its sustainability. (68) With no assurance of a given share of the allowable catch, they must increase their fishing power to maximize the catch per unit of effort. (69) With no practical limit on the numbers of fishing companies who have access, and no right to a share of the resource, the fishing industry has an inherent tendency toward both overcapitalization and overexploitation of marine fishery resources.

Explicit Subsidies

Explicit subsidies, both direct and indirect, have significantly exacerbated the tendency of marine fisheries toward overcapitalization and overfishing. In the crucial period of the 1950s and 1960s, the rise of government subsidies to the fishing industry gave a major impetus to the modernization of the fishing fleet in many countries. Low interest loans typically covering 50 to 80 percent of the costs of new vessels or modernizing existing boats, with repayment periods ranging from 6 to 20 years. (70) Outright grants for the initial costs of purchasing fishing boats or gear were also employed when generous loans failed to stimulate sufficient private investment in marine fisheries. Some governments (the United States, Canada and Belgium), guaranteed loans for the entire amount of mortgages on boats. Relief from taxes and from import duties on fishing vessels, gear and equipment was also a common form of subsidy. Operational subsidies, i.e., payments to vessel operators to cover their losses and price supports, began as a means of tiding the industry over during a time when prices were low and/or costs were high but became permanent fixtures in the fishery policies of some countries (UK, France). And some governments subsidized the construction of fish processing plants through grants, loans or sale at bargain prices. (71)

During the 1950s and 1960s, there was no increase in the number of vessels in the world's fishing fleets, except in the case of Russia. But in most fishing fleets, there was a major leap in the tonnage and catching power of the vessels. In Japan, the number of fishing craft decreased by 15 percent in the 1948-1960 period, but the total tonnage rose 43 percent and the horsepower of the fleet by 92 percent. Highly mechanized fishing fleets were able to roam move much faster and farther, and they became far more efficient in catch per unit of effort. Revolutionary fishing technologies came into general use during this period: radar, sonar and electronic navigation aids to locate the fish more easily, fine mesh gill nets and other gear to catch more of them and freezers on tuna boats and large refrigeration ships to carry them to processing facilities. (72)

There can be little doubt that the subsidies poured into the industry were a major reason for the

extent and rapidity of these changes in a number of the world's major fishing fleets. In the case of Canada, federal and provincial governments financed most of the costs of new vessels and modernization of existing vessels, up to half of it in the form of outright grants. (73) A government report in 1970 concluded that subsidies had led both to a rapid expansion in the number of vessels of 25 grt (gross registered tons) or larger, and to the development of a modern fish processing industry. It confirmed that subsidies were responsible for overcapitalization in both fishing and processing. (74)

The United Kingdom's fleet was also revolutionized through government-supported vessel modernization. In 1951, the fleet consisted largely of coal-burning vessels that were on the average 40 years old. But the government provided almost $100 million in grants and loans between 1951 and 1960 for vessel modernization, with the result that by the early 1960s, 90 percent of the fleet was less than ten years old, and it had many times the fishing power than it had a decade earlier. (75)

The subsidy-driven modernization of fishing fleets brought about a dramatic intensification of fishing that quickly began to overwhelm the regenerative capacity of the fish stocks. Between 1956 and 1965, the world's fisheries output increased by 50 percent. (76) By the first half of the 1970s, the catch of four major groundfish species (Silver hake, Haddock, Cape hake and Atlantic cod) were already in sharp decline. (77) Fishery output in the waters of the European Community doubled between 1958 and 1968, and some of the most popular species, such as herring and cod, were already being overfished. The annual average annual catch of adult herring in North Sea waters increased from only 0.6 million tons in the 1950s to 1.7 million tons in the 1960s. By 1977, however, the herring catch had fallen to less than a third of the 1960s average. (78)

But governments and fishing fleets were able to ignore these danger signs by simply moving from fisheries that had been overfished to new fishing grounds, in a pattern called "serial overfishing." (79) Even as fishing grounds were beginning to decline because of overcapitalization and overcapacity in the industry, European countries were increasing their subsidies to stimulate even more investment in vessel construction and modernization. Most European countries were still focused on modernizing the vessels belonging to their nearshore fleets, while offering payments for scrapping older vessels, and for "laying up" vessels (temporary withdrawal from fishing). These laying up premiums, prompted in large part by moratoria on fishing for certain overfished species and the expectation that EEC stocks would eventually rebound, were essentially operating subsidies for idle capacity, which effectively maintained overcapacity rather than reducing it. (80)

Six major European fishing states spent a total of $275 million in 1980 to subsidize the increased fishing power of their fleets.(81) And the EEC itself, which had been making grants to fishermen for new or modernized vessels since 1970, increased its contribution to that objective to about $40 million in 1983. (82) This combination of national and EEC subsidy programs were largely responsible for more than tripling the engine power of the national fleets of EEC member states between 1970 and 1983. (83)

This further increase in overcapacity took place despite the oil price hikes and subsequent slow growth and high inflation in many European states, the loss of distant water fishing grounds because of the establishment of 200 miles exclusive fishing zones by coastal states, and the evidence of declining catch from overfishing, which raised uncertainties in the industry about whether fishing quotas would be available in the future. (84) In an undistorted market, these conditions would undoubtedly have produced a withdrawal of investment from marine fisheries, a reduction in fishing effort and a significant easing of pressure on fish stocks.

The EEC continued to increase its financial support for fisheries between 1983 and 1990, providing

premiums for laying up and scrapping vessels, loans for construction or modernization of nearly 900 vessels each year in member states, and support for new fisheries agreements. EEC subsidies thus had the effect of replacing the least efficient vessels with the most efficient ones, exacerbating still further the problem of overcapacity. (85)

Subsidization of fuel costs, whether through rebates, tax exemptions or official sales at concessionary prices, has become one of the most important forms of financial support for fishing fleets. The value of fuel subsidies to the fishing fleet of the former Soviet Union was estimated at $5-6 billion annually. (86) And it is widely used in APEC member economies, including the United States, Canada, Japan, Taiwan, and Indonesia). (87) Paying all or part of the costs of fuel for fishing vessels has both an overcapitalization effect and a technology effect as well. It tends to encourage the use of more expensive fuel-intensive engines, which allow fishing vessels to range more widely and to harvest fish stocks that had been less exploited because of their distance from port. (88)

Strictly speaking, the fishing industry has not been subsidized by government failure to capture rent, because the overinvestment generated by an common property, open access regime causes total costs to equal total revenues, and the rent disappears from fishing within a given jurisdiction altogether. (89) However, many fishing fleets obtain free access to fishing grounds from their own government, meaning that the right to harvest fish is given away. Many countries waive the payment of fees for access to their national economic zones to their own fishing fleets. (90) And developed countries with highly mechanized distant water fishing fleets provide those fleets with free access to the national economic zones of developing countries by paying the license fees for them. The EU contributes half the costs agreed to by individual members for access by their fishing fleets to developing country fishing zones. The EU spends about $200 million annually for such fishing rights for its fleets, half of that for African countries. (91) These distant water fishing fleets usually capture an extremely high percentage of the catch in the fishing zones of developing countries. (92) The environmental cost of these subsidies in terms of overexploitation is increased by the inability of some developed countries to police their EEZs and the blatant underreporting of the catch by foreign vessels. (93) Already more than 25 percent of all fish consumed in the European Union member countries are caught by EU-registered boats in the waters of developing countries. (94)

Both price controls and export controls on fish have been used to provide a subsidy to the domestic fish processing industry. In 1984 Canada banned the export of certain species of herring and salmon in unprocessed form, arguing that the purpose was to conserve exhaustible stocks of natural resources. The export ban subsidized Canadian processors by making artificially cheap fish available to them. (95) The Finnish processing industry was more directly supported with subsidized prices of herring and sprats at various times to keep prices at a steady level throughout the year. (96) The environmental impact of such subsidies is to further undervalue the stocks of herring and salmon, to increase demand for processed fish and to reduce the incentive for the processing industry to be efficient in its use of fish.

Because of overcapacity and the absence of rents, the fishing industry loses massive amounts of money every year. The FAO has estimated that the worldwide fish catch is worth approximately $70 billion annually, but that industry costs are in the neighborhood of $124 billion annually. The $54 billion in estimated annual industry losses are covered in part by fisheries subsidies and in part by commercial debt. The Japanese fishing industry has incurred $19 billion in financial liabilities, an unknown proportion of which has been assumed by the Japanese government. The FAO has suggested that most of the global fishing deficit has been underwritten by governments, mainly Japan, the former Soviet Union and the combination of European states and the EU. (97) But there is no published data on subsidies to support such a conclusion.

Figure 2 presents estimates of explicit fisheries subsidies in APEC member economies. The data on

which these are based are incomplete, because the topic has become politically sensitive. Most of the published data available reflect only direct subsidies from budgeted programs, excluding many tax exemptions and indirect subsidies. In some cases, indirect subsidies must be estimated on the basis of partial information and projections. A particularly important gap in the data is the assumption of debt by governments. For some countries, the only data available are for one type of subsidy. So the estimates understate the extent of subsidies in APEC member economies.

Implicit Subsidies

Whatever the true level of subsidies to the fisheries industry from government intervention, the unpaid environmental costs of overfishing the world's fisheries may be an even greater source of subsidy. As noted in the timber case study, to ensure that markets work to allocate resources efficiently, the prices of fish should include the extraction cost, the cost of environmental damage that is caused by the extraction and the user cost, or opportunity cost foregone by consuming the resource rather than leaving it for future consumption. But in fact, the prices of fish do not include either of these social costs, thus conferring an implicit subsidy on commercial fishing.

The first step in calculating the full costs of fishing under conditions of overcapacity is to estimate the value of fish stocks that are lost through overfishing and that could be recovered through reduced catch and stock rehabilitation. The FAO estimates that proper management of depleted stocks could increase fishing revenues by $15 billion annually. (98) Such an estimate would be the basis for calculating the intertemporal user cost of the present level of overfishing. The intertemporal user cost would be calculated by adding all benefits of reduced harvesting in future years that are now being foregone by overfishing and applying an appropriate discount rate to that total. (99)

The primary environmental externality associated with the overexploitation of fisheries resources is fish stock depletion that cannot be completely reversed because of fundamental changes in marine ecosystems. Mining marine fisheries often involves taking so many fish -- or taking so many young, undersized fish as bycatch -- that it disturbs the ecosystem, either through changes in the genetic diversity of fish stocks or by permanent alteration in predator-prey relationships. That can lead to long-term decline of the fish stocks. In the cases of demersal stocks in the Yellow Sea and East China Sea and pollock in the central Bering Sea, for example, fish stocks have fallen to one-fifth to one-tenth of levels that prevailed before the overfishing of the 1950s and 1960s, with no prospect of early recovery. (100)

When the social costs of environmental externalities of overfishing are combined with the intertemporal user cost, the total subsidy conferred by global society -- and future generations -- on fishing through market prices could be approximated. That subsidy is undoubtedly much larger than the total of fisheries subsidies through official interventions on behalf of the industry.

The implicit subsidy to fisheries production could be reduced or eliminated either by imposing a tax on fish catch that would reduce fisheries output to the socially optimal level or by a new set of regulatory interventions that would reduce the incidence of externalities and opportunity costs of fishing. At present the resource is being priced artificially low because of failure to internalize environmental externalities. (101) Assuming that fish prices are highly elastic, i.e., that consumers will buy progressively less of a fish as the price goes up, a tax on fish catch could be devised that would have the effect of reducing the fish catch. (102)

The case for a reform of the regulatory system for fishing, however, is even more compelling, given the fact that the common property or open access regime for fishing exerts such a powerful pressure on fishery resources. The common property/open access fisheries regime is, in fact, the main cause of environmental externalities in the fisheries sector and thus the main source of implicit subsidies

to fishing. The most urgently needed subsidy reform in the fisheries sector, therefore, is to eliminate the system under which fishermen must compete against each other for shares of the catch.

That would require assigning to fishermen companies property rights or "exclusive use rights" to a share of total catch of a species that could be traded and therefore would have long-term value. Such an exclusive use right would give the owner an interest in future returns to investment in fishing, and therefore in preventing depletion of the fish stocks. Individual transferable quotas (ITQs) are percentage shares of a total allowable catch allocated to an individual fisherman who can sell them to someone else. In a number of commercial fisheries in Canada, Iceland, New Zealand and Australia, ITQs have been shown to reduce the level of capitalization in the industry, increase profitability and eliminate the incentive to take as many fish as possible. Although an ITQ regime would require an increase in administrative capacity to monitor fish catch, it can also be administered so as to pay for the costs of that increased capacity. And most quota holders would be far more cooperative with authorities in enforcing quotas strictly than they are under an open access regime. (103)

III. POLICY IMPLICATIONS AND PROPOSALS

These case studies underline the importance of reforming natural resource management policies and practices that directly or indirectly subsidize extraction or harvesting of the resource and contribute to resource depletion as well as distorting trade in many cases. These problems could be addressed in the next few years in several possible international fora: the World Trade Organization (WTO) and its Committee on Trade and Environment (CTE), the Convention on Biological Diversity (CBD), the Intergovernmental Panel on Forests (IPF), and the Asia-Pacific Economic Cooperation (APEC) forum. I will assess briefly the potential for each of these fora to make substantive progress in moving toward reform of natural resource subsidies, and offer specific suggestions for APEC's work in this area.

The World Trade Organization

The Uruguay Round of global trade negotiations included a new subsidies agreement as well as a separate agreement on agricultural subsidies and an agreement to establish a new Committee on Trade and Environment. The agricultural agreement is supposed to bring about a total reduction in those subsidies regarded as "trade distorting" of 20 percent of an Aggregate Measure of Support for the 1986-88 base period. But the agreement also legitimized EU subsidy payments to farmers, which cannot be challenged until 2003 at the earliest. (104) Efforts by the United States and the "Cairns Group" to include the fisheries sector in a comprehensive agreement to reduce agricultural subsidies were unsuccessful due to opposition by Japan and other East Asian fishing states. (105)

The new subsidies agreement will affect some natural resource subsidies, but will leave others untouched. Apart from the fact that it exempts agriculture from its provisions for multilateral or unilateral actions against subsidies that harm a WTO members domestic industry, the code's definition of subsidy appears to exclude many environmentally important forms of subsidy from its scope. It defines subsidy as a "financial contribution" provided by, or at the direction of, a government, including a direct transfer of funds, uncollected revenues that would otherwise be owed the government (citing the example of "fiscal incentives such as tax credits"), or the provision of a good or service to a firm or industry. (106)

This definition makes it difficult for a WTO member to take action against another member which subsidizes a natural resource industry by charging too little -- or nothing -- for the right to extract

natural resources. The failure of governments to capture rents from logging concessionaires and the waiving of or paying for fisheries access fees would thus fall through the net of the subsidies code.

Nor does the WTO code cover the use of tariff policies to subsidize natural resource producers, either by protecting high-cost producers through high tariffs on imports, as in the case of coal, or by providing cheap logs to processors through prohibitively high tariffs on log exports.

Other natural resource subsidies affecting trade are not covered by the WTO subsidies regime, either because their impact on international trade operates through agricultural commodities (i.e., irrigation subsidies in the United States) or because their impact on trade is dispersed across many industries (i.e., energy subsidies). And of course the subsidies regime does not cover implicit subsides, for which trade measures may not be an appropriate policy response in any case.

Some natural resource subsidies could probably qualify for multilateral or unilateral action under the subsidies code. It could be shown that Germany, Belgium and the UK are impeding coal exports to those countries, and that they are covering the operating losses sustained by the industry, which make their coal subsidies actionable. It could be shown that some fish exporting countries are covering operating losses sustained by the fishing industry. And the fishery subsidies provided by several countries probably amount to more than five percent of the value of the exported fish and are thereby actionable under the code.

The WTO Committee on Trade and Environment (CTE), which was established by the 1994 Uruguay Round agreement, is not likely to negotiate any new binding agreements on environmentally-related trade issues. But it could prepare the groundwork for future such agreements to be negotiated elsewhere. The CTE has discussed the environmental benefits of removing trade restrictions and distortions, including subsidies, in 1995 and 1996, focusing almost entirely on agricultural subsidies, which are of concern to a number of members of the committee. Argentina, which chairs the committee, has proposed that the CTE develop a work program to identify ways and means to reduce and/or eliminate environmental degradation due to trade restrictions and distortions in the agricultural sector.

Other sectoral subsidy issues, such as logs, fish, and coal, have not thus far been the subject of discussion in the CTE. But the CTE could be a forum for documenting the case for environmental benefits from subsidy removal and proposals for developing work programs on those issues.

The CTE will not deal, however, with the problem of implicit subsidies. The OECD countries have reaffirmed their opposition to the idea that subsidies be defined in global trade rules to include within their scope the failure of government to force producers to pay the costs of environmental externalities and that countervailing duties be permitted as a response to lower environmental standards. (107) So there would be no support for opening a discussion of implicit subsidies in the WTO.

The Intergovernmental Panel on Forests

The U.N. Commission on Sustainable Development established the Intergovernmental Panel on Forests (IPF) in 1985, with a mandate to make recommendations for global cooperation on forests. The IPF has had three sessions, and has produced a very long, heavily-bracketed text for further consideration at its fourth and final meeting next April. The text does not break any new ground in regard to concrete actions to curb deforestation. Log export restrictions to encourage domestic processing are referred to in the current negotiating text as non-tariff barriers whose elimination could bring about "better access of forest products to the international market." However, the G-77 has bracketed that reference as unacceptable, and an NGO proposal suggests that log export restrictions "may promote the attainment of sustainable forest management."

A number of different formulas are under discussion for national and international action on tariff and non-tariff restrictions on trade in forest products, including a request to the WTO to continue to promote reduction in such trade barriers. (108) The IPF will probably create another forest policy forum to continue an international discussion of trade-related issues, among other topics, for as long as three to five years. That follow-on body could be a forum for documenting the environmental effects of subsidies in the forest sector and urging further international action on the issue. Judging from the discourse on these issues within the IPF, however, the CSD-sponsored process on forests appears to be dominated by representatives of government agencies that have little concern for the environmental consequences of subsidies.

The Convention on Biological Diversity

The Conference of the Parties of the CBD decided to address conservation and sustainable use of coastal and marine biological diversity at its second meeting in November 1995, and requested that its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) make recommendations on scientific, technical and technological aspects of the problem. In the final report of its first meeting, the SBSTTA recommended that the COP "identify constraints, including economic, for conversion of fishing gear and phase-out of fishing over-capacity, and the possibility of reducing subsidies for fisheries." (109)

The COP had a contentious debate on that recommendation with some delegates arguing that the subject was politically sensitive and had potential trade implications. But the COP authorized the Executive Secretary of the COP to use an experts' meeting to evaluate all subsidies, including those to the fisheries sector, that affect conservation and sustainable use of marine and coastal biological diversity in light of Article 11 of the CBD, which calls for economically and socially sound incentive measures for conservation of biological diversity. (110)

A meeting of country experts will be convened by the Secretariat of the CBD in early 1997 to discuss priority issues, and the evaluation of the impact of subsidies on marine and coastal biodiversity could be included among those issues. The CBD could be an important venue for discussing the issue of subsidies to the fisheries sector in the next two years. It is a somewhat more favorable venue than those discussed above because of the greater representation of environmental ministries in the convention's COP.

APEC

APEC is potentially a favorable forum for dealing with natural resource subsidies. In the APEC context, subsidies can be considered in the context of far-reaching trade liberalization without the fear of trade sanctions that inevitably accompany the subject in the WTO as well as the CSD. APEC is committed to integrating environmental considerations "in all sectors and at all levels" of its work, and it is now at the stage of beginning to decide how environmental issues fit into the work plans of its sectoral and cross-sectoral working groups. This process is going forward against the backdrop of the "Osaka Action Agenda", which calls for all APEC fora, including sectoral working groups, to begin work on actions aimed at trade liberalization and facilitation.

The first APEC working group to include natural resource subsidies in its work program is the Fisheries Working Group (FWG), which agreed in June 1995 on an "Action Program for Fisheries" which includes fisheries trade and investment liberalization as one of its two basic priorities. The effects of subsidies on management are among the four areas to be explored. At its May, 1996 meeting in Santiago, Chile the FWG agreed to undertake a four-year fisheries sector trade studies

program, mainly focused on assembling comprehensive, comparable and up-to-date data on tariffs, non-tariff measures, investment measures and subsidies. (111)

The FWG subsidies study, which will take place only in the final year of the four-year program (i.e., in the year 2000), will use the narrow definition of subsidies in the WTO subsidies code, thus putting many important sources of subsidy technically outside its scope. (112) If successful, however, it would be the first ever comprehensive documentation of the direct, budgetary subsidies for fisheries in APEC member economies. The results of that study could, in turn, provide the basis for further work in the FWG and in other APEC fora on the aim of reducing and phasing out natural resource subsidies.

Apart from the FWG, the APEC institution that appears to be most appropriate to deal with the issue of natural resource subsidies as both an economic and environmental policy issue is the Economic Committee, established in 1995 as the result of the 1994 Joint Ministerial Statement in Jakarta. The Economic Committee is a forum for dialogue on both trade liberalization and sustainable development in APEC member economies. The term "subsidies" is certain to touch political sensitivities in that forum, as it does in every other international forum, but given its broad, cross-sectoral mandate, the Economic Committee could consider the subject of natural resource subsidies without having to put that term on its work program.

Instead, the Committee could adopt as part of its work program the problem of economic instruments to ensure sustainable natural resource management. That approach would have three distinct advantages. First, it would locate the discourse in the context of natural resources management and sustainable development in general, rather than in the arena of trade liberalization. In other words, it would deal with the problem in the context of economic instruments rather than as a trade policy issue, thus steering clear of the contentious problem of trade sanctions. The economic instruments approach should lend itself well to cooperation among economists and resource management specialists, thus depoliticizing the issue. Second, the concept of using economic instruments to manage natural resources and the environment is one with which APEC member economies have already become comfortable. Economic instruments use market signals rather than direct regulation to manage environmental problems, modifying relative prices through taxes, charges or other economic incentive measures, including subsidy removal. (113) It would be more difficult for representatives of member economies in the Economics Committee to reject an economic instruments approach than a directly trade-related approach to natural resource subsidies.

Third, the economic instruments approach could take as a point of departure basic principles on natural resource pricing that have been agreed to over the past decade both in Agenda 21 and within the OECD. As noted above, OECD ministers have endorsed the "User-Pays Principle" as part of national pricing policies for natural resources aimed at economizing on the use of the resource. They have also adopted a pricing rule for renewable resources that the price should cover both the resource itself and the externalities associated with its production and use as well as the depletion cost of short-run consumption. (114)

Moreover, Agenda 21 included clear commitments to "incorporate environmental costs in the decisions of producers and consumers, to reverse the tendency to treat the environment as a 'free good' and to pass these costs on to other parts of society, other countries, or to future generations," and to "move more fully towards integration of social and environmental costs into economic activities, so that prices will appropriately reflect the relative scarcity and total value of resources and contribute towards the prevention of environmental degradation." (115)

Finally, the economic instruments approach would make it possible to raise the issue of implicit subsidies. By focusing on the pricing of natural resources, government officials and NGOs would be

able to broaden the discussion of subsidies well beyond the formal definition that will be used by the FWG for its data-collection work.

The Economic Committee work program could include an element on economic instruments for sustainable management of natural resources in the APEC member economies that would include the following activities:

- the adoption by APEC economies of the OECD's User-Pays Principle and pricing rule;
- exchanges of views and studies on the economic and environmental benefits of applying the principle and pricing rule in various natural resource sectors in the APEC member economies;
- development of methodologies for applying the pricing rule to different natural resource sectors;
- studies of the obstacles to applying the User-Pays Principle and the pricing rule in each sector and perhaps on an economy-by-economy basis, and ways in which those obstacles could be overcome.

Eventually, agreements reached on how full-cost pricing could be applied in various natural resource sectors could be integrated into the work program of the FWG, complementing the narrower approach it has now adopted. But more importantly, agreements on full-cost pricing could be integrated into the "Individual Action Plans" for trade and investment liberalization to which APEC member economies committed themselves at Senior Officials Meetings in Singapore in December 1995 and Manila in February 1996. Developing agreement in the Economic Committee on full-cost pricing would broaden the scope of these individual action plans and enhance their value.

FIGURE 1

Estimates of Rent Capture on Timber Concessions
Selected APEC Economies
(percent of total potential rent)

Philippines (late 1980s)	9-14
Malaysia (Sabah and Sarawak 1991)	35-53
Indonesia (1993)	20-33
Canada (British Columbia 1979)	33-67

Sources:
Philippines: World Bank reports summarized in Rigoberto Tiglao, "Forest Fires," Far Eastern Economic Review, March 23, 1989.
Malaysia and Indonesia: Jeffrey S. Hammer and Sudhir Shetty, East Asia's Environment (Washington, D.C.: World Bank, 1995).
Canada: Richard Schwindt, "The British Columbia Forest Sector: Pros and Cons of the Stumpage System," in Thomas Gunton and John Richards, eds, Resource Rents and Public Policy in Western Canada (Halifax, Nova Scotia: Institute for Research on Public Policy, 1987).

FIGURE 2

Estimated Annual Fisheries Subsidies
Selected APEC Economies
(billions of US dollars)

United States (1996)	.280
Canada (1990-91)	1.200
Japan (1995)	7.500
Taiwan (1991)*	.130
China (1990)	.800

*fuel subsidies only

Sources:

United States: U.S. National Marine Fisheries Service for on-budget support; Peter Weber, Net Loss: Fish, Jobs and the Marine Environment (Washington, D.C., Worldwatch, 1994)
Canada and Japan: McLeod, Market Access Issues for the New Zealand Seafood Trade (Wellington: New Zealand Fishing Industry Board, 1996) pp. 42, 64-65
Taiwan: Weber, Net Loss.
China: Xinhua News Agency, "Bank Provides Huge Loans to Fishing Industry," July 7, 1990.

Notes

(1) For an exposition of the economic concept of subsidy, see Warren F. Schwartz and Eugene W. Harper, Jr., "The Regulation of Subsidies Affecting International Trade," Michigan Law Review 70 (1972) 839-841. The economic principle underlying the economic concept of subsidy is often presented without using the term "subsidy." See, for example, Horst Siebert, Economics of the Environment: Theory and Policy (Berlin: Springer-Verlag, 1987); ***Please press the "BACK" button on your browser to return to the text of the document***

(2) Alan O. Sykes, "Countervailing Duty Law: An Economic Perspective," 89 Columbia Law Review (1989) 199, 204; Schwartz and Harper, "The Regulation of Subsidies," 840-841.

(3) Stephan Barg, "Eliminating Perverse Subsidies: What's the Problem?" in Subsidies and Environment: Exploring the Linkages (Paris, Organization for Economic Cooperation and Development, 1996), p. 29.

(4) See, for example, Schwartz and Harper, "The Regulation of Subsidies," which defines subsidies more broadly than taxing and spending and notes that this definition is "broader than others that have been employed. (p. 842)

(5) OECD, Integrating Environment and Economy: Progress in the 1990s (Paris: OECD, 1996), p. 32.

(6) See Gary Hufbauer and Joanna Shelton-Erb, Subsidies in International Trade (Washington, D.C.:

Institute for International Economics, 1984), pp. 10-11.

(7) Julian Lowe and David Lewis, The Economics of Environmental Management (Oxford: Philip Allan, 1980), p. 19.

(8) OECD, Integrating Environment and Economy, p. 32.

(9) See C. Ford Runge and Tom Jones, "Subsidies, Tax Incentives and the Environment: An Overview and Synthesis," in OECD, Subsidies and the Environment, p. 10.

(10) Ralph De Gennario and Gawain Kripke, Earth Budget: Making Our Tax Dollars Work for the Environment (Washington, D.C.: Friends of the Earth, 1993). For a summary of tax incentives that encourage extractive activities, see Dana Clark and David Downes, What Price for Biodiversity? (Washington, D.C.: Center for International Environmental Law, 1995), pp. 12-14.

(11) Kym Anderson, "Effects on the environment and welfare of liberalizing world trade: the cases of coal and food," in Kym Anderson and Richard Blackhurst, eds, The Greening of World Trade Issues (Ann Arbor: University of Michigan Press, 1992), p. 168. note 1.

(12) David Malin Roodman, Reforming Subsidies, Worldwatch Paper no. 133 (Washington, D.C.: Worldwatch, forthcoming)

(13) C. Ford Runge, Freer Trade, Protected Environment (New York: Council on Foreign Relations, 1994), p. 40.

(14) Anderson, "Effects on the Environment," p. 168.

(15) Benedict J. Clements, "Public Expenditure Policy and the Environment: A Review and Synthesis," in Bedrich Moldan, ed., Economic Instruments for Sustainable Development (Prague: Ministry of the Environment of the Czech Republic, 1995), p. 124; Jumanah Farah, Pesticide Policies in Developing Countries: Do They Encourage Excessive Pesticide Use? (Washington, D.C.: World Bank, 1993); Robert L. Paarlberg, "Managing Pesticide Use in Developing Countries," in Peter M. Haas, Robert O. Keohane and Marc A. Levy, eds., Institutions for the Earth: Sources of Effective International Environemntal Protection (Cambridge and London: MIT Press, 1993), p. 3`9.

(16) This method of subsidy is analyzed in depth in Jorge Miranda, "Las Restricciones a la Exportacion de Insumos Como Instrumento Para Subsidiar la Produccion de Bienes Finales," Working Paper 93-02, Direccion General Adjunta de Investigacion de Dumping y Subvenciones Unidad de Practicas Commerciales Internacionales, Secretariat de Comercio y Fomento Industrial, Mexico City, October 1993.

(17) The original concept of economic rent refers to a situation in which a portion of profits cannot be reduced through competition from additional suppliers, because other units of the resource cannot be made available at any price. This situation is not characteristic of natural resource markets, of course. See R. Paris and I. Ruzicka, "Barking up the Wrong Tree: The Role of Rent Appropriation in Sustainable Forest Management," ADB Environment Office Occasional Paper No. 1, May 1991, pp. 2-3. In the context of natural resource management, however, the term is commonly used to refer to the difference between the market value of the resource and the costs of attaining a socially efficient level of harvest (i.e., including a "normal" level of profit). See Edward B. Barbier, Joanne C. Burgess, Joshua Bishop and Bruce Aylward, The Economics of Tropical Timber (London: Earthscan, 1994), p. 67.

(18) Philip Webre, "Effects of Countervailing Duties on Natural Resource Subsidies," Staff Working

Paper, Congressional Budget Office, September 1985, p. 28.

(19) Ralph De Gennaro and Gawain Kripke, Earth Budget: Making our Tax Dollars Work for the Environment (Washington, D.C.: Friends of the Earth, 1993), p. 25.

(20) David W. Pearce, "Economic Incentives and Renewable Natural Resource Management," Renewable Natural Resources: Economic Incentives for Improved Management (Paris: Organisation for Economic Cooperation and Development, 1989), pp. 14-15.

(21) Concluding comments by David W. Bromley and David W. Pearce in OECD, Renewable Natural Resources: Economic Incentives for Improvement Management (Paris: OECD, 1989), p. 157.

(22) Ferenc Juhasz, "Guiding Principles for Sustainable Development in the Developing Countries," in Edward Dommen, ed., Fair Principles for Sustainable Development (n.p.: Edward Elgar, 1994), pp. 39-41.

(23) Bromley and Pearce, in OECD, Renewable Natural Resources, loc. cit.

(24) See Runge, Freer Trade, Protected Environment, Table 1, pp. 42-43.

(25)Robert Repetto, Trade and Sustainable Development (Geneva: United Nations Environment Programme, 1994), pp. 12-15.

(26) Dennis Mahar, Environmental Policies and Deforestation in Brazil's Amazon Region (Washington, D.C.: World Bank, 1988); Mary Pamela Lehmann, "Deforestation and Land Use Patterns in Costa Rica," in Harold K. Steen and Richard P. Tucker, eds., Changing Tropical Forests: Historical Perspectives on Today's Challenges in Central and South America (n.p.: Forest History Society, 1992), p. 59.

(27) See C. Ford Runge, Balancing Trade Liberalization and Environmental Interests (New York: Council on Foreign Relations, 1994), pp. 37-47; Kym Anderson, "Effects on the Environment and Welfare of Liberalizing World Trade: the Cases of Coal and Food," in Kym Anderson and Richard Blackhurst, eds., The Greening of World Trade Issues (Ann Arbor: University of Michigan Press, 1992), pp. 162-163.

(28) James A. Tobey and Henri Smets, "The Polluter Pays Principle in the Context of Agriculture and the Environment," The World Economy (January 1996), 68.

(29) Sandra Postel, Last Oasis (New York and London: W. W. Norton, 1992), pp. 156-157.

(30) The World Bank, Economywide Policies and the Environment: Emerging Lessons from Experience (Washington, D.C.: World Bank, 1994).

(31) Roodman, Reforming Subsidies.

(32) Anderson, "Effects on the Environment," pp. 147-149.

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(108) IPF Working Group II, Draft Text for Negotiation, "IV. Trade and Environment Relating to Forest Products and Services."

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(115) United Nations Conference on Environment and Development, A/CONF.151/4 (Part I), 22 April 1992, Adoption of Agreements on Environment and Development, Agenda 21, p. 101, para 8.31.(a) and (b).
