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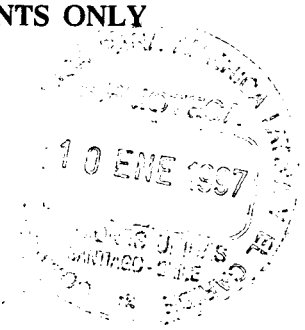

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DEMAND-BASED MECHANISMS TO FINANCE THE GREEN ENVIRONMENT IN LATIN AMERICA *

*/ This document has been prepared by Mr. Ramón López, University of Maryland, USA and University of Chile, Chile. The opinions expressed herein are the sole responsibility of the author and do not necessarily reflect the views of the sponsoring organizations.

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DEMAND-BASED MECHANISMS TO FINANCE THE "GREEN" ENVIRONMENT IN LATIN AMERICA

EXECUTIVE SUMMARY

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This paper argues that there are several basic issues which are necessary to clarify before even start talking about financing sustainability. The first is whether or not it is in the world interest to achieve environmental sustainability in the South. After the industrialized countries practically eliminated most remanent of the natural environment in the Northern hemisphere, it is likely that the consequences for the world of the South doing the same would be catastrophic. The economic cost of repairing even part of the environmental damages generated now at a world scale could eventually be extremely high if measures to prevent such additional damages are not taken soon. Thus, the answer to this first question is a clear yes and, hence, the world as whole should be prepared to finance environmental projects that would prevent such an environmental disaster.

The second question is whether international transfers (particularly from the North to the South) are likely to become an important source of funding for the South. If the North has a lot to gain by preventing the South from following the same path of environmental destruction that the Northern economies followed one would expect a large contribution from the industrial economies. Based on the experience of the last decade or so, however, this has not been nearly the case. Latin America, for example, has received less than US$500 million a year in concessional aid that somehow could be related to environmental sustainability (López, 1994). This is a minuscule figure when compared with the estimated funding needs for environmental sustainability in Latin America of over 2% of GDP, that is between US$20 and US$25 billion (The World Bank, 1992). It appears that, for various reasons going from lack of credibility of the public sector in the South to budgetary concerns and anti tax feelings in the US and other developed countries, one cannot expect a really significant contribution of the North to sustainability in the South despite the obvious gains for the world that such financial cooperation could, in principle, bring to the world.

If the international funding for the environment from official sources has been and is likely to continue to be almost negligible in the near future, then the burden of the financial effort will have to come from the South itself and, perhaps in part, from private sources from the North. The third question is then whether it is in the national interest of the countries in the South to promote environmental sustainability that is to be in large part financed by the South itself. Or, alternatively, if the environmental investments are likely to pass the vital profitability test required by the private sector to become a significant source of funding for such investments.

Based on the recent Latin America experience, it appears that there is a wide range of projects to improve the so-called "brown environment" that are profitable once adequate shadow prices reflecting individual country welfare are taken into consideration. There are some, mainly in the energy and sanitary sectors, that even have private profitability. Moreover, the acceleration of economic growth in Latin America seems to be increasing the opportunities for profitable investments in the "grey environment". Also, there is some evidence that the Latin American countries are now finding financial resources to improve the mechanisms to address air pollution and other urban environmental problems (Dourojeanni, 1996). This is also consistent with the results from empirical analyses that have found that most, but not all, of the grey resources start improving once per capita income reaches $4000 to $5000 per capita (see, for example, Grossman and Krueger, 1993). Several countries in the Region are now reaching these per capita income levels.

Something very different, however, happens with the "green environment". Few investments in the protection or in the truly sustainable exploitation of natural forests, aquatic natural habitats and other rural resources are currently profitable from the individual country perspective and much fewer are privately profitable. It has been suggested that eco-tourism, genetic prospecting, non-timber forest extraction and other environmentally sound forest exploitation could be activities that are simultaneously environmentally benign and profitable. Unfortunately, these activities generally do not pass the profitability test except in cases of, for example, highly unique sites from the point of view of eco-tourism and biological prospecting (Southgate, 1996; Southgate and Clark, 1993).

Given the large natural forests still remaining in Latin America, it is unlikely that forest conversion is not in the pure national interest of the countries in the Region. In fact, several recent studies in the Amazon have shown that most forest clearings for agriculture have had a high long run rate of return, even if calculated excluding all government subsidies (Schneider, 1993; Mattos, Uhl and Goncalvez, 1992; Ozorio de Almeida, 1992). The current level of natural forests are likely to be too large if the pure country interest is considered even if all positive national externalities are

fully taken into account. The only reason why the rate of deforestation is not even greater in many Amazon countries is that most of the remaining natural forests are in remote areas where the necessary public infrastructure (mostly roads and other services) takes time and large financial resources to be built. It is a problem of capital rationing or, ironically, insufficient financing, rather than a lack of potential profitability that is delaying a much greater forest destruction in many Latin American countries. It is only when the global forest externalities (i.e., carbon sequestration, biodiversity reserve) are taken into account that deforestation in most natural forests in the Region becomes a bad "business" (López, 1996). There are indications that the recent acceleration of economic activity combined with increased private capital investment and a greater availability of financial resources for the public sector that the economic recovery is causing, is inducing a resurgence of deforestation in Latin America (Dourojeanni).

The implication of the above is that the Latin American governments are as disposed to protect the green environment as the currently developed countries were 50 or 60 years ago. With the exception of certain geographic sites that are of critical importance to protect important watersheds or that have a special value for eco-tourism or for genetic prospecting because of their uniqueness, governments in the Region are not likely to truly be interested in making their exploitation sustainable. This in spite of the profusion of declarations, "action plans" and even legislation and other forms of mostly public relations to appease the international and the national environmental lobby. A recent good example of this is the lack of implementation of the Tropical Forest Action Plan and of many land zoning legislation throughout the Region.

If sustainability for the green environment is not for the most part in the national interest of the Latin American economies and if governments and the private sector are at best willing to make a token contribution to such a goal, what are then the options to promote sustainability and prevent a possible environmental disaster? It appears that a good alternative is to use what has been regarded as an enemy of the environment, the market, as an instrument to achieve green sustainability. The idea is the development of an institutional system that can provide a mechanism for consumers around the world to express their environmental preferences and their willingness to pay for achieving green sustainability.

A base for a system like this has already been discussed and in a small part implemented with the eco-labelling system. What is needed is an institutional system that provides objective criteria to certify a large number of products according to the environmental soundness of their production processes. Also, international boards comprised of respected technical personnel to certify products in the various areas

should be established. A similar system is already in place and working quite well in many countries around the world in connection with the so-called organic foods. This system would allow consumers to pay a premium for certified goods according to their environmental preferences. Even more importantly, this would allow international trade organizations to establish trading criteria for the most important goods. The costs of the improvements in the environment that a system like this imply would be shared by consumers in the North and producers in the South, with the resulting cost shares being determined by the elasticity of demand of the products and the sensitivity of the cost of production to the environmental norms required for certification.

Countries that are able to guarantee the environmental soundness of their products early on will be able to extract above normal profits by exploiting the advantage of being an early producers of the "new goods". What environmental certification does is to introduce product differentiation on the basis of the environmental component of the production processes. If consumers, particularly in the rich countries are willing to pay for the environment, they will reflect this in the market place by paying a substantial premium for goods produced under environmentally benign conditions. Given that this may not solve free riding and other problems, it is also possible that countries take collective action to establish a duty system to prevent or discourage their consumers from buying products that do no meet the certification criteria.

DEMAND-BASED MECHANISMS TO FINANCE THE "GREEN" ENVIRONMENT IN LATIN AMERICA

Over the past few years, environmental sustainability in the South has become a matter of serious concern. After the currently industrialized countries practically eliminated a large portion of the natural environmental resources in the Northern hemisphere, there are clear trends indicating that the developing countries are doing exactly the same in the Southern hemisphere. There is a certain consensus that a repetition of the environmental destruction of the North in the South is likely to have serious consequences for the world´s ecological system, that could entail large long run economic costs and seriously impinge upon the growth potential of the world. Latin America could, in principle, make a large contribution to environmental sustainabilty given its enormous endowments of natural resources, particularly natural forests and biodiversity.

But, environmental sustainability in the South involves significant costs while the benefits, mostly accruing in the long run, are only in part likely to be retained by the South. The North would obtain large benefits out of the greater protection of the natural resources achieved by the South, particularly in terms of a lessening of threats related to global warming, ozone depletion and others. In fact, according to recent estimates, the additional costs (over and above the current expenditures) of sustainability may easily reach 2% of GDP, which for Latin America would be equivalent to about 20 to 25 billion dollars per annum (The World Bank, 1992). Thus, environmental sustainability implies large financing needs for Latin America which would have to be raised and also a sharing of these costs with the rest-of-the-world, particularly with the developed countries.

The purpose of this paper is to analyze the potential for international financial cooperation and certain conditions required for the succes of a strategy to obtain the necessary financial resources for environmental sustainability. In particular, the paper discusses the three questions posed in the title, what type of environmental projects are more likely to be succesfully financed, who could or should contribute to their financing and what mechanisms could be used to promote the required mobilization of financial resources? A basic assumption of the analisis is that individuals and private firms will participate in the financing of environmental projects only if it is profitable to do so and that the Latin American goverments may, but not necessarily, contribute to the financing of environmental projects that are beneficial to their respective countries. In fact, depending on the internal political economy conditions, on the institutional capacities of the governments and on the extent of government corruption, governments may not necessarily promote environmental projects that are clearly beneficial for their countries or they may even promote unsustainable activities. That is, a clear national interest is a necessary

but not sufficient condition for the national governments to participate in the financing and promotion of environmental sustainability. These assumptions may seem all too obvious to be even mentioned explicitly, but several analyses and the conception of many, sometimes expensive, programs for sustainability have implicitly ignored these behavioral assumptions.

The focuss of this paper will be the so-called "green environment" (natural forests, aquatic natural habitats and other rural resources) and will make reference to urban or brown environmental resources (air quality, sewage, urban water quality, energy, etc.) mostly for comparison purposes. Most of the global externalities are generated by the green resources and it is, therefore, in the preservation and sustainable exploitation of these resources that the most interesting issues regarding the interaction between domestic and international sources of financing arise.

1. GROWTH, POLICY DISTORTIONS AND THE GREEN ENVIRONMENT

Given that the comparative advantages of most countries in Latin America are still in natural resource-intensive activities, the green resources are those that receive the greatest pressures as the Region deepens its process of economic openess and economic growth is reactivated. It has been argued that it is futile to think on additional funding for the environment when many government policies have gone in the direction of promoting precisely an unsustainable use of the environment (Panayotou, 1995). Direct and indirect subsidies for agriculture, water use and forest conversion have been blamed for causing a great deal of destruction of natural resources (Binswanger, 199). Hence, the removal of these policies was considered to be the most effective way of financing sustainability and indeed a logical prerequisite to other forms of raising financial resources for this purpose. Over the last few years, most of these distortionary policies, including those that heavily subsidized credit and provided tax incentives for deforestation, have, in fact, been eliminated or greatly reduced in Latin America.

Given the nature of the comparative advantages of the Region, the recent economic revival and the increasing degree of openess of the economies, are rapidly becoming sources of serious pressures on environmental factors of production, roughly corresponding to the green environment, but, at the same time, the raising income levels are beginning to have a positive impact on environmental consumer goods, roughly corresponding to the "brown environment" (Dourojeanni, 1996). What happens is that both the green and the brown environmental resources are normal factors of production and consumer goods, respectively. Therefore, it is not surprising that increased economic growth tends to induce greater demands for a

better quality of the environmental consumer goods, particularly in the urban sectors, which is where most of the population in Latin America (about 70%) is concentrated. But growth also increases the demand for environmental factors of production, mainly of natural resources located mostly in rural areas.

The Latin American experience suggests that a wide range of projects to improve the "brown environment" are becoming profitable once adequate shadow prices reflecting individual country welfare are taken into consideration. There are some, mainly in the energy and sanitary sectors, that even have private profitability. Moreover, the acceleration of economic growth in Latin America seems to be increasing the opportunities for profitable investments in the "brown environment". Also, there is some evidence that the Latin American countries are now finding financial resources to improve the mechanisms to address air pollution and other urban environmental problems (Dourojeanni, 1996). This is also consistent with the results from empirical analyses that have found that most, but not all, of the brown resources start improving once per capita income reaches $4000 to $5000 per capita (see, for example, Grossman and Krueger, 1993). Several countries in the Region are now reaching these per capita income levels.

Something very different, however, happens with the "green environment". Few investments in the protection or in the truly sustainable exploitation of natural forests, aquatic natural habitats and other rural resources are currently profitable from the individual country perspective and much fewer are privately profitable. When the culprit of resource degradation was, or thought to be, mostly the policy distortions that were also attempting against economic efficiency, it was easy to recommend their elimination as a way of financing sustainability with the consequent win-win effect, more growth for the Latin American countries and better preservation of the environment for the world. But now the main source of pressures on the green environment is increasingly becoming economic growth itself, particularly in the context of an export-oriented strategy, which in part was originated in the removal of the distortions advocated in the name of the environment.

It is true that there is still a significant distortion in most Latin American countries that aggravates the tendencies toward the minining of the green resources, consisting in the lack of well- defined property rights on part of the land and other natural resources. A high proportion of the green resources are public property, which, in fact, given the lack of enforcement, many times, means open access. But, as shown below, there are many examples that illustrate the fact that even under exclusive and fully enforced private ownership of natural resources, their economic

value is dominated by alternative uses of the land that involve eliminating or greatly reducing the area under natural forests.

The case of the native forests in southern Chile is also illustrative. The opening up of the economy generated significant opportunities for exporting native forests in the form of chips mainly to the Japanese market. These opportunities have been fully used , with the consequence of a very rapid rate of native forest loss. (There are no reliable data of the true rate of native forests lossses in Chile, and the few estimates existing have been a source of great controversy, causing even the dismissal of the government researchers that obtained them. However, for any one visiting the forest regions in southern Chile and talking to a large numbers of residents, as the author did, the clear signs of large recent native forest clearing are fully corroborated with an almost unanimous assessment of the residents, who complain of rampant forest destruction). What is important is that this forest loss has ocurred almost entirely in privatly-owned lands with no problems of property rights enforcement whatsoever. It has been purely motivated by the fact that the profitability of the native forest transformed into wood chips for the export market clearly dominates that of the standing forests.

The revival of growth is already beginning to alleviate the financial situation of the governments making it possible to have more money to build new roads that for the most part facilitate access to areas where most rural resources are located, thus promoting their more intensive exploitation. Further, among the many lessons recently learned out of the structural adjustments, the governments in the Region learnt that they can, at least in part, overcome their financial constraints by using private road concessions as a way to promote more new roads without directly using their own resources. The new pill now is, therefore, harder to swallow ; to promote green environmental sustainability governments should restrain the environmental demands that growth imposes and reduce road construction into areas that are environmentally fragile. But this requires in one way or another putting limits to the use of the environmental resources and, hence, now, unlike the case when excessive resource degradation was due to distortionary policies, the countries of the Region have to pay a price for environmental sustainability in the form of less growth.

It has been argued that environmental sustainability is good for long run growth for the countries that implement it and, hence, that environmental sustainability, far from reducing growth, promotes it. This argument may have some validity when environmnental degradation is due to distortions but not when it is a subproduct of growth itself as is, in large part, the new reality in the Region. Of course there is some room for controlling natural resource degradation when it induces negative externalities of local or national consequences. But the scope of these limitations is

likely to be restricted to a relatively small part of the resource degradation induced by growth. Many environmental projects have been implemented under the asssumption that the environmentally benign exploitation of the natural resources may reconcile the economic growth and environmental sustainability objectives. Eco-tourism, genetic prospecting, non-timber forest extraction and other environmentally sound forest exploitations have been singled out as activities that satisfy these two goals simulatanously. Unfortunately, as several studies have shown, these activities pass the profitability test only in highly unique sites from the point of view of tourist attraction, biological specificity or particularly rich non-timber products (Southgate, 1996, Southgate and Clark, 1993). Ironically, the main reason why there are not large revenues or rents to be raised out of these environmentally friendly activities is the relative abundance of green resources in Latin America. Scarcity rents that would make these uses more competitive may appear once the green resources become much less abundant.

Given the large endowments of natural resources in most countries in the Region, particularly in South America, it is unlikely that green environmental sustainability is in the interest of the individual countries. Growth at the cost of part of the natural resources is probably profitable from the point of view of the individual Latin American countries as it was for the currently developed countries. Even if the discount rate were very small (and there are evidences that this is not the case), implying great concerns for the future generations, environmental sustainability would not necessarily be desirable strictly from an individual country perspective, although total asset sustainability could be. That is, a low discount rate would imply that the current generation would like to maximize current growth subject to maintaining or even enhancing the total value of the asset stocks, including man-made and natural assets. As long as there is a some substitution between natural and man-made capital, there is no reason why it is not in the interest of individual countries that have a large endowment of natural resources as most of the South American countries, to mine part of their natural resources particularly if this facilitates them to increase their man-made capital.

(The substitution potential for the consumers between man-made and domestic or natural environmental goods is likely to be greater at a country scale than at the world level. The reason for this is that the consumers´ welfare in a particular countriy is likely to be dependent not only on the environmental resources of the country of residence of the consumer, but also on the environmental goods available in other countries. This implies that the elasticity of substitution between non-environmental and domestic environmnetal goods of the representative consumer in individual countries is likely to be greater than the elasticity of substitution of the representative consumer of the world. Thus, sustainability at a world scale allows for

much less substitution between the two goods than at the individual country level, implying that the optimal asset combination at the world scale involves more environmental goods than at the individual country level).

Not all natural resource degradation, however, is consistent with economic growth. There are plenty of examples in Latin America where great natural resource losses have yielded very little growth or have been even counterproductive. Most countries in Central America have reached a level of forest loss that is causing serious economic losses due to soil erosion and to increased risks of natural disasters. Deforestation in areas where soils are particularly poor and inadequate to support agriculture or other activities even for short periods, or deforestation in steep areas and watersheds that is likely to cause negative consequences in terms of natural disasters, flooding and soil erosion, are examples of wasting natural resources with little or even negative growth effects for the countries. Deforestation of hill and mountain ecosystems, which is likely to be an indicator of deforestation with negative local externalities, has been even higher than in other ecosystems in Latin America. According to the World Resources Institute (1995), the annual rate of deforestation in these ecosystems was 1.2% in tropical Latin America during the 80's. That is, the rate of deforestation in steep areas has been more than 50% faster than in areas less likely to cause local or national negative externalities.

Much deforestation is, however, not wasteful. The "mining" of certain tropical areas for lumber, agriculture, minerals or oil can provide positive net returns to the countries to the extent that the loss of trees does not cause serious domestic negative externalities. Thus, if public policy is devised exclusively from the perspective of the individual countries, it would have to promote forest conversion to agriculture and other activities in areas that allow for positive rates of return after considering all local externalities. There is an optimal degree of deforestation from the point of view of individual countries, which given the current high levels of the stock of forests in most tropical South America, is probably far from being reached.

Contrary to the common perception, it appears that many forest conversions to agriculture and cattle production in tropical areas have generated adequate rates of return even if calculated excluding government subsidies. A recent study by Schneider (1993), using a large volume of empirical evidence of settlement and colonization projects in the Amazon, concludes that "...in economic terms, agriculture in the Amazon is doing relatively well..." and "...incomes and asset accumulation by colonists in the Amazon appear high relative to similar indicators elsewhere in

Brazil..."(p. 1)[1]. A study by Mattos, Uhl and Goncalvez (1992) found that ranching in the Eastern Amazon is economically viable under a variety of circumstances. In fact, they found that ranchers, particularly medium and large size holders, are currently investing in improving degraded pastures obtaining sizable profits. Furthermore, a detailed analysis by Ozorio de Almeida (1992) of five settlement projects in the Brazilian Amazon provides evidence that crop yields are increasing over time and that real land prices are rising.

Other studies, in particular FAO/UNDP/MARA (1992) and Jones et al. (1992), provide evidence consistent with the above findings. In particular, they also show that incomes in Amazon settlements are generally high allowing for significant rates of accumulation of capital and that the soil fertility has not declined.

The above empirical evidence covers settlement projects that have remained active over the last two or three decades. Trying to make generalizations for Amazon settlements out these cases is, however, risky mostly due to the sample selectivity biases that this may involve. The settlement projects that have survived for long periods are by definition those that were implemented in areas suitable for agriculture. The question is how many settlement projects have failed and effectively been completely abandoned due to lack of economic feasibility. The important thing is that these "abandoned" projects are not in the studies´ samples simply because they are "invisible".[2] An unbiased assessment of the agricultural potential of the Amazon can only be obtained by analyzing both surviving and non-surviving settlements. Notwithstanding this important caveat, what the existing empirical evidence seems to show is that profitable agriculture is feasible in many areas of the Amazon and that at least, part of the deforestation, can be a source of true economic growth.

If the global externalities of the Latin American tropical forests are also considered (carbon sequestration and biodiversity reserve), it is clear that the optimal level of tropical forests is much greater than if only intra-country effects are considered. It is even possible that global welfare maximization would require a forest area larger than current levels. On the other hand, welfare maximization of the individual Latin American countries may imply natural forest areas perhaps only modestly larger than

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[1]Schneider does indicate that turnover remains high and even abandonment of plots are still reported. He shows, however, that the most likely causes of these phenomena are differences in the opportunity costs and discount rates between early settlers and newcomers, as well as to certain government interventions, rather than to agronomic limitations of the soils.

[2]Schneider does include abandonment in his analysis, but this refers only to abandonment within projects that on the whole have survived.

those in North America or other countries in the North, where less than 10% of the original natural forests remain.[3] This could imply providing public incentives for the protection of ecosystems that clearly generate domestic positive externalities, including the preservation of river basins, watersheds, other water sources, recreation areas and forest areas important to prevent soil losses.

The main reason why the rate of deforestation in many heavily forested countries in South America is not even greater is that most of the remaining natural forests are in remote areas where the necessary public infrastructure (mostly roads and other services) takes time and large financial resources to be built. It is a problem of capital rationing or, ironically, insufficient financing, rather than a lack of potential profitability that is delaying a much greater forest destruction in many South American countries. It is only when the global forest externalities (i.e., carbon sequestration, biodiversity reserve) are taken into account that deforestation in most natural forests in South America becomes a bad "business" (López, 1996). There are indications that the recent acceleration of economic activity combined with increased private capital investment and a greater availability of financial resources for the public sector that the economic recovery is causing, is inducing a resurgence of deforestation in Latin America (Dourojeanni, 1995).

In summary, the Latin American governments are as disposed to protect the green environment as the currently developed countries were 60 or 80 years ago. With the exception of certain geographic sites that are of critical importance to protect important watersheds or that have a special value for eco-tourism or for genetic prospecting because of their uniqueness, governments in the resource-rich countries of South America are not likely to truly be interested in making their exploitation sustainable. This in spite of the profusion of declarations, "action plans" and even legislation and other forms of mostly public relations to appease the international and the national environmental lobby. A recent good example of this is the lack of implementation of the Tropical Forest Action Plan and of many land zoning legislation throughout the Region. (Dourojeanni, 1996).

2. THE POTENTIAL BENEFITS OF INTERNATIONAL COOPERATION: THE CASE OF TRADE IN CARBON EMISSIONS

If protecting the green resources is not in general in the interest of most countries in the Region, particularly of the heavily endowed countries of South America, but

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[3]Given the fragility of tropical soils, the role that natural biomass plays in tropical areas is more important than in temperate areas. Thus, one could expect that the individual country's interest would call for somewhat greater forest areas in the tropics than in temperate regions.

it is clearly in the interest of the world as a whole, then the only alternative to a more rapid degradation of the green environment is that, through international cooperation, the South American countries be compensated for at least part of the opportunity costs of the green resources. This section provides a rough estimation of the potential gains of trade in just carbon emissions between the tropical South American countries and the "rest-of-the-world". When we henceforth refer to international support for the South we do not mean foreign aid provided for the benefit of the individual countries that receive it, but, rather, mutually beneficial cooperation between the North and the South.

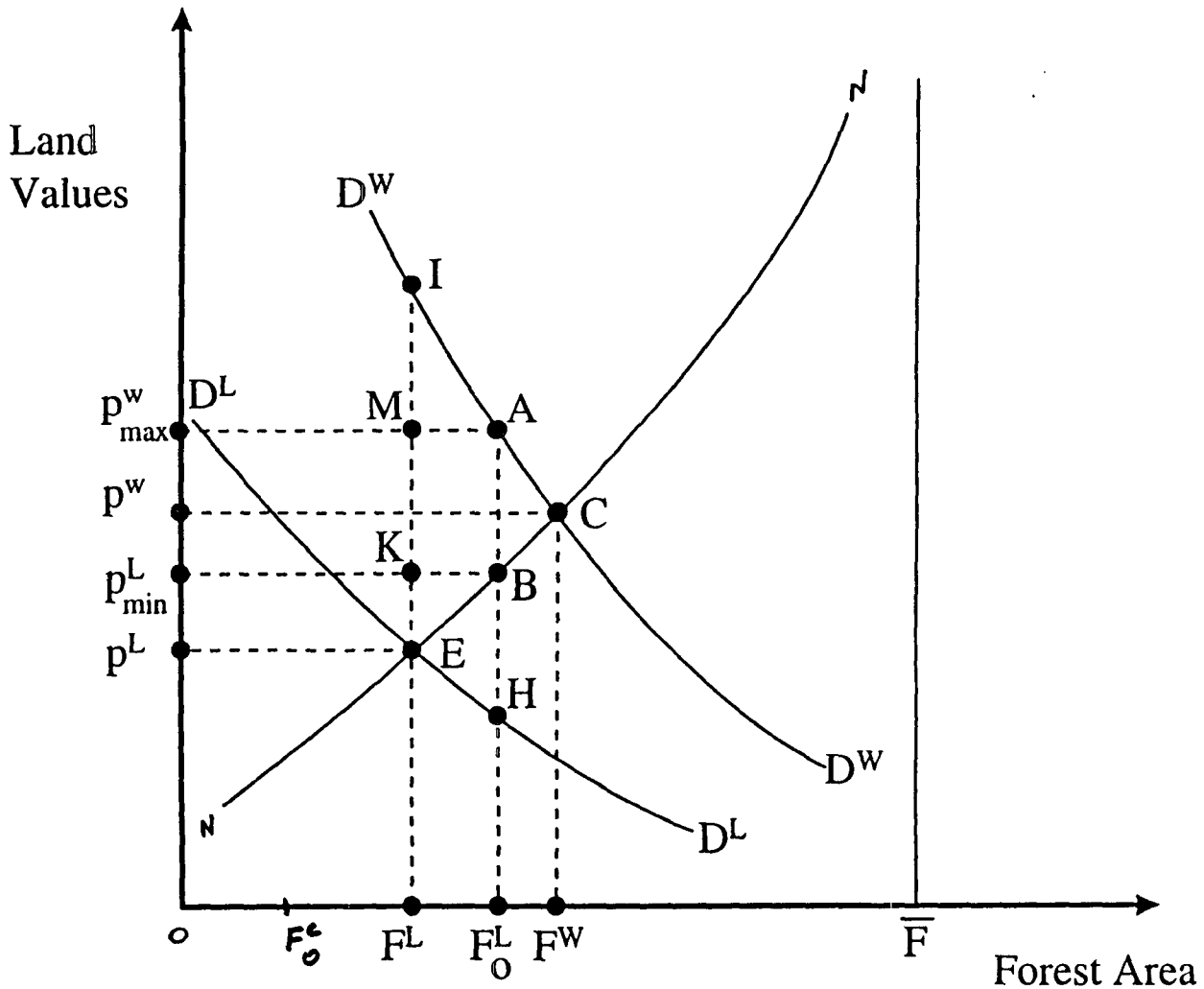
Land
Values
D^W
I
p^w_{max}
D^L
M
A
p^w
C
K
p^L_{min}
B
p^L
E
H
N
D^W
D^L
N
0
F^L_0
F^L
F^L_0
F^W
$\overline{F}$
Forest Area

Figure 1.

Figure 1 illustrates this. The horizontal axis measures the remaining forest areas before any settlement with F-bar being the land area originally covered with forest, or the maximum forest area, and the vertical axis measures the forest land (rental) value. The schedule NN represents the net marginal value product of the alternative uses of the forest lands (i.e., agriculture, logging, etc.). The schedule D^W shows the marginal value product of the standing tropical forest for the world as a whole and D^L shows the marginal value of the standing forest for the countries where the forest is located. The NN curve is upward-sloping reflecting the increasing opportunity cost that conserving a greater forest area involves for the country that owns the forest. The downward sloping of the D^W and D^L schedules reflect the increasing cost of deforestation for both the world and the landlord countries as the forest gets depleted. The position of the demand schedule D^w is naturally dependent on the availability of forest in the rest-of-the-world. Thus, the analysis is conditional on a fixed level of forest outside Latin America.

The D^L schedule includes all the benefits that the standing forest brings for the landlord countries, including protection against slide, floods, soil degradation as well as their valuation of biodiversity and carbon sequestration capacity. The D^W schedule is the summation of the D^L plus the benefits for the rest of the world that the standing forests provide (mostly associated to the avoidance of global climatic changes and the value of the biological reserves). This schedule is drawn as a convex curve to reflect the fact that the marginal value of the standing forests increases very fast as the forest stock declines.

Welfare of the world as a whole would be maximized at point C where the stock of forest is F^W and the marginal value of the forest is P^W. By contrast, the welfare of the landlord countries that owned forest is maximized at point E, at a forest level of only F^L and a rental value of the forested land of only P^L. Deforestation takes time and investments and, thus, the landlord countries may not yet be at the point of welfare maximization. Suppose that the current level of the forest remaining is between F^L and F^W as is the likely case in most of the tropical South American countries where there is still a large area covered with forests. If the world does not compensate the forest "owners", deforestation would continue at least to level F^L with large losses to the world (indeed it could go beyond F^L if the domestic externalities are not internalized). If the loss of natural forest is more or less irreversible (biodiversity losses, for example, are likely to be irreversible), the best that the world can do is to minimize further losses by stopping deforestation at level F^L_0.

The world can easily, in principle, compensate the landlord countries to stop further deforestation since the world marginal gains are P_{max} and the landlord countries'

marginal opportunity cost is only P_{min}. The actual compensation at the margin will be anywhere between these two prices, depending on the negotiating capacity of the landlord countries vis-a-vis the rest-of-the-world. Since the landlord countries also obtain benefits out of the standing forest (represented by D^L schedule), the rest of the world would only have to pay BH as a minimum and AH as a maximum. Indeed, the minimum total compensation in order to stop deforestation at F_0 would be the area EBH and the maximum possible total compensation would be the area IEHA. The important thing is that even if the rest-of-the-world pays the marginal price P_{ax} per hectare for all the excess (potential) deforestation ($F_0 - F^L$), the rest-of-the-world would still have a net gain of IMA.[4]

Forests at a level between the world optimum and the individual country optimum such as point F^L_0 in Figure 1, probably depict a situation that roughly prevails in most tropical South America. The situation in Central America and Mexico is perhaps better approximated by a point such as F^C_0 in Figure 1, that is, where the current forest levels are below even the individual country optimum. This distinction is important because international cooperation in the form of technical assistance, policy advice and concessionary projects to decrease deforestation (which are the most common forms of international involvement) are likely to be more effective and encounter true cooperation from the national governments in cases illustrated by F^C_0 than by those represented by F^L_0 in Figure 1.[5] In the latter case governments are not likely to cooperate and many international initiatives would be diluted.

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[4]In fact, studies have shown that the value of Amazon forested lands for agriculture or logging is less than its value for carbon sequestration (Schneider, 1993b). But, of course, this large carbon sequestration value is obtained by considering the benefits for the whole world. If only the Amazon countries' benefits of carbon sequestration are considered, the agriculture and logging value is probably greater.

[5]Given the current world concern about tropical forest losses, national governments are not likely to publicly recognize that their true objective is to exploit their forest resources more intensively. Greater forest exploitation in countries with still massive forest is not only economically beneficial for the countries' economies, but also, politically, forest colonization is often an important way of relieving social pressures stemming out of excessive land concentration and poverty. Additionally, forest development is a good instrument to attract foreign capital and establishing national sovereignty (López, 1992). The insistence of many countries in tropical South America in their expansion of roads and infrastructure into forested areas with or without international assistance is consistent with this hypothesis. Also, the wave of massive forest concessions that are currently being negotiated in various countries in the Region, is another indication of the true objectives of the country governments (Dourojeanni, 1995). The willingness of governments to actively promote forest loss has been recognized in the literature for a while: "...Most of the policies leading to forest loss and degradation are well intended , but others have been adopted with full knowledge of the destructive consequences" (Johnson and Cabarle, 1993, emphasis added by the author).

In the absence of a comprehensive program of action and compensation to reduce or eliminate deforestation, sporadic internationally financed projects to protect specific sites are likely to be rather ineffective even if the actual projects are successful. The reason for this is that, if countries are not committed to reducing deforestation, all that these projects achieve is to shift deforestation elsewhere. That is, a government may agree to receive aid to protect specific sites, but without a true national priority to reduce overall deforestation, more deforestation would be allowed elsewhere. There is a degree of substitution or fungibility in the geographic location of deforestation![6]

In summary, international policy advice, technical assistance and sporadic concessionary projects to arrest deforestation are more likely to be effective in countries that, because of their extreme past forest losses, are already below the optimum forest level from the perspective of their own national interest than in countries that could still individually benefit out of greater deforestation.[7] This is so because, in the former case, it is more likely that a coincidence of interests between the individual country and the rest-of-the world occurs, thus facilitating cooperation. This implies that international support in its present form is likely to be better invested in Central America and Mexico than in most of the still highly forested countries of South America.[8] In South America, international support should be very selective, being limited mostly to the protection of ecosystems that provide domestic positive externalities including watershed protection or that are particularly, unique and have little substitutability with other forests. Apart from those cases, the only way of having a significant effect in reducing deforestation in most of South America would be through a comprehensive international agreement that truly incorporates the national governments in the conservation objective by an adequate compensation mechanism.

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[6]Foreign assistance might still be effective in preserving certain unique localized ecosystems which might be particularly important to protect for special characteristics that are not found elsewhere. That is, foreign assistance to the still highly forested countries of South America can be effective when it is targeted to the protection of sites that do not have good substitutes.

[7]It is important, however, to focuses the international assistance on either protecting remaining natural forest or on degraded areas where their restoration is not too difficult and expensive. Some areas may, indeed, be so degraded that their restoration would be extremely expensive.

[8]It might be argued that there is too little forest remaining in Central America and the Caribbean to have any significant impact on carbon sequestration. Although deforestation has been very intense in those regions, in only five Central American countries (El Salvador, Honduras, Guatemala, Panama and Costa Rica) there are about 17 million hectares of natural forest remaining (Kaimowitz c). Moreover, there are large areas of secondary forests that can still be preserved. Additionally, there are certain unique ecosystems in Central America that are worth protecting for the benefit of the world.

Although the above arguments are valid from the viewpoint of intensification of the exploitation of forest resources, there is an important qualification to be made in connection with the way in which this process of intensification takes place. As shown in the next sections, it appears that deforestation in Latin America involves too much waste of potentially valuable timber due to the extreme reliance on fire as a means to clear forest lands. One reason for this may be insufficient roads and other infrastructure in remote areas to make logging profitable. If agriculture is less intensive in transportation than timber, we get that lack of adequate transportation would give forest burning for agriculture an advantage over logging.

In this latter sense, there is a certain coincidence of interest between the South American tropical countries and the rest-of-the-world. Since forest burnings are a major source of carbon dioxide emissions that contribute to the global greenhouse effect, a change in the method of deforestation toward more timber extraction and less forest burning is also in the interest of the world as whole.[9] Thus, there may be room for cooperation between the tropical South American countries and the rest-of-the-world in promoting this shift without any need for significant compensation. That is, even within the current narrow mechanisms of North-South cooperation, it is possible to achieve important gains for both, Latin America and the world. This would require to focus the international assistance more sharply in reducing forest burning instead of diluting the efforts in projects that are not economically feasible or in areas that because of their lack of uniqueness, are easily "substitutable ".

An important question concerns the costs of protecting a large portion of the remaining tropical forests in Latin America. The opportunity cost of the forest lands to be protected is difficult to estimate. But recent estimates of the land values of settlements in the Amazon can give an idea of the orders of magnitudes implied. The average land value in eight large settlements throughout the Amazon estimated by Ozorio de Almeida (1992) and reproduced by Schneider (1993a) in 1991 was US$219 per hectare or about US$245 in 1995 dollars. Since this includes the value of investments attached to the land as well as the value of part of the public

[9]It is true that most of the wood extracted will eventually be released into the atmosphere as CO_2 and, hence, that carbon emissions will increase regardless of the method of forest clearing used. There is, however, an important difference: When forest are burned, there is a massive emission of carbon gases over a very short time period, while if the wood is extracted for industrial uses, the emissions are spread over a long period of time. To the extent that the world ecosystem has a limited carbon clearing capacity per unit of time, and to the extent that carbon-reducing technological innovations are developed through time, a gradual emission of carbon is probably less serious as a source of greenhouse effect than if such emissions are concentrated in time.

infrastructure required to bring the land into production, the actual value of the undeveloped forest land for agriculture must be much less. Thus, the $245 per hectare represents an absolute upper bound for the opportunity cost of land.

The lowest observed average land value among the eight settlements was about US $70 in 1995 money. Since this value applies to the least developed and most remote settlement, we may use this value as a better estimator of the opportunity cost of undeveloped forest. Schneider (1993b) provides a range of estimates of the value of forest land in agriculture for various Amazon regions. He found that these values fluctuated between $2.50 and $300 per hectare.[10] Therefore, our $70 figure falls well within the range estimated by Schneider.

An opportunity cost of $70 per hectare implies a rental annual value of about $7 to $14 per hectare if we assume discount rates in the 10% to 20% range (and an infinite time horizon). Apart from the opportunity cost of the land, one also has to include the cost of physically protecting and managing the national parks.[11] Assuming annual management cost of the order of $2-3 per hectare, the total annual cost per hectare of forest land protected would range between $9 and $17. This would imply that a compensation of the order of US$6.5 and US$10 billion per annum could promote the conservation of a very large portion of the Latin American tropical forests, perhaps as much as 70% to 80% of it.

According to estimates by Goldemberg (1990), a tax equivalent to only one dollar per barrel of oil or six dollars per ton of coal-equivalent would generate $50 billion per annum. Thus, preserving a vast proportion of the remaining natural forest in Latin America would require a tax equivalent to less than 20 cents per barrel of oil (or $1.2 per ton of coal-equivalent). This would amount to about a 1% add-valorem carbon tax. Another way of putting in perspective this cost is to consider that the world GNP in 1994 was about $30 trillion and thus, the total forest protection bill would amount to less than 0.03% of the world income.[12] It would also be equivalent to about two weeks Pentagon budget!

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[10]These values, however, include the value of land attached investment as well as part of the public infrastructure value that is capitalized in the price of land.

[11]Also, it is possible that investment in forested areas may provide rates of return of capital above the market rates, that is, that a disequilibrium situation may prevail in which the rates of return to capital invested in formerly forested areas are higher than elsewhere in the economy. Compensation should, thus, also allow for this additional opportunity cost.

[12]Given that, as shown below, such a transfer would be beneficial for both, the North and the South, it should not be considered as part of foreign aid. For this reason, it is not appropriate to compare these flows with the current levels of foreign aid.

Schneider (1993b), using various estimates based on measures of the marginal world damage from global warming per ton of carbon, found that the cost per ton of carbon saved (i.e., not released into the atmosphere) varies between $1.8 and $66. The cost implicit in enacted carbon taxes, mostly in Northern European countries, ranges from $6 to $45 per ton of carbon saved. Multiplying the cost per ton of carbon by the carbon content per hectare of Amazon forest, he found that the value of carbon sequestration per hectare of the Amazon fluctuated between $198 and $803 when the marginal world damage cost estimates are used, and ranged between $671 and $4,950 when the implicit cost of carbon in the European tax scheme is used. Consequently, it appears that there is ample room for mutually beneficial trade in carbon emissions between the North and the South. The minimum price that the Amazon countries would require to avoid conversion of forest lands ($70 per hectare) is less than 40% of even the lowest estimates of the marginal benefits of the forest that the North would be willing to pay ($198 per hectare).

Using Figure 1, we can obtain a lower bound measure of the net benefits for the world of an agreement that would contract 650 million hectares in South America for permanent protection.[13] In Figure 1, according to the data just presented, assuming the lowest carbon sequestration estimated value per hectare, P_M^w = $200, P_{min}^L = $70 and F_0^L = 650 million hectares. Also, suppose that in the absence of an international agreement, the South would continue deforesting until only about 20% of the original forest remains, i.e., deforestation would cease at about 200 million hectares. That is, in Figure 1 we have that F^L = 200 million hectares. The total benefit for the world of implementing an international agreement that stops deforestation at 650 million hectares is equal to the area IABE in Figure 1. Since we do not know the slopes of the D^w and N curves, we cannot determine the size of this area. However, the minimum size of this area occurs if both, D^w and N curves were flat. That is, the minimum gain out of the agreement is the area AMKB in Figure 1, where KB = 450 million hectares and AM = P_{ax} - P_{in} = $130. Therefore, the minimum net benefit for the world of the agreement, considering just the carbon sequestration value of the Amazon, would be about $58.5 billion. This is the absolute minimum for two reasons: First, we are using the lowest carbon sequestration value per hectare of Amazon land and second, we are assuming that both the demand for carbon sequestration and the supply of forest land are infinitely elastic, clearly a highly unrealistic assumption.

[13]We use the 650 million hectares figure just as an illustration of the potential benefits of the agreement. More detailed studies would be required to establish the optimal forest areas to be protected.

Table 1. Net World Benefits of An International Agreement Under Alternative Scenarios Considering Carbon Sequestration Only

	Carbon sequestration value per hectare		
	Lower bound	Medium	Upper bound
	$200	$671	$4,950
World demand for forest and supply of forest schedules are infinitely elastic	$58.5 billion	$270 billion	$2.2 trillion
Unit elastic world demand forest and infinitely elastic supply of forest	$125.5 billion	$692 billion	$3.8 trillion
Unit elastic world demand and supply schedules	$146 billion	$713 billion	$3.89 trillion

Assumptions: (1) The agreement consists in saving 650 million has of tropical forest in Latin America (mostly in the Amazon).

(2) It is assumed that, in the absence of an agreement, the closed forest area in the Amzaon would decline to 200 million hectares.

(3) The lower bound carbon sequestration value per hectare corresponds to the lowest estimate of global warming costs available. The medium level corresponds to the lowest implicit value in the carbon taxes enacted in Europe and the upper bound corresponds to the maximum implicit value in such taxes.

Table 1 provides a range of estimates for the net gains to the world of stopping deforestation in the Amazon (leaving about 650 million hectares covered with forest), under alternative assumptions. The D^w demand schedule is likely to be rather steep, that is, as the forest is reduced, its marginal value for the world is likely to increase very rapidly. Hence, if we conservatively assume that the elasticity of demand for forest is equal to one, we obtain that the value per hectare of carbon sequestration increases as we move from F_0^L to F^L in Figure 1 from $200 to $655 per hectare. In this case, the area of IMA would be equal to almost $67 billion and the total net gain for the world would increase to $125 billion. Also, if the value per hectare of Amazon forest is estimated using the lowest implicit cost in enacted carbon taxes, $671 per hectare, then the net benefit of an international agreement would reach about $692 billion. The most plausible values among the estimates in Table 1, are probably those given by the medium scenario, with unit elastic supply and demand curves. This yields a net gain of about $713 billion. This figure corresponds to the total present value of the cumulative benefits for the world. Hence, using a 10% discount rate this implies a net annual benefit of about $70 billion, or approximately 0.2% of the world's GNP.

3. THE CURRENT CONTRIBUTION OF THE NORTH TO GREEN SUSTAINABILITY IN LATIN AMERICA

The previous section shows that only accounting for the carbon sequestration effect of the natural forests there are very large potential benefits to the world of protecting these resources from other unsustainable uses. Apart from the carbon benefits, there are additional benefits that are not likely to be entirely appropriated by the landlord countries, such as the preservation of genetic biodiversity and positive climatic influences of natural habitats that are harder to quantify, but not less important. This would suggest a high level of interest among both the northern and southern countries to cooperate or trade. The Latin American countries could obtain greater benefits by selling their rights to forest conversion than what they could obtain by doing so and the rest-of-the-world could also obtain a net benefit after paying a rental price for the preservation of national forest since these costs would be lower than the costs of having to reduce carbon emissions themselves.

Unfortunately, the reality is that such an interest has not been reflected in any decisive action. In fact, the total concessional assistance for environmental investments received by Latin America from both official and private sources in the North has been less than US$500 million annually over recent years (Lopez, 1994). This does not cover even 3% of what the World Bank estimated to be the minimum additional costs required by the Region to achieve environmentally sustainable

development (The World Bank,1992). Although only a fraction of the extra expenditures for environmental sustainability in Latin America will have a positive impact on global environmental problems, doubtless much more than 3% of these expenditures will have direct or indirect global effects. Thus, despite several recent initiatives, the current concessional contributions of the North to environmental sustainability in Latin America, represent merely a token show of concern. A much greater contribution would be required to implement a serious international partnership towards sustainability.

What explains this lack of collaboration in spite of the obvious gains for both parts? There are several factors that conspire against such collaboration: 1. There is a general lack of trust in the North regarding the capacity of the governments and other institutions in the Region to implement environmental projects and on their ability to use any financial flows appropriatly. 2. In many countries of the North there is a significant anti-tax and anti-spending feeling which is usually translated into highly conservative fiscal policies that particularly restrict spending in projects of hihly uncertain outcomes, such as transfering resources to governments in the Region to be used in sustainable development. 3. Excessive reliance on centralized institutions and on governments as the main entities to provide funding and to develop and implement environmental projects. 4. Lack of a full understanding of the quantitative importance of the gains to be made out of North-South cooperation in environmental preservation . 5. Inadequate leadership from goverments in the North as well as from the international institutions that should promote international cooperation. 6. A failure to accept the fact that a greater extraction of natural resources in most highly endowed countries of the Region is in their national interest and that governments, regardless of their declarations, plans and legislations, are effectively not interested in reducing resource extraction. 7. Related to the previous reason, an inclination among the international community to believe the romantic idea that growth and green resource preservation are automatically compatible. This has led to spend significant funds in projects that eventually fail or that can succed only under very special conditions.

Instead of promoting a comprehensive and systematic mechanism that would generate enough financial resources and at the same time the incentives for a broad program of protection of the green resources, the international effort has dilluted the little financial resources available into a large variety of projects that deal with resources that are not always of priority from the point of view of international cooperation. This approach has generally ignored the fact that in a context of large remaining resources, there is a high degree of fungibility of the natural resources and the protection through international funding of one site may only imply that more natural resources will be extracted from other sites. Similarly, financial

resources are also fungible and, thus, in the absence of a broad program of resource protection and funding that encompasses a large proportion of the green resources, greater foreign funding to promote specific environmental projects may release domestic funding for purposes such as road building, that could be detrimental for the environment. Thus, the piecemeal centralized or semi-centralized approach to environmnetal funding in resource-rich countries does not seem to work and a more comprehensive and decentralized approach is needed.

4. ELEMENTS FOR A COMPREHENSIVE INTERNATIONAL AGREEMENT TO REDUCE GREEN ENVIRONMENTAL DEGRADATION: MECHANISMS AND FINANCING

In this section we discuss two programs for green sustainability that link funding and incentives for protection very closely. Both systems are demand-based in the sense that provide incentives for consumers to show in the market their environmental preferences or provide incentives to producers to fund the green environment in Latin America. Additionally, both systems have been implemented and, thus, proven in limited ways. Also, the emphasis is in decentralization and in the comprehensiveness of the programs to avoid the pitfalls of the conventional piecemeal approach. The first one, is a broad system of ecolabelling and green certification that covers practically all goods produced using green resources, and the second one, is a broadening and profoundization of the so-called Joint Implementation system.

The first one involves the development of an institutional system that can provide a mechanism for consumers around the world to express their environmental preferences and their willingness to pay for achieving green sustainability. A base for a system like this has already been discussed and in a small part implemented with the eco-labelling system. What is needed is an institutional system that provides objective criteria to certify a large number of products according to the environmental soundness of their production processes. Also, international boards comprised of respected technical personnel to certify products in the various areas would have to be established.

A similar system is already in place and working quite well in many countries around the world in connection with the so-called organic foods. This system would allow consumers to pay a premium for certified goods according to their environmental preferences. This would also allow international organizations to establish standarized norms and trading criteria for the most important environmental goods without discrimination on the basis of country of origin of the products. That is, the criteria for certification would be homogenous and apply to all producers whether

located in the North or the South. The costs of the improvements in the environment that a system like this imply would be shared by consumers in the North and producers in the South, with the resulting cost shares being determined by the elasticity of demand of the products and the sensitivity of the cost of production to the environmental norms required for certification.

It is important to endicate that a broad sysrem of certification may trigger a competitive process among the countries that produce green resource-based goods. Countries that are able to guarantee the environmental soundness of their products early on will be able to extract above -normal profits by exploiting the advantage of being an early producers of the "new goods". That is, as long as consumers are willing to pay significant premiuns for environmental soundness, producers of natural resource-based goods that adopt early on environmentally friendly processes will enjoy extra profits what will rapidly entice them to adopt these new processes more rapidly. This is not much different to the Shumpeterian race for technological adoption, where individual producers see a profit for early innovation but once the innovation has been widely adopted the extra profits disappear.

What environmental certification does is to introduce product differentiation on the basis of the environmental component of the production processes. This, however, may not solve free riding problems because consumers do not benefit directly out of their individual decisions regarding consumption of (the more expensive) goods produced with environmentally friendly processes. Individual countries may take collective action to establish a self-financed system that taxes uncertified goods and uses these tax revenues to subsidize certified goods so that the price differential between certified and uncertified goods is reduced or even eliminated

Although a massive program of environmnetal certification could have a significant positive effect on green environmental sustainability, its effects on the preservation of the natural resources are mostly indirect. Further, even if the certification process has a broad scope, it will be difficult to cover all relevant goods and its implementation, particularly for intermediate goods, may involve great complexities. For these reasons it may be convenient to complement the certification system with a more direct agreement that would involve a dramatic expansion of the protected areas. The idea is to include most forest areas that can be reasonably protected, excluding only those forests that are already in settled areas or that are highly threatened given existing population and development pressures. Given that, as argued before, the piecemeal approach does not work, it is essential that the protection programs encompass a very sizable portion of the forested lands. The larger the protected areas relative to the total forest, the less important is the substitution or fungibility effect.

A sufficiently large compensation fund would be necessary in order to assure a real commitment from the national and local governments. The fund would be devoted to investments in already settled areas and to social rural poverty programs to reduce pressures on national parks. Additionally, part of the fund would be invested in improving the physical protection of national parks, particularly in establishing an efficient system of park rangers.[14] Subject only to broad guidelines on the use of the international fund, national and local governments should decide for themselves on the specific allocation of the money to best assure the protection of the national parks. The countries would receive an annual payment on the basis of the natural areas which they commit to protect. The annual payment would be conditional on the preservation of the agreed areas, which can be closely monitored using remote sensing as well as other techniques.

To finance a scheme like this Dourojeanni (1995) and others have proposed a world-wide carbon tax. The rationale for the carbon tax is that the preservation of the forest would mainly play a role of carbon sequestration needed to mitigate the climatic effects of carbon emissions. However, given the political difficulties of raising taxes in many developed countries, an expansion of the "Joint Implementation" provision of the climate convention signed in Rio de Janeiro could be more feasible, as a mechanism to finance this initiative. This system allows firms in the North to enter into direct agreements with the South to develop experimental carbon-offset schemes. That is, firms could either choose to restrict their carbon emissions or could fund carbon sequestration projects in the South usually by promoting less deforestation or greater reforestation. Some US utility companies are entering into agreements with Costa Rica to develop carbon sequestration projects.

An important advantage of the Joint Implementation system is that it works in a decentralized manner without requiring the development of another large bureaucratic body. Also, the fact that no direct new tax is involved is a feature that could make the scheme easier to be politically accepted, particularly in the USA. The firms that provide the funding retain some control on the use of such funding, which is an additional factor that could increase the acceptability of the scheme. Finally, the fact that the Joint Implementation procedure was approved in the Rio Convention suggests that most countries in the North and South would be prone to

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[14]The need for park police to enforce national park protection is rarely mentioned in the literature. However, effective national park protection requires both to reduce the incentives to encroach and exploit the national parks' resources and to allow for physical protection of the parks. No matter what you do to decrease incentives, there will always be people interested in obtaining easy profits out of the free national parks' resources. In the absence of adequate enforcement, most efforts to decrease the encroachment incentives are likely to be lost.

implement it. Notwithstanding these advantages, it is likely that the Joint implementation mechanism may not be of sufficient scope by itself to permit the massive transfer of resources required to assure protection to most of the remaining tropical forests.

The issue of acceptance of a forest protection scheme by the South is very important. As shown below, the North can afford to pay the South values above their opportunity costs for most forested lands. That is, the South and the North can both gain by allowing carbon trade through forest protection. Economic benefits, however, may not be sufficient to entice the South to accept an international agreement. Many governments are likely to regard such an agreement as a loss of "sovereignty" over their territories, which could lead to a reluctance to participate even in the presence of clear economic benefits. These concerns, however, can be greatly reduced by integrating national, state and local governments as well as community organizations and local NGOs early on into the analysis of the cost/benefits of alternative uses of the forested lands, planning of the additional areas to be protected, the allocation of the funds into different programs and the monitoring and enforcement of the measures designed to protect the forest areas.[15]

[15]An interesting example is the case of Suriname, where a recent study by Sizer and Rice (1995) clearly demonstrated that the benefits of providing logging concessions to certain logging firms are far less than what the country could obtain from international sources interested in protecting the forests or in promoting sustainable exploitations. In fact, the IDB is now taking the lead in designing an assistance package that could compensate Suriname for protecting those forests.

5. CONCLUSIONS

The main message of this paper is that the achievement of green environmental sustainability in Latin America requires to combine the availability of financial resources from abroad with the design of clear incentives for both the governments and the private sector in the Region to truly incorporate sustainability among their priority goals. There is no automatic preference in the Region for green environmnetal sustainability, but such preference needs to be induced through a comprehensive system of financial incentives.

With the idea of providing some quantitative notion to the expectation that there are gains to be made out of international cooperation, we have considered the scope for one possible grounds for such cooperaration, trade in carbon emissions, showing that the potential gains to be made from such trade are extremely large. More gains can be made out of other forms of international environmental cooperation, but to materialize these potential gains the modality of the international cooperation and financing needs to be changed. The emphasis on the partial piece-meal approach should be changed and replaced by a more decisive and comprehensive approach that establishes directly clear long -run goals for dramatically increasing the protected areas and improve their protection.

The emphasis of the proposed measures is on using the market forces as much as possible within a decentralized and largely demand-based system of incentives and financial transfers. The base of this system would be to broadly expand two mechanisms already in place that have shown to work quite well within the highly limited extent to which they have been applied. Ecolabelling, through a serious and standarized system of worldwide certification, applied to the majority of the environmentally based products, should be one of the backbones of this system. The other pilar should be based on an international agreement by which the developed countries rent the right of conserving a large part the green resources to the Region using, perhaps, the joint implementation system as the basis for its application.

Finally, we note that if demand-based incentives are used to raise financial resources for sustainability, the distinction between domestic and international sources is rather meaningless. The financial resources are provided by all consumers that are willing to pay for environment sustainability whether from Latin America or elsewhere.

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