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Antonie Bauer and Gerhard Illing\*

## Debt-for-Nature Swaps: Axing the Debt instead of the Forests

*Combining debt reduction with halting deforestation seems to be an attractive way of solving two urgent global problems at the same time at hardly any cost. But this view may be overly optimistic. What are the advantages and the drawbacks of debt-for-nature swaps? Are there any better alternatives?*

Tropical deforestation has become an increasing concern not only to environmentalists. Only recently, the FAO announced that deforestation rates had increased from eleven million hectares per year in 1980 to 17 million hectares in 1990—an area larger than Austria, Switzerland and the Netherlands taken together. There are several reasons why we should be worried about this development. Tropical forests are a valuable resource—not only on a local, but also on a global scale.

There are many forest products besides timber that are valuable. Among them are nuts, honey, game, berries, rattan, resin and rubber as well as substances for pharmaceutical products. Though some of them are consumed by the local populations only, there is also an expanding market for many of these goods. In 1983, Indonesia already exported \$ 127 million of these non-timber products—yet this amounted to only 11% of wood export earnings.<sup>1</sup> In fact, non-timber exports could be much higher if more attention was paid to them and less to wood products. This is especially important as tropical trees are largely a non-renewable resource—but rattan, pharmaceutical plants and the various foodstuffs are not. This implies that once-and-for-all chopping down of trees might be less efficient for a tropical country than letting various forest products grow in the shelter of those trees.

One of the global goods that are seriously threatened by deforestation is biological diversity. Tropical forests are

the habitat of thousands of plant and animal species, many of which we do not even know yet. More than half of the world's species live in tropical forests, some of them only in very small areas. More and more animals and plants are becoming extinct. Biodiversity is not just a value in itself or a hobby-horse for biologists; there are also commercial values attached to it. The rich and unique genetic material of the tropical forests can help breed plants that resist diseases and pests; new foods can improve the world's diet and—last but not least—many medicinal plants are still awaiting their discovery by the pharmaceutical industry.<sup>2</sup>

### Greenhouse Effect

Another major global concern is the so-called greenhouse effect. Tropical forests are not only very important for the regional climate, they can also play a role in changing the global climate. Greenhouse gases such as carbon dioxide absorb outgoing long-wave radiation. Thus, the balance of outgoing radiation with the incoming solar radiation is upset; the earth warms, increasing its radiation into space until a new equilibrium is reached. The most important greenhouse gas so far has been carbon dioxide which is released through the combustion of fossil fuels—and through deforestation.

<sup>1</sup> Cf. M. Gillis: Indonesia: public policies, resource management, and the tropical forest, in: R. Repetto, M. Gillis: Public policies and the misuse of forest resources, Cambridge et al., 1988, p. 66.

<sup>2</sup> For an overview of the biodiversity of tropical forests and its uses cf. R. Repetto: Overview, in: R. Repetto, M. Gillis, op.cit., pp. 12-14.

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The concentration of carbon dioxide has risen roughly a fourth over preindustrial levels and is rising further. Up to half of the anthropogenic additions so far may have been due to land use change (mainly deforestation), mostly in temperate countries where the trend has now been reversed. Instead, in the past few decades deforestation has become rampant in tropical countries, now adding very roughly two gigatons of carbon to the atmosphere every year, about a fourth of total anthropogenic emissions.

Though the costs and especially the benefits of limiting global warming have not been assessed sufficiently yet, it is clear that something will have to be done about it unless we want to commit the earth to ever-increasing temperatures. Among the many possible strategies for reducing greenhouse gas emissions, there are two low-cost alternatives: increasing efficiency of energy use and slowing – or even reversing – deforestation trends. A sensible greenhouse policy will have to employ both.

Halting deforestation is a cheap alternative because the benefits of deforestation as it is practised at present are low. As we will show in the following, most of deforestation has its root in perverse incentives set by government policies or in the lack of property rights to the areas that are cleared.

### Reasons for Deforestation

Reasons for deforestation vary from country to country. Among them are:

□ *expansion of agriculture.* Many developing countries experience fast population growth; at the same time, land is very unequally distributed, and large plantations are very capital-intensive and employ little labour. This can have a negative impact on the forests as they have to supply a living to a growing number of people. In former days, shifting cultivation meant a sustainable way of living. The poor tropical soils cannot support permanent agriculture. However, left alone after a cultivation period of maybe two years, they can regenerate within reasonable time, maybe twenty years, after which the land can be cleared and cultivated again. Population pressure, however, has led to shorter fallow periods, eroding and degrading the soils, as well as the clearing of ever larger areas.

This problem is aggravated by government-sponsored or spontaneous migration. Indonesia is an example for such a policy. Farmers were encouraged to move from the densely populated main islands like Java and Bali to

sparsely populated islands like Sumatra or Kalimantan (the Indonesian part of Borneo). More than a million families have already been moved as a part of the transmigration programme. However, agricultural practices adapted to the fertile Javanese soils failed on the outer islands; as soils are quickly exhausted, more and more farmers are turning to shifting cultivation, thus clearing even more of the forests than originally planned.<sup>3</sup>

Large-scale agriculture such as the extensive cattle ranching in Latin America is also very detrimental to the forests. Cattle production in these areas is mostly not profitable in itself as the pastures cannot support many animals and quickly degrade.<sup>4</sup> Nonetheless, it was made attractive by various tax credits and subsidies in Brazil. Even after these incentives have been largely removed, converting forests into pastures is still attractive as it is a means of securing title to land.

□ *logging.* Though by no means the only cause of deforestation, the sale of timber contributes much to forest clearing, especially in Asia. Not accounting for external effects, the exploitation of tropical forests for the sale of timber may be a reasonable strategy. As tropical forests take an extremely long time to regenerate, they might be considered a non-renewable resource – and economic theory would predict as well as recommend ultimate exhaustion of such a resource. On the other hand, there are non-wood products as described above that make the forest a renewable resource; and there are also practices like selective cutting that might make sustainable management of forest resources possible. Yet selective cutting – e.g. the removal of only the most valuable trees – has its own drawbacks. One is due to perverse incentives: concessionaires frequently only have to pay royalties for the trees that they sell in the end, but not for any damage caused to the remaining forest. Thus, there is no incentive at all for careful treatment of the non-target trees. So half of the trees may be destroyed while only a tenth is removed.<sup>5</sup> Another problem is that shifting cultivators often rush in after the loggers have penetrated into the forests and roads have been built.

There are further reasons for the inefficiency of current logging practices. Tropical countries as the resource owners mostly fail to appropriate from the concessionaires the rents from logging; only a small share is usually paid in royalties, fees or taxes. At the same time, leases are not on a permanent basis, but are issued only for a limited time

<sup>3</sup> Cf. Deutscher Bundestag: Zweiter Bericht der Enquete-Kommission Vorsorge zum Schutz der Erdatmosphäre zum Thema Schutz der tropischen Wälder, Drucksache Nr. 11/7220, 1990.

<sup>4</sup> Barbier et al. report that a high return on typical Amazonian cattle projects is reversed to a 90 percent net loss once subsidies are removed. Cf. *Ambio*, Vol. 20, No. 2, 1991, p. 56.

<sup>5</sup> Cf. R. Repetto: Die Entwaldung der Tropen: ein ökonomischer Fehlschlag, in: *Spektrum der Wissenschaft*, Juni 1990, p. 123.

that is much shorter than a forest's regeneration period. Thus, firms' incentives to preserve the forests decline even further: they can extract the rents only when they cut the trees; and any tree left to grow might be cut by someone else later on.

□ *fuelwood needs.* Another consequence of growing populations is an increasing demand for fuelwood. Most households in developing countries cannot afford commercial fuels, thus depending on collecting wood for cooking and other purposes. As the forests are a common-property resource, they are overused. It does not pay for anyone not to cut a tree when there is the danger of someone else's cutting it; and there is certainly no motive at all for planting a new tree though afforestation for fuelwood purposes has become an urgent matter in many tropical countries.

□ *government and industry projects.* Projects such as the "development plan" for Carajás in Brazil are notorious for destruction of the forests. Iron ore is not only to be mined, but also to be processed there; industry is to be built up in an area more than a tenth of Brazil's total area that was mostly covered by forests. This project—like many others—is heavily subsidized contingent on promising export earnings that are needed for debt service.<sup>6</sup> The expansion of infrastructure associated with such industrial expansion, e.g. roads through hitherto untouched forests, is the cause of further destruction of the forests as it makes them accessible to farmers and loggers.

### Costs and Benefits

To conclude, the benefits of current forestry practices in tropical countries seem to be rather small. Farmers, fuelwood collectors and logging companies have little interest in preserving the forests as they are neither their property nor theirs for permanent use—free access leads to overexploitation; the reasonable strategy under such conditions is to extract all the rents from a plot as quickly as possible and then move on. These problems are further aggravated by government policies that often set incentives for excessive deforestation—sometimes inadvertently, as with the short-term logging concessions, too low royalties or the building of roads through closed forests; sometimes on purpose, as with large industrial projects, resettlement programmes or tax benefits granted for the conversion of forests into pastures.

Though it is clear—and largely undisputed—that the costs of deforestation by far exceed its benefits and that something should be done about it, it is much less clear

what should be done and who should do it. The worldwide climate as well as biodiversity are global goods though the forests in question are located in a small number of countries. The forest-owning countries certainly cannot be expected to bear the costs of preserving these forests themselves. If they supply a global good, all nations benefiting from it should pay for it—at least in theory.

There is no point in arguing that deforestation is harmful to the tropical countries themselves so that even without subsidies, they should have an interest in stopping it. Whatever the reasons may be, rates of deforestation are increasing rather than decreasing, and though some tropical countries have changed their forest policies, there is little reason for optimism. It is up to the developed world to give these countries incentives for preserving their valuable natural resources.

Unfortunately, the tropical forests are an international public good. Whenever public goods are at stake, we have a free-riding problem: though many parties are interested in the provision of that good, none of them is particularly eager to pay for it; instead, everyone hopes that the others will pay. The obvious result is that nobody pays, and the good is not supplied though everyone would be better off if it were. On a national scale, this problem can be solved by the government: it (more or less voluntarily) chooses the optimal quantity of the good in question, produces it and enforces its citizens' contributions via taxation. Unfortunately, there is no international authority that can enforce similar contributions from all the countries that would benefit from saving the tropical forests.

### Role of Foreign Debt

This is where the discussion of linking environmental problems to the international debt crisis sets in—another problem that greatly bothers both industrial and developing countries. Combining debt reduction with halting deforestation seems to be the ideal way of killing two birds with one stone. After all, most tropical countries are heavily indebted. Some suffer from a severe debt crisis. As indicated above, there may be a direct link between foreign debt and the destruction of rain forests: in the desperate attempt to service their debt, these poor countries might be forced to overexploit their natural resources. Indeed, there is some evidence that countries like Brazil heavily subsidize the expansion of export-oriented industries at the expense of their forests. If this is a general phenomenon, a debt reduction will benefit not only the starving population in the underdeveloped countries, but at the same time it will also help preserve nature for the benefit of the rich.

The link between debt and deforestation, however, is

<sup>6</sup> For more details on large industrial and hydroelectric projects cf. Deutscher Bundestag, op. cit., pp. 186-195.

much more subtle and anything but clearcut. Foreign debt allows a country to spend more resources today than currently earned (either for higher present consumption or for higher investment) and pay them back in the future. If capital markets were perfect, a country's optimal intertemporal consumption path could be decoupled from its income path, and no inefficiency would arise in the way environmental resources are allocated. In reality, however, the developing countries are suffering from severe credit constraints.

### Constraints

These credit constraints have ambiguous effects on the depletion of natural resources. On the one hand, they tend to favour the exploitation of natural resources beyond the efficient level. The default risk of an indebted country is seen to be increasing with its level of debt, and thus the interest rate charged by the banks increases with the level of debt. High interest rates, however, result in a higher time preference of the affected countries and thus make present consumption more attractive. As shown by the theory of natural resources, the optimal steady state stock of renewable resources is the lower the higher the rate of time preference. In the extreme, it may even be optimal to dispense completely with all future returns and consume the total stock in the present.

In addition, a country suffering from a liquidity crisis may risk being cut off completely from international trade unless it is servicing some of its debt. In this case, the liquidity constraints may result in the overexploitation of natural resources: the indebted country is forced to cut trees and mine mineral resources simply as a means of raising export earnings (or of reducing import payments).

On the other hand, however, one could argue that the effect of a high level of debt on exploitation of the rain forest goes just the other way: in the presence of credit constraints, countries suffer from a debt-overhang. When severely indebted countries are cut off from access to further loans, they are forced to give up investment with potentially high returns. Thus, the high level of debt constrains development relative to the efficient amount. If a lack of foreign resources is the cause of low industrialization, a reduction in debt could result in a higher standard of living by stimulating growth rates. Yet, as shown above, the attempt to industrialize is often seen as one of the main reasons for the destruction of tropical forests.

Thus, on theoretical grounds, there seems to be no clear evidence about the effect of debt reduction on the number of trees felled. This indeterminacy is confirmed by empirical studies. Testing the correlation between tropical

deforestation and several debt indicators, Amelung found no econometric evidence of a stable relationship.<sup>7</sup> To hope that the survival chances of the tropical forest could be stimulated by an unconditional debt reduction seems to be rather naive.

### Global Warming

There is a further effect of development that has not been considered yet: the ultimate goal in preserving tropical forests besides stopping the loss of biological diversity is to limit global warming. But certainly speeding up development in third-world countries is bound to increase their energy consumption, another cause of CO<sub>2</sub> emissions. Yet this effect is ambiguous as the use of more advanced, capital-intensive technologies could be a precondition for increasing energy efficiency in these countries. (The average African evening meal is cooked with five times the energy required for a European dinner.<sup>8</sup>) Studies show that by adopting the most energy-efficient technology available, developing countries could enjoy a standard of living equal to that of Western Europe in the late 1970s without markedly increasing their present energy consumption. Despite that fact, a total decoupling of growth and energy use, even though technically feasible, seems to be an unlikely scenario in the near future for most developing countries. As industrialization has a much higher priority in these countries than a clean environment, clean or energy-efficient technologies will only be installed if they are cheaper (economically more efficient) than more wasteful technologies. Under some circumstances, this will indeed be the case. But though there is some scope for costless efficiency improvement, in general, however, efficiency technologies are costly and thus legal restrictions have to be imposed in order to give incentives to use them. One should not expect that poor developing countries will adopt such restrictions when it is difficult to promote them even in rich, highly developed countries.

On the other hand, developing countries often simply cannot afford energy-efficient technologies because they usually have to import them and thus are made to feel their credit constraint; besides, improvement of energy efficiency typically requires relatively high capital outlays in the beginning, with savings accumulating later on. Thus, alleviating the credit constraint might lower the rate of time preference and make such investments attractive.

<sup>7</sup> Cf. T. Amelung: Debt-for-Nature Swaps als Instrument zum Umweltschutz und zur Entschuldung der Dritten Welt – Zwei Fliegen mit einer Klappe?, Kiel Institute for World Economics, Working Paper No. 476, 1991.

<sup>8</sup> Cf. Frances Cairncross: Energy and the Environment, survey, *The Economist*, Vol. 320, No. 7722, p. 23.

The total effect of debt reduction on the rate of deforestation and on CO<sub>2</sub> emissions is hard to tell. Nevertheless, there may be good reasons to combine environmental conservation with debt reduction schemes. Instead of paying cash for the preservation of tropical forests, it could be more attractive to offer debt reduction in return. This is the idea behind debt-for-nature swaps, which are becoming more and more popular. Attracted by the fact that claims of banks on debt in highly indebted countries are traded at a considerable discount on secondary markets, private environmental organisations see them as a chance of buying environmental quality at a cheap price – though, as we will show later on, this cheap price is a fallacy.

### Debt-for-Nature Swaps

The idea of making such deals was copied from the experience with debt-for-equity swaps. These swaps, initiated first by Chile in 1985, were considered one way out of the debt crisis. The debtor country agrees to convert debt of foreign banks into local currency at a rate lower than the nominal value, but above the market value in the secondary market. The local currency may be used for the privatisation of state-owned assets or for investment purposes. At first sight, these swaps seem to promise not only to reduce the external obligations of the indebted country, but – at the same time – also to speed up local investment. Actually, however, debt-for-equity swaps do not reduce foreign obligations, they rather convert debt claims into equity claims. That means that, in the future, the private foreign investors are likely to transfer their returns to the home country – so there will be a resource flow in the same way as with debt service payments; only the timing of the payment stream is different. The foreign obligations of the indebted country are reduced only in so far as the conversion rate is below the face value.

Whereas equity swaps convert foreign debt into private investment, debt-for-nature swaps convert it into environmental quality. The mechanism is similar: foreign debt is converted into local currency at a rate above the market value in the secondary market. So environmental agencies buy cheap debt on the second-hand market and convert it into good value. But despite the superficial similarity between the two instruments, they have quite different impacts: in contrast to equity swaps, debt-for-nature swaps cancel all future transfers to the lending country (even though property rights may be transferred, forests cannot be moved). Furthermore, the nature swaps reduce the whole face value of the indebted country's foreign obligations. This is true at least given the conditions agreed upon in the transactions undertaken so far.

One main problem with debt-for-equity swaps is their inflationary impact. The swaps carried out on a large scale at the end of the eighties in Brazil and Argentina had enormous inflationary effects. For that reason, they have been reduced drastically. The swaps do not provide fresh foreign investment capital, rather the country's own debt obligation is converted into local currency. This transaction has to be financed somehow, and the easiest way is by printing new money. Alternatively, if it is financed by an increase in local government debt, the swap substitutes local for foreign debt. Swaps reduce the government budget deficit only if they are used as a means of privatising existing state assets. So it is not surprising that, recently, privatisation has been the main purpose of equity swaps.

### Illusions

In theory, debt-for-nature swaps can be seen as an ideal instrument for privatising the rain forest. The indebted country could simply convert foreign debt into property rights (claims on tropical trees). One of the main attractions of swaps seems to be that they offer good environmental quality at a cheap price since the debt can be bought at a considerable discount on the secondary market. Thus, by "recycling second-hand debt", it may appear that lots of trees can be saved in a good bargain. This suggests that the higher the discount, the more forests could be preserved. Under rational economic behaviour, however, such a hope turns out to be an illusion. What really counts is the real price for an acre of preserved forest: how many trees can be saved in hard currency? This depends not on the conversion rate of debt, but rather on the agreements negotiated with the indebted country. So, in effect, it depends on the bargaining power of the parties involved. The conjecture that a higher discount means a better bargain would hold only if the bargaining power of an indebted country was decreasing with the discount on the secondary market.

Such a relation is, however, far from obvious. A high discount indicates that the market anticipates a low probability of repayment. For a country in such conditions, a marginal reduction of foreign debt may have a pretty low value as it can hardly improve its credit rating. Therefore, it may be in a rather strong bargaining position when asked to make environmental concessions. Thus, a high discount does not automatically imply that a higher number of trees are traded for a given nominal value of debt.

In practice, however, the debt presented in those swaps which have been carried out so far has not been linked to a transfer of property rights. It was mostly converted into

local currency with the intention of financing expenditures on environmental programmes (such as maintenance payments for protected areas (forest management) or establishing environmental funds).<sup>9</sup> Usually, the foreign debt is converted into long-term bonds issued by the government in local currency. Future expenditures are then financed out of the interest income. This procedure minimizes the risk of inflationary effects. They will result only if the actual payments are financed by printing money.

All in all, debt-for-nature swaps seem to be a fairly attractive route to solving two of the most urgent problems – the global environmental problem and the debt problem – at the same time at hardly any cost. But this view is overly optimistic. The swaps suffer from several drawbacks, and there may be better ways of coping with these problems.

### Moral Hazard Problems

Various control problems make it difficult to enforce the legal arrangements of a debt-for-nature swap. First of all, there is a moral hazard problem involved in the intertemporal contract. In the absence of international courts, the incentive of sovereign indebted countries to keep their promises is drastically reduced once a debt reduction has been arranged. As soon as foreign debt is cancelled, private environmental organisations are provided with hardly any instruments to enforce the arrangement. But even if the government of an indebted country were willing to stick to the agreement, guaranteeing the enforcement of property rights in tropical forests by civil servants is a delicate task: the power of private money is much stronger in many developing countries than the power of legal institutions.<sup>10</sup> So there is an additional moral hazard problem between the government and its civil servants.

A swap of interest payments rather than a swap of total debt could help cure both of these moral hazard problems. If interest payments on debt are cancelled contingent on the condition that the rain forest is preserved, the local government has a much stronger incentive to supervise these activities. In addition, under such conditions it will be in the self-interest of the civil servants (e. g. the forest management) to carry out the instructions. Being "bribed" by environmental groups, they have a fairly effective

motive not to destroy their source of income. A main reason for deforestation in developing countries is the lack of institutions willing and/or able to guarantee property rights. Conditional payments may be a promising and credible way of giving adequate incentives for establishing such institutions.

### Interest Swaps

Converting the debt into long-term bonds and swapping the annual interest is, in addition, much more in line with the idea of compensation payments for externalities: if less of the tropical forest is destroyed relative to the amount seen as profitable from a national point of view, the developing countries provide an ongoing service to the industrialized countries. This service should be rewarded with continuous payments. Moreover, conditional contracts could react flexibly to changes in demand or supply conditions for these services.

Furthermore, annual interest payments solve the indexation problem of locally denominated debt. Due to the high inflation rates in most countries concerned, the real value of debt once converted into local currency can be maintained only if it is indexed in some way to a hard currency. If contracts are designed such that the foreign debt itself is not cancelled, but rather only interest payments are converted, this problem does not arise. One may object that debt denominated in national currency is safer because local contracts can be taken to the national court, whereas there is no international court to enforce foreign contracts. But such a view would be shortsighted. Local debt can be expropriated in a much more subtle way than by declaring default. It makes no difference if the value of debt erodes because of high inflation or because of suspension of payments (historically, by the way, nearly all foreign debt contracts have been paid back by the indebted countries). If only interest on debt is swapped, the indebted country may seem to be worse off than under an arrangement that swaps the debt stock itself. In the first case, the nominal stock of foreign debt (as reported in world debt tables) appears to be much higher. This, however, is simply an accounting illusion: if the conservation of rain forests is credible, the effective amount of debt reduction is equivalent under both schemes.

### Opportunity Costs

An efficient solution of an externality problem such as tropical deforestation requires that the countries providing positive externalities should be compensated by the countries which benefit from those externalities. Whereas the tropical forests are a public good for the benefiting countries (all the countries profit from biodiversity being

<sup>9</sup> For a survey of swaps undertaken up to now and an outline of the mechanism see J. Rosebrock, H. Sondhof: Debt-for-Nature Swaps: A Review of the First Experiences, in: *INTERECONOMICS*, Vol. 26, No. 2, pp. 82-87.

<sup>10</sup> One example of the problem of enforcement is the first nature swap arranged between Conservation International and Bolivia. The agreement was to extend to a remotely located forest reservation area which – as a centre for cocaine production – was not under the control of the Bolivian government. (Cf. D. Oberndörfer: *Schutz der tropischen Regenwälder durch Entschuldung*, München 1989, p. 25.)

preserved and from reduced release of carbon dioxide), the forests are a private good for the tropical countries supplying them: for them, maintaining them involves opportunity costs in terms of alternative uses. The efficiency condition requires that the sum of marginal willingness to pay for providing one more tree in all benefiting countries together is equal to the marginal cost of not cutting one more tree in each tropical country.

This condition may be violated for quite different reasons: due to the free-rider problem, the true willingness to pay may not be revealed. On the other hand, the forests may not be preserved in those countries where opportunity costs are lowest. This seems to be a danger inherent in debt-for-nature swaps. By their nature, they discriminate between tropical countries: they can be arranged only for those countries whose debt is traded on the secondary inter-bank market. The bulk of these countries is located in Latin America. In the seventies, private banks rated countries on this continent as those with a potential for high growth and thus were eager to lend them money at profitable rates. Other countries which were considered to be less creditworthy got hardly any bank credit; at best they received credits from government agencies. During the eighties, the risk that the debt might not be repaid increased dramatically across all developing countries. But only private banks were able or willing to consolidate these risks by trading them on a secondary inter-bank market. Thus, if payments to preserve rain forests are restricted to debt-for-nature swaps, many countries are automatically excluded without any economic justification. So, theoretically, an excessive number of deals might be made with a limited number of countries whereas other countries are inefficiently neglected.

### Cash Transactions

But then again, if one takes into account that all trades ever made in debt-for-nature swaps up to now have had a negligible impact on the environment, the danger seems small that an inefficiently high level of rain forests has been arranged for any country. Rather, the argument shows that there are still good bargains to be made with tropical countries whose debt is not traded on the inter-bank market. Countries with rampant deforestation include Cameroon, India, Indonesia, Myanmar (the former Burma) and Viet Nam.<sup>11</sup> Cash transfers to such countries may preserve rain forests at a cheap price.

There may be an even wider scope for cash transactions. The discount on a country's debt is an indication that the indebted country is suffering from credit constraints. For such countries, receiving cash transfers instead of debt reductions may actually be of much higher

value. Thus, such transfers might save more trees for the same money. The reasoning is straightforward: the country can always spend the cash on repurchasing part of its debt on the secondary market. But being severely credit constrained, it may be better off by spending the money otherwise. This also reinforces the argument above: countries whose debt is not traded on the secondary market (because they had never access to any bank credits) may even be more credit constrained and thus they may be in an even weaker bargaining position. This implies that the best bargains might be made there.

The fact that swaps (and not cash payments) are so popular suggests that their main strength is to overcome at least partially the free-rider problem in some of those countries that benefit from the positive externalities of the rain forest. Conservation is a public good, and as with all public goods, the incentive to free-ride makes it unlikely that each country affected is willing to reveal its true willingness to pay. Solving the debt crisis, however, creates benefits that accrue to a limited number of countries, thus greatly reducing free-riding incentives. Combining the debt problem with the preservation of the environment thus seems to be attractive in the political process in some industrialized countries. Debt-for-nature swaps are apparently popular even in the United States – though the United States' stance in global negotiations on limiting greenhouse warming has so far been a major obstacle to international agreements. This popularity is probably due to the fact that debt-for-nature swaps help solve this country's banking problem as well.

Of course, all payments made by private environmental groups must be negligible relative to the amount required for an efficient preservation of nature and the global climate; they may be more effective in saving biodiversity as selective preservation of particularly valuable habitats may be possible. Agreements on a greater scale concerning the preservation of tropical forests will have to be made, and large cash flows from the industrial countries to tropical countries will be necessary. Such solutions can only be hoped for as the result of multilateral negotiations, e. g. on preventing further global warming. In the same way, the payments made so far have had hardly any noticeable effect on reducing the level of debt, and they will certainly never solve the debt crisis. But in the absence of grand plans for either of the global problems, debt-for-nature swaps are one of the very few means available of alleviating developing countries' debt burden and at the same time saving at least part of the tropical forests.

<sup>11</sup> For a review of recent estimates of deforestation cf. World Resources Institute: World Resources 1990-91, New York and Oxford 1990, pp. 101-105.