

## Financing SD: Country Undertakings and Rights for Environmental Sustainability

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# **Financing SD: Country Undertakings and Rights for Environmental Sustainability**

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## **Abstract**

The paper proposes a global mechanism to finance and promote sustainable development (SD) that is multinational, provides incentives for rich and poor countries to promote SD, incorporates the principle of common but differentiated responsibilities and links incentives and funding for SD to structural benchmarks and performance targets. The mechanism would operate as a large fund into which rich countries would pay based on their level of population, per capita income and change in an individual or composite measure of environmental sustainability. The approach offers a number of features that make it a superior mechanism to the Global Environmental Facility (GEF). Receipts from the funds, called Country Undertakings and Rights for Environmental Sustainability (CURES), would be made to poor countries based on their population, per capita income and absolute level of environmental sustainability. To illustrate the mechanism, Genuine Savings (GS) is used as a measure of environmental sustainability and country contributions and payments from a \$10 billion annual fund are calculated and compared. The control of Indonesian forest fires is used as an example where CURES could be used to fund initiatives that could generate very large global benefits.

**JEL classification:** O1, O2, Q2

**Keywords:** sustainable development, environmental performance, genuine savings

*The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.*

Principle 6, Rio Declaration on Environment and Development at The United Nations Conference on Environment and Development (12 August 1992).

## **1. Introduction**

Sustainable development became a widely accepted policy objective following the release of the report of the World Commission on Environment and Development (WCED) in 1987. Its focus on the need for a collective resolution of global environmental problems led to the 1992 United Nations Conference on Environment and Development (UNCED). In the Rio Declaration on Environment and Development (RDED) at the UNCED, accepted by over 150 nations, countries agreed to work towards "...international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system" (United Nations, 1992).

Three important developments that came from UNCED include The United Nations Convention to Combat Desertification (UNCD) that came into force in 1997, The United Nations Convention on Biological Diversity (UNCBD) that came into force in 1993 and The United Nations Framework Convention on Climate Change (UNFCCC) that came into force 1994. Subsequent developments in these conventions, such as the Kyoto Protocol drawn up in 1997, have defined the roles, responsibilities and targets for individual countries to achieve under these agreements. Under all three agreements is the notion of "common but differentiated responsibilities" defined under Principle 7 of the RDED such that all countries bear a responsibility to address environmental challenges, but rich countries acknowledge a special responsibility in terms of supplying technologies and financial resources in the pursuit of sustainable development. This principle was reaffirmed at the World Summit on Sustainable Development (WSSD) held in 2002, which also called for common efforts to be made to promote the integration of

economic development, social development and environmental protection as mutually reinforcing components of sustainable development (United Nations, 2002).

One of the mechanisms for achieving common but differentiated responsibilities is the Global Environmental Facility (GEF). Since 1992 the GEF has made transfers to poor countries and is funded by rich nations. As of February 2002, the GEF had authorized payments to poor countries totaling over US\$2 billion (World Bank, 2002a). These payments have helped cover the incremental costs in developing countries associated with combating climate change, loss of biodiversity, degradation of international waters, stratospheric ozone depletion and persistent organic pollutants (World Bank, 2002b). Despite these payments and the three United Nations conventions on the global environment, common and integrated policies to promote sustainable development and improve overall environmental quality, especially in poor countries, have yet to fully materialize. Thus, ten years on from UNCED, and despite considerable progress in *some* measures of environmental performance, many challenges still remain.

The principal difficulties in promoting sustainable development include the linking of the different causes and solutions to environmental degradation and the financing of projects that promote sustainable development and capacity development, especially in poor countries. To help overcome these challenges, the paper proposes an innovative global mechanism called Country Undertakings and Rights for Environmental Sustainability (CURES) to promote sustainable development in both rich and poor countries, while recognizing common but differentiated responsibilities. In section 2 we present criteria that any global mechanism should fulfill to achieve the stated objectives of the UNCED and the WSSD. In section 3 we illustrate how CURES could be implemented and outline the payments and transfers in a numerical example. To show how the funds transferred under CURES might be utilized, we describe a potential application in Indonesia in section 4. Section 5 compares CURES to the current administrative and funding structure under the GEF. Section 6 concludes.

## **2. Global Mechanisms for Sustainable Development**

Since the first United Nations Conference on the Human Environment (UNCHE) in 1972, a great deal of data and information has been obtained on how human activities affect the global environment. In 1985 a stratospheric ozone "hole" over Antarctica was first reported that the authors hypothesized may have been caused by emissions of chlorofluorocarbons (CFCs) into the atmosphere (Farman *et al.*, 1985). Beginning in the 1980s, and stimulated by some of the highest ever recorded temperatures in the northern hemisphere, increased attention has been given to anthropogenic causes of climate change associated with land use change (especially tropic deforestation) and other emissions of greenhouse gases. In the past 20 years other global concerns have emerged including biodiversity losses associated with destruction of habitats and habitat fragmentation, pollution induced environmental stresses caused by acid rain, and the bioaccumulation of persistent organic pollutants from industrial chemicals and pesticides.

Attempts have been made to address global environmental problems multilaterally through a variety of international conventions. A problem with such a "patchwork" approach is that it may be possible for a country to meet its international treaty obligations in terms of biodiversity, desertification, climate change and trans-boundary pollution, but for its environmental quality to decline. This may arise because of negative spillovers from other countries or because of other causes of environmental degradation not specified under existing conventions. For example, the most recent United Nations environmental convention---the Stockholm Convention on Persistent Organic Pollutants--was adopted as recently as 2001 (United Nations Environment Programme 2002) while a host of other environmental problems remain unresolved in a multilateral context.

The issue is not that multilateral conventions are inappropriate, but that they are insufficient. If the plan of action of the WSSD is to be realized new mechanisms that complement existing conventions are required. Some of these mechanisms are currently being developed such as "partnerships for sustainable development" and some are partially in place, such as the GEF. However, further developments in both funding and

incentive mechanisms to promote global sustainable development are almost certainly required if the ambitious goals of the WSSD are to be realized. The *minimum* conditions required of global mechanisms that promote sustainable development are that they:

- be multinational, and involve as many countries as possible,
- provide financial incentives for both rich and poor countries to promote sustainable development in an integrated way,
- incorporate the principle of common but differentiated responsibilities and
- link incentives, finance and resources for sustainable development to measurable and accepted performance targets.

Using these four principles, we present a mechanism for global sustainable development--Country Undertakings and Rights for Environmental Sustainability (CURES).

### **3. Country Undertakings and Rights for Environmental Sustainability (CURES)**

CURES would operate as a large fund into which rich countries would pay based on their level of population, per capita income and their change in environmental sustainability performance. Unlike the GEF, however, contributions and receipts from the fund would depend on a transparent funding formula that would encompass any project (small or large) provided that it promoted environmental sustainability. Thus it would not be bound by or constrained to any existing multilateral environmental agreement, although it could be used to help achieve the goals of United Nations environmental conventions.

CURES payments would be made out of the fund to poor countries, below a given income threshold, based on their level of population, per capita income and absolute level of environmental sustainability. In keeping with United Nations international conventions, the mechanism for promoting sustainable development would be determined on a national basis. However, the implementation of projects and undertakings to promote environmental sustainability would almost certainly involve partnerships between communities, different levels of government, non-governmental organizations and private enterprises.<sup>1</sup> Payments from the fund, however, would be *conditional* on

ensuring that any transfers to a country were spent on projects that promote environmental sustainability with verifiable performance criteria.

Recipient countries assigned receipts, called CURES that represent the right to receive a payment from the fund, would be able to sell them to another recipient country, provided that the trade resulted in a verifiable improvement in environmental sustainability in the purchasing country. This would allow for maximum flexibility and would help direct funds to where they have the highest perceived returns. A potential problem is that the sale of CURES from one country to another could allow the seller to use the funds for purposes other than promoting environmental sustainability. However, the purchaser of the CURES would be obliged to meet the conditional funding conditions for recipient nations.

Countries could bank or borrow CURES directly with the fund or through inter-temporal trades with other recipient countries. Thus a country could arrange to “borrow” a CURES payment from another recipient country provided that it returned an agreed to CURES payment at an agreed to date. This would allow a country to borrow additional funds for up-front investment in particular programs, or bank CURES if its absorption capacity had not caught up with its allocation.

### 3a Calculating CURES

Each country’s contributions to, or receipts from the CURES fund, would be calculated using the defined criteria of population size, income and a measure of environmental sustainability. Countries would be split into either a contributor or a recipient group based on a per capita income threshold. Rich countries would pay into the fund while poor would receive CURES payments from it. In addition to the per capita income threshold, the actual amount paid or received by each country would depend on its population (larger populations implying greater contributions and receipts) and level of environmental sustainability (better performance reduces contributions and receipts).

A way to calculate payments and receipts is to derive a “country factor” derived from measures of population size, per capita income and environmental sustainability. For ease of calculation and comparability these measures would be normalized to be between 0 and 1 where a higher score implies either a larger contribution for a rich country or a larger CURES receipt for a poor country. A value equal to or below the lower boundary of one of the three measures would be assigned a zero score while a value at or above the upper boundary would be assigned a score of unity. The range can be truncated by setting the boundaries above the lowest indicator value, and below the highest indicator value, respectively.

An individual country factor is defined as the product of the normalized scores from the three measures and is given by equation (1),

$$\text{CURES COUNTRY FACTOR}_i = P_i^\alpha \bullet Y_i^\beta \bullet E_i^\chi \quad (1)$$

where  $P_i$  is the normalized population score,  $Y_i$  is the normalized per capita income score and  $E_i$  is the normalized environmental sustainability score for country  $i$  that may be derived from one or several measures of environmental sustainability.

A greater weight to any of the three measures ( $P$ ,  $Y$  or  $E$ ) across all countries can be achieved by changing the values of the weights  $\alpha$ ,  $\beta$  and  $\chi$  in (1). These weights could, and most probably should, differ between recipient and donor countries. For example,  $\beta < 1$  for recipient countries would ensure that nations with smaller per capita incomes would receive relatively *more* CURES payments than if  $\beta = 1$ . One justification for such a weighting is that poverty contributes to unsustainable environmental practices (Holden *et al.*, 1998). By contrast,  $\beta > 1$  for donor countries would ensure that payments into the fund would increase disproportionately with per capita income---an outcome that corresponds to the notion of common but differentiated responsibilities.

Whatever the weights assigned to  $\alpha$ ,  $\beta$  and  $\chi$ , the CURES country factor can be normalized to range from 0 to 1. The derived CURES country factor would determine

the proportion of the funds paid into the fund by donor countries and the CURES payments or receipts from the fund for recipient countries. To calculate the dollar contribution or payment for each country, each CURES country factor would be multiplied by a uniform adjustment factor that would ensure the total contribution and receipts equal the desired total size of the fund.

A feature of the CURES formula given in (1) is that if any of the three indicators were zero, the CURES country factor would also be zero such that the country would make a zero contribution (if a rich country) or becomes ineligible for a CURES payment (if a poor country). This feature, at least in terms of the per capita income measure, allows for a smooth transition between the poor and rich countries if the grouping is based on income levels. For instance, a country in the contributors group that is very close to the cut-off point scores an income factor close to zero and is therefore obliged to contribute almost nothing; conversely, a country that is at the top of the income range for the recipients group receives very little. Similarly, particularly good environmental performance of a country in the contributors group can be 'rewarded' with a zero environmental factor, exempting that country from having to make contributions.

#### *Choice of an Environmental Measure*

To calculate contributions and CURES receipts, an acceptable measure of environmental sustainability is required. Given that environmental performance and sustainability cover many dimensions, any individual measure should itself be a composite of different aspects of the environment and development indicators.

To illustrate how CURES may be calculated, we use genuine savings (GS) as a measure of environmental sustainability although other composite measures could also be used.<sup>2</sup> It should be emphasized, however, that in principle any composite indicator or a set of indicators could be used to determine CURES payments and receipts. A particular advantage of GS is that it can be calculated directly from the system of national accounts. GS is defined by equation (2)

$$GS = GNP - C - \delta K - n(R - g) - \sigma(e - d) + m \quad (2)$$

where *GNP* is gross national product, *C* is aggregate consumption,  $\delta K$  is depreciation in produced capital, *n* is net resource rental rate, *R* is resource extraction, *g* is resource growth,  $\sigma$  is the marginal social cost of pollution, *e - d* is net change in the pollution stock and *m* is investment in human capital, as measured by current educational expenditures. Thus GS represents traditional net savings (gross national product less aggregate consumption less depreciation of produced capital) plus current education expenditures less the natural depletion in natural resources valued at the resource rental rate and less the net increase in stock pollutants valued at the marginal social cost of pollution (Hamilton and Clemens, 1999).<sup>3</sup>

GS has a number of advantages as an indicator of sustainable development. First, it is easy to calculate from the system of national accounts and thus is available for almost every country and over several years. Second, it is a broad measure of sustainable development and includes investments in human and produced capital as contributing to sustainability.<sup>4</sup> Third, it is an accepted measure of sustainability and superior to other widely used indexes (Pearce *et al.*, 1996), such as the human development index (Neumayer, 2001).

For donor countries, we use the *change* in genuine savings through time, rather than comparing levels of genuine savings across countries to determine the level of contributions. This provides an additional incentive for rich countries to improve environmental sustainability as efforts to improve this measure are much more directly rewarded than if absolute levels of GS were used. Using the change in GS also overcomes the potential problem that the measure depends, in part, on structural characteristics of countries. For example, Singapore and Hong Kong regularly have among the highest genuine savings levels, while Kuwait and Saudi Arabia are extreme outliers at the low end. Further, the *change* in GS is not correlated with income levels, and for all but a few outliers among the rich countries is in a narrow band between -1 and

+2 percent. This relationship is illustrated in Figure 1 where the change is calculated based on a five-year moving average.

[Put Figure 1 here]

By contrast to donor countries, it is desirable to differentiate CURES receipts according to structural characteristics as it directs funds to countries with the greatest need. In other words, funds should be directed to where they are most needed to promote environmental sustainability and capacity development. As a percentage of GDP, genuine savings vary enormously between countries, from below minus 30 to above plus 30 per cent, as shown in Figure 2. Negative GS can be interpreted as an indicator of non-sustainability as it implies that the value of depletion of natural resources and cumulative pollution exceeds the national investment in produced and human capital. Despite the high variance, there is an identifiable positive correlation between genuine savings and income per capita.

[Put Figure 2 here]

### 3b A Numerical Example

To illustrate the relative contributions into and receipts from a CURES fund by country, we assume a CURES fund size of US\$10 billion per year. Regardless of the size of the CURES fund, the contributions or receipts of the total fund would be the same, less any administration costs. Banking and borrowing in each year would be approximately balanced. The choice of the actual fund size would depend on several factors including the ability and willingness to pay of contributors and the ability of recipient countries to absorb the funds in verifiable projects for environmental sustainability.

For our numerical example, and purely for illustrative purposes, we assign a per capita GDP threshold of US\$5,000. Thus countries with per capita income in excess of the

threshold are potential contributors while countries below the threshold are potential recipients.

### *Donor Countries*

Using data from the World Development Indicators for 2001 (World Bank 2001), 32 countries are potential contributors to the fund while all other nations are potential recipients. As per formula (1), contributions into the fund are determined by the following.

(a) Population, whereby more populous countries tend to pay more. For 1999, the population for the 32 contributing countries ranges from less than 1 million to 278 million for United States.

(b) GDP per person in US\$, whereby richer countries tend to pay more. The per capita GDP in 1999 for the 32 countries ranges from US\$5,000 (the income threshold) to US\$36,232 (Switzerland).

(c) *Change* in genuine savings, whereby the *greater* the increase (or the smaller the decrease) in GS, the *less* a contributing country will tend to pay. For our example, the change in GS is defined as the difference in the 5-year moving average in the most recent period for which data is available (1995-1999) and the 5-year moving average in the immediate preceding period (1994-98). The range for the 32 contributing countries is -1 to just above +2 percentage points.

To illustrate how the payments from donors are calculated, Table 1 gives the normalized scores, CURES country factor and per capita and total payments for the United States, Japan, Germany and Australia. The United States is the largest country in the contributors group and scores a population factor of 1.0, and its per person income is 89% of that of the richest country, yielding an income factor of 0.89. The change in GS as a share of GDP from 1994-1998 to 1995-1999 is minus 0.3 percentage points, which is in the bottom third of the defined range, yielding an environmental factor of 0.77. Multiplying the three factors with the exponents equal to unity yields a country factor of

0.69. Scaling this up, along with all other country factors, yields a US contribution of US\$4.1billion, or around US\$15 per person.

Japan has the highest per capita contribution at around US\$18. Both the income and environmental factors are slightly higher for Japan than for the United States. Germany is in the top third in terms of potential donor countries on a per capita income basis and is in the bottom half in terms of GS performance. Australia, with a per person income close to the mid-point of the distribution, contributes at a below average per capita rate because of a slight increase in GS over the defined period.

[Put Table 1 here]

Table 2 compares the payments and key indicators of the principal contributors into the CURES fund. The United States is the largest absolute contributor to CURES, accounting for 42% of global contributions, followed by the European Union and Japan that pay for 29% and 23% of the CURES fund respectively. On a per capita basis, the European Union's contributions are just over half that of the United States and well below the average, because of lower average incomes and improvements in GS in a number of European countries over the period 1994-198 to 1995-1999. All other contributors combined account for only 6.5% of total contributions, at an average rate of just over US\$3 per capita. This is because the group comprises some large countries with relatively low per capita incomes, such as Argentina and Korea.

[Put Table 2 here]

The distribution of contributions in relation to per person incomes is plotted in Figure 3, for all 32 countries (EU disaggregated). The positive correlation between per capita income and contributions reflects the influence of the income factor, while the variation in contributions for any given income level is due to differences in the GS indicator.

[Put Figure 3 here]

Two countries have zero, or close to zero, contributions: Ireland, which increased its GS by more than two percentage points and is, thus, above the cut-off point for contributors; and the Czech Republic which has a per capita income at just above the income threshold for contributors. The variations in contributions into the CURES fund are particularly large in the high-income range. Two of the five countries with the highest per capita incomes have the highest per capita contributions (Japan and United States), two contribute equal to the average (Norway and Denmark), and Switzerland contributes relatively little because it significantly increased its GS over the defined period.

### *Recipient Countries*

Countries with GDP per capita below US\$5,000 can potentially receive money from the CURES fund. For the purposes of our example we have data available on GS for 100 nations. Receipts or payments from the fund by country are determined by the following criteria.

- (a) Population, whereby more populous countries tend to receive more CURES payments. The population in 1999 for the 100 countries ranges from less than one million to 1.254 billion (China).
- (b) GDP per person, whereby poorer countries tend to receive more CURES payments. For 1999, the income ranges from just over US\$100 for the poorest sub-Saharan African country to US\$5,000, the threshold income level.
- (c) *Absolute* level of GS, whereby countries with the lowest levels of GS tend to receive more CURES payments. We use the 5-year average of GS for our calculations that ranges from -36 to +31 as a percentage of GDP.

Table 3 provides an example as to how the CURES payments are calculated for three recipient countries---Brazil, Indonesia and Nigeria. Brazil is a populous country that receives a relatively small share of CURES funds because it has a relatively high (among recipient countries) per capita income. Indonesia, with a similar GS rate, receives an allocation several times higher on a *per capita* basis because of its lower income level.

By contrast, Nigeria is a very poor country with an exceptionally low GS. Consequently its per capita income and genuine savings factors are both close to 1 such that it receives per capita CURES payment of more than double the average of all recipient nations.

[Put Table 3 here]

Under the described calculation and weighting method, poor countries with large populations tend to receive large funding. The environmental indicator affects the CURES payments, but plays a relatively minor role compared to the income and population measures. A different weighting scheme under formula (1) that assigns a greater importance to the environmental measure would result in a different distribution of payments.

In keeping with the experience of intergovernmental transfers in developing countries (Bird and Smart, 2002) in the provision of efficient public services, recipient countries receiving CURES payments would be required to meet conditions for funding. The sole purpose of the conditions would be to help ensure funds were used as effectively as possible. These conditions would include a clear objective from the recipient country as to what would be achieved along with a statement as to resources required to meet the goal(s) with specified benchmarks to attain the performance targets.

To ensure accountability for CURES payments, no country would be able to receive funds unless the money could be spent on a verifiable project with measurable benefits to environmental sustainability. This would avoid CURES funds being misdirected for other purposes that do not promote sustainable development or environmental sustainability. Given that failures to achieve agreed-to outcomes could arise from factors beyond the control of recipient countries, each project would have defined “structural benchmarks” (Adam and Gunning 2002) that could also be related to a decision support system or possibly critical threshold values defined for each project (Nijkamp and Vreeker, 2000). Failure to achieve initial benchmarks would trigger further investigation and possibly technical assistance to ensure project objectives were achieved, but persistent failures in

meeting benchmarks would incur graduated sanctions culminating in the ultimate sanction of the freezing of all CURES funds allocated to a project. This form of conditionality would assist recipient countries to meet targets and would provide a financial incentive for improvements in environmental sustainability.<sup>5</sup>

To help ensure that CURES payments are directed to where they generate the greatest return, the allocated annual payments could be transferable between countries. In such a market, CURES payments would trade at a discount reflecting the fact that any disbursements from the fund have to be spent on verifiable projects or investments with measurable benefits. Regardless of the allocation mechanism, actual disbursements (as opposed to the right to receive a disbursement defined by CURES payments) would in every case be conditional on projects or investments meeting defined criteria for environmental sustainability.

For a CURES fund of \$US10 billion, the average CURES payment would be US\$2 per person in the recipient countries. This compares to an average of around US\$8 of overseas development assistance (ODA) for this group of countries. ODA is, however much more unevenly distributed than CURES payments, and the two measures are not correlated.<sup>6</sup> Given the formula in (1), the most populous countries are the largest recipients of CURES payments. For example, India and China together receive 39% of the fund's CURES payments. India obtains an above-average allocation of almost US\$3 per person per year due to its relatively low-income level. By contrast, China receives comparatively low payments per capita and only around 10% of global CURES payments, due largely to its exceptionally high GS ratio because of very high traditional net savings. The contrast between the per capita CURES receipts of the two countries illustrates the importance of the choice of environmental measure in determining CURES payments.

Table 4 presents the “top 10 list” of recipient countries in terms of absolute receipts. The countries include a mix of large and medium-sized countries with either exceptionally

low incomes or low GS, or both, such as Nigeria and Ethiopia. Overall, the 10 largest recipient countries account for two thirds of total CURES payments.

[Put Table 4 here]

Table 5 indicates that the “top 10 list” of countries with CURES receipts per capita is dominated by smaller countries with exceptionally low GS or per capita income (or both). This group accounts for just 12% of global CURES payments, of which half is allocated to Nigeria. At around US\$5 per person per year, payments to this group are over twice the average per capita level. For every country in Table 5, with the exception of Nigeria, ODA is much higher than the calculated CURES payments.

[Put Table 5 here]

The overall relationship between CURES payments and per capita income is shown in Figure 4. All countries with a per capita income of US\$ 700 or less receive above average payments per person. Thus the poorer is the country the more it tends to receive in CURES payments.

[Put Figure 4 here]

#### **4. A CURES Case-study: Forest Fires in Indonesia**

To show how CURES payments could be spent and their potential to promote environmental sustainability we present a case study of an impediment to environmental sustainability in a recipient country---the forest fires in Indonesia. This is an example of on-going environmental degradation that has effects that run counter to the objectives of the UN conventions on climate change and biodiversity, but that escapes the mechanisms set up under these conventions. Moreover, these problems are clearly beyond the current means of the government to address effectively.

#### 4a The effect of the fires

The forest fires in Indonesia have become an annual occurrence in recent years. The fires occur mainly on the islands of Kalimantan (Borneo) and Sumatra. The fires cause the destruction of forests with associated loss of timber and ecosystem services such as flood protection and erosion control, result in biodiversity losses, and release large amounts of carbon into the atmosphere. Smoke from the fires contributes significantly to the 'Asian brown cloud', an area of high semi-permanent air pollution over large parts of Southeast Asia that has adverse health and economic effects throughout the region.

The fires in Indonesia were particularly extensive in 1997-98. The total area burned has been estimated at 10 million hectares (ha), with about half of that being forestland (Applegate *et al.* 2002). As a direct result of these fires, a drop in the numbers of rare and endangered animal species has been recorded. Smoldering fires in peat forests were particularly devastating, causing most of the haze problem, as well as generating very large carbon emissions. Based on satellite imagery and on-ground measurements in Kalimantan and extrapolating for other areas, Page *et al.* (2002) estimate that between 0.8 and 2.6 gigatons<sup>7</sup> of carbon were released from peat lands in the 1997-98 fires in Indonesia, equivalent to 13% to 40% of annual global carbon emissions from fossil fuel combustion.

On the basis of these estimates, Indonesia may have been the largest emitter of climate-changing carbon dioxide in 1997-98, ahead of both the United States and China. Under the upper range estimate, emissions from peat fires in that year were roughly the same as the combined global emission reductions (including the United States) targeted under the Kyoto Protocol for 2008-12. Preventing or limiting future fires is also critically important as up to 50 gigatons of carbon (an amount 8 times greater than current world emissions from fossil fuels) are still stored in peat lands in Indonesia.

#### 4b How CURES could help

The Indonesian fires occur for a combination of reasons---climatic, economic, social and institutional. Fires are particularly extensive in years of drought, which are generally associated with El Niño-Southern Oscillation events. In such years, fires spread more easily and take longer to be extinguished by rain. A significant cause of fires is clearing. The culprits are both commercial companies that find fire the most cost effective way of clearing native vegetation for establishing plantations, as well as semi-nomadic farmers clearing land for shifting agriculture. In both cases, the damages from fire are largely external to those who set them, and fires are rooted in private economic considerations. Fire is also used as a weapon in conflicts between villagers or with plantation companies (Colfer, 2002). In all of these cases, the virtual absence of law enforcement and institutions for fire prevention is at the heart of the problem. In addition, the institutional capacity to detect and fight fires is seriously underdeveloped.

There have been significant efforts to explore the causes of the Indonesian fires, and to a lesser degree initiatives to address them and to build up fire response capacity. Many of these have been financed and run by Western donor countries. However, there has been precious little discernible effect. Despite promises of action, there is still no coordinated approach between Indonesian government agencies. Corruption, dysfunctional government institutions and devolvement of responsibility for natural resource management to the district level under administrative decentralization mean that plantation companies continue to get away with using fire for clearing, and little is done to provide shifting cultivators with alternatives to their clearing practices.<sup>8</sup>

Addressing the problem requires both political will and financial muscle. If the Indonesian government had large financial resources available for preventing and fighting forest fires, this could provide both the incentive and the means for action. CURES could be the source of funding for an outcome-oriented program to reduce forest fires.

A coordinated program for fire prevention and management could comprise a number of measures. Applegate *et al.* (2002, pp. 303ff.) propose policy initiatives to reduce the

occurrence and spread of fires, and we outline how CURES payments could help put those measures in place:

- Land-use zoning and management: By law, provinces are required to have spatial plans and land-use zoning in place, but these plans are either not completed, subject to political manipulation or simply ignored. All peat soils should be delineated and any burning on them prohibited. CURES could be used to provide incentive payments to regional governments to implement and enforce zoning and regulations. If the funds at stake are large enough, local authorities may find it more lucrative to comply with environmental objectives than to accept side payments from plantation companies.
- Land clearance for conversion to cultivation: Licences for clearing could be auctioned, and those undertaking the clearing would have to post a significant bond that would be forfeited if inadequate land clearing practices (burning) were used. The proceeds would be used for fire prevention. CURES could be used for matching the proceeds from such auctions. For example, for every dollar raised in auctioning clearing licences, another dollar from CURES funds could be added to fire prevention funds, or simply transferred to the provincial government as an incentive payment to implement competitive bidding.
- Drought and fire information systems: Provincial fire management centers and weather stations need to be reliably linked. CURES could pay for the necessary equipment and capacity building.
- Institutional strengthening and development of local capacities: The enforcement of forestry rules needs to be strengthened with more personnel on the ground, and training for fire prevention and fighting needs, as well as planning for and research into fire at the local level needs to be improved. CURES could pay for training and additional personnel.

In addition, there have been proposals that limited government-sponsored land-clearance programs should be set up for local farmers.<sup>9</sup> CURES could pay for acquiring the necessary land and for clearing the land in an environmentally responsible manner. Finally, CURES could even be used to buy off formal or informal property rights from

plantation companies. This could take the form of annual payments to concession holders, subject to the land in question not being burned.

Clearly, some of these measures would be controversial, as they could be seen to reward polluters, especially because they would be financed through international transfers. However, the more controversial measures may also hold the greatest promise. There would need to be well-designed procedures to determine what kind of measures would be eligible for CURES funds, and how to monitor and verify implementation, as well as careful definition of structural benchmarks and performance targets.

Under our illustration of a US\$ 10 billion annual CURES fund, Indonesia would receive around US\$ 400 million per year. Fire prevention and management could be made a priority spending area for a number of years. If additional funds were needed for a limited period of time, for example for buying off land use rights and setting up institutions and technical equipment, Indonesia could buy CURES from other recipient countries, or borrow additional CURES from the fund and pay back by drawing on its allocation in future years.

Continued funding would, however, depend on the money being put to good use, and strict performance standards would have to be applied to avoid the funds being siphoned into other uses—a point of particular concern under a weak and changing institutional framework such as in Indonesia.

If CURES could go even some way to reduce the incidence and severity of future forest fires in Indonesia, it would make a large contribution to protecting biodiversity and reducing carbon emissions relative to almost any other global policy initiative. Other examples exist of how CURES could provide targeted and well-funded investments with both very large national and global benefits.

## **5. CURES versus GEF**

The proposed CURES funding mechanism shares a number of similarities with the GEF that is managed through the World Bank. In particular, they both represent large funding mechanisms for sustainable development that direct resources from rich to poor countries. However, there are substantial differences between the two approaches, with several desirable features that are unique to CURES. These differences suggest that CURES is preferable to the GEF as a multilateral financing mechanism for sustainable development.<sup>10</sup>

One of the most obvious differences between the two approaches is that payments into and receipts from the CURES fund would be much more transparent and open. This is because both donor and recipient countries would know precisely their payments and receipts in advance using formula (1). By contrast, allocation of funds under the GEF is dependent on the projects brought by countries and NGOs to it and its changing funding priorities. Under CURES, countries would also be able to predict (with a small margin of error) their future receipts as the factors (measures of income, population and environmental sustainability) used to calculate CURES receipts would not change substantially from year to year and, thus, recipient nations could plan better their development strategies and project implementation. The transparency in funding to countries would also help avoid the perception of political interference in determining payments that has been identified as a potential problem with the GEF (Young, 2002).

Another important difference between the two mechanisms is that the payments into the fund by donor countries will be more equitable with CURES in the sense that the richer the country and the poorer its environmental sustainability performance, the proportionally greater its payment. For example, under the GEF the United States contributes less than a quarter of the total funds while under the CURES mechanism it would contribute over 40% of the total. To illustrate the differences, a comparison of the relative contributions under CURES and the GEF, by selected donors, is presented in Table 6.

[put table 6 here]

CURES would also help address apparent inequities under the GEF whereby some poor countries (China, Cote d'Ivoire, India, Nigeria, Pakistan, Turkey) are also donors, each making contributions of up to 0.5% of the total fund. Thus fixing national payments into the fund and receipts from it to an agreed to formula is both politically neutral in implementation and would favor poorer countries---characteristics that should allow CURES to garner greater international support and enlarge the opportunities for sustainable development planning.

A useful feature of CURES is the incentive they provide for donor countries to improve their environmental sustainability. In particular, countries that improve the defined measure or index of environmental sustainability contribute proportionally less to the fund. This incentive would likely be more than just a financial benefit as it should give the leaders of better performing countries "bragging rights" both domestically and internationally. In terms of poor countries, the CURES receipts would also provide an important source of funding. Further, with conditionality based on structural benchmarks and critical thresholds, CURES would provide strong national incentives to improve environmental sustainability.<sup>11</sup>

Another important benefit of CURES relative to the GEF is its in-built flexibility that allows for inter-temporal trade-offs with CURES banking, and improved efficiency in the funding allocation with CURES trading. For example, a country that may have difficulties in absorbing current CURES receipts can "bank" the funds for future use. In addition, trading of CURES between countries would help promote efficiency in the sense that projects with the highest perceived national benefits could be funded via a market mechanism. By contrast, under the GEF no inter-temporal trading of benefits or priorities occurs at the funding level, and the final allocation of funds lacks the discipline of a market mechanism that rewards projects with higher expected returns.

The administration of CURES also offers a number of desirable characteristics in terms of the allocation of funds. Under the GEF, for instance, funding has nominally been

targeted to cover “incremental” or additional costs so as to allow projects with national benefits to generate global benefits (GEF, 2003). Further, funds have primarily been directed to projects that meet the stated objectives of the United Nations environmental conventions, such as the UNFCCC or UNCBD. By contrast, with CURES whether projects generate national or global benefits is irrelevant in terms of what poor countries have the right to receive from the fund. Further, under CURES, the sole criterion for funding projects is that funds be directed towards measurable goals with defined environmental sustainability benefits. Thus CURES enlarges the set of potential projects and allows countries to undertake projects that may be of solely of national benefit.

CURES offer an example of what could be achieved with a transformed GEF should there be a fourth replenishment beyond the current GEF funding round that is scheduled to end in 2006. By comparison to the current GEF, CURES is more responsive to recipient country needs, promotes greater efficiency with banking and trading, offers the potential of a more streamlined process of disbursement and assessment and provides additional incentives for rich countries to promote environmental sustainability. Moreover, by enlarging the number of potential projects and placing greater reliance on poor countries for the development of projects, CURES goes well beyond what is proposed in the 2003-2006 GEF third replenishment. CURES would also assist in capacity building at a governmental level in poor countries and would give recipient nations a greater role in the funding, planning and implementation of sustainable development.

## **6. Concluding Remarks**

It is thirty years since the first United Nations conference on the environment and ten years since the United Nations Conference on Environment and Development. Despite some significant gains in terms of livelihood and environmental quality many of the laudable goals of these conferences remain unrealized. Indeed, most of the world’s population lives in impoverished conditions in terms of human development and environmental quality relative to the standards of those living in the richest countries.

To help address these on-going problems, a new and innovative mechanism that promotes sustainable development is proposed called country undertakings and rights for environmental sustainability (CURES). This funding mechanism has a number of advantages over existing institutions, such as the Global Environmental Facility (GEF), and would complement current conventions on environment and development.

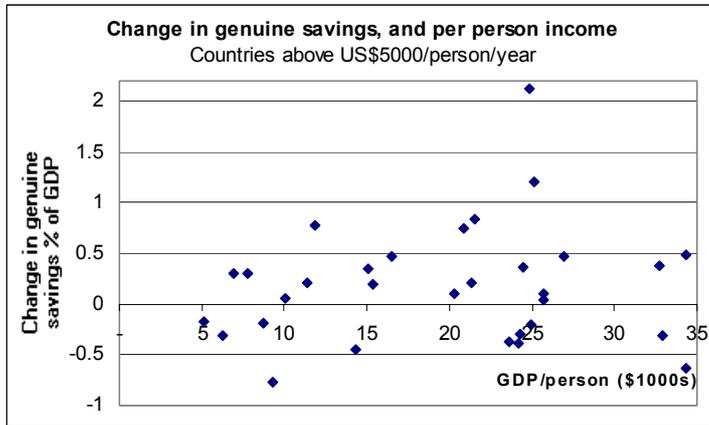
CURES would involve all countries and promote overall environmental sustainability, provide financial incentives for both rich and poor countries to improve national environmental performance, incorporate the principle of common but differentiated responsibilities and link incentives to verifiable and measurable accepted performance targets. The CURES mechanism for sustainable development, if widely adopted and funded at a sufficiently high enough level, would offer a significant boost to global sustainable development and would greatly assist poor countries to address the twin challenges of poverty and environmental degradation.

## References

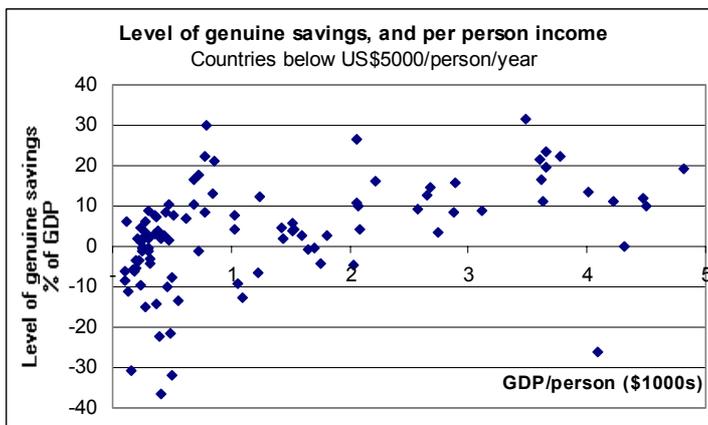
- Adam, C.S. and J.W. Gunning. 2002. Redesigning the Aid Contract: Donors' Use of Performance Indicators in Uganda. *World Development* 30, 2045-2056.
- Applegate, G., Smith, R., Fox, J.J., Mitchell, A., Packham, D., Tapper, N. and Baines, G. 2002. Forest fires in Indonesia: Impacts and solutions, in Colfer, C.J.P. and Resosudarmo, A.P. (eds), *Which way forward? People, forests, and policymaking in Indonesia*, RFF/CIFOR/ISEAS.
- Bird, R.M. and M. Smart., 2002. Intergovernmental Fiscal Transfers: International Lessons for Developing Countries. *World Development* 30, 899-912.
- Global Leaders of Tomorrow Environment Task Force (Chair Kim Samuel-Johnson). 2001. *2001 Environmental Sustainability Index*. Prepared in collaboration with Yale Center for Environmental Law and Policy and the Center for International Earth Science Information Network of Columbia University for the World Economic Forum in Davos, Switzerland, January 2001.
- Colfer, C.J.P. 2002. Ten propositions to explain Kalimantan's fires, in Colfer, C.J.P. and Resosudarmo, A.P. (eds), *Which way forward? People, forests, and policymaking in Indonesia*, RFF/CIFOR/ISEAS.
- Dasgupta, P. 1996. The Economics of the Environment, *Environment and Development Economics* Vol. 1 (4), 387-428.
- Farman, J.C., B.G. Gardiner and J.D. Shanklin. 1985. Large Losses of Total Ozone in Antarctica Reveal Seasonal ClO<sub>x</sub>/NO<sub>x</sub> Interaction. *Nature* Vol. 315, 207-210.
- Global Environmental Facility (GEF) 2003, Eligibility Criteria, [http://www.gefweb.org/Operational\\_Policies/Eligibility\\_Criteria/Incremental\\_Costs/incrementatl\\_costs.html](http://www.gefweb.org/Operational_Policies/Eligibility_Criteria/Incremental_Costs/incrementatl_costs.html).
- Global Environmental Facility (GEF) Council 2002, Summary of Negotiations on the Third Replenishment of the GEF Trust Fund, September 19, World Bank.
- Hamilton, K. and M. Clemens. 1999. Genuine Savings Rates in Developing Countries, *World Bank Economic Review* Vol. 13 (2), 333-356.
- Holden S.T., B. Siferaw and M. Wik. 1998. Poverty, Market Imperfections and Time Preferences: of Relevance for Environmental Policy? *Environment and Development Economics* Vol. 3 (1), 105-130.
- Jones, A. 2002. Benefits to the Public Sector of Tri-Sector Partnerships. Business Partners for Development, Water and Sanitation Cluster, <http://www.bpd-waterandsanitation.org/english/wssdportal.htm>

- Kolk, A., 1998. From Conflict to Cooperation: International Policies to Protect the Brazilian Amazon. *World Development* 26, 1481-1493.
- Neumayer, E. 2001. The Human Development Index and Sustainability---A Constructive Proposal. *Ecological Economics* 39, 101-114.
- Nijkamp, P. and R. Vreeker, 2000. Sustainability Assessment of Development Scenarios: Methodology and Application to Thailand. *Ecological Economics* 33, 7-27.
- Page, S.E., F. Siegert, J.O Rieley, H-D V Boehm, A. Jaya and S. Limin, 2002. The Amount of Carbon Released from Peat and Forest Fires in Indonesia during 1997, *Nature* Vol. 420, 61-65.
- Pearce, D., K. Hamilton and G. Atkinson. 1996. Measuring Sustainable Development: Progress on Indicators, *Environment and Development Economics* Vol. 1, 85-101.
- United Nations. 2002. World Summit on Sustainable Development---Plan of Action. [http://www.un.org/jsummit/html/documents/summit\\_docs/2309\\_planfinal.htm](http://www.un.org/jsummit/html/documents/summit_docs/2309_planfinal.htm)
- United Nations. 1992. Report of the United Nations Conference on Environment and Development <http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm>.
- United Nations Environment Programme. 2002. The Hazardous Chemicals and Wastes Conventions <http://www.pops.int/documents/background/>
- Van Soest, D. and R. Lensink. 2000. Foreign Transfers and Tropical Deforestation: What Terms of Conditionality? *American Journal of Agricultural Economics* 82, 389-399.
- World Bank. 2002a. GEF Projects. <http://www-esd.worldbank.org/gef/projectSummary.cfm>.
- World Bank. 2002b. Sustainable Development and the Global Environment: The Experience of the World Bank Group---Global Environmental Facility Program. Washington DC: The World Bank.
- World Bank. 2001. *World Development Indicators on CD-ROM*, World Bank: Washington D.C.
- World Commission on Environment and Development (WCED). 1987. *Our Common Future*, Oxford University Press, Oxford.
- Young, Z. 2002. *A New Green Order: The World Bank and the Politics of the Global Environment Facility*, Pluto Press, London.

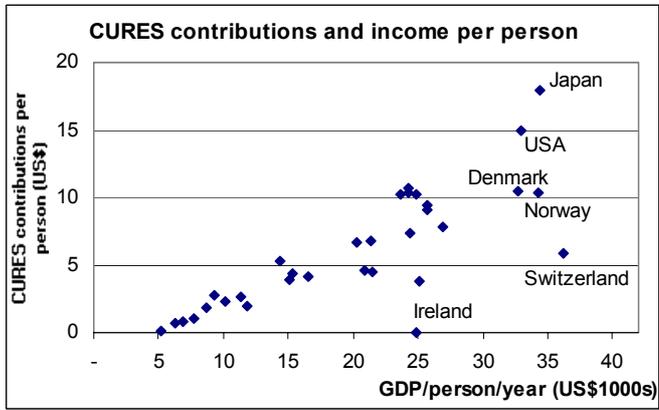
**Figure 1: Change in Genuine Savings and Per Capita GDP**



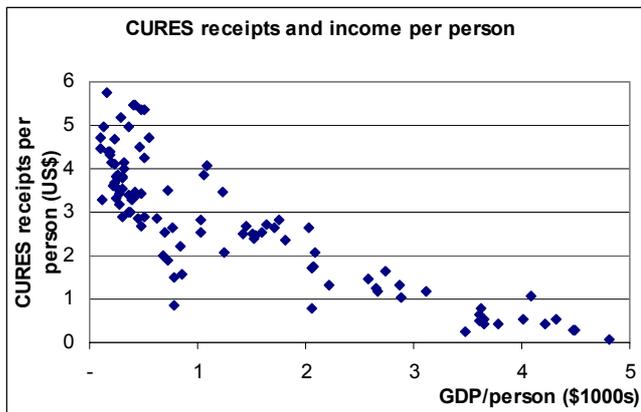
**Figure 2: Level of Genuine Savings and Per Capita GDP**



**Figure 3: CURES contributions and Per Capita GDP**



**Figure 4: CURES receipts and Per Capita GDP**



**Table 1: Examples for calculating contributions to CURES**

	United States	Japan	Germany	Australia
Indicators:				
Population (million)	278	127	82	19
GDP/person (US\$'000/year)	33	34	26	21
Change in genuine savings (% of GDP)	-0.3	-0.6	0.0	0.2
Factors (normalized and truncated):				
Population factor	1.00	0.45	0.30	0.07
Income factor	0.89	0.94	0.66	0.52
Genuine savings factor	0.77	0.88	0.65	0.60
Multiplication of factors (with equal weights):				
Country factor	0.69	0.38	0.13	0.02
Payments into a US\$10 billion CURES fund:				
Total payments (US\$million/year)	4,146	2,274	775	128
Payments per person (US\$/person/year)	14.97	17.96	9.44	6.77

**Table 2: Contributions to the CURES fund using data for 1999**

	Contributions to CURES			Indicators			Average genuine savings 1995-99 (% of GDP)
	US\$/person	US\$ million	share of total (%)	Population (m)	GDP/person (\$000s)	Change in genuine savings from 1994-98 to 95-99 (percentage points)	
United States	14.97	4,165	41.7	278.2	32.9	-0.3	9.0
Japan	17.96	2,274	22.7	126.6	34.3	-0.6	18.0
European Union	7.77	2,915	29.1	375.0	22.6	average: 0.1, range: -0.4 to +2.1	average: 14.3, range: 8.8 to 28.7
Others *	3.18	646	6.5	203	13.8	average: 0.4, range: -0.8 to +1.2	average: 13.9, range: -30 to +41
Total	10.17	10,000	100	983	25.2	average: 0.2, range: -0.8 to +2.1	average: 12.9, range: -30 to +41

\* comprises Argentina, Australia, Barbados, Canada, Czech Republic, Hong Kong, Israel, Korea (Rep.), Kuwait, New Zealand, Norway, Saudi Arabia, Singapore, Slovenia, Switzerland, Uruguay

**Table 3: Examples for calculating CURES receipts**

	<b>Brazil</b>	<b>Indonesia</b>	<b>Nigeria</b>
<b>Indicators:</b>			
Population (million)	168	688	124
GDP/person (US\$'000/year)	4.5	0.207	0.3
Genuine savings (% of GDP)	12.1	16.5	-15.2
<b>Factors (normalized and truncated):</b>			
Population factor	0.134	0.165	0.098
Income factor	0.105	0.862	0.943
Genuine savings factor	0.465	0.392	0.920
<b>Multiplication of factors (with equal weights):</b>			
Country factor	0.007	0.056	0.086
<b>Receipts from a US\$10 billion CURES fund:</b>			
Total receipts (US\$million/year)	49	417	640
Receipts per person (US\$/person/year)	0.29	2.01	5.16

**Table 4: Receipts from the CURES fund: the 10 largest recipient countries (data for 1999)**

	CURES receipts			Indicators		
	US\$/person	US\$ (millions)	share of total (%)	Population (millions)	US\$ GDP/per capita	Genuine savings, average from 1995-99 to 95-99 (% of GDP)
India	2.86	2,854	28.5	998	448	8.3
China	0.84	1,056	10.6	1,254	789	29.9
Nigeria	5.16	640	6.4	124	283	-15.2
Pakistan	3.39	457	4.6	135	431	2.6
Indonesia	2.01	417	4.2	207	688	16.5
Bangladesh	2.98	381	3.8	128	360	7.6
Ethiopia	4.71	296	3.0	63	103	-8.5
Russian Federation	1.63	238	2.4	146	2,746	3.6
Vietnam	2.99	232	2.3	78	370	7.5
Philippines	2.54	188	1.9	74	1,031	7.8
Sum of the 10 largest recipients	2.11	6,757	67.6	3,205	696	16.9
90 remaining recipients	2.11	3,243	32.4	1,535	2,040	10.4
<b>total or average</b>	<b>2.11</b>	<b>10,000</b>	<b>100.0</b>	<b>4,740</b>	<b>1,131</b>	<b>13.1</b>

**Table 5: Receipts from the CURES fund: the 10 countries with the highest per capita payments (data for 1999)**

	CURES receipts			Indicators		
	US\$/person	US\$ (millions)	share of total (%)	Population (millions)	US\$ GDP/per capita	Genuine savings, average from 1995-99 to 95-99 (% of GDP)
Eritrea	5.76	23	0.2	4	162	-30.9
Yemen, Rep.	5.47	93	0.9	17	400	-22.2
Lesotho	5.46	11	0.1	2	415	-36.6
Armenia	5.37	20	0.2	4	484	-21.5
Azerbaijan	5.35	43	0.4	8	502	-32.1
Nigeria	5.16	640	6.4	124	283	-15.2
Mauritania	4.97	13	0.1	3	369	-14.2
Sierra Leone	4.95	24	0.2	5	135	-11.3
Haiti	4.73	37	0.4	8	551	-13.6
Ethiopia	4.71	296	3.0	63	103	-8.5

**Table 6: Percentage of Total Contributions by Selected Donors under CURES and GEF**

	<b>CURES</b>	<b>GEF (3<sup>rd</sup> replenishment)</b>
United States	41.7	22.2
EU	29.2	46.3
Japan	22.7	18.8

Sources: GEF (2002) and authors' calculations.

## End Notes:

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<sup>1</sup> For examples of tri-sector partnerships see Jones (2002), <http://www.bpd-waterandsanitation.org/english/wssdportal.htm>

<sup>2</sup> For instance, the Environmental Sustainability Index (ESI) devised by Columbia University could also be used. The Global Leaders for Tomorrow Taskforce (2001) report on ESI and further details on the index are available at <http://ciesin.columbia.edu/indicators/ESI/>.

<sup>3</sup> The only stock pollutant considered in the GS used in this paper is that associated with carbon dioxide where a marginal social cost of \$20 per ton of carbon in 1990 is used.

<sup>4</sup> Dasgupta (1996, p.413) in reference to green Net National Product (NNP), that is analogous to genuine savings, notes that "...small policy changes, including small investment projects, that are recorded as an improvement (deterioration) by the index are at once those that result in an increase (decrease) in social well-being."

<sup>5</sup> Such an incentive mechanism is consistent with what has been proposed by Kolk (1998) and Van Soest and Lensink (2000) in terms of foreign transfers to promote forest conservation whereby the aid is dependent on the forest stock and the rate of deforestation such that transfers are *declining* in the rate of deforestation.

<sup>6</sup> The simple correlation coefficient between the two series is 0.15.

<sup>7</sup> One gigaton equals 1 billion tons

<sup>8</sup> "Haze from Indonesia a perennial woe", *Asia Times*, 10/9/2002.

<sup>9</sup> *Asia Times*, op cit.

<sup>10</sup> It would not be desirable to have both CURES and the GEF. To help ensure just one global funding mechanism, it may be possible to transform the GEF at the end of its third replenishment in 2006 into a mechanism similar to that proposed for CURES.

<sup>11</sup> According to Young (2002) only 12% of GEF projects have resulted in final evaluations. This suggests a deficiency in the GEF relative to that proposed for CURES where evaluations, assessments, benchmarks and critical thresholds would be critical components of the funding mechanism.