# Financial support for biodiversity protection in developing countries - does the CBD mechanism lead to an appropriate level of biodiversity protection?

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## 1 Introduction

This paper considers the provision of biodiversity protection in developing countries in connection with the Convention on Biodiversity (CBD). The CBD proposes a solution to solve the problem of insufficient biodiversity protection in developing countries. A number of major developed countries have committed to provide "new and additional financial resources" to developing countries to enable them to protect their own biodiversity (Article 20). Using article 21 of the Conferences of the Parties the Global Environmental Facility (GEF) was appointed to operate the financial mechanism under the CBD. The overall question now is whether the regulations concerning the financing of biodiversity protection lead to efficient provision of biodiversity protection in developing countries.

Two specific questions are:

- Do the new and additional financial resources provided through the GEF lead to an appropriate level of biodiversity protection?
- Will the financial and political negotiations lead to an appropriate level of biodiversity protection?

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This paper will address these two questions and is organised as follows[2]: Firstly, there is a description of what is understood as economic analysis and an economic perspective. Secondly, biodiversity services are described as public goods and global public goods, respectively. The market failure problem of providing public goods is explained and articles 20 and 21 are presented as a solution. Thirdly, the two aforementioned questions are examined with a comparison of estimated costs for biodiversity protection and actual spending of the GEF and an analysis of the replenishment regulations. Both of these considerations lead to the thesis that the current regulations contribute to an undersupply of global biodiversity protection. It is argued that the economic criterion for the amounts of money provided by the industrialised countries should be their benefits from protection of biodiversity. To verify the thesis a contingent valuation study, its results and validity are discussed and compared to the actual spending of the GEF. The results of this study support the assumption that the request for global biodiversity protection is significantly higher than the actual spending of the GEF. This further supports the argument for greater attention from political decision makers on preferences of the public for biodiversity protection spending.

## 2 Economic analysis and economic perspective

In this paper economic analysis is understood as questioning whether the use of resources leads to an efficient production of a private or public good (Zimmermann & Henke 1994; Hanley, Shogren & White 1997). The economic perspective includes the assumption of self-interested individuals maximising their personal benefits. With biodiversity protection and services we are confronted with provision problems as the good in question is a (global) public good.

In a complete market, once several conditions are achieved, the activities of self-interested individuals lead to a socially optimal production of goods. The individual marginal costs correspond to the social marginal benefit. If not all the conditions are met, markets are incomplete and externalities occur. Public goods are a case of externalities - no one can be excluded from the consumption of these benefits and additionally, no rivalry in consumption occurs (Samuelson, 1951 cited in Hanley, Shogren & White 1997; Cansier 1993). There are few incentives for companies to produce goods with positive external effects. As the users

[2] It is assumed knowledge that biodiversity and its components are suitable for the satisfaction of human needs.

cannot be excluded from the consumption of the goods, they tend not to reveal their demand. They can consume the good without paying for it ("free riding") and consequently the producer gains no revenue from (a part of) the benefits he produces and therefore his production is lower than the actual demand for the good. The classic solution for this case of market failure is the provision of the public good by the government (Hanley, Shogren & White 1997).

Because biodiversity services are regarded as public goods, it is easy to see how the market failure problem described above can occur. This leads to the implication that biodiversity services are undersupplied and should be provided by the government. But it is not easy for the government to provide the good, unlike in the case of "normal" public goods. Some of the positive external effects of biodiversity protection occur globally thus, biodiversity services are referred to as global public goods (Kindleberger 1986, Kaul, Grunberg & Stern 1999, Perrings & Gadgil 2003).

The provision of global public goods produces special challenges. There is no government which can provide the public good (Kaul, Grunberg & Stern 1999). In the case of biodiversity, there is no supranational institution or "world government" which would have the authority to internalise the external effects of biodiversity conservation (Hanley, Shogren & White 1997, p. 163). From an idealised economic point of view, this institution would have to organise the protection of biodiversity in developing countries at a level where the global marginal cost of biodiversity protection corresponds to the global marginal benefit of protection.

As participating nations began to recognise the importance of biodiversity protection in developing countries and the problem of undersupply of the public good, they tried to find solutions to the problem. Subsequently, parts of the CBD can be regarded simply as regulations to ensure the provision of biodiversity services in developing countries.

## 3 Contribution of CBD to provision of biodiversity protection in developing countries

With articles 20 and 21 of CBD, a multinational regulation was agreed upon to contribute to the solution of undersupply of biodiversity protection in developing countries. The incremental cost approach, which leads to the sharing of expenses for biodiversity protection projects, was also agreed. Developed countries are committed to providing new and additional financial resources for biodiversity conservation. However, they only pay for ***global environmental benefit*** of measures or projects to protect biodiversity in developing

countries[3]. The national or local benefit that occurs from these projects in developing countries has to be financed by national governments or co-financers. At the same time Article 20(2) states, that "implementation of these commitments shall take into account the need for adequacy".

From an economic point of view this "need for adequacy" can be interpreted in several ways. In most cases, the discussion about adequacy concerns the sharing of burdens between developing and developed countries. Developing countries interpret "adequacy" by estimating that the contributions should be as high as the individual costs incurred when protection measures are implemented. The already developed nations viewed that the contributions should be adequate to finance only the social costs of these protection measures. Beyond the discussion of cost sharing between developed and developing country parties, the need for adequacy can be alternatively interpreted. For example, as a level of contributions from donor countries that allows for a global efficient level of protection of biodiversity in developing countries.

An optimal global level of biodiversity conservation in developing countries can be achieved when the global social marginal costs of protection are as high as the social marginal benefit of the protection. The question is thus; are the commitments of donor countries adequate in terms of global efficiency?

With Article 21 and the Conference of the Parties (COP I), the Global Environmental Facility (GEF) was appointed to operate the financial mechanism under the CBD. Thus, the GEF is the institution that organises the governmental provision of financial resources for biodiversity protection in developing countries. Does the regulation laid down by the CBD and achieved by the GEF lead to a level of biodiversity protection where global social costs and benefit are equal?

[3] "The developed country Parties shall provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention and to benefit from its provisions and which costs are agreed between a developing country Party and the institutional structure referred to in Article 21, in accordance with policy, strategy, programme priorities and eligibility criteria and an indicative list of incremental costs established by the Conference of the Parties." Article 20 (2) CBD

# 4 Financial resources from the GEF and costs of worldwide biodiversity protection

## 4.1 Financial resources provided by the GEF

When analysing GEF finances, it is important to distinguish between payments to and from the fund. As well as biodiversity protection projects, the GEF fund also finances climate change, international waters, ozone, land degradation and persistent organic pollutants projects.

Every four years the donor countries decide on the payments for the following four years. After the pilot phase of the GEF (1991-1993) the fund was replenished three times: in 1993 (GEF-1), 1997 (GEF-2) and 2002 (GEF-3) (Streck 2001; Horta, Round &Young 2002; GEF 2002e; GEF 2002f). The intended ratio for the focal area biodiversity was 32 - 41% of the whole GEF fund (Bundesregierung 1999, GEF 2002f). For GEF-1 approximately $834 million was agreed on to finance biodiversity conservation (GEF 2002e). For 2003 - 2007, $960 million is planned for biodiversity protection in developing countries (GEF 2002f). From these figures, we can deduce a computed value of $240 million annual planned payments into the GEF fund.

Germany contributes 11 - 12% of the total amount of the donor countries (GEF 2002e; GEF 2002f). Thus, via the GEF, Germany spends a calculated annual amount of approximately US$25 million on biodiversity protection in developing countries (see Table 1).

**Table 1: Payments in the GEF ( in US$ million with exception of 1)**

| | GEF-1 (1994-1997) | GEF-2 (1998-2002) | GEF-3 (2003-2007)[4] |
|---|---|---|---|
| (1) commitments in billion US$ [5] [6] | approx. 2 | approx. 2 | 2,92 (2,21)[7] |
| (2) percentages of contributions for biodiversity [8] [9] | 41.7% | 39% | 32% |
| (3) absolute payments for biodiversity[10] | 834 | 676 | 960 |
| **(4) calculated annual payments for biodiversity [11]** | **208** | **169** | **240** |
| (5) Germany's contributions (absolute and as percentages of whole GEF)[12] | 238 (11.9%) | 228 (11.4%) | 264 (11%) |
| (6) average annual contributions of Germans for biodiversity to GEF[13] | approx. 25 | approx. 22 | approx. 21 |

**Source: see footnote (own assembly)**

Figures concerning payments from the GEF projects are as follows: "from 1992 to 2002, GEF had allocated nearly $1.4 billion for 470 biodiversity projects in 160 countries" (GEF 2002b).

[4] planned
[5] (GEF 2002e)
[6] (GEF 2002f)
[7] US$ 2.21 million are new commitments (Horta, Round &Young 2002). The difference results from carryover of GEF-2 resources and investment income.
[8] (Bundesregierung 1999)
[9] (GEF 2002f)
[10] calculated from (1) and (2)
[11] calculated (3) /(4)
[12] (GEF 2002e; GEF 2002f)
[13] calculated from (2) and (5)

Over the ten year period 1992 - 2002, an average of $140 million was spent annually on biodiversity projects. According to the GEF website $991 million in grant payments was made between 1991 and 1999. An additional $1.5 billion in co-financing for biological diversity projects was mobilized (GEF, internet, focal areas). In total, the annual contribution from industrialised countries for biodiversity protection in developing countries from 1991 – 1999 was $310 million (see Table 2).

**Table 2: Payments from the GEF for biodiversity protecting projects**

| Source | Period | Spending | Annual spending |
|---|---|---|---|
| (GEF 2002b) | 1992-2002 | US$1.4 billion | US$140 million |
| GEF (gefweb.org) | 1991-1999 | US$991 million (grants) plus US$1.5 million (co financing) | US$310 million |

**Source: own assembly**

### 4.2 Costs of global biodiversity protection

There are only a few estimates of the costs of global biodiversity protection and biodiversity protection in developing countries. The annual estimates range from US$170 million for traditional protection of tropical rain forest (Reid & Miller 1989) to over US$500 million for the protection of 25 biodiversity hot spots, mostly in developing countries. This is equal to the protection of 1.4% of the earth's land surface or 44% of the vascular plant species and 35% of the species in four vertebrate groups (Myers, Mittermeier & Mittermeier 2000). Another estimate of US$27.5 billion is for a representative global network of protected areas (James, Gaston & Balmford 1999) (see Table 3).

These estimations refer to different items of protection and have been reached using different methods. Thus, a "definite" assessment of costs does not exist and the appraisals should be considered as rough approximations.

**Table 3: Annual cost of biodiversity protection**

| Subject of protection | Annual costs (US$ million) | Author |
|---|---|---|
| **Traditional protection of tropical rain forests** | 170 | Reid & Miller (1989) |
| **2000 species** (500 individuals per species) | 1250 | Reid & Miller (1989) |
| **Activities outlined in agenda 21 for biodiversity protection** | 440 | Agenda 21 (1992) |
| **Comprehensive global conservation programme** | 300,000 | James et al. (1999) |
| **Representative global network of protected areas** | 27,500 | James et al. (1999) |
| **1.4% of the land surface of the earth.** (44% species of vascular plant species, 35% species of vertebrate species) | 500 | Myers et al. (2000) |

**Source: different objects of protection, authors, years and estimations (own assembly)**

### 4.3 Comparison of GEF costs and spending

It is evident that all cost estimations are higher than the actual GEF spending. The rough estimations vary substantially. If we assume the estimates of US$27.5-500 million are realistic and compare them to the estimated payments of US$140-310 million, the factors between spending of the GEF and estimated costs are 1.5 to 200.

From an economic perspective, the estimated costs cannot be seen as an absolute benchmark for GEF spending. However, if we do use them as benchmarks we have to bear in mind that biologists see this problem from a natural scientific viewpoint. They do not deal with the needs of people. From a biological perspective the dimension of a necessary biodiversity protection cannot be defined, as biologists do not consider the "objective" necessity of biodiversity protection. They can estimate the costs of protecting 25 of the "hottest hot spots" which cover 1.4% of earth's land surface, or the possible costs of strictly protecting 10% of

the land surface to get a representative global network of protected areas. Previously, natural scientists defined levels of protection whilst often ignoring the needs of the population. However, over the last decade social needs have been taken into account and the target of protecting 1.4 – 10% of earth's surface is now, to some degree concerned with the needs of people and can therefore be used as a benchmark for biodiversity protection. Their cost estimations are however, based on the actual individual costs of protection projects. Often the policies of developing countries are "environmentally unfriendly" or ignore the scarcity of the environment. This makes nature consumptive activities relatively cheap and nature "sparing" activities expensive. If governments of developing countries introduced more environmentally friendly policies, environmental protection would be cheaper and therefore new costs would be lower than the calculations mentioned above.

Thus, the estimated costs should not be perceived as economically necessary or reasonable, but rather as a frank indication that the present payments are too low in terms of an optimal economic level of protection.

# 5 Negotiations for the replenishment of the GEF fund

## 5.1 Procedure of replenishment

Every four years the GEF fund has to be replenished. There is little information publicly available on how the replenishment negotiations actually take place, but it roughly follows this procedure. The council of the CBD asks the World Bank for renewal of the GEF fund. The World Bank convenes the donor countries and negotiations begin to restock the fund. Representatives of donor countries negotiate their individual contributions and how the total donation amount should be divided. This is based on a scheme developed by the International Development Association of the World Bank for the shares of development assistance (Horta, Round &Young 2002; Hanley, Shogren & White 1997), which is based on the economic strength of each nation. "In practice, however, contributions reflect political will more than agreed formulas." (Horta, Round &Young 2002, chap.2). Furthermore, national representatives act under strong restrictions of (national) ministers of finance (Kaiser, 2003).

## 5.2 Results of negotiations

The replenishment negotiations of the GEF are written down in the 'Summary of Negotiations' (see Appendix I). The following is an excerpt concerning the levels of overall commitment from donor countries.

The biggest amount is provided by the USA (21% [of the whole GEF fund spending]) followed by Japan (18%), Germany (11%), and the UK (GEF 2002f). The order in which contributions are made to fund corresponds to the order in which more developed countries would appear on a national GDPs list. However, the donor countries contribute different percentages of their GDP to the fund. Nations which we could call "leaders" committed a total of 0.01% of their GDP to the GEF over four years (Japan, France, Germany, UK, Canada). Some smaller countries, we could call them "front-runners", spent more than 0.02% of their GDP e. g. Sweden and Denmark. The "taillights" of the more developed donor countries committed 0.005% or less of their GDPs: e. g. USA or Spain *(*see Table 4*)*(GEF 2002f)".

**Table 4: Country contributions to the GEF-3 (extract)**

| Nation | Percentage of GDP for GEF (for four years) | Contribution in US$million |
|---|---|---|
| Sweden | 0.03 | 72 |
| Denmark | 0.023 | 36 |
| UK | 0.012 | 190 |
| Germany | 0.012 | 264 |
| Japan | 0.011 | 423 |
| France | 0.011 | 163 |
| Canada | 0.011 | 103 |
| USA | 0.0023 | 500 |
| Spain | 0.0023 | 19 |

**Source: commitments to the GEF 3 according to Summary of Negotiations (GEF 2002f), GDPs according to the CIA world fact book http://www.cia.gov/cia/publications/factbook/fields/2001.html [own calculations]**

## 5.3 Short analysis of negotiations

If we assume, according to public choice theory, e.g. Buchanan (cited in Frey 1994) that governments or representatives of governments, respectively, try to maximise their personal benefits and that these personal benefits depend on (national) re-election, than we have unfavourable requirements to solve a problem, which is characterized as follows:

The task to protect biodiversity of global interest demands international collective action. At the same time the probability of this approach to the problem being successful is relatively low.

Thus the requirements for the negotiations on contributions for biodiversity protection in developing countries are as follows: There are representatives of (developed) nations who are expected to solve the problem of biodiversity loss, who, however, also have national interests. At the same time very little is known about the benefits of biodiversity protection. Thus every invested amount is at risk of becoming a misdirected investment. Furthermore, every nation has little influence on overall protection activity and the level of biodiversity protection. National governments can trust or hope that the good (biodiversity services) will be provided even if their own contribution is low. Particularly if they assume that the importance of global biodiversity protection is relatively low for voters in their home country, national governments have low incentives to contribute a large amount of money. Moreover, the level of difference the contribution has made in terms of biodiversity protection is not easy to communicate in the home country. When governments act in national (short term) interests, because the sources for (potential) votes for re-election are the citizens of these nations, it is in their personal interest to invest national funds on projects that have a direct impact on national problems. And biodiversity protection in developing countries does not seem to directly influence the short term well-being of citizens in developed countries.
These considerations lead to a conclusion that the national governments have high incentives to act as a "free rider" and have low incentives to spend money on global biodiversity protection.

On the other hand nearly all of the developed nations want to be seen as participating in a "worthy cause" and there are higher expectations on some developed countries. Not to lose international credibility as a country which cares about the global environment explains in my opinion why nations contribute at all.

## 6 Undersupply thesis

The analysis of GEF spending and negotiation leads to the theory that the actual amount and procedure resulting in commitments from donor countries to finance biodiversity protection in developing countries, does not lead to a globally adequate level of protection.

It seems worthwhile to estimate the benefit of biodiversity protection in developing countries in order to enable a developed country to verify the thesis.

## 7 Case study – willingness to pay for the conservation of biodiversity

There are several economic methods to estimate the benefits of items or issues. Some are based on revealed preferences (or market data) and are called indirect methods (like the travel cost method or the replacement cost method). Others are based on stated preferences collected through direct questioning on willingness to pay for described goods or through observed choices of goods with slightly different attributes or parameter values, respectively.

In this study the Contingent Valuation Method (CVM) was chosen to estimate the benefit which arises in developed countries from the protection of biodiversity.

CVM is very popular in environmental economics to estimate values of non-market goods (Hanley, Shorgren & White 1997). In Contingent Valuation (CV) studies respondents are asked how much they are willing to pay for a non-market good or whether they are willing to pay a specific amount for a good[14]. From these answers the median and mean of payments can be estimated and the economic benefit of providing the valued good can be evaluated with respect to the basic population. Many studies evaluate the benefit of conservation of a single species or specific conservation projects like national parks (Loomis & White 1996; Hanley, Wright & Adamowicz 1998). The aim of this study was to survey the benefit of biodiversity protection in developing countries.

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### 7.1 Study design

The population of the survey consists of German residents (native and foreign) aged 18 and older[15] [16]. Because of the huge basic population of 66.4 million, a minimum sample of 1,000 people was interviewed to ensure a representative result. A telephone survey was selected as

[14] first question format is called “open-ended” the second “dichotomous choice”

[15] One part of the basic population is its eligible voters. In Germany people are eligible to vote when they turn 18. 1998: 60.8 million (1998). (Federal Statistical Office, Bundeswahlleiter)

the interview technique, primarily because of restricted financial resources. Telephone numbers were generated using the "random digit dialling method"[17], and the "last-birthday-method"[18] was adopted. The object of valuation was the protection of half of the endangered species expected to become extinct in the next 10 years[19]. A tax increase was used as the payment vehicle[20] because it was felt that respondents take this form of payment seriously (compared with making a donation to a nature conservation organisation). A nature tax (comparable to a visitors tax) was considered implausible for respondents, particularly because of the non-excludability from the benefits of biodiversity conservation (Bateman et al. 2002). The dichotomous choice format[21] was chosen for the willingness to pay (wtp) question. This format is favoured because it is most similar to purchase decisions (Spash 1999). It is also particularly suitable when respondents are unfamiliar with the good they are valuing. The wtp question for the protection of half of the endangered species in developing countries was evaluated as an unfamiliar question, demanding attention and thought from respondents. Thus, the dichotomous format should facilitate an answer to the wtp question. Results of CV studies are difficult to validate and the object in question here is particularly abstract. Furthermore, the results of this wtp question are difficult to compare with data of other studies. To test the validity of the wtp result, additional variables were collected. These were derived from a socio-psychological theory, the protection motivation theory developed by Rogers (1977, 1983). It is assumed that if the answers to the wtp question can be forecast with the answers to the questions deduced from the psychological theory, the responses to the wtp question are valid.

### 7.2 Study results

In April and May 2001 a total of 12,000 numbers were dialled, 3,675 persons were contacted and read the screening text. 58% refused to participate in an interview, but only 1.5% dropped out and a total of 1,017 people were interviewed (see Table 5).

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[16] 5.775 million (2001), 5.561million (1998) (Federal Statistical Office)
[17] With this method random telephone numbers are generated.
[18] When contact is established, the person with the latest birth date is asked to participate.
[19] At first glance the protection of surface area seems to be the appropriate measure. However, focus group interviews determined people do not imagine areas in acres or hectares. Also the goal of protection of e.g. tropical rain forests is not only to protect biodiversity, but also concerns the climate. As we wanted to assess the value of biodiversity protection, the protection of "natural areas" or tropical rain forests was deemed inappropriate.
[20] To decide on an appropriate payment vehicle the popular pro and con arguments were considered (Mitchell 1988, Bateman 2002).
[21] A question requiring a "yes" or "no" answer.

**Table 5: Sample report**

| | Cases | Percentages |
|---|---|---|
| **Telephone-Number Total** | **12000** | **100.0%** |
| neutral outfalls | 5177 | 43.1% |
| no connection | 4537 | 37.8% |
| wrong connection / number has changed | 83 | 0.7% |
| business telephone number | 557 | 4.6% |
| **Revised Gross I** | **6823** | **100.0%** |
| other outfalls | 3148 | 46.1% |
| no connection tone, no contact | 1701 | 24.9% |
| busy | 86 | 1.3% |
| answering machine / mailbox | 601 | 8.8% |
| fax machine/ modem (whistle) | 541 | 7.9% |
| strong communication problems | 219 | 3.2% |
| **Revised Gross II** | **3675** | **100.0%** |
| not neutral outfalls | 2658 | 72.3% |
| cancelled appointments | 41 | 1.1% |
| person not available in given time period (10 contact attempts) | 427 | 11.6% |
| refusals | 2135 | 58.1% |
| drop outs | 55 | 1.5% |
| **Realised Interviews** | **1017** | **27.7%** |

**Source: own research and own calculations**

54.7% of respondents were female, 45.3% were male. The age group ranging from 25-45 years was over-represented and people older than 65 were under-represented (see Table 6).

**Table 6: Percentages of people in age groups in the sample and in the basic population**

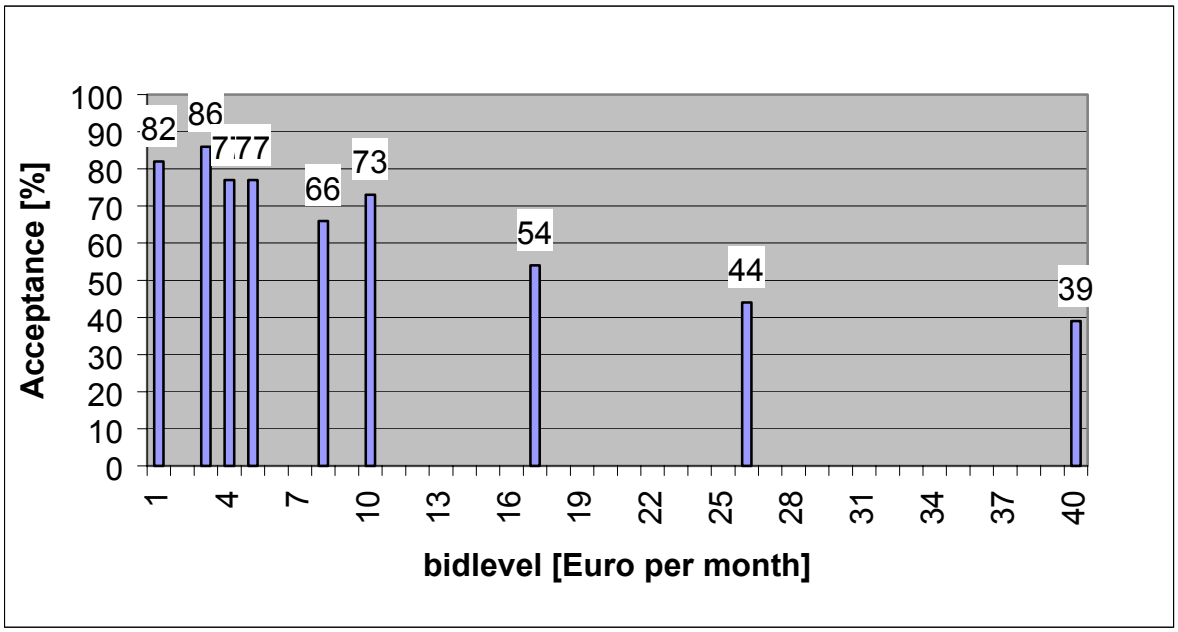
| | Percentage of sample | Percentage of basic population |
|---|---|---|
| 15(18)-25 | 15 | 13 |
| 25-45 | 45 | 36 |
| 45-65 | 29 | 31 |
| 65+ | 12 | 20 |

**Source: own research and own calculations**
**Data for basic population: Federal Statistical Office (Germany), 2002**

The sample is more or less evenly distributed over different income categories and this seems comparable to the basic population, however, it is not easy to evaluate the overall representation of the sample (see Appendix II).

The respondents were asked randomly if they were willing to pay a specific amount ranging from 1 to 40 Euros. The bid levels were 1, 3, 4, 5, 8, 10, 17, 26, and 40 Euros. The acceptance and rejection rate respectively range from 39% to 82% depending on the bid level. If a respondent had to decide about the 1 Euro amount, the probability of a "yes" answer was 82%. If the bid level was 40 Euro the probability of a "yes" answer was 39%.

**Graph 1: Acceptance rate at different bid levels (own calculations)**




A logistic regression with variables from the protection motivation theory and socio-demographic variables was performed to test the validity of the wtp answers and to calculate the mean and median of wtp resulting from the model.

Explanatory variables for the acceptance or rejection of the payment are:

- self-efficacy (= the belief in the effect of the own payment for the protection of biodiversity in developing countries)
- bid level (financial costs of contribution to protection)
- responsibility (of the respondent for the protection of species in developing countries)
- age
- threat appraisal (perceived threat as consequence of loss of biodiversity)
- opinion about whether the industrialised countries have the right to interfere in biodiversity protection affairs of developing countries
- whether the respondent had visited a developing country[22]

[22] The income is also a significant explanatory variable. 16.9% of the respondents who agreed to pay and 28.6% of the respondents who did not agree to pay did not provide information about their income. If income is included as an explanatory variable the percentage of explainable model cases increases, while the number of analysed cases decreases. Furthermore, biases in the mean and median wtp result are generated. Thus, the model was calculated without consideration of income.

The pseudo-$r^2$ (Nagelkerkes) of the model is 0.339. From the median values of the explanatory variables and their regression coefficients, the mean and median of wtp can be calculated as follows:

$$x_1 = \frac{\beta_0 + \beta_2 * \bar{x}_2 + ... + \beta_j * \bar{x}_j + ... + \beta_k * \bar{x}_k}{-\beta_1} \quad (1)$$

$\beta_1$ = regression coefficient of the bid level

$x_1$ = median of the wtp= bid level where an average respondent is indifferent

$\beta_0$= constant

$\bar{x}_j$ = average parameter value of the explanatory variable $x_j$

$\beta_j$ = regression coefficient of the variable $x_j$

(Backhaus 2000)

The median of wtp ($x_1$) is 22 Euros. This can be deduced from the model as an average monthly wtp of the respondents. In terms of conservative average wtp estimation, we assume that people who refused to participate in the survey or dropped out (59.6%) have a wtp of zero Euros. We also assume that people who cancelled their appointments or who were not available at the time the survey was taken have the same wtp as people who took part in the interviews (total = 40.4%). The multiplication of the calculated wtp of 22 Euros with the sample population (40.4%) results in an average wtp of approximately 9 Euros.

This can be interpreted as an expression of (monthly) benefits for an "average" German resident resulting from the protection of 25,000 species in developing countries over the next 10 years. We assume a basic population of 66.4 million people. A multiplication of the average wtp and the basic population results in approximately 600 million Euros monthly and 7 billion annual wtp, respectively. This can be taken as a potential (annual) benefit for Germany if 25,000 species in developing countries are prevented from extinction.

With the acquired value of 9 Euros we can attempt to roughly estimate the benefits that occur in the "main" donor countries[23]. Taking a comparable percentage of beneficiaries in these countries (~80% of the population), a similar average benefit per capita and the population of

[23] USA, UK, Japan, France, Germany, Australia, Belgium, Canada, Finland, Italy, Netherlands, Norway, Sweden and Switzerland (CIA 2002)

the main donor countries, we can calculate a benefit resulting from protection of 25,000 species in developing countries to be 4.4 billion Euros.

### 7.3 Discussion of results

Every endeavour was made to get a representative sample but the final breakdowns indicate that this objective may not have been achieved.

Some people might have refused to participate because the expression "nature conservation" was used in the screening text or because they were unwilling to take part in a telephone interview or any other form of survey. The results may be biased if respondents are affected by specific expressions e.g. "nature conservation". The sample is clearly not representative in terms of age and this may bias the results as older people have lower wtps than younger people. As gender is not an explanatory variable, it does not matter that the sample is not gender representative.

The wtp answers are valid because the pseudo $r^2$ (Nagelkerke) of the regression model is 0.339. This figure indicates a moderate to good model (Backhaus et al. 2000). In terms of a conservative calculation of the average wtp estimation (Arrow et al. 1993), a wtp of zero is assumed for people who refused to participate.

The size of the basic population has a strong influence on the result and we cannot be certain that some people did not reply on behalf of their household rather than just for themselves (as was requested). If that occurred frequently, the previous calculation would have led to an over-estimation of Germany's wtp. If we calculate with the number of households (=34 777[24]), Germany's annual benefit would be approximately 3.8 billion Euros.

## 8 Conclusion

GEF spending on biodiversity protection and the estimated costs of global biodiversity protection together with the analysis of regulations concerning the replenishment of the GEF fund, lead to the hypothesis that payments from developed countries into the fund are lower than economically adequate.

The result of a contingent valuation study can be interpreted as verification of this thesis. Germany currently contributes 25 million Euros annually into the GEF fund for the protection

of biodiversity. However, the wtp of people living in Germany can be estimated to be as high as 3.8 billion Euros. Thus, the benefit and wtp of people is higher than actual national contributions. If we assume a similar wtp in other main donor countries, the benefit of the protection of 25,000 species over the next 10 years can be re-appraised to 4.4 billion Euros annually.

This value may be condemned as unrealistic, but it should be understood within the dimension of the estimated costs for a representative global network of protected areas and a comprehensive global conservation programme, respectively.

The results of the study show that the commitment from donor countries should be higher. Furthermore, politicians should be more considerate of the preferences of the population for biodiversity protection in developing countries. The results of this study can be used to emphasise the need for greater attention to preferences of the public in decision making on biodiversity protection activity and spending.

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APPENDIX I

Summary of negotiations on the third replenishment of the GEF Trust Fund (GEF 2002f)

**GLOBAL ENVIRONMENT FACILITY TRUST FUND** **Attachment 1**
**THIRD REPLENISHMENT OF RESOURCES**

**CONTRIBUTIONS**
**(in millions)**

| | Calculated Basic Contributions | | Supplemental Contributions | | GEF-3 Total Contributions | | | |
|---|---|---|---|---|---|---|---|---|
| **Contributing Participants** | (%) | SDR | SDR | | % | SDR | National Currency | g/ |
| Australia | 1.46% | 27.60 | | | 1.46% | 27.60 | 68.16 | |
| Austria | 0.90% | 17.01 | 0.69 | a/ | 0.94% | 17.70 | 24.38 | |
| Belgium | 1.55% | 29.30 | 3.67 | a/ | 1.74% | 32.97 | 41.98 | |
| Canada | 4.28% | 80.91 | | | 4.28% | 80.91 | 158.94 | |
| China | - | 4.00 b/ | 4.44 | a/ d/ | 0.45% | 8.44 | 78.71 | |
| Cote d'Ivoire | - | 4.00 b/ | | | 0.21% | 4.00 | 3,758.86 | |
| Czech Republic | - | 4.00 b/ | 0.50 | a/ | 0.24% | 4.50 | 194.36 | |
| Denmark | 1.30% | 24.58 | 3.37 | | 1.48% | 27.95 | 298.18 | a/ |
| Finland | 1.00% | 18.91 | 2.03 | | 1.11% | 20.94 | 30.00 | a/ |
| France | 6.81% | 128.84 a/ | | | 6.81% | 128.84 | 164.00 | |
| Germany | 11.00% | 207.96 | | | 11.00% | 207.96 | 297.92 | |
| Greece | 0.05% | 0.95 | 3.55 | a/ c/ | 0.24% | 4.50 | 5.73 | |
| India | - | 4.00 b/ | 3.99 | a/ d/ | 0.42% | 7.99 | 426.39 | |
| Ireland | 0.11% | 2.08 | 2.42 | a/ c/ | 0.24% | 4.50 | 5.73 | |
| Italy | 4.39% | 82.99 | | h/ | 4.39% | 82.99 | 118.90 | |
| Japan | 17.63% | 333.41 a/ | | | 17.63% | 333.41 | 48,754.33 | |
| Korea | 0.23% | 4.35 | | | 0.23% | 4.35 | 7,142.95 | a/ |
| Luxembourg | 0.05% | 0.95 | 3.05 | c/ | 0.21% | 4.00 | 5.73 | |
| Mexico | - | 4.00 b/ | | | 0.21% | 4.00 | 4.00 | a/ |
| Netherlands | 3.30% | 62.39 | | | 3.30% | 62.39 | 89.38 | k/ |
| New Zealand | 0.12% | 2.27 | 1.73 | c/ | 0.21% | 4.00 | 12.13 | |
| Nigeria | - | 4.00 b/ | 0.50 | a/ | 0.24% | 4.50 | 4.00 | |
| Norway | 1.06% | 19.96 | | | 1.06% | 19.96 | 228.32 | |
| Pakistan | - | 4.00 b/ | | | 0.21% | 4.00 | 320.63 | |
| Portugal | 0.12% | 2.27 | 1.73 | c/ | 0.21% | 4.00 | 5.73 | |
| Slovenia | - | 1.00 | 0.13 | a/ | 0.06% | 1.13 | 313.94 | |
| Spain | 0.80% | 15.12 | | | 0.80% | 15.12 | 21.67 | |
| Sweden | 2.62% | 49.53 | 7.45 | | 3.01% | 56.98 | 764.67 | |
| Switzerland | 2.43% | 45.94 | | | 2.43% | 45.94 | 99.07 | |
| Turkey | - | 4.00 b/ | | | 0.21% | 4.00 | 4.00 | |
| United Kingdom | 6.92% | 130.82 a/ | 19.09 | a/ | 7.93% | 149.91 | 117.83 | |
| United States | 20.86% | 394.36 | | | 20.86% | 394.36 | 500.00 | f/ |
| 1. New Funding from Donors | 88.99% ** | 1,715.50 | 58.34 | | 93.82% | 1,773.84 | | |
| 2. Supplemental Contributions including Credits | | | 12.50 | a/ k/ | 0.66% | 12.50 | | |
| 3. Investment Income e/ | | | | | | 105.00 | | |
| 4. Carryover of GEF Resources j/ | | | | | | 450.00 | | |
| **5. Total Projected Resources to Cover GEF-3 Work Program ( 1 + 2 + 3 + 4 )** | | | | | | **2,341.34** | | |

** GEF basic shares, which are originally derived from the GEF-1 and were largely maintained in the GEF-2, do not add up to 100%.

*a/ Contributing Participants have the option of taking a discount or credit for acceleration of encashment and; (i) including such credit as part of their basic share; (ii) counting such credit as a supplemental contribution; or (iii) taking such discount against the national currency contribution. France and Japan have opted to include the credit for accelerated encashment in their basic share. The United Kingdom has chosen to accelerate encashment of its basic and supplemental contributions. A credit for accelerated encashment is thus included in its basic share and its supplemental contribution. Austria, Belgium, China, Czech Republic, Greece, India, Ireland, Nigeria, and Slovenia have opted to include the credit for accelerated encashment as a supplemental contribution. Denmark, Finland, Korea, and Mexico have opted to take a discount against their national currency contribution. Canada chose to acclerate encashment of its contribution but not to take either a discount or a credit.*

*b/ Represents the agreed minimum contribution level to the GEF-3.*

*c/ These Contributing Participants have agreed to adjust their contributions upward to the agreed minimum contribution level of SDR 4 million.*

*d/ China and India have indicated that they would contribute more than the agreed minimum contribution level of SDR 4 million.*

*e/ Represents projected investment income expected to be earned on resources projected to be held in the GEF Trust Fund over the GEF-3 commitment period (FY03 through FY06).*

*f/ In addition to four annual installments of USD 107.5 million, the United States will provide USD 70 million in the final year of the replenishment upon achievement of the performance measures outlined in Schedule 1 to this Table. The achievement of such measures will be determined by the Council on the basis of verification by the Independent Monitoring and Evaluation Unit, and taking into account any unforeseen events or circumstances that may prevent their achievement.*

*g/ Calculated by converting the SDR amount to the national currency using an average daily exchange rate over the period from May 15, 2001 to Nov 15, 2001, as agreed by the Contributing Participants at the May 7, 2001, GEF-3 replenishment meeting.*

*h/ For this Contributing Participant, acceleration of encashment is under consideration.*

*j/ Represents the amount carried over to the GEF-3 pursuant to paragraph 9 of Resolution No. ____, valued on the basis of June 30, 2002 exchange rates.*

*k/ Represents a credit from acceleration from Canada in the amount of SDR 10.13 million and a supplemental contribution from The Netherlands in the amount of SDR 2.37 million, bringing The Netherlands' total national currency contribution to EUR 92.76 million.*

APPENDIX II

| | **Study sample** | | | **Basis population** | |
|---|---|---|---|---|---|
| | frequency | percentages | Valid percentages | Income-categories [25] | Percentages basis population |
| Less than 900 Euros | 127 | 12 | **16** | < 920 | **16.7** |
| 900 – 1,250 Euros | 107 | 11 | **13** | 920-1534 | **27.7** |
| 1,251- 1,600 Euros | 138 | 14 | **17** | 1534-2556 | **32.5** |
| 1,601 - 2,000 Euros | 124 | 12 | **16** | | |
| 2,001 - 2,500 Euros | 107 | 11 | **14** | | |
| More than 2,500 Euros | 197 | 19 | **25** | >2556 | **22.9** |
| **total** | **800** | **77** | **100** | | |
| Do not know/ not specified | 217 | 21 | | | |

Own research data

[25] Federal Statistical Office, Datenreport 2002, p. 212