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# Priorities for Biodiversity Conservation in the Tropics

By World Conservation Monitoring Centre

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## SUMMARY

*This study provides an assessment of the extent to which habitats in the tropics are protected and guidance on prioritising conservation action from global and national perspectives. At the global level, investments should be strategically targeted towards biologically richer countries and habitats inadequately represented within protected areas. In the case of habitats that are well represented within protected areas, investments should be targeted towards effectively managing such sites. At national levels, countries should aim to ensure that all habitats are well represented within their protected areas system.*

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## INTRODUCTION

Much of the world's biological diversity is concentrated in the tropics, particularly where conditions are hot and wet. Tropical forests, for example, contain over half of the world's biodiversity (WCMC, 1992). But how much of biodiversity is protected, how much is being invested in its protection and, from a global perspective, what are the priorities and most appropriate strategies for its conservation?

While there have been various assessments of the status of biodiversity within each of the tropical regions (Sub-Saharan Africa: MacKinnon and MacKinnon, 1986a; Indo-Malaya: MacKinnon and MacKinnon, 1986b; MacKinnon, 1996; Pacific: Dahl, 1986; Latin America & Caribbean: Dinerstein *et al.*, 1995), there has never been a single pantropical evaluation of conservation priorities.

This study makes use of several extensive spatial datasets, not previously available, to provide for the first time a comprehensive assessment of the conservation status of biodiversity throughout the tropics. The main findings of relevance to policy makers, planners and donors are presented in this paper. Further details can be found in the full WCMC report, which also includes a more exhaustive analysis of the conservation status of tropical forests (Murray *et al.*, 1996).

# METHODS

## Biodiversity status

In order to assess biodiversity status in the tropics, a habitat classification system (Box 1) was used to quantify the extent to which major ecosystems are represented within protected areas.

### Box 1 Habitat classification system

This is based on an ecofloristic zone (EFZ) classification system developed by F. Blasco and P. Legris of the Centre National de la Recherche Scientifique, University of Toulouse, France to standardise existing vegetation classifications of tropical Asia and the Pacific (Sharma, 1986; FAO, 1989). Subsequently, the classification was applied to the vegetation of Africa (Sharma, 1988) and South America (Lavenu, Bellan and Meste, 1988). It has since been digitised by FAO for the entire tropics as part of its Forest Resources Assessment 1990 Project.

The classification represents potential vegetation and is based on four criteria:

- climate (mean annual precipitation, length of dry season, temperature and relative humidity),
- physiognomy and structure of vegetation using interpretation of satellite imagery,
- edaphic factors (soil and physical environment), and
- dominant or characteristic forest species of indigenous flora.

Thirteen major zones are distinguished, each represented by one or more EFZs in the different tropical regions. Whereas major zones are common to all regions (except the Mediterranean which occurs only in tropical Africa), EFZs are characteristic of particular regions, as shown in Maps [1](#), [2](#) and [3](#). In this study the terms habitat and major habitat are used synonymously with EFZ and major zone, respectively.

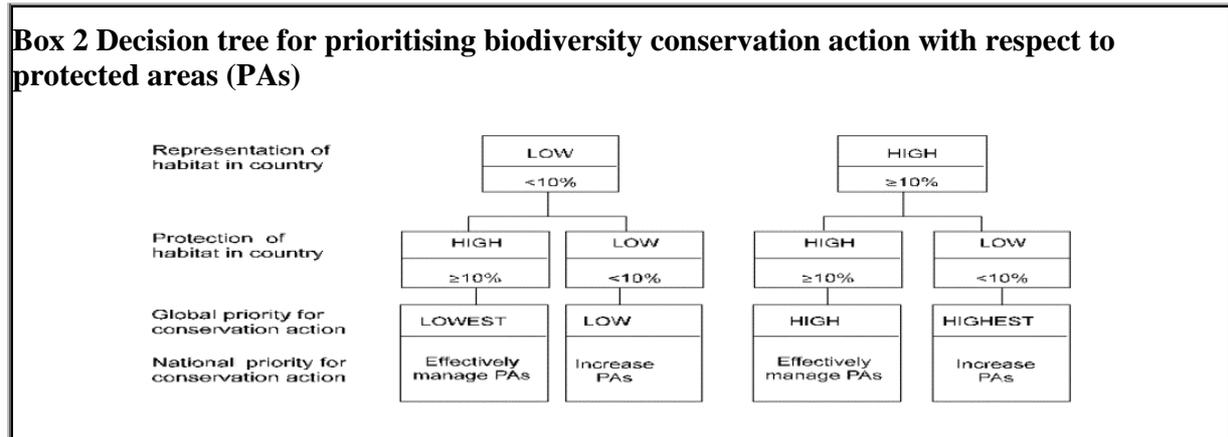
Statistics were generated by overlaying vector datasets of protected areas and habitats, using Geographic Information System technology. All protected areas 1,000ha, and known to exist and mapped in mid-1995 were included in the analysis.

A protected area is defined as:

*"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means"* (IUCN, 1994).

A combination of the percentage of a habitat found within a given country and its percent protection within that country was used to prioritise the need, and define the strategy, for conservation action.

Thus, a habitat with a significant proportion (less than or equal to 10%) found within a particular country but largely unprotected (% represented within protected areas) is given highest priority for conservation action, the most appropriate strategy being the creation of protected areas. Conversely, a habitat that is sparsely represented (%) within a country but, nevertheless, well represented (less than or equal to 10%) within the national protected areas system is given lowest priority for conservation action, the most appropriate strategy being effective management within existing protected areas. These and other scenarios are explained in Box 2.



The minimum of 10% for representation within protected areas is based on that agreed at the III World Congress on National Parks and Protected Areas to be an appropriate and practical target for each of the world's major ecosystems (McNeely and Miller, 1984). This target was applied to biomes at the IV World Congress (IUCN, 1993).

### Investments in protected areas

Expenditure on protected areas was used as an indicator of levels of investment in protecting biodiversity. Expenditure was considered for 1992 in terms of national investments, based on protected area agency budgets, and foreign aid channelled through bilateral and multilateral aid agencies (i.e. Official Development Assistance).

The analysis was restricted to 15 of the 25 countries prioritised for development assistance by the UK under its Renewable Natural Resources Strategies. Data for other countries was not available.

### Constraints

The data used in this study are subject to the following limitations:

- Those protected areas whose location was not known could not be included in the analysis (estimated at ≤10% sites).
- In cases where only point locations, rather than boundaries, were available for protected areas, circles were mapped proportional in size to the area of the site.
- Estimates of foreign aid for protected areas are conservative, since it was not possible to obtain comprehensive information on relevant projects from all bilateral and multilateral donors. The estimates represent commitments, rather than actual disbursements, in 1992.

# RESULTS

## Pantropical overview

The protection status of major habitats is summarised in [Table 1](#) and illustrated in [Map4](#).

The results show that:

- Protected areas cover 7.7% of the tropics.
- Of the five regions, South & South-East Asia and Central America & Caribbean are least well protected.
- Wet and moist major habitats are better represented in protected areas than dry major habitats. This probably reflects national and foreign policies to promote the conservation of tropical rain forests, and drier habitats being more prone to conversion to agriculture.
- Major habitats well represented in protected areas are lowland wet (21.8%), mostly found in tropical America, and montane moist (11.9%). Poorly represented major habitats are premontane dry (2.9%) and montane dry (2.2%). The latter is the least extensive major habitat, with a total area of only 308,080 sq.km.
- Protection of several major habitats is marginal (%) in certain regions, namely:
  - lowland sub-dry: C. America & Caribbean
  - lowland very dry/sub-arid: C. America & Caribbean
  - lowland arid/desertic: S. & S.E. Asia, S. America
  - premontane dry: S. & S.E. Asia
  - montane dry: Africa, C.America & Caribbean

## Strategies for conservation action

The distribution of each habitat is summarised by country in the [Annex](#), according to a range of conservation priorities and strategies defined in Box 2.

An example of how to use the [Annex](#) is given in Box 3 to show the priority and appropriate strategy for conserving a habitat within each of its range countries. Reference should also be made to Maps [1](#), [2](#) and [3](#) which show the distribution of habitats and protected areas.

Salient features of the analysis are as follows:

- seven habitats are currently not represented within protected areas (Box 4).
- 13 habitats fall exclusively within the territory of a single country. Such countries, therefore, are solely responsible for their protection (Box 5).

**Box 3 An example of how to interpret conservation priorities summarised in the [Annex](#)**

Reference to the [Annex](#) shows that deciduous forest (EFZ 15) in Africa is potentially found in Kenya, Mozambique, S. Africa, and Tanzania. Conservation priorities and strategies within each country are as follows:

**S. Africa**

has less than 10% of EFZ 15; less than 10% of that which occurs in the country lies within protected areas.

*Global conservation priority:* lowest

*National conservation priority:* effectively manage that which is protected.

**Kenya**

has less than 10% of EFZ 15; less than 10% of that which occurs in the country lies within protected areas.

*Global conservation priority :* low

*National conservation strategy :* increase representation within protected areas to at least 10%.

**Tanzania**

has less than 10% of EFZ 15; less than 10% of that which occurs in the country lies within protected areas.

*Global conservation priority :* high

*National conservation strategy :* effectively to manage that which is protected.

**Mozambique**

has less than 10% of EFZ 15; less than 10% of that which occurs in the country lies within protected areas.

*Global conservation priority :* highest

*National conservation strategy:* increase the representation within protected areas to at least 10%

**Box 4 Habitats currently not protected**

**Tropical Africa**

EFZ 2 - lowland rain forest (Madagascar)

EFZ 18 - wooded grassland with baobab (Angola, Zaire)

**Tropical Asia**

EFZ 14 - evergreen & semi-evergreen forest (Viet Nam)

EFZ 29 - deciduous & mixed forest (Cambodia)

EFZ 31 - temperate & alpine forest and scrub (Pakistan)

EFZ 36 - subtropical hill forest (Sri Lanka)

**Tropical America**

EFZ 8 - cerrados (Brazil)

### **Box 5 Countries with sole responsibility for the conservation of habitats within their territory**

#### **Tropical Africa**

Kenya (1 habitat)

Madagascar (9 habitats)

South Africa (10 habitats)

#### **Tropical Asia**

Cambodia (1 habitat)

India (4 habitats)

Indonesia (5 habitats)

Malaysia (2 habitats)

Myanmar (1 habitat)

Pakistan (2 habitats)

Sri Lanka (1 habitat)

Viet Nam (2 habitats)

#### **Tropical America**

Brazil (5 habitats)

peru (1 habitat)

Note: Habitats are identifiable from the [Annex](#).

### **Investments in protected areas**

Using the number of habitats within a country as a measure of its biological richness, [Figure 1](#) shows that biologically diverse countries tend to spend less on protected areas than less diverse countries. This is attributed to fewer financial resources being available in biologically rich countries, and agrees with a more extensive, worldwide analysis of protected area investments (James *et al.*, in press).

Levels of foreign aid for biodiversity conservation, however, are weakly related to habitat diversity ([Figure 2](#)), suggesting that donors have tended to appraise the biological richness of a country in their allocation of aid for conservation.

Although the allocation of foreign aid is unevenly distributed, [Figure 3](#) shows that it makes a substantial difference to the total investment in protected areas in approximately one-third of countries sampled. However, foreign aid does not adequately compensate for the low level of national investments in biologically rich countries.

## **POLICY IMPLICATIONS**

This study provides initial guidance on global priorities, and the most appropriate strategies, for biodiversity conservation in the tropics. Biodiversity conservation policies and interventions should be guided by the following principles:

### **Global priorities**

- Investments should be strategically targeted towards habitats inadequately represented within protected areas, with priority given to countries with sole or major responsibility for their conservation. In particular, the proportionately less extensive protected area networks in South & South-East Asia and Central America & Caribbean, poorer representation of drier habitats in protected areas, and marginal or zero protection of certain habitats need to be addressed.
- In the case of habitats that are well represented within protected areas, investments should be targeted towards effectively managing such sites, with priority given to countries with sole or major responsibility for such habitats.
- Investments should be prioritised towards biologically richer countries.

### **National priorities**

- Countries should aim to ensure that all habitats are well represented within their protected areas system.

Given that the habitat classification system represents potential vegetation, conservation strategies will need to be validated by more detailed assessments of the actual distribution and condition of the vegetation at national levels.

## **FUTURE MONITORING**

The value of using GIS technology to quantify the representativeness of protected area systems in the tropics is clearly demonstrated by this study. However, the present analysis is limited to habitats. It should be complemented by a similar quantitative assessment of the representation of centres of species diversity, speciation and endemism within protected areas.

This study also highlights the need to procure data on the effectiveness with which protected areas are managed to guide aid interventions, particularly as investments become increasingly directed from the establishment of protected areas to their maintenance.

A tripartite information system on:

- representation of tropical habitats and species hot spots within protected areas,
- effectiveness of protected area management, and
- national and foreign aid investments in protected areas

would enable cost-effective strategies for conserving biodiversity in the tropics to be developed and monitored.

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