

## The world's riches: biodiversity and change (1)

### BIODIVERSITY

**Biodiversity** means biological diversity. It is the variety of all forms of life on earth – plants, animals and micro-organisms. It refers to species (species diversity), variations within species (genetic diversity), and interdependence within species (ecosystem diversity) and habitat diversity.

It is estimated that there are up to 30 million species on earth. However, only 1.4 million species have yet been identified. The tropics are the richest area for biodiversity. Tropical forests contain over 50% of the world's species in just 7% of the world's land. They account for 80% of the world's insects and 90% of primates.

### THE VALUE OF TROPICAL RAINFORESTS

Industrial uses	Ecological uses	Subsistence uses
Charcoal	Watershed protection	Fuelwood and charcoal
Saw logs	Flood and landslide protection	Fodder for agriculture
Gums, resins and oils	Soil erosion control	Building poles
Pulpwood	Climate regulation e.g. CO <sub>2</sub> and O <sub>2</sub> levels	Pit-sawing and saw-milling
Plywood and veneer		Weaving materials and dyes
Industrial chemicals		Rearing silkworms and bee-keeping
Medicines		Special woods and ashes
Genes for crops		Fruits and nuts
Tourism		

### DEFORESTATION OF THE TROPICAL RAINFOREST

Tropical forests are being destroyed at a rate of over 11 million hectares a year (or 21 ha/minute). Increasingly, tropical rainforests are very scattered and fragmented. The Amazon rainforest is the main exception, although it is imploding.

#### Causes of deforestation in Brazil

There are five main causes of deforestation in Brazil:

- agricultural colonization by landless migrants and speculative developers along highways and agricultural growth areas
- conversion of the forest to cattle pastures, especially in eastern and south-eastern Para and northern Mato Grosso
- mining, for example the Greater Carajas Project in south-eastern Amazonia, which includes a 900 km railway and extensive deforestation to provide charcoal to smelt the iron ore; another threat from mining comes from the small-scale informal gold mines, *garimpeiros*, causing localized deforestation and contaminated water supplies
- large-scale hydroelectric power schemes such as the Tucuruí Dam on the Tocantins River
- forestry taking place in Para, Amazonas and northern Mato Grosso.

Other causes include:

- drought (increases risk)
- climate change (can cause drought)
- timber exploitation (fires are used to overcome laws about clearing timber for sale, or to create a source for damaged and thus cheap timber)
- selective logging (can create artificially dry forests by opening up the canopy)
- lightning (the main natural cause)
- land clearing ("slash-and-burn" agriculture during dry and windy conditions can cause major fires).

#### Trends

Deforestation in Brazil shows five main trends:

- 1 It is a recent phenomenon.
- 2 It has partly been promoted by government policies.
- 3 There is a wide range of causes of deforestation.
- 4 Deforestation includes new areas of deforestation as well as the extension of previously deforested areas.
- 5 Land speculation and the granting of land titles to those who "occupy" parts of the rainforest is a major cause of deforestation.

## The world's riches: biodiversity and change (2)

### EFFECTS OF DEFORESTATION

There are many effects of deforestation, including:

- disruption to the circulation and storage of nutrients
- surface erosion and compaction of soils
- sandification
- increased flood levels and sediment content of rivers
- climatic change
- loss of biodiversity.

Deforestation disrupts the closed system of nutrient cycling within tropical rainforests. Inorganic elements are released through burning and are quickly flushed out of the system by the high-intensity rains.

Soil erosion is also associated with deforestation. As a result of soil compaction, there is a decrease in infiltration, an increase in overland runoff and surface erosion.

Sandification is a process of selective erosion. Raindrop impact washes away the finer particles of clay and humus,

leaving behind the coarser and heavier sand. Evidence of sandification dates back to the 1890s in Santarem, Rondonia.

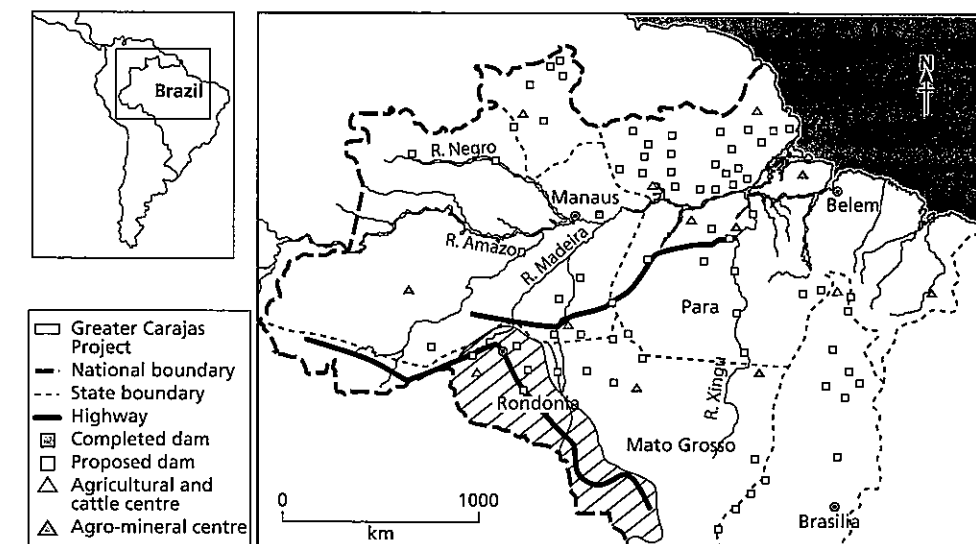
As a result of the intense surface runoff and soil erosion, rivers have a higher flood peak and a shorter time lag. However, in the dry season river levels are lower, the rivers have greater turbidity (murkiness due to more sediment), an increased bed load, and carry more silt and clay in suspension.

Other changes relate to climate. As deforestation progresses, there is a reduction of water that is re-evaporated from the vegetation, hence the recycling of water must diminish. Evapotranspiration (EVT) rates from savanna grasslands are estimated to be only about one-third of those of the tropical rainforest. Thus mean annual rainfall is reduced, and the seasonality of rainfall increases.

### AMAZON'S RESCUE REVERSED

Government satellite images show that at least 1249 square miles (3235 km<sup>2</sup>) of rainforest were lost between August and December 2007, mainly because of soy planting and cattle ranching. The true figure could be as high as 2700 square miles (almost 7000 km<sup>2</sup>).

Environmentalists say as much as 20% of the rainforest has already been destroyed, mostly since the 1970s. A further 40% could be lost by 2050 if that trend is not reversed, they estimate.



Economic development and deforestation in the Brazilian rainforest

### THE COST OF ENVIRONMENTAL INACTION IN NIGERIA

The conventional constraint on government and private sector action has been concern about the costs of taking new environmental protection measures. This narrow preoccupation has overshadowed the equally important consideration of the mounting economic, social and ecological costs of not acting.

A recent World Bank study provides a stark assessment of the risks and enormous costs if no remedial action is taken. In sum, the long-term losses to Nigeria of not acting on growing environmental problems are estimated to be around \$5000 million annually.

Soil degradation	3000
Water contamination	1000
Deforestation	750
Coastal erosion	150
Gully erosion	100
Fishery losses	50
Water hyacinth	50
Wildlife losses	10
<b>Total</b>	<b>5110</b>

Annual costs of inaction (US\$ million/year)