CHAPTER 27

Humid Tropical Environments

The humid tropical environment has generated great interest amongst geographers in recent years as concern about deforestation and its local and international impacts has been widely publicized. It is a large and diverse environment. At one extreme we have the nation state of Singapore and at the other we have the almost untouched rain forests of Papua New Guinea. In this chapter we concentrate on the physical aspects of the environment, with particular emphasis on the forested areas, how they are changing under the economic pressures of development and how some form of sustainable development may allow both survival and economic return. In this case it is unwise to describe the physical environment alone as the problems of ecological damage can be understood only in economic terms. Many students have strong views about development in tropical rainforest areas. By introducing the social, political and economic factors at work in tropical countries, the students can be made aware that the problem is much more complex than simply ‘the forest must be preserved’.

Most broadsheet newspapers and natural history journals contain articles about the rain forest to provide up-to-date information in addition to the usual wide range of web sites. The National Geographic always contains splendid photographs to accompany articles about tropical forests.

Climate

- Much of the sun’s energy is absorbed in the tropics, so it acts as a source for heat transfer to energy-deficit regions.
- There are three main climatic zones of the humid tropics: the equatorial trough zone; the monsoon areas; and the trade-wind zones.
- In the equatorial trough zone, temperatures are uniformly high, with a greater diurnal than annual variation. Precipitation occurs throughout the year, though most areas have a drier season.

Geomorphology

- The humid tropics are associated with deep weathering caused by the higher activity rates of chemical processes at warmer temperatures when moisture is available.
- In steeper areas mass movement is the main process operating on the landscape.
- In regions of calcareous rock, solution is highly significant and produces distinctive landforms.

Soils

- Tropical soils are the products of rapid weathering and strong leaching. They are dominated by kaolinitic clays.
- Organic matter is rapidly decomposed under tropical conditions. Maintaining organic matter at levels suitable for agriculture is a major problem.
Tropical forests

- The true tropical rain forests grow in lowland areas receiving more than 1700 mm of rain per year and with no distinct seasonality.
- Soils beneath tropical forests are intensely weathered. They have a low cation exchange capacity and few bases.
- Tropical forests are renowned for their species diversity; there may be over 100 species of trees per hectare.
- Complex relationships often exist between different forest species. Insects and animals are often involved with pollination and seed dispersal.
- Much of the nutrient store of a tropical forest is in the vegetation rather than the soil. Turnover is very high compared with other biomes.

Environmental change

- There has been debate about the amount of change which has taken place in tropical forests. Some argue for the stability of forests since the Tertiary period. Others argue that dramatic changes occurred during the Quaternary period, with only isolated patches of forest surviving.
- Recent concern has been expressed about the rate of deforestation of the humid tropics. Rain forest is being used as a ready source of timber and converted into poor-quality grazing land or plantation agriculture.
- Information about deforestation has improved through remote sensing, though regrowth of forest is rarely mentioned or monitored.
- Deforestation leads to loss of species diversity, loss of natural resources and environmental changes on the local and regional scales.

Forest management

- Many suggestions have been made on how to manage forests so that they benefit local people, nations and the global environment.
- Many designated National Forest Parks, which might be expected to be safe from inappropriate exploitation, have been affected by illegal logging.
- In areas of economic pressure on forest resources, the forests must be seen to be making a contribution.
- Recently efforts have been made to develop the idea of ecotourism, as in Costa Rica and Belize; the forest then becomes the tourist resource.

CASE STUDY – Paraguay, Conflicts of Conservation and Development

There is increasing pressure on a variety of ecosystems through population growth and the quest for economic development. Development can mean wealth creation and most
governments strive to achieve higher levels of prosperity for their country through the encouragement of industry and agricultural improvements. Both of these processes depend upon the natural resources of a country, such as forests, fertile soils, or minerals. Forests can be used for timber, fertile soils will grow good crops and minerals can be used internally or exported onto the international market. All of these developments are likely to cause the destruction of the natural vegetation and its biodiversity.

We are finding that tropical forests are being cleared at a rapid rate (see Chapter 27) to both exploit their timber and replace them by agriculture such as soya beans, palm oil or ranching. Similar deforestation took place in Europe and North America many centuries ago as economic development and population growth or migration put pressure on the land. Unfortunately we are now more aware of the consequences of forest clearances – reducing biodiversity and the value of forest as a store of carbon to absorb those emissions from fossil fuel combustion.

An alternative value has been put on forests by ecotourism. It is argued that people will pay to view the forest and see it in a natural form unaffected by human interference. There are a number of examples, such as Costa Rica, Ecuador, Kenya and Nepal, where tourists are attracted because of the survival of the natural environment. The idea is to reduce any negative effects that often accompany conventional tourism (as on the Costas of Spain) and also provide income for local people. If more money can be made from retaining the forest than by cutting it down, it is much more likely to survive.
Unfortunately even this idealistic idea of viewing nature without disturbing it has caused problems. Whenever a developed life-style is transferred to an undeveloped region there will be an impact. Water supplies, food supplies, removal of waste and social impact on surrounding indigenous communities all have potential problems. For example, lack of adequate sanitation in some of the East African game parks results in the disposal of campsite sewage into rivers, affecting local wildlife, livestock and people who use the river water for drinking.

There are few detailed studies of the need to conserve nature because of the difficulties of obtaining adequate data and the vested interests that are often attached to such investigations. A recent study of the economic costs and benefits of conservation in eastern Paraguay provides a useful examination of what is involved and what gains and losses there may be in conserving the biodiversity of an area.

The area concerned is the Mbaracayu Forest Biosphere Reserve which is within the highly threatened Atlantic forests of eastern Paraguay (Figure 1). In 1973 it was largely forested but by 2004, the area of forest cover had decreased to only 56% and was becoming highly fragmented. Pressure on the forest by clearing came from agricultural smallholders with cash and subsistence crops (12%), large-scale cattle ranching (14%) and soybean production (2.4%), the most profitable use in the area. There is also a small population of Ache, an indigenous group, who use the forest for traditional hunting and gathering, including a protected area which is closed to other activities. Extraction of timber still takes place and there are several sawmills in the area.

The conclusions of the study are dependent on many of the assumptions made about possible costs and benefits. The original study would have to be consulted to see the full range of arguments raised. However it did find that the economic benefits of ecosystem services that are generated locally (meat from wild animals and timber) were small and offset only a fraction of the costs of conservation. In contrast, the value of forests for carbon storage dominates the economic equation and far exceeded the conservation costs. This conclusion causes problems as the greatest value of the forest appears to be in conserving carbon for the global good rather than a contribution to the local economy. The argument for ecotourism as a source of local wealth generation seems more realistic if the money generated by the tourists does stay within the local economy. In many cases, the operation is supported by international organisations and there is little gain by the surrounding communities. Influential groups, such as timber extractors, can exert pressure and sway government bodies to allow extraction beyond a sustainable level. The owners of ecotourist centres are likely to wish to maximize the benefits from their operation. By increasing the number of tourists, a company will gain economic benefit while generating a greater environmental cost. Many environmentalists have argued for the need of an accreditation of such ecotourism activities but, as yet, there are no universally agreed standards and “common land” is likely to be exploited further.
Essay and discussion questions

1. The popular view of a humid tropical climate is of abundant rainfall that largely falls from convectional storms every afternoon. To what extent is this realistic?
2. Describe the nutrient budget of tropical rain forest and demonstrate how it differs from those of other biomes.
3. The lush vegetation of tropical rain forest gives the impression of rich soil. Is this a valid assumption?
4. Choosing one particular example, describe the nature of deforestation and explain why it is occurring.
5. Why are the rain forests believed to be important in affecting the levels of greenhouse gases?
6. How should Brazil treat the Amazonian forest so that it benefits from its resources without damaging them irreparably?
7. Is ecotourism in the humid tropics environmentally friendly?

Further reading


Web resources

http://www.mongabay.com A website concerned with wildlands and wildlife, especially tropical forest area. Issues a number of interesting articles together with a weekly newsletter. Good for case studies.
Website of Terrestrial Ecosystem Monitoring, an EU supported organization that is concerned with providing information about global land cover statistics that includes a section on tropical rainforest. Vegetation maps can be downloaded for a range of areas.

The Tropical Forest Information Center is a partner with NASA Earth Science Information to disseminate information about the state of the world’s tropical forests. Downloads are available of rates and areas of deforestation as well as the current situation of forest.

If you want to see what conditions in parts of a rainforest look like, this web site is based on Suriname on the north coast of South America and shows a cross section from the coast inland with many plants and animals.

A website that aims to publicize the pressures being placed on tropical rainforest. Full of useful information though some statements and bullet points may be considered contentious.