

African Environments and Resources



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Preface

For the rest of this century and beyond, most Africans will derive their living from the productivity of the soil, water, and vegetation resources of the continent. Yet this continent, perhaps more than all others, has real physical constraints on the productivity of the environment. These limitations have been compounded by layers of human misuse and mismanagement.

In attempting to analyze the most important features of the African environment we have deliberately focused on those characteristics and issues which we judge to be most important in the current and future management of environmental resources. Issues of management of the environment are, therefore, woven into the fabric of the text.

However, this is not a comprehensive analysis of development problems in Africa. We are well aware of the complex combinations of historical, social, economic, and political factors which interacting upon the physical environment explain individual current African country and regional situations. We have attempted to acknowledge these issues where they are especially relevant to our themes but it is not practical to explore them in any great length in a book of this size. Rather we direct ourselves to the considerable task of analyzing the salient environment issues in this large and important continent and through this introduction present the background for more detailed studies and analysis.

This work is meant to be read by the nonprofessional in the field. It is hoped that it will also serve some of the overview needs of professionals in resource management, environmental conservation and development; and to students in these and other fields interested in Africa. The introductory chapters provide an overview of the environmental characteristics of the continent in an analysis of the geographic and environmental history of Africa. This we judge is important in providing the physical setting of the continent and in exploring some of the distinctiveness of Africa from other continental size areas. Africa does have distinctive characteristics of dryness, widespread plateau or plainlands topography, generally old and somewhat infertile soils, and peculiar river basin patterns. Some background to the evolution of the management of resources over this large continent is provided in Chapter 3 which particularly emphasizes the historical evolution of ethnic and national management systems.

In the next section of the book we take a broadly defined ecosystem approach. Here we identify and address the major environmental and resource issues of the tropical rainforest, the savanna – dry forest, the arid and semi-arid areas, the highlands, and the extratropical zones of northern and southern Africa. Each of these systems has distinctive patterns of natural occurrence and responses to change. The most dramatic changes occur when rainforest and highland ecosystems are inappropriately modified by human actions; the most widespread and in some respect currently most important transformations are those in the savanna and dry areas of the continent. Although these ecosystems are more resilient than the tropical rainforest or highland ecosystems, they are undergoing

PREFACE

a process of desertification over wide areas, and it is difficult to create new management styles which could reverse this trend under current constraints.

The extratropical areas of northern Africa are discussed mostly in the context of coastal and urban problems; in southern Africa the unequal segregation of land along racial lines is taken as the main context in which to look at resource management.

In the last section of the book we take a thematic approach to a number of topics not adequately covered by the ecologic divisions. These include river basin issues, urban resource problems, and environment issues associated with mineral and industrial development. River basin management is a vital component of Africa's development and the physical factors influencing this development are discussed in Chapter 9. Urban growth is a significant factor of African development over the last twenty years and as towns and cities grow new kinds and new dimensions of resource management occur both within the city and in its hinterland. City growth has created a new and important set of environmental problems in Africa.

The general conclusions reached are indeed somewhat pessimistic. There are no quick or easy solutions to the complex of African environmental and resource-management problems. But based on a better understanding of the environment and of the management systems involved in the different parts of Africa, there are clear paths forward. It is vitally important that a beginning is made on addressing the issues raised here. It is timely that the direction be set and the first steps taken in that direction. If this book can help in the process of achieving better resource management in Africa, we will feel truly rewarded.

L. A. Lewis and L. Berry

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Many individuals have helped us through the various stages of this publication. We were particularly fortunate in that the reviewers of the manuscript for the publisher made numerous constructive comments during the initial phases of writing. In addition, Mary Hartman, Jeanne Kasperson, and Ophelia Mascarenhas helped us locate information that would not otherwise have been found. Finally, enough praise cannot be given to Karen Shepardson, who not only typed the final manuscript from a rough draft but had to contend with both authors' handwriting.

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1 African environments and resources: an overview

Introduction to the African environment

With over 75 percent of its area between the tropics, Africa has a wide range of environmental settings that all differ strikingly from the environments that predominate in Europe and North America. In addition, a large proportion of the lands beyond the tropics are extremely dry. Because of the different environments, both human and physical, on the continent, Africa often is misunderstood. There are numerous broad generalizations, yet few are valid when examined within the diverse realities of the continent. This situation often arises because a single specific case has been extrapolated to represent the whole of the continent.

General climate and vegetation

Figure 1.1 is a generalized map of Africa which delimits areas having adequate precipitation. The formula used to develop this map separates areas with adequate soil moisture for plant growth for much of the year (less than one), areas with adequate moisture for some of the year (between one and two), and areas which have low levels of water availability throughout the year (greater than two). Only a relatively small part of the continent – less than 20 percent – lies in the first zone (humid). A major part of the landmass of Africa thus has either short-term or long-term water deficiencies. This one fact may be the single most important thing to remember about Africa; for the most part, it is a dry continent.

About 90 percent of Africa is classified as having climates which are tropical in character. Average annual temperatures are relatively high over most of the land, exceptions occurring at the northern and southern edges of the continent and at high elevations. However, important seasonal and diurnal temperature changes occur throughout the continent. But, with most of Africa situated in the tropics, the crucial climatic component that divides one season from another is precipitation. Thus, more often than not, the inhabitants divide one part of the year from another into wet and dry seasons.

As this study is concerned with an area over 30,000,000 km², almost 20 percent of the Earth's land surface, it is essential to subdivide the continent into areas of roughly similar environmental characteristics. Using Thornthwaite's classification as a basis, Africa is divided into about 12 generalized climatic

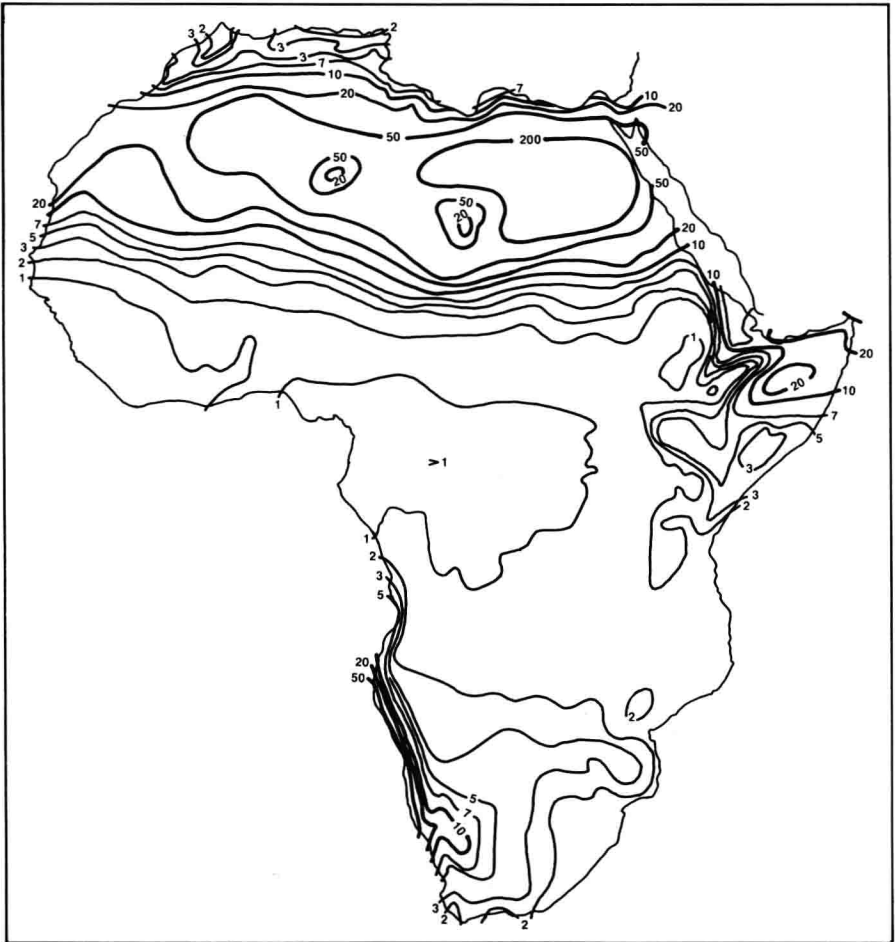


Figure 1.1 Annual moisture characteristics of Africa (from UN Conference on Desertification 1977):

$$\text{dryness ratio} = \frac{\text{mean annual net radiation}}{(\text{mean annual precipitation}) \times (\text{latent heat of vaporization})}$$

units* (Fig. 1.2). About 37 percent of Africa's total area, according to this classification (Fig. 1.2, category II), is arid; about 13 percent is semi-arid (category IIA, III) and about 23 percent subhumid (category IV, VIII). Once again, moisture is identified as a crucial environmental factor.

* It must be noted that the boundaries that appear on climatic figures, except where topographic features cause sharp breaks, do not represent sharp lines but mark zones where one climatic region grades almost imperceptibly into another.

INTRODUCTION TO THE ENVIRONMENT

Vegetation and climate are closely related, except where human activity has significantly altered the plant cover. The basic natural vegetation types found in Africa are characteristic of the tropical, subtropical, and montane conditions. Figure 1.3, a generalized African map of basic natural vegetation types, shows that 8 important categories exist throughout the continent, though they are all subsets of 5 major sets:

- (1) the tropical rainforests which are found in areas having rainfall in excess of 1500 mm with no drought period;
- (2) the savannas which are found in areas having three to eight months of drought, with heavy rains at other times;
- (3) desert vegetation, which is found when rainfall averages less than 200 mm per year;

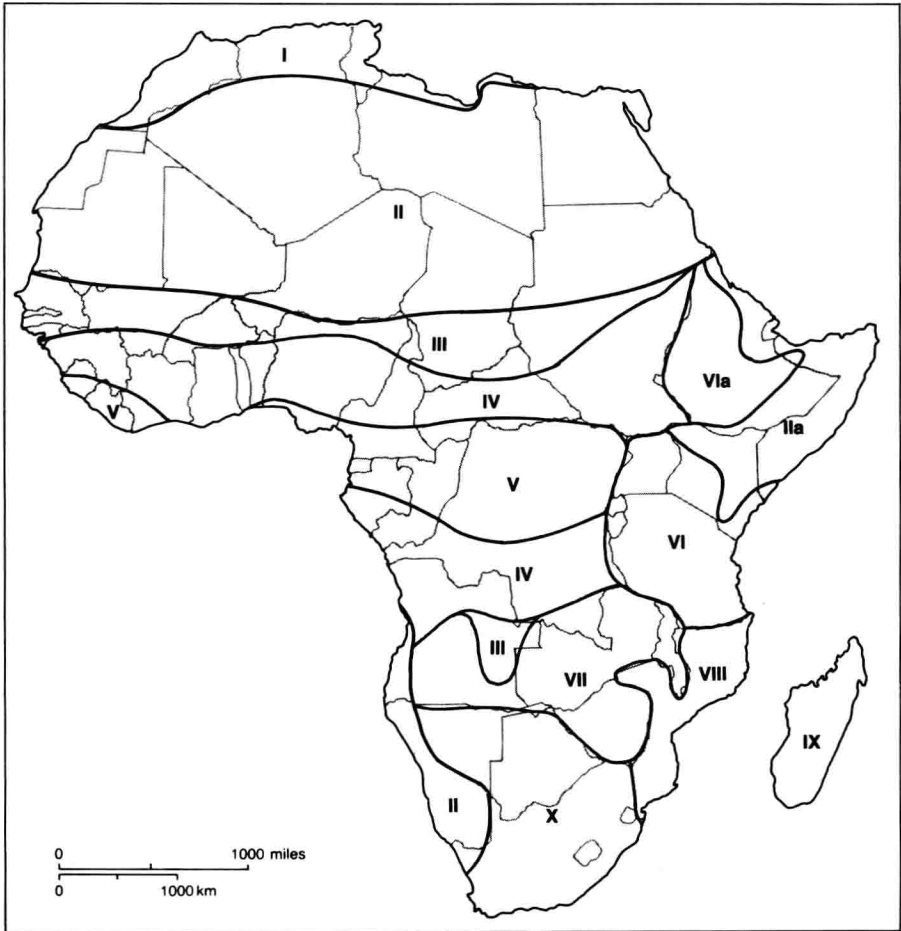


Figure 1.2 Major climatic zones of African climates (from Griffiths 1972).

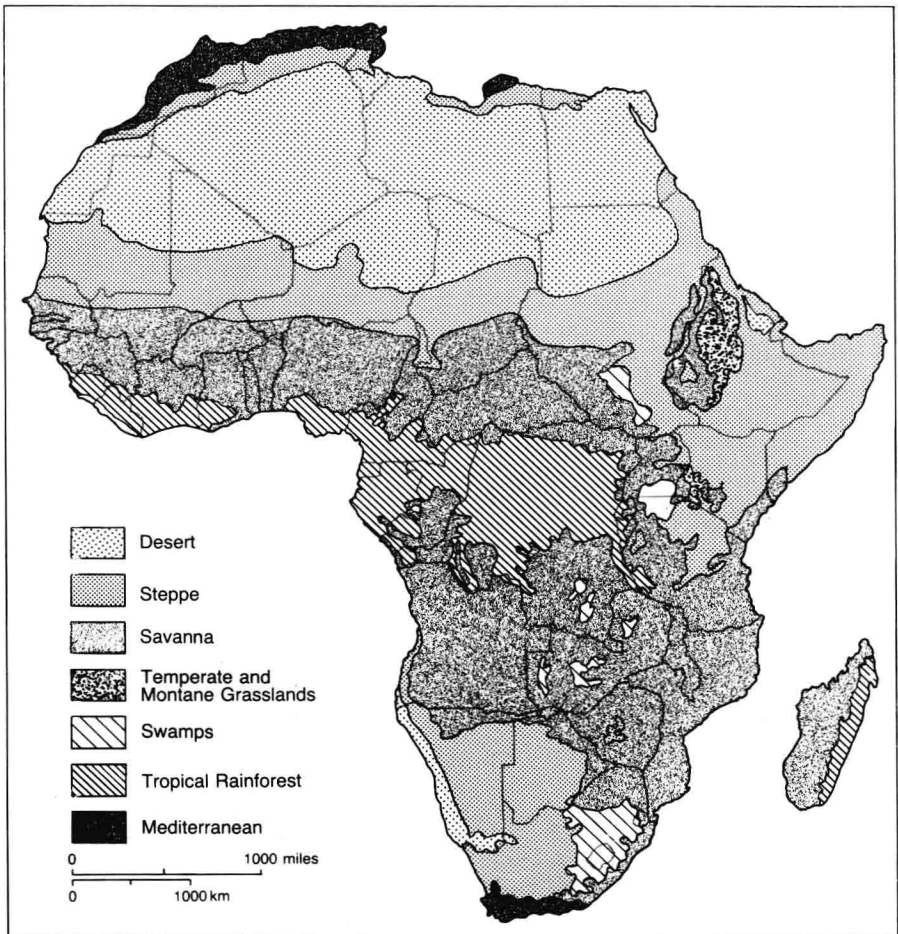


Figure 1.3 Primary African vegetation zones (from Hance 1975).

- (4) mountain vegetation, which is found where elevation has lowered temperatures and rainfall is ample – generally in belts between 1500 and 2300 m;
- (5) the scrubland categories which exist in zones having nine or ten months of near drought.

Surface water

Because a large part of Africa has dry climates, only a small percentage of precipitation that enters into the river systems flows into the ocean. Table 1.1 provides comparative data for the world's major landmasses. Asia, Australia, Greenland, and Africa all have low levels of runoff per unit area. Europe, North America, and South America have much higher levels.

Table 1.1 World distribution of runoff.

| Location | Atlantic slope | | Pacific slope | | Regions of interior drainage | | Total land area | |
|---|------------------------------|-------------|------------------------------|-------------|------------------------------|-------------|------------------------------|-------------|
| | Area (1000 km ²) | Runoff (cm) | Area (1000 km ²) | Runoff (cm) | Area (1000 km ²) | Runoff (cm) | Area (1000 km ²) | Runoff (cm) |
| Europe (including Ireland) | 7,959 | 29.0 | — | — | 1,712 | 10.9 | 9,671 | 26.1 |
| Asia (including Japanese and Philippine islands) | 11,981 | 16.2 | 16,312 | 29.1 | 13,657 | 1.7 | 42,271 | 17.0 |
| Africa (including Madagascar) | 13,235 | 35.6 | 5,462 | 21.8 | 11,113 | 1.8 | 29,811 | 20.3 |
| Australia (including Tasmania and New Zealand) | — | — | 4,232 | 13.9 | 3,732 | 0.6 | 2,964 | 7.6 |
| South America | 15,646 | 47.5 | 1,318 | 44.5 | 987 | 6.6 | 17,977 | 44.9 |
| North America (including West Indies and Central America) | 14,657 | 27.4 | 4,862 | 48.5 | 834 | 1.1 | 20,442 | 31.5 |
| Greenland and Canadian Archipelago | 3,882 | 18.0 | — | — | — | — | 3,882 | 18.0 |
| Malayan Archipelago | — | — | 2,621 | 160.0 | — | — | 2,621 | 160.0 |
| Total or average | 67,356 | 31.5 | 35,250 | 39.3 | 32,035 | 2.1 | 134,641 | 26.7 |