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ENVIRONMENTAL SYNOPSIS

1993

BURKINA FASO



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BURKINA FASO AT A GLANCE

There are numerous factors hindering Burkina Faso's development. It has:

- no access to the sea
- a semi-arid climate subject to severe variations
- an economy affected by the variable climate and a degraded environment
- strong competition to its exports of livestock products from European and Latin American countries
- a low level of economic development — the estimated GNP of US\$345 per capita is among the lowest on the continent
- explosive population growth: 3% in 1991, and a high density considering its limited natural resources
- heavy dependency on repatriation of expatriates' salaries, food aid, grants and loans from foreign governments and international organisations

The country has, however, a number of assets:

- a dynamic agricultural sector which seems to be the real driving force behind the economy
- a GDP growth (3.5% in volume) that is higher than population growth: inflation was held down to 3% in 1986-1991
- strong economic activity and the sustained rhythm of economic and financial reforms, which should impress donors

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PREFACE

This environmental overview of Burkina Faso was requested by the Commission of the European Communities — specifically the Directorate-General for Development (DG VIII A/1).

It was prepared on the basis of a desk-top study of information to hand as a briefing for CEC officials. Wherever possible the most recent figures and information were employed as sources¹.

After the introductory Fact Sheet and outline of Key Issues, the report is divided into three chapters. The first deals with institutional infrastructure, especially related to environmental issues, together with national and international legislation and training opportunities. The second reviews the country's natural resources. The final chapter evaluates the nation's ecological heritage and considers its past, current and foreseeable environmental problems. Because the information changes so rapidly, no attempt has been made to provide a comprehensive survey of international organisations working in Burkina Faso. Instead, the reader is advised to contact the organisations themselves for an up-to-date summary of activities.

The IUCN team responsible for the preparation of this Synopsis included: Jeremy Carew-Reid, R. David Stone, Peter Hulm, Thérèse Lethu, Paul A. Driver, Claire Santer, John Watkin, and Brian Johnston. Additional editorial assistance was provided by Anthony J. Curnow, Adrienne Jackson, Paul E. Ress, Gamini Senevirate and Wendy Lubetkin.

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¹ A note on the data sources follows the detailed reference list. Within the text, individual sources are indicated by the number of the reference inside brackets, e.g. [24]. Metric weights and measurements are used throughout. A billion refers to 1,000,000,000.

FACT SHEET

Natural Resources

Land area: 274,122km²

Climate: Tropical

Rainfall: Annual rainfall is between 635mm and 1145mm (mostly from May to September); highest in the south-west and lowest in the north-east

Ecological zones: Sudanian regional centre of endemism; Sahel regional transition zone

Languages: French (official), Fululde, Tamasheq, More, Gurma, Bisa, Kassem and others

Main towns: Ouagadougou (capital city) 448,000; Bobo-Dioulasso 273,000; Koudougou 60,000; Tonkodago 99,500; and Ouahigouya 75,000 (1986 figures)

Currency: CFA Franc. Exchange rate December 1992: FCFA424.25 = £1; FCFA267.24 = \$1

Measures: Metric system

Land use: Cultivated land 34,230km²; permanent pasture 100,000km²; forest and woodland 67,200km² (1987-1989)

Protected areas: Four categories are recognised (national park, total faunal reserve, partial faunal reserve, classified forest). Eleven protected areas accounted for 35,306km² in 1991 (13% of Burkina Faso)

Agriculture: The main food crops are millet, sorghum, maize and rice. The main cash crops are cotton, karité (sheanut), groundnuts, sesame, sugar and cashew nuts

Livestock: Cattle 2,900,000; sheep 3,339,000; goats 6,137,000; pigs 520,000; asses 476,000; horses 70,000; chickens 22,000,000 (1991 estimates)

Fisheries: 7006 tonnes (1990)

Mining: Reserves are known only for gold (27-35 tonnes) and iron ore (13 million tonnes). There are also known to be deposits of antimony, marble, zinc, silver, manganese, phosphate, diamond and limestone. In 1991 gold accounted for 18% of exports (second after cotton). Production in 1991 was four tonnes

Demography

Population size: 9.6 million (1991)

Population growth: 3% per annum (1987-1991)

Projected population in 2025: 20 million

Population distribution: Under 15 years 43.8%; 15-65 years 48.1%; over 65 years 3.4% (1990 estimate)

Fertility rate: 6.5 (1990)

Sex ratio: Female 51.7%; male 48.3%

Spatial distribution: Urban areas 9%; rural areas 91% (1990)

Urbanisation rate: 5.3% of population a year (1980-1990)



Health and Education

Infant mortality (deaths/1000 live births): 133 (1990)

Mortality of under-5s (per 1000 live births): 228 (1990)

Life expectancy: 48 years (1990)

Access to safe drinking water (% of population): 69% (1988-1990)

Access to sanitation (% of population): 8% (1988-1990)

Access to health service (% of population): 49% (1987-1989)

Enrolment in education (1988):

Level	Number enrolled	% male	% female
Primary	411,907	62	38
Secondary	62,582	68	32
University	4,498	77	23

Industry and Pollution

Main industries: Food processing, textiles

Energy: *Types* - wood, thermal, hydro-electric; *consumption* - a few major industries in Ouagadougou consume most generated power. Domestic supplies rely almost entirely on fuelwood

Economic Indicators

GDP: US\$3060 million (1990)

GDP per capita: US\$332 (1990)

GDP growth rate: 4.3% (1980-1990)

Agricultural % of GDP: 32% (1990)

Exports at current market prices: US\$160 million (1990)

Imports at current market prices: US\$480 million (1990)

Official development assistance: US\$315 million (1990)

Total external debt: US\$834 million (1990)

Sources: [2, 3, 7, 8, 20, 21, 22, 23, 31, 34 and 38] unless otherwise indicated

KEY ISSUES

Background

Burkina Faso — formerly known as the Republic of the Upper Volta — is a land-locked nation situated within the tropical savannah zone of West Africa. Lying between latitudes 9° and 15°N and longitudes 2°E and 5°W, Burkina shares a common border with Mali to the west and north and Niger to the east (Fig. 1). Bénin, Togo, Ghana and Côte d'Ivoire share its southern boundary.

Political context

Burkina Faso, which took its present name in 1984, has had a turbulent political history since independence from France in 1960. In the fifth coup d'état since independence, the current head of State, Captain Blaise Compaoré seized power in October 1987. Many of these political and social upheavals have had a profound effect on the economy as well as a significant impact on the environment.

On the political level, the process of democratisation begun in 1990 ended with the adoption of a new constitution in 1991. This led to the election of the President of the Republic by universal suffrage in December 1991 and the organisation of legislative elections in May 1992. Despite some minor disturbances, the transition period came to an end in a manner that seemed favourable to the new democratic institutions.

The key environmental issues identified in Burkina Faso at the present time are:

- drought and related water management issues;
- land degradation and the risk of encroaching desertification;
- inappropriate human and livestock pressures on fragile land resources;
- lack of timber for fuel and building; and
- threatened and diminishing wildlife resources.

As Burkina Faso is situated in a transition zone characterised by considerable variations in rainfall, the soil, biomass and water are in a precarious state; they are limited in quantity and are constantly deteriorating because of inappropriate land-use and increasing population pressure (the population is expected to reach 20 million by 2025). Other problems such as pollution, industrial growth and urbanisation, although poorly understood are also likely to contribute to environmental degradation in Burkina in future years. They will require remedial action.

Considerable progress has already been made in treating some of the most urgent environmental problems, especially soil erosion, desertification, shortage of wood, and the development of stable water supplies. These modest achievements have, however, proved expensive.

Poverty and the environment

Burkina Faso ranks among the poorest countries of the world with a GNP per capita of US\$345 in 1991. The rural sector remains the mainstay of the economy. Including

livestock raising and forestry it accounts for 32% of GDP. Almost 90% of the population depends on subsistence agriculture. Urban dwellers maintain strong links with the rural sector. With its economy almost entirely dependent on agriculture, the country was one of the worst sufferers in the Sahel drought of 1969-1974, and was also badly hurt by the droughts of the late 1970s and those of the 1980s.

Water resource management

Drought and famine are now major recurrent problems in Burkina. This is especially obvious in the northern states where food productivity is low and the rains — when they arrive — are often torrential, leading to flooding and soil erosion. The flooding also interrupts famine disaster relief programmes and causes additional suffering and environmental destruction. In 1988 an estimated 10,000 people were affected by flooding in Soum, Oudalan and Seno provinces in the north. More than half of these people were made homeless. The southern region, in contrast, has adequate water supplies when properly conserved. Water-borne diseases, however, are prevalent in this region and, consequently, there is little agriculture and settlements are few.

Water conservation was once widely practised in Burkina Faso, although on a small scale. Today, small earth dams are again being constructed and farmers are reviving traditional terracing practises. For the moment, no major water resource projects are planned even though the need for adequate water supplies is greater every year.

Loss of wildlife resources

With approximately 13% of the country set aside as protected areas, Burkina Faso would appear to have a reasonable system of conservation sites. However, almost all of these locations lie within a single ecosystem — the Sudanian woodland and grassland zone — and consequently representative sections of other ecosystems receive no official protection.

Many of the existing protected areas are important transfrontier reserves with neighbouring Niger, Bénin, Côte d'Ivoire Ghana and Togo, but few receive adequate protection. Management is generally poor, with too few well-trained and -equipped staff to prevent hunting (primarily for bush meat), grazing and agricultural encroachment. A thorough review of the protected area system in Burkina Faso is essential. Future efforts to establish conservation areas should include sustainable development projects for rural communities.

Population and livestock pressures

With its population now approaching 10 million people, Burkina is the most densely populated country within the Sahel region. The demographic pattern is quite uneven, with greatest concentrations found in and around the Mossi Plateau, where soils and the climate are more favourable to agricultural practices than in other regions. This concentrated settlement pattern has led to severe overgrazing pressures, as well as deforestation and localised urban pollution.

Livestock management is a traditional activity for the semi-nomadic Fulani people of north and eastern Burkina. Precise figures on the numbers of livestock currently kept are unavailable, but in 1989 it was estimated that there were about four million cattle, five million sheep and over six million goats in the country. The unpredictable rainfall pattern, combined with increasing agricultural activities in these regions has necessitated the use of more restricted feeding grounds for these migrating herds. The end result has been increased pressure on fragile earth resources, and this has contributed to soil erosion and eventual desertification.

Land degradation and encroaching desertification

A combination of low relief, deforestation, poor soil structure with low organic matter, overstocking and unpredictable rainfall patterns has resulted in widespread soil erosion in Burkina Faso. A comparative analysis of aerial photographs has enabled the International Centre for Agricultural Research and Development (CIRAD) to examine this situation in the Sahelian part of the country. The extent of degradation increased from 5% to 27% between 1955 and 1974. Desertification has continued on a larger scale: comparison with 1972 data indicates that 38% of the designated area has remained in good condition, but another 21% of the area has been affected by desertification and is now constantly degrading [32].

Efforts to combat sheet erosion and encroaching desertification have included the initiation of village-based reforestation programmes. Greater resources, however, must be made available to counteract the destructive agricultural practices and deforestation pressures that aggravate this problem.

Shortage of timber resources

Firewood collection places the heaviest demands on the country's limited forest resources, although clearing for agriculture and forage materials also takes a significant toll. Commercial timber production is insignificant at the present time, although some 67,200km² of forest remain. The most severe pressure on remaining forests is in the north and central region, where the majority of the population have settled.

Persistent shortages of fuelwood have led to the extensive use of cereal husks and animal dung as alternative fuel sources. While these sources are not energy-efficient, more importantly their use as fuel deprives the already impoverished soils of valuable organic matter. Trials have been conducted with fuel-efficient stoves, although their effectiveness has not been evaluated. The situation for fuelwood and forage is now critical in many areas of the country and urgent action needs to be taken before the remaining vestiges of woodland are degraded or destroyed.

The economy and the environment

From 1986 to 1991 the economy performed well with an average growth rate of 3.5% each year. Inflation was limited to 3%. This growth was largely due to the agricultural sector, which grew at 2.5% a year from 1986 to 1990 [36]. On the other hand, despite an expansion in mining production, growth in the manufacturing sector remained slight as did that of transport and commerce. The institutional and legal frameworks remain restrictive,

with severe regulations, a rigorous trading regime and price controls, and an inappropriate structure for encouraging domestic incentives. All of these factors discourage investors and trade.

Economic development in this Sahelian country faces a huge environmental challenge. The challenge consists of a semi-arid climate which is subject to extreme variations, a relatively dense population in relation to natural resources, an explosive population growth of 3%, and a very degraded physical environment. The production of foodstuffs, which has increased by 4% annually, requires that an ever-increasing amount of land be cleared for agriculture.

What action has been taken by the Government?

A five-year development plan for 1986-1990 was launched in August 1986. It emphasised the need for national economic independence and the support of the people for proposed development schemes. Among its objectives were major investments in the agricultural sector (almost 20% of planned spending), the development of water resources (24%), the continuation of the fight against desertification, an improvement in the quality of life, especially for women, a greater degree of integration between the different sectors of the economy, and a reduction in regional disparities. While the overall effects of this plan have not yet been thoroughly analysed, the government announced in mid-1990 that a new Five Year Plan was being developed for 1991-1995.

A new property law was announced and revised in 1991 with a view to increasing security for land-users. A popular national programme was launched to encourage rural communities to improve their own management of their resources, to replant trees, conserve soils, and make better use of water resources. A national family planning programme was also promoted. Similarly, a programme dubbed "the three battles" —against uncontrolled bush fires, uncontrolled grazing, and over-exploitation of timber, was developed. A national forestry fund has been set aside for forest management and the fight against deforestation. A campaign against desertification, developed within the framework of the Sahelian anti-deforestation strategy, has also been pursued.

Although there have been positive results, the implementation of these programmes has met with three problems: the first relates to decision-making which is too centralised, without sufficient participation from the field. The second is linked to the lack of integration between various activities and insufficient coordination between the public services responsible for implementation. The third relates to the property law, which does not work in the field [30].

In attempting to overcome these problems, the government simultaneously launched a National Environmental Action Plan (NEAP) and a management programme for village lands. A seminar on the environment was held in October 1989. This led to a consensus on the role of the NEAP. The role involved outlining a policy linking environment and development, proposing a coherent framework within which the various activities could operate, recommending the tools to be used in the follow-up, disseminating evaluation and

environmental information in general and, finally, promoting environmental education and training.

INSTITUTIONAL CONTEXT

Environmental Institutions

The Ministry of Planning and Cooperation (created in 1984) is responsible for national development programmes, as well as for the administration of international activities, according to the Five-Year Popular Development Plan (Plan Quinquennal de Développement Populaire-PQDP). It has initiated a Bureau of Study and Planning (Direction des Etudes et de la Planification) within other ministries. This Bureau meets every two months to discuss progress on various projects.

The principal institution for environmental matters, the Ministry of the Environment and Tourism (Ministère pour l'Environnement et Tourisme), was created in 1976 and is responsible for nature protection, food stocks, as well as energy issues. It is also responsible for the Directorate General of Water and Forests (Direction Générale des Eaux et Forêts), which includes the Department of Forestry and Reforestation (Direction des Forêts et Reboisement) and the Department of Fisheries and Aquaculture (Direction de la Pêche et Pisciculture); Ministry of Agriculture and Livestock (Ministère de l'Agriculture et de l'Elevage), created in 1984; Ministry of Water (Ministère de l'Eau); and the Ministry for Rural Cooperative Action (Ministère de l'Action Coopérative Paysanne).

The Ministry of the Environment and Tourism is likewise officially responsible for the national anti-desertification programme. One of its main priorities has been the promotion of reforestation programmes around villages, especially in the northern part of the country. In 1986, the National Committee against Desertification was established to organise actions to prevent further encroachment of the desert. At the same time, the National Commission to Combat the Effects of Drought (Commission Nationale de Lutte Contre les Effets de la Sécheresse) was formed.

The administration of parks and reserves is the responsibility of the Department of National Parks, Faunal and Hunting Reserves (Direction des Parcs Nationaux, Réserves de Faune et de Chasse). Forest management comes under the Department of Forest Planning and Reforestation (Direction de l'Aménagement Forestier et du Reboisement).

Environmental Policies and Standards

Burkina Faso is divided into 30 provinces, which contain 300 departments and 7,285 villages (Fig. 1). Each department is responsible for planning and implementing its own agricultural operations and each reports to the Ministry of Rural Development.

Burkina Faso is currently carrying out its second five-year Plan for Popular Development. This Plan deals with the medium-term growth and development of the environment and tourism for the period 1991-1995, and incorporates the National Action Plan for the Environment (NEAP).

National and International Organisations

There are a number of national and regional organisations involved in environmental monitoring in Burkina, including the Centre d'Etudes Phytosociologiques et d'Ecologie (specialists in plant ecology, bioclimatology, vegetation mapping, desertification); ORSTOM — Institut Français de Recherche pour le Développement Scientifique en Coopération (specialising in water resources and geographical studies); CESAO — Centre for Economic and Social Studies in West Africa (concentrating on rural development activities, especially training); CTRO — Centre Régional pour la Télédétection (international remote sensing centre); CTFT — Centre Technique Forestier Tropical (research in deforestation, fuelwood and charcoal problems); IBE — Institut Burkinabé d'Energie (responsible for research and promotion of alternative energy sources/supplies); IRAT — the Institut de Recherches Agronomiques Tropicales; and IRBET — Institut de Recherche en Biologie et d'Ecologie Tropicale (researches various aspects of floral and faunal interest).

Development aid and relief organisations are also well represented in Burkina Faso. Some of the most important include Africare (working on nutrition and agriculture), Catholic Relief Services (primarily involved in agricultural development activities); Oxfam, the UK-based charity (providing technical advice on appropriate technology); and the World Vision Relief Organization (specialising in small dam and irrigation construction).

International environmental organisations that are providing technical assistance include IUCN (conservation and sustainable use of natural resources in southern Burkina Faso); FAO/UNEP (management of natural forests around Ouagadougou to provide firewood; management of the natural lake, Mare d'oursi, including dune stabilisation); DDA (village-level forestry projects); GTZ (sustainable resource management in the central plateau area); and the Government of the Netherlands (development of village forestry projects).

Since 1985, the Wageningen Agricultural University in the Netherlands has been working with counterpart members of the Comité Interafricain d'Etudes Hydrauliques, Ministère d'Environnement et du Tourisme and the National Institute for Agricultural Studies and Research (INERA) in Ouagadougou. Its principal activities are concerned with irrigation and development, sustainable land-use (including soil and water conservation) and plant protection.

Legislation Concerning Natural Resource Management and Environmental Protection

At the international level Burkina Faso is party to the following conventions: the African Convention for the Conservation of Nature and Natural Resources; the (World Heritage) Convention concerning the Protection of the World Cultural and Natural Heritage; the (Bern) Convention for Conservation of European Wildlife and Natural Habitats (one of only two African countries); the (Geneva) Convention on Fishing and Conservation of Living Resources of the High Seas; the (Niamey) Agreement on the Commission,

Navigation and Transport on the River Niger; and the (Ramsar) Convention on Wetlands of International Importance especially as Waterfowl Habitat.

Burkina is signatory to the Law of the Sea, the Vienna Convention (Protection of the Ozone Layer), and the Montreal Protocol (Substances that Deplete the Ozone Layer). Burkina Faso is a member of the Inter-State Fight Against Drought in the Sahel (Comité Inter-Etat de Lutte contre la Sécheresse dans le Sahel - CILSS) created by the Ouagadougou Convention of 12 December 1973. This convention was established to address problems caused by drought, in particular to guarantee foodstuffs at the regional level. The Secretariat for CILSS is in Ouagadougou.

Burkina Faso is not party to CITES — the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

National environmental legislation needs revising and updating as many of the existing regulations date back to before independence.

On the economic/political front, Burkina Faso is a member of the United Nations, the UN Economic Commission for Africa, the Economic Community of West African States (ECOWAS) and the Lomé Convention.

Environmental Training Institutes and Training Capacity

The National Centre for Scientific and Technological Research (CNRST) has a Research Institute on Tropical Biology and Ecology (IRBET) established in 1987. This institute is involved in a wide range of activities, including various research activities dealing with flora and fauna, inventories, and the problems of desertification.

One national organisation in particular has been very successful with its training programme: the so-called Six "S" Association (Se Servir de la Saison Sèche en Savanne et au Sahel). Founded in 1967, the Association seeks to assist local people by demonstrating non-destructive methods on a wide range of environmental issues, ranging from primary health care to wood resource management. Back-up assistance is provided to self-help (*Naam*) groups, a movement founded on the traditional Mossi village organisation. The scheme has been highly successful and, by 1985, there were 1350 *Naam* groups in Burkina [13]. This grassroots movement has stimulated similar activities in Senegal, Mauritania, Mali, Niger and Togo.

Cultural Aspects of Resource Utilisation

Improving the status of women in society, in particular, is a major priority for the government of Burkina Faso. One of its concerns is to involve women increasingly in all spheres of political, economic, social and cultural activities in order to help promote economic and social development.

Acknowledging the role of rural women in agricultural production, household labour and the education of children, the government has already introduced measures to reduce female illiteracy, which currently exceeds 95%.

In order to understand the significant role which women play in national food production, the World Bank, in collaboration with UNDP, has undertaken an investigation of their importance in the production of crops and soil management in Africa. Specific case studies have already been made in Burkina Faso [29].

STATE OF THE ENVIRONMENT

Inventory of Natural Resources

Ecological zones

Burkina lies astride two climatic zones: the north of the country is distinctly Sahelian, a reflection of the reduced and irregular rainfall in the area, while the remainder of the country lies within the savannah belt (Sudanian zone). The vegetation pattern was formerly dominated by Sudanian woodlands, although the now densely populated centre of the country has been transformed into park-like woodland. There are dry *Acacia* woodlands in the north.

The country's relief is physically dominated by a wedge-shaped plateau (200-500m above sea level) which slopes slightly from north to south and is carved by a number of broad river valleys such as those of the Mouhoun (formerly Black Volta), Nazinan (Red Volta) and Nakabé (White Volta). While Burkina is largely enclosed within the loop of the Niger River, this major confluence never actually flows through the country. In fact, Burkina Faso has no navigable rivers.

Burkina experiences two alternating seasons: a rainy season from June to October and a dry season from November to May. Mean annual rainfall varies from less than 400mm in the extreme north to more than 1000mm in the southeast. Temperatures are high in the north, especially at the end of the dry season. In March, the mean temperature in Ouagadougou (the capital) is 41°C. Throughout most of the country the dry east wind from the Sahara — the Harmattan — blows from March to May. From May to October, the climate is hot and wet, becoming drier from November to March. The rainy season lasts a maximum of five months from May to October.

Water

Water resources vary a great deal from one region to another in Burkina Faso: in the southern part of the country, supplies are adequate, but water-borne diseases are common, while in the semi-arid north, rainfall is irregular and often so intense that most of it is lost as runoff. In many cases, rivers are either in full flood, or parched dry. As a result, groundwater resources are inadequate and wells have frequently to be constructed (see Water Pollution and Water Shortage).

Drainage is by a number of major river systems (Fig. 3): the Komoé River and its tributaries drain the south-eastern slopes of the Tagouara Plateau, while the western slopes drain all the way to the inland delta of the Niger River in Mali, via affluents of the Bani River. The north-western slopes of the Tagouara Plateau drain to the Mouhoun, which also receives drainage from Mali in the north via the Sourou River. The central highland blocks drainage west to either the Mouhoun or the Nazinan, or eastwards to the Nakabé [9].

The principal wetlands are riverine floodplains which are inundated seasonally. None of the floodplains is very large by comparison with those of neighbouring countries, but most rivers have them and, in many cases, they are heavily used for rice cultivation, fishing and for traditional uses of the marginal vegetation. These are also very important for wildlife, especially waterfowl.

There are five small natural lakes: Tengréla, Bam, Dem, Mare d'Oursi and Lake Higa. The largest of these — Lake Bam — has a storage capacity of 31 million m³. Water from Lakes Dem, Bam and Mare d'Oursi is used for small-scale irrigation purposes, as well as fishing [9].

There are also several artificial impoundments. The most important of these is the Tougouri Barrage, with a storage capacity of six million m³ of water and the Yalogo Barrage (10 million m³), both of which supply fish as well as water for agriculture and domestic use. Two other notable dams are located in the far north near Djibo (2.2 million m³) and near Ouahigouya (2 million m³). They supply water for domestic purposes. In addition, there are over 300 small farm and community dams throughout the country [9].

Existing water resources appear to be considerably under-utilised with less than 3% of the annually available surface water used. In Burkina, for example, only 4% of the potentially irrigable areas are under full or partial water control. Efforts to introduce effective water use and irrigation systems are limited by the government's capacity to manage these facilities, as well as the farmers' lack of familiarity with the intensive techniques associated with irrigated farming [5].

In recent years, many of the smaller floodplains have been converted to rice cultivation, a trend which has also spread to some of the larger river systems. For example, it has been estimated that approximately half of the total wetland area of the Komoé River system in Burkina has been used for growing rice [9]. The ecological impacts of this practice have not been evaluated.

Forest

There are three main vegetation zones which correspond to the climate and soil structure (see Fig. 3). In the south the Sudano-Guinean zone receives more than 1000mm of precipitation per annum and is characterised by tall trees forming a canopy, a woody understorey as well as a herbaceous understorey. Dominant species include *Isobertinia doka*, *Daniellia oliveri*, *Butyrospermum paradoxum* (karité), *Parkia biglobosa* (nééré), *Lannea microcarpa*, *Acacia albida* and *Tamarindus indica*.

Further north, the Sudanian zone, lying between the 600mm and 1000mm isohyets, is a mosaic of open forest. It is the most extensive vegetation zone in Burkina Faso. It has also been severely altered by human activities, especially on the Mossi Plateau where population densities are highest. Predominant vegetation includes *Acacia leota*, *A. macrostachya*, *Combretum glutinosum*, *C. micranthum*, *C. nigricans*, *Dalbergia melanoxylon*, *Commophora africana* and *Pterocarpus lucens*.

The Sahel zone is found in the northern regions that receive less than 600mm of rain annually. It is characterised by a mixture of grasses, bushes and widely scattered trees. Annual grasses are abundant during the rainy season and provide seasonal feed for livestock. Trees and bushes are major sources of forage for animals during the dry season. Typical species include *Acacia radiana*, *Grewia* sp., *Tenax* sp. and *Mareua* sp.

Commercial timber production is insignificant, despite the relatively large area (34,230km²) under forest. Much of the remaining forest lies within the two of the country's national parks — Po and "W". An estimate of the annual removal of roundwood is given in Table 1. As elsewhere in Africa, the area of intact woodland is steadily decreasing, mainly because of felling for fuelwood.

Table 1. Roundwood removal ('000m³, excluding bark) [8]

	1985	1986 (*)	1987
Saw logs, veneer logs and logs for sleepers	1	1	1
Other industrial wood (*)	304	312	321
Fuel wood (*)	6,443	6,618	6,792
Total	6,748	6,931	7,114

(*) FAO estimate

Local tree-planting projects are strongly encouraged by the government and stiff penalties have been imposed for illegal felling. International assistance is also being provided in the form of timber development projects, especially in the Kompienga (EDF funding) and for the more recent development at the Bagré dam (FAO-financed).

A variety of trees is cultivated and protected at the village level. On the Mossi Plateau, for example, karité (shea nut) and nééré (locust bean), as well as baobab, tamarind and wild fig trees are carefully tended as essential food resources.

The forests are also an important source of protein in the form of "bushmeat" for a large proportion of the rural and urban population. Poaching is widespread throughout the country, with antelopes (chiefly duikers) being the main quarry. The value of this resource has not been examined in Burkina, but it is believed that wildlife resources in general have been grossly over-exploited. In an attempt to relieve the pressure on wildlife in the southern region of the country, a game ranch has been developed at Nazinga (see Biodiversity).

Burkinabé also rely on the forests for a wide range of natural foods, herbs and medicinal plants. An estimated 80% of the population are familiar with the use of medicinal plants, many of which have been over-exploited. Three national centres using traditional

medicinal plants as a means of healing have been established at Ouagadougou, Banfora and Fada N' Gourma.

Agriculture

Agriculture represented 32% of GDP in 1990 [31] and provides employment and income for 90% of the workforce. Subsistence farming takes up 90% of the cultivated area, almost 50,000km².

The annual 2.5% growth in the agricultural sector from 1986 to 1990 is due to the return of favourable climatic conditions, access to new land, an increase in production in zones using hydroponic farming methods, and improved farming techniques [36].

The production of grains increased significantly from 1980-1989, especially millet and sorghum, with a total production of 1.8 million tonnes. The yield in 1991 was 1.5 million tonnes as a result of drought. Production of corn, which had increased rapidly from 1988 (130,000 tonnes) to 1990 (216,000 tonnes), remained stationary in 1991 (216,000 tonnes). The production of vegetables also increased. In 1989 the government signed an agreement with FAO to promote the consumption of vegetables.

Cotton remains the primary export resource of Burkina Faso (30% of exports in 1991). The area under cotton increased by about 30% between 1989-1990 (1500km²) and 1990-1991 (1663km²). Cottonseed produced in 1990-1991 reached a new record of 189,540 tonnes (+24%) as compared with 1989-1990 [36]. In total, production more than doubled between 1975 and 1985. This trend led to the expansion of growing areas and the introduction of incentive measures by the government.

In the past, cash crops were produced only as the surplus of subsistence cultivation, and included shea nuts (karité nuts) and sesame seeds. In recent years, however, technical assistance within the agricultural sector has concentrated on improving cash rather than food crops. Government investment too has concentrated on cash crop production, especially in cotton, groundnuts, sugar, cashew nuts and market gardening, with financial aid from, among others, the European Development Fund (EDF). Subsistence farming is not nearly as productive as it could be: technology is rudimentary (most of the land preparation and cultivation is done by hand), select seeds are in limited supply and inorganic fertilizer is used on only approximately 3% of the cultivated land. Crop residues are burned in order to clear the fields for easier planting and also to provide a salt from the ashes. This salt is high in potassium and local people prefer this when cooking sorghum and millet. Fallow fields and grasslands are also often burnt as a traditional practice. A study of the use of additives, such as pesticides and fertilizers, by farmers in the cotton-growing areas was carried out by CIRAD in 1991. Surveys of 450 plots of land have shown that, whatever the method of farming (manual, using draught animals, or mechanical means), the recommendations are not respected [32].

Despite the generally fragile soil structure, agricultural activities are widespread. The sector is almost entirely dependent on rain-fed agricultural practices. It is therefore particularly vulnerable to drought. Thus, in those years when climatic conditions have been unfavourable, severe shortages have been experienced, as witnessed during the 1983-

1984 and 1984-1985 droughts, when total output of cereals reached an average of only 1.1 million tonnes annually. However, in those years when conditions are favourable, the country almost attains self-sufficiency in basic foodstuffs. For example, in 1988-1989, the national production of millet and sorghum was estimated at a record 1,825,500 tonnes, while the output of maize and rice reached 226,700 and 39,100 tonnes, respectively. In recent years, some improvements in productivity have been brought about by development programmes, but the scope for expansion is limited by generally unfavourable climatic conditions, inadequate water supplies and the poor, heavily eroded soils.

The soil resources of Burkina Faso are derived from rock types which characteristically yield soils of low productivity. Their nutrient and mineral content is now also seriously depleted as the scanty resources have been subjected to land use practices that have stripped the soil of fertility. Throughout the country, erosion rates are high and water infiltration rates low. Within the savannah ecosystem, slash-and-burn agricultural methods, drought and overgrazing tend to increase erosion.

While the production of cash crops is of fundamental importance to Burkina's economy, it has also caused major problems: the desire to earn more from cash crops has restricted the area under millet and sorghum, while increasing the pressure on the land. The length of fallow periods has been steadily reduced — especially in the Mossi plateau — and the soil is rarely allowed sufficient time to recover its natural fertility. One side effect of attempting to increase crop output has been an increased use of pesticides, from 118,000 litres in 1970 to about one million litres in 1987 [26].

There are plans to develop irrigation schemes for rice cultivation in order to meet local demand. A project is being implemented at Bagré, on the Nankabé River, providing irrigation for an area of 50km², from which an estimated 32,000 tonnes of paddy rice would be produced, together with 15,000 tonnes of maize and 7,500 tonnes of vegetables. Other irrigation projects are also being developed at Sourou and Zorgho. In 1991 the CCCE provided FF8million for the development of several projects in the Sourou valley to convert some 150km² of this fertile area to hydroponic farming [39]. A study of possible cross-breeding of foreign strains of rice was carried out within the framework of an ORSTOM and CIRAD collaboration in 1991 [32].

Bearing in mind the influence of this sector on Burkina Faso's economy, an Agricultural Structural Adjustment Programme (PASA) is being prepared with the support of the World Bank and other donors. The aims are the modernisation and diversification of production, re-enforcement of food sufficiency, and improvement of natural resource management. To this end, six key sectors have been identified: grains, livestock farming, cotton, sugar, other industrial crops (karité nuts, sesame seeds, peanuts), and fruit and vegetables. This programme also includes the establishment of a contract between the State and OFNACHER (National Office for Grains) and the State and SOFITEX (Society of Fibres and Textiles in Burkina Faso) [36]. The ultimate aim of PASA is to help establish the industrial, legal and financial bases for ensuring sustained growth in this sector (4% a year), in the medium term.

In 1991 the World Bank provided US\$28 million towards the implementation of PASA, particularly for sector-based agricultural reforms. France (US\$21 million), the CEC (US\$20 million) and the African Development Bank (US\$13 million) have also supported the programme [29].

Livestock

Long considered as one of the main sources of wealth in this Sahelian country, livestock farming represented only 12% of GDP and 8% of exports for the period 1988-1991. The policy for developing farming in the dunes and low-lying areas seems to have been developed to the detriment of farming of large grazing animals. A new geographical distribution of livestock farming is also visible: movement of large grazing animals from the Sahelian area to the intermediate zone and the intensification of farming in this zone [36]. Farming is practically the 'private hunting ground' of the semi-nomadic Fulani.

Livestock has been a major export product. In 1987, however, the livestock sector accounted for only 5.4% of the country's export earnings — less than half its contribution in previous years. Exportation of livestock products, especially those destined for Côte d'Ivoire, now has to compete with exports from European and Latin American countries [36].

Livestock production is concentrated in the thinly populated northern and eastern regions of the country and has been largely the preserve of the semi-nomadic Fulani people. Livestock was once Burkina's main export, with about 90% of its cattle going to Côte d'Ivoire.

Stock breeding is practised essentially along traditional lines: the generally low level of training, inadequate organisation of breeders for production and marketing, poor animal hygiene and the difficulty in ensuring a reliable and adequate food supply have resulted in low livestock productivity. In order to address some of these problems, a livestock production programme has been developed for the west of the country. A West African regional development project for those areas affected by trypanosomiasis, supported by FAO, includes Burkina Faso.

In 1991 there were an estimated 2.9 million cattle and 9.4 million sheep and goats in Burkina (see Fact Sheet for further details). With the periodic resurgence of drought, however, figures have become increasingly unreliable. There are slaughter houses in Ouagadougou and Bobo-Dioulasso, and plans to build a meat-processing factory at Ouagadougou.

The French Ministry of Cooperation, through FAC, provided FF11 million in 1992 towards a livestock-raising project as part of PASA [33].

Fisheries

Being a land-locked country, Burkina has limited fishery potential and the small catch (5000-6000 tonnes) is consumed locally. Burkina is thought to have one of the lowest

consumption rates of fish of all African countries, with fish supplying less than 10% of protein to the diet. Dried and smoked fish are imported from Mali and Côte d'Ivoire.

Aquaculture is not widely practised, although one fish farm, near Banfora, which opened in 1980, can produce about 400 tonnes per annum. This has stimulated interest in fish farming and an EDF rural development scheme is assisting with the creation of additional farms in other Burkinabé villages. In 1988, a fish hatchery was opened at Bazéga, which has since produced about 200,000 fry each year. There is therefore considerable potential for development in this sector at the village level.

Protected areas and wildlife

There are four categories of protected areas: National Parks (areas of wildlife management with no exploitation); Total Faunal Reserves (primarily set aside for the conservation and management of the native fauna and its habitat, where hunting, settlement and other human activities are either prohibited or closely controlled); Partial Faunal Reserves (areas administered as a hunting zone, especially for large game); and Classified Forests. Details are given in Table 2 and sites are illustrated in Fig. 4.

Table 2. Protected areas of Burkina Faso

Category	Number of reserves	Area (km ²)
National Parks	4	6,193
Total Faunal Reserves	2	2,090
Partial Faunal Reserves	4	18,557
Classified Forests	59	8,466
Total	69	35,306

Established protected areas now cover about 13% of the country, with Partial Faunal Reserves and Classified Forests comprising 76% of this amount.

The largest single reserve — Sahel Partial Faunal Reserve — encompasses an area of 16,000km², near the borders of Niger and Mali, and plays an important role in protecting the transboundary migratory routes of many species. The vast majority of the protected areas in Burkina Faso lie within a single vegetation zone, the Sudanian woodland and grassland zone, and are located largely in the south. Little of the land in the centre or east of the country is included in protected areas at the present time.

The most important wildlife areas in Burkina are the Po, Arly, "W" and Deux Bales National Parks, as well as the Nazinga Game Ranch south of Ouagadougou and the Comoé-Leraba and Diefoula-Logoniegue Classified Forests. Most of the Sahel PFR, apart from the northwest corner, is now seriously degraded by livestock, with many people living in the reserve [14]. A new Biosphere Reserve has been created (UNESCO Man

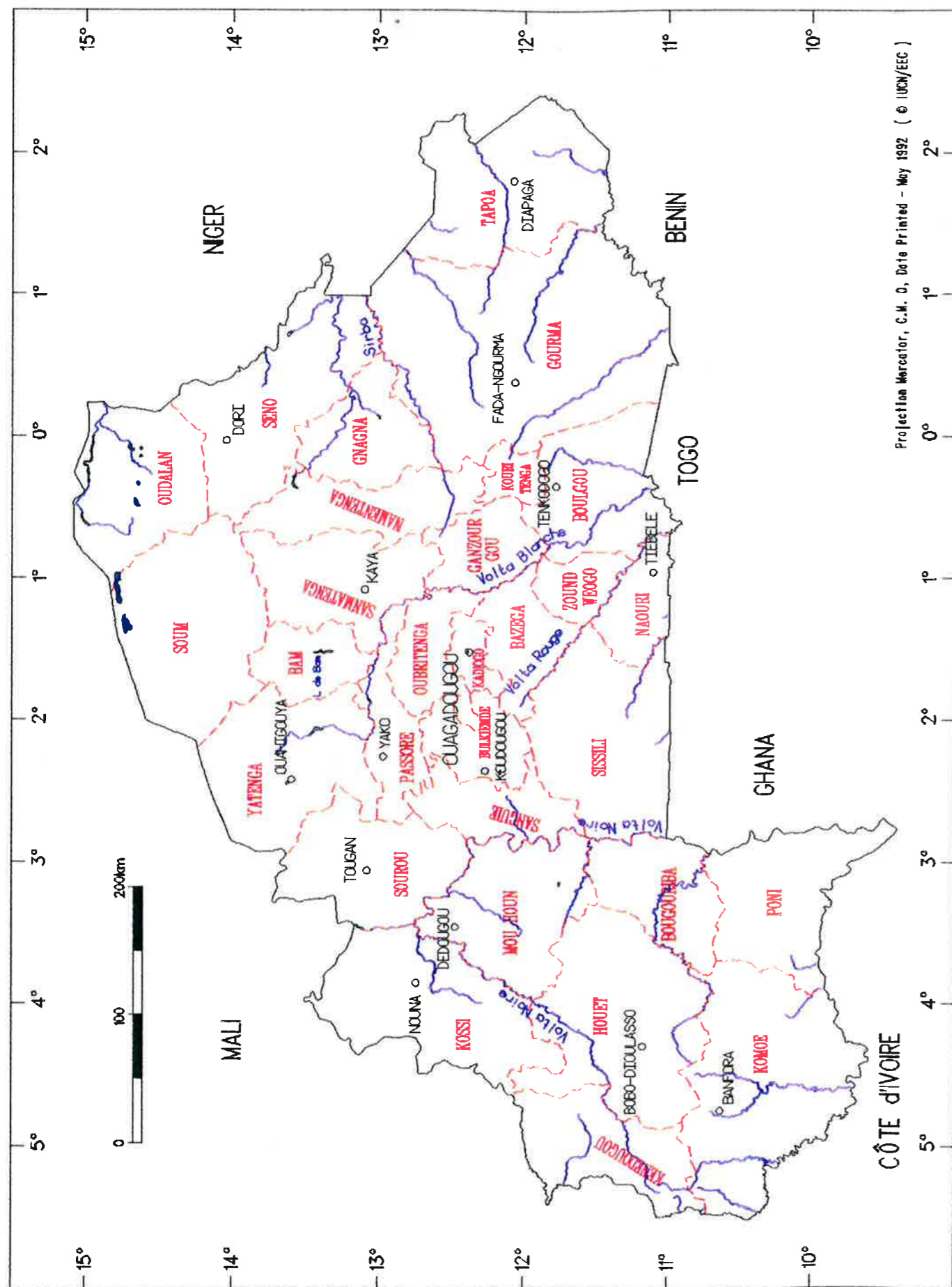


Figure 1. Administrative Boundaries and major towns of Burkina Faso

Burkina Faso

and the Biosphere (MAB) Programme) in the west, at Mare aux Hippopotames (163km²), which includes relict populations of forest zone species. There are also several outstanding proposals for additional protected sites.

Many of the country's protected areas are important frontier enclaves, especially for the larger mammals which migrate with no regard for international boundaries. For example, "W" NP lies on the borders of Bénin and Niger, while the Arly/Singou complex also offers a forest continuum with the neighbouring Pendjari woodlands in Bénin. Other smaller classified forests touch the borders of Niger, Côte d'Ivoire and Ghana. A proposal to set up a single authority to manage the three contiguous "W" national parks in Burkina Faso, Bénin and Niger, totalling over 10,000km², and to raise funds for its operation, is under consideration [19].

Although the existence of protected areas in Burkina has a long history, most reserves exist only on paper [18]. Management has never been effective, largely due to a severe shortage of manpower, equipment and resources. Thus, wildlife resources are, in all probability, heavily over-exploited. In 1980, the government commissioned a report on the wildlife resources of the rural areas which made certain management proposals for some of the protected areas and wildlife populations [15].

Bushmeat is an important source of protein for local people, with a wide range of species being hunted. To safeguard this valuable resource, there must be areas of total protection for wildlife to maintain viable populations of breeding animals.

Non-renewable resources

There are indications of substantial mineral resources in Burkina but, to date, few have been exploited with the notable exception of gold. Mining constitutes a relatively unimportant factor in Burkina's economy, and is largely limited to the production of antimony at Mafoulou and marble at Tierra. The feasibility of exploiting zinc and silver reserves at Perkoa is currently being investigated.

Gold is mined at Poura (estimated reserves 27-35 tonnes). Output has exceeded all expectations. First started in 1984, through SOREMIB (Société de recherche et d'Exploitation Minière du Burkina Faso), exploitation has always been irregular. In 1989 there was a sharp decline in gold production and exports due to a cave-in at the main commercial mine. Exploitation of high grade ore has been maintained; earnings of FCFA122 billion were recorded from 1987-1990. Future prospects are, however, not so bright. The low price of gold and maintenance costs at the mines have resulted in an estimated loss of FCFA2 billion. Official export figures for gold, estimated at 23% of total exports in 1988, dropped to 18% in 1991. Nonetheless, gold remains the second-most important export, after cotton [36].

Potentially, Burkina's richest mineral resource is the deposit of manganese in the Tambao area in the northern part of the country. The existence of 13 million tonnes of ore has been known since the 1960s, but the viability of its exploitation depends on the completion of the 320km railway from Ouagadougou.

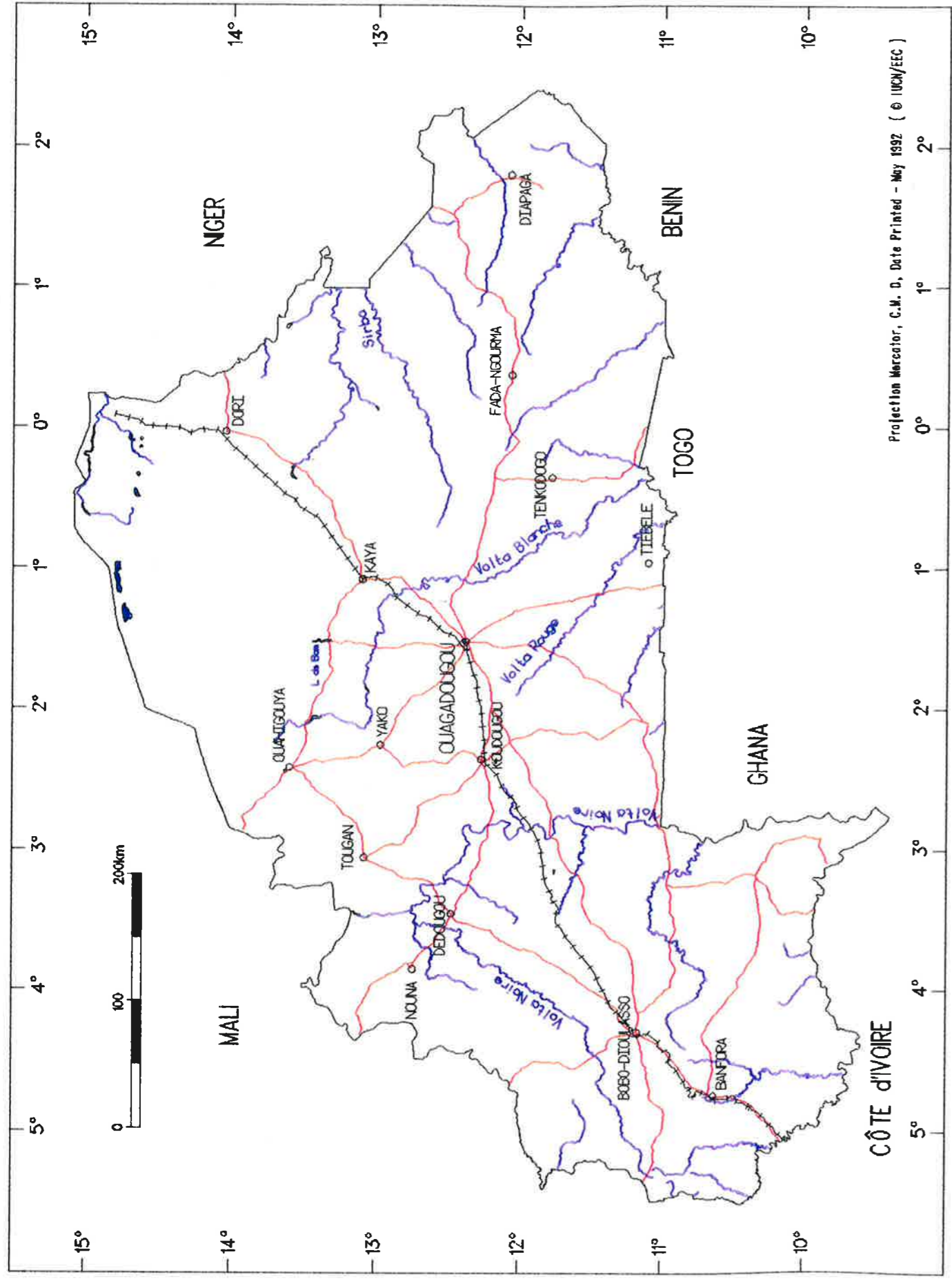


Figure 2. Major communication routes in Burkina Faso.

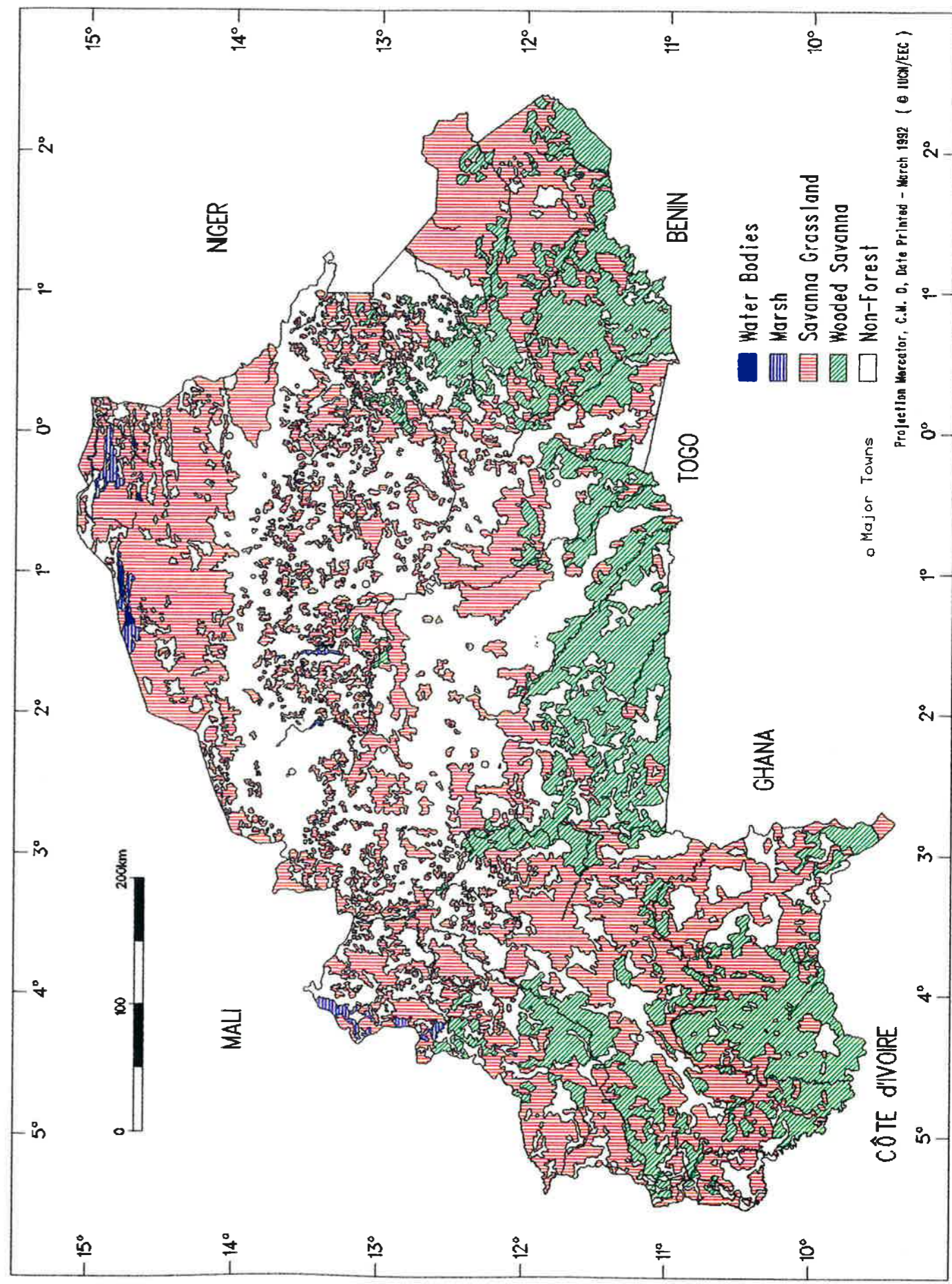


Figure 3. Vegetation pattern of Burkina Faso.

See text and Annex I for further details.

State of the Environment

Other resources which are being investigated include phosphates (reserves estimated at over 200 million tonnes at Kodjari), nickel (30-70 million tonnes at Bonga), lead, zinc, bauxite, diamond, marble and limestone.

The development of these possible sources of wealth is hampered by the lack of expertise in exploitation as well as the absence of proper equipment and infrastructure, especially energy supplies and transportation. A large number of international development agencies are currently assisting with feasibility studies to develop adequate infrastructure. The Institute for Geological Research and Mining (BRGM) has recently announced a plan for mineral exploitation in Burkina Faso [33].

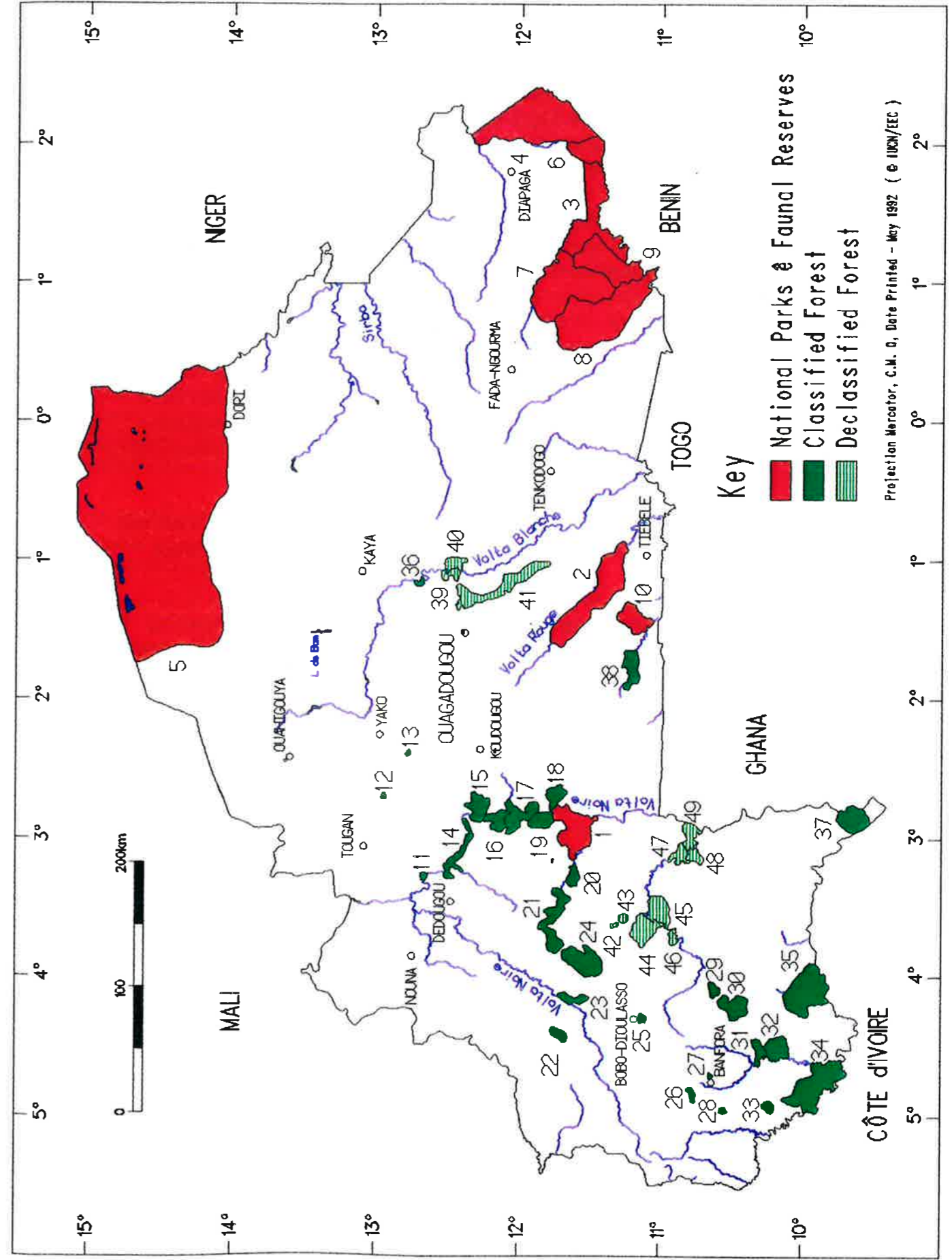


Figure 4. Protected Areas of Burkina Faso. See text and Annex II for further details.

Industry

Main industrial sectors

The industrial sector accounted for 24% of GDP in 1991 [31]. Burkinabé industry involved about 177 companies most of which are involved in food-processing and textiles. These activities have developed as a result of import substitutions. Following a long period of stagnation, industry was revitalised in 1986 and 1987.

Industrial growth is limited by the lack of raw materials, the need to import all of the country's fuel, the small domestic market, and the shortage of financial and management skills. Political uncertainty has also deterred foreign investment in the past, although this now appears to be changing.

There are two main industries in Burkina Faso: textile manufacturing which uses local supplies of cotton, and sugar processing, the country's single largest industry, which employs about 4500 employees at a plant in Banfora. Another sugar factory is under construction in the Sourrou area. Other state-owned industries include flour milling, brewing and plastics. Privately-owned factories manufacture soap, cigarettes, beer, shoes and tyres, and there is also a bicycle assembly plant.

There are plans to build a small fertilizer plant at Ouagadougou. This would benefit the agricultural community who now rely on imported sources for their meagre supplies.

The industrial sector is dominated by public enterprises of which six represent 60% of the country's manufacturing activities. SOFITEX and SOSUCO are important to Burkina Faso's economy in terms of exports and jobs. SOFITEX's situation seems to be improving following the implementation of a recovery plan, whereas SOSUCO, temporarily re-established after a successful recovery plan in 1984, is once again in difficulty because of the drop in agricultural production, the poor quality of finished products, and competition from imported sugar [36].

Within the framework of the structural adjustment programme, an initiative supporting the privatisation of public enterprises and the improvement of the economic environment (free trade and prices) was launched in 1991.

Location of industry

Almost all of the industry is concentrated in the Ouagadougou-Koudougou region (71%). The other main centre is the Bobo-Dioulasso-Banfora complex which, despite being the economic capital because of its role in trade with Mali and Côte d'Ivoire, has only 18% of the national industry sector [1].

Energy sources and consumption

Until 1988 the nation's electricity was generated exclusively from thermal sources, with production reaching 141 million kWh in 1987. The total capacity of Burkina's five generating stations is 38.9MW, with over 60% of this supply coming from the Ouagadougou plant. The other stations are at Bobo-Dioulasso (9.4MW), Koudougou

(4.4MW), Banfora (0.8MW) and Ouahigouya (0.4MW). There is a plan to provide electricity to seven other urban centres in the near future [7].

In order to satisfy demand, plans for a number of hydro-electric power plants have been developed, of which the first, a 15MW project on the Kompienga River (developed at a cost of US\$90 million), became operational in 1989. Similar projects are now being developed on the Nankabé River (estimated capacity 7.5MW) and on the Mouhoun (60MW), although maximum production is never likely to be attained at either station because of the low level of rainfall in these regions.

Aside from the increase in the national production of electricity, there are on-going discussions with international funding agencies for assistance in developing a national electricity grid network. Studies are also under way for the extension of the Ghanaian electricity network to Ouagadougou.

Pilot projects for solar electric power generation plants have been undertaken and are showing encouraging results for meeting village power needs. However, in most rural situations, fuelwood remains the basic source of energy and constitutes over 90% of the present energy consumption.

In an effort to compensate for environmental degradation, more than 350,000 fuel-efficient stoves were built in 1986 and 1987 and distributed on a national scale [6]. Unfortunately, the effectiveness of this project has never been evaluated.

There are no reports of oil exploration and all petroleum products are imported, albeit at an extremely low level (81,000m³ of petrol, 17,726m³ of paraffin, 36,315m³ of gas oil, 29,500 tonnes of diesel and 25,000 tonnes of fuel oil in 1988 [7]).

In 1991 the CCCE granted FF4.5 million to SONABEL (National Society for Electricity in Burkina Faso) to examine the feasibility of joining the country's electricity network with that of Côte d'Ivoire [39].

Demography and Urbanisation

Demographic pattern

The population was estimated at 9.6 million in 1991. According to official figures the population in 1975 — the country's first census — was 5,638,000. By 1988 this figure has risen to 8,509,000, representing an average density of 31 inhabitants per km². But because of the extreme variations in climate, agricultural output and availability of natural resources, it is unrealistic to refer to an 'average' human density in Burkina Faso, as this may range from 2-5 persons per km² in the north and east, to 50-60 inhabitants per km² in the central plateau [26]. It is important to recognise, however, that while Burkina has one of the smallest areas of the six Sahelian countries (Chad, Mali, Mauritania, Niger and Senegal), its population is now the largest. Population density is highest on the Central Mossi Plateau (30km²), where most agricultural activity is concentrated, and lowest in the arid north and the fertile river basins of the southwest, where endemic health issues are a major problem. Details of the population distribution are provided in Table 3.

Burkina Faso is a conglomerate of ethnographically different groups, who are either sedentary farmers, semi-nomadic herders or nomadic pastoralists. The majority of the population are members of two major West African cultural groups, the Voltaic and the Mande. The Voltaic group is far more numerous and includes the Mossi people who account for half of the total population. These people are traditionally sedentary farmers and it is their culture which exerts a dominant influence upon so many aspects of life in Burkina Faso.

Other ethnic groups include the Fulbe (Peulh) in the north (10%), Lobi south of Diébougou and around Gaoua and Kampti (7%), the Bobo around Bobo-Dioulasso and Dédougou (7%), the Samo in the region of Tougan and Toma (2%), the Sénoufo in the region of Banfora (6%), the Gourounsi around Léo and Koudougou (5%), the Bousance at Tenkodogo (5%) and the Gourmantché (5%) in the east.

The majority of the population hold to traditional animist beliefs. Around 20% of the population are Muslim and 5% are thought to be Christian.

Population growth

The population is gradually increasing: population growth reached 2.1% from 1965-1980 and grew to 2.7% from 1980-1987 and to 3% from 1987-1991. An estimated 43.8% of population are now under 15 years of age [36]. World Bank figures show an increase in the proportion of Burkinabé of working age (15-64 years) from 48% to 52% between 1965 and 1988, and predict a further increase to 58% by 2025 [7].

To date, there has been no policy of State intervention to control the population size (with an annual growth rate 2.8% and increasing) since the government has not perceived a need to limit population growth. In general, population concerns are related to the health and well-being of the predominantly rural populations and perceived in terms of high

Table 3. Population distribution in relation to land resources in Burkina Faso (1984)

Province	Population	Area (km ²)	Density
Sahel			
Oudalan	89,900	10,046	9.0
Seno	175,500	13,473	13.0
Soum	160,000	13,350	12.0
Central Plateau			
Yatenga	637,000	12,292	52.0
Bam	175,100	4,017	43.5
Passore	262,600	4,078	64.0
Sanmatenga	340,900	9,213	37.0
Namentenga	202,300	7,555	27.0
Sanguie	208,400	5,161	40.0
Bulkiemde	373,600	4,138	90.0
Oubritenga	259,700	4,693	55.0
Kadiogo	274,000	1,169	234.0
Bazega	253,300	5,313	48.0
Ganzourgou	149,700	4,078	37.0
Kouritenga	127,500	1,627	78.0
Zoundweogo	200,000	3,453	58.0
East			
Gnagna	147,600	8,600	17.0
Gourma	231,100	26,613	8.5
Tapoa	110,600	14,780	7.5
West			
Sourou	279,200	9,487	29.5
Kossi	244,300	13,177	18.5
Mou-Houn	240,300	10,442	43.0
Kenedougou	118,600	8,307	14.0
Houet	370,800	16,472	22.0
Bougouriba	213,000	7,087	30.0
Poni	216,600	10,361	20.0
Comoé	210,800	18,393	11.5
South Centre			
Sissili	144,600	13,736	10.5
Naouri	88,300	3,843	23.0
Boulgou	358,600	9,033	40.0
Total	6,773,900	274,200	24.7

morbidity and mortality rates, inappropriate spatial distribution and the effects of emigration patterns. Population is therefore not perceived primarily in demographic terms in Burkina Faso. Emigration has, until now, absorbed some of the population increase. Future efforts to decrease infant mortality and the present high emigration rates (especially amongst middle-aged male workers) may, in fact, increase the rate of population growth in the near future [10].

Only since the early 1980s has population policy been considered an important part of the overall national development plan (the National Population Council was created in 1983). The government has now expressed the need to formulate a policy that will be consistent with the country's economic situation and cultural traditions. A population policy is currently being prepared by the National Population Council.

Improving the status of women — a priority issue for the government — could also influence fertility and thus population growth. Socio-economic development, such as agricultural programmes (for males and females), an improved education system and increased employment opportunities, is also expected to influence significantly the rate of population growth [10].

Internal and external migration

In addition to its demographic consequences, migration is a major force both economically and environmentally in Burkina Faso.

There are several patterns of migration which are relevant to environmental issues: transhumance, the seasonal migration of nomadic herders, for example, has been practised as a way of life for centuries. This tradition was largely practised in the northern regions of the country, in the Sahel where, despite the large numbers of animals involved, its seasonal nature enabled the resources to recover between seasons. Increased and now constant pressure from national and regional refugees, as well as their animal herds, have combined with a changing climate and encroaching desertification to produce a severely degraded habitat over much of the northern part of the country.

Rural-urban migration has increased in recent years with country-dwellers hoping to find employment and an improved standard of living in towns and cities. As rural-urban migration has largely been surpassed in size by emigration, however, the urban population has remained small, increasing at 5.3% a year between 1980 and 1990.

Rural to rural migration has also increased in recent years, especially since the time of the first major drought in the 1960s, with most people moving from the densely populated Mossi Plateau and the north towards the relatively fertile southwestern region. An internationally sponsored plan has been devised to encourage the migration of the population to under-utilised regions to reduce human pressures on environmentally sensitive areas, as well as to increase the national agricultural output. The long-term practicality of this strategy, however, is uncertain as it exacerbates an already critical situation by creating artificial concentrations of people and their animals in other relatively fragile regions.

Overall, the relatively high population density, combined with the poor soil, the lack of expansion in productive employment, and the demand for plantation and industrial labour in neighbouring Côte d'Ivoire, has resulted in substantial emigration. About 450,000 people leave each year, mainly for Côte d'Ivoire and Ghana, and it has been estimated that between 50,000 and 100,000 of them will stay away permanently. Concern has recently been expressed about this as it may well have a long-term impact upon socio-economic development in Burkina Faso.

Extent, density and distribution of urbanisation

Unlike the governments of many neighbouring countries, Burkina Faso is concerned not about rural to urban migration, but about migration between rural areas. In fact, there are very few major urban developments and it has been estimated that only about 9% of the population now lives in urban communities, compared to 6% in 1975. Even the government considers that the growth of Ouagadougou, the capital and largest metropolitan area, is unsatisfactorily low. The government has decided to decentralise its activities. In keeping with this strategy, the town of Bobo Dioulasso, in the heart of the most prosperous agricultural zone, has benefitted from a special investigation. A former economic capital, this town has a long tradition of trade with neighbouring regions because of its location on the road and rail network.

Comprehensive rural development strategies are intended, in part, to make the fertile south-western part of the country more habitable, for example, by improving the health infrastructure. This may have serious consequences for the environment as land colonisation schemes are almost certainly going to be introduced.

Health issues

Burkina Faso has an epidemiological situation marked by malaria and tuberculosis, as well as endemic and epidemic illnesses such as measles, yellow fever, polio and leprosy.

A campaign against AIDS has been implemented. By March 1992, 1263 cases had been reported to WHO. The rate at which the virus is spreading is clear from the following figures: in 1985 less than one case per month was recorded. By 1988, more than one case was reported each day. In 1988, 13 provinces were affected. Two years later all provinces were affected. The CEC has supported the fight against AIDS at the government and provincial levels [37].

A national immunisation campaign, "Vaccination Commando", was conducted in 1984. An estimated 730,000 children were successfully vaccinated against measles and approximately 1.7 million against yellow fever and meningitis. From 1988-1990, 50% of one-year-old children were vaccinated [34]. Dispensaries, with trained staff, are now generally equipped to cope with such activities [37].

The country's five-year plan (1986-1990) provided the population with improved access to health care and disease prevention. In cooperation with international organisations the government has carried out programmes to improve nutrition, and provide sanitation, a clean water supply and a health clinic to each of the country's villages. In 1990,

mortality, particularly infant mortality, was still high with 133 deaths for every 1000 live births [34]. Within the Structural Adjustment Programme, emphasis is placed on promoting the health of mothers and their children, as well as on family planning. It also includes involving local communities in decision-making, the supply of medication, and the financing of health services. The aims are to reinforce socio-health coverage and improve the quality of health service benefits [37].

The regional campaign against onchocerciasis (a parasitic disease also known as "river blindness") — launched in 1974 — has produced encouraging results, particularly in Burkina Faso. The Volta Development Authority (AVV), set up in 1974, is aimed at repopulating and promoting areas abandoned as a result of this disease. These areas represent 17% of the country. The AVV is currently operating in 91 villages, covering an area of 2450km² and more than 400,000 people [37].

In 1991, five multilateral and seven bilateral agreements and 66 NGOs dealt with 78 projects relating to programme of the Ministry for Public Health [37].

The French Ministry of Cooperation provided FF11 million towards improvement of hospitals in 1992. This project is aimed at developing autonomous management in the two national hospitals. Also participating in the programmes are the World Bank and the Dutch, Italian and Canadian governments (FF6.7 million) [33].

Through its Health Department, ORSTOM is carrying out an Environment and Health Programme. Its aim is to relate the epidemiological variations of vector-carried, water-borne illnesses to land use activities. An effort has also been made in Burkina Faso to understand the principal factors in the mortality of young children [35].

ANALYSIS OF POLLUTION AND DEGRADATION PROCESSES

The environmental problems of Burkina Faso arise largely from intensive land-use practices in the semi-arid savannah region, a lack of water resources, and a concentration of people and their animal herds in critical zones of the countryside. Expanding patterns of aridity have decreased the carrying capacity of the land for both livestock and human populations. The effects of intensive resource utilisation have been exacerbated by recent droughts which have caused severe hardship to the majority of the population. Desertification has resulted from intense land-use patterns, coupled with adverse climatic factors.

Water Pollution and Water Shortage

The water situation in Burkina is a critical matter and one of extremes, ranging from drought to flood conditions.

Dam construction has always been a major issue in Burkina. In addition to the many existing dams, several large-scale projects are in progress. To date, these have tended to focus on flood control and irrigation, with little thought given to the generation of hydro-electric power. The Sourou project, designed to irrigate some 400km² of land, revolves around the construction of the Samandéni dam. Another major irrigation dam is being constructed at Sewta. Work is now complete on the Kompienga dam, but progress has been delayed at the Bagré dam. Work is expected to start on the Nounbiel dam project following confirmation by Russian experts that the project would be technically feasible.

Most of the country (86%) overlies a poor aquifer. The presence of groundwater tends to be extremely variable and intermittent. Groundwater recharge is mainly from the sporadic rainfall and thus major seasonal fluctuations occur in the water table. In most areas the depth of wells averages 15-40m and they may produce a flow of 0.5-8m³/hour. There are now several thousand low-yield wells in Burkina Faso, which are used primarily for human resources as well as for the watering of livestock.

Traditionally, the Mossi people have constructed rock bunds and stone terraces to conserve water and prevent soil erosion. After decades of neglect, farmers are once again expressing interest in these traditional techniques.

On a bigger scale, the construction of small earth dams is again being encouraged to increase crop production and to provide water for people and animals during the dry season. Most of these dams are between three and ten metres high and are subject to high evaporation rates and seepage, with resulting losses of up to 70% of stored water [5].

There is no information available on water pollution in Burkina Faso at the present time. This is unlikely to be a major issue of concern in the rural environment at the moment,

although if higher levels of fertilizer are applied to crops (as is intended), it is likely that these could be washed into streams and rivers under flood conditions.

Soil Erosion and Degradation

Burkina Faso fringes the Sahel region, which is situated between the 13th and 14th parallels and, in the case of Burkina, covers the provinces of Yatenga, Bam, Sanmatenga, Namentenga and Gnagna, 44,000km² (16% of the country's land area). Potential evapotranspiration is higher than average rainfall in all parts of the country, and may be as much as 3-4 times higher in the central plateau. The dry season is eight months or longer as one moves north, which precludes any regeneration of plant cover until well after the first rains of the wet season. Seasonal effects of human and animal pressure are more likely to result in bare soil surfaces in the savannah zone than in the more forested lands of the south.

The Yatenga Plateau was once the prosperous heartland of the Mossi empire. It is still the most densely settled area of Burkina Faso, but over two decades of poor rainfall, coupled with the increased pressure of human and animal populations, have taken a devastating toll on this area. The result has been encrusted soils, a lowered water table, failed crops, etc. Due to its low relief, soil erosion in Burkina Faso tends to occur as sheet erosion during runoff and is exacerbated by the following conditions: bare soil surfaces due to human activities and overgrazing; poor soil structure due to low organic matter, animal movement and cropping practices; crusting type soils that have low infiltration rates and high coefficients of runoff; high intensity rainfall; and long unbroken slopes.

In order to reduce soil erosion, OXFAM has recently been experimenting with the construction of simple, low stone ridges constructed along natural contours of the Yatenga Plateau. These have proven to be highly successful, trapping water and increasing penetration while simultaneously reducing runoff and erosion [see 16].

Runoff, as sheet flow, may be 5-20% of rainfall under savannah conditions, increasing to 20-50% on land under traditional agriculture, and may go up to as much as 60 or 80% of the total rainfall on bare soil, or on soil impoverished by cultivation.

On the central plateau, the greatest erosion problems are found in the provinces of Ouagadougou, Kaya, Ouahigouya, the northern part of Koudougou, the north-eastern part of Dédougou and some parts of Koupéla.

To investigate the growing problem of encroaching desertification a special committee was formed — National Committee Against Desertification — which has since devised a Plan National de Lutte Contre la Désertification. Its main activities have been to promote the development of village-based reforestation programmes in order to meet fuelwood needs, to introduce more efficient means of cooking and to establish plantations along the frontiers of the encroaching desert zone.

At the village level, the development and integrated management of the land and its resources by the local inhabitants is strongly encouraged. One such project in north Yatenga province involves 110 villages and 85,000 people. The French Ministry of Cooperation provided FF2.5 million in 1991 for this activity [33].

Deforestation

The exploitation of Burkina's forests falls into three categories: land clearing, fuelwood cutting, and grazing, all of which interact to place an increasing burden on the savannah's limited vegetative resources and its regenerative capacity.

Firewood collection places the heaviest demands on Burkina's limited forest resources. The per capita consumption of firewood has been estimated at 1m³/year [17] which, including wood required for construction, resulted in the felling of approximately seven million cubic metres each year for the whole country. Regional centres of high population density have led to excessive offtake, causing local shortages. This, in turn, has resulted in the commercialisation of timber, especially firewood.

The annual rate of deforestation, as a percentage of the total forest area, for the period 1980-1988, has been estimated at almost 2% per annum. Various organisations have been involved in agroforestry and reforestation programmes in Burkina in recent years, in an attempt to relieve the pressures of fuelwood collection on existing forests.

Biodiversity

Wildlife resources have not been well documented, although it is often assumed that Burkina has a higher density of wildlife than any of its neighbouring states. Several important sites of biological diversity have already been identified and are now included within the national system of protected areas (see Protected Areas and Wildlife). However, as previously mentioned, few of these sites receive adequate protection.

A national strategy for wildlife conservation was prepared in 1987 [25] and focused on the economic, cultural and scientific value of the country's wildlife resources. To date, however, little action has been taken to implement this strategy. There is therefore an urgent need for a new census of the biological diversity of Burkina, both in the floral (including forestry) and faunal domains. Many species are at their extreme geographical limits in this country, which makes it important to identify threatened species in order to take preventive action to preserve them.

In regard to biological diversity, there are estimated to be over 1100 plant species in Burkina (618 genera), although the level of endemism is unknown. One of the 30 top priority elephant (*Loxodonta africana*) populations in Africa is to be found in the "W" National Park, with an estimated 1700 animals, and overlapping into Bénin and Niger. Other important populations are believed to exist in the Arly-Singou area, while others are

found in the Nazinga Classified Forest. "W" National Park is also home to one of West Africa's largest buffalo (*Synercus caffer*) populations.

Antelopes are also well represented with a total of 16 species. One of these, the scimitar-horned oryx (*Oryx dammah*) is feared to be almost extinct (if not already so) in Burkina Faso. An internationally important korrigum (*Damaliscus lunatus korrigum*) population lives in the east, especially in Arly and "W" National Park, with neighbouring populations in adjacent Bénin and Niger. Korrigum in Burkina Faso are currently threatened by illegal hunting and livestock grazing activities [14]. Small populations of dorcas (*Gazella dorcas*) and dama gazelle (*G. dama*) occur in the far north, but these are certain to become locally extinct unless the Seno-Mango Biosphere Reserve is established in the immediate future. Red flanked (*Cephalophus rufilatus*) and grey duikers (*Sylvicapra grimmia*) inhabit "W" and Nazinga, but the overall status of forest duikers is unknown.

The reptilian fauna includes the Nile (*Crocodylus niloticus*), slender-snouted (*C. cataphractus*) and dwarf crocodiles (*Osteolaemus tetraspis*), all of these species are severely depleted. The status of the rare African spurred tortoise (*Geochelone sulcata*) is unclear, but attempts to breed this species at Nazinga as part of a utilisation scheme are encouraging.

The Nazinga Game Ranch, 120km south of Ouagadougou, established within the Classified Forest, is probably the best known attempt to incorporate wildlife utilisation as part of the rural economic development process in West Africa. Recent developments at the ranch, which include the involvement of local people in developing a park infrastructure (protection, clearing trails, building dams for water reservoirs and fish ponds), have already shown extremely promising results. As a result of the increased protection in the region, wildlife stocks have increased to a level where certain species may now be selectively harvested. Products are sold as 'bushmeat' in Ouagadougou, and profits (FCFA20 million in 1988-1989) re-invested in the enterprise.

Tourism is also expanding in the area and, in the period 1988-1989, over 2000 people visited Nazinga. Safaris and game hunting brought in an additional FCFA1.2 million for the 1988-1989 season [11, 12].

Urban Environment

The urban environment in Burkina Faso has not been well described in the literature. Approximately 13% of the total population live in towns and cities, but the present government has not expressed any concern over this proportion. The most serious problems are likely to occur in and around Ouagadougou, with housing, sanitation and access to fresh drinking water likely to be the main issues. Collection of fuelwood is a major problem around all settlements in Burkina as it is still the principal source of energy for a large part of the population, although alternative sources have been introduced (see Energy Sources and Consumption).

The World Bank, through the International Development Agency (IDA), granted US\$22.2 million in 1990 to strengthen the institutional capacities of the organisational, technical, and financial authorities of Ouagadougou and Bobo Dioulasso. This project was co-financed by the Italian Government.

The French Ministry of Cooperation also supports decentralising the population and implementing a housing policy. In 1991 FAC provided FF2.7 million towards implementation of this strategy. The CCCE finances refuse collection and sanitation within the framework of an economic housing pilot project in Burkina Faso, and urban development in Ouagadougou. In 1992, FAC provided FF3 million to train community administrative officials [33].

Energy Issues

By far the most important source of energy in Burkina is wood: timber resources provide an estimated 90% of the nation's energy needs, as illustrated in Table 4.

Table 4. Primary energy balance, 1989 (million tonnes oil equivalent) [7]

	Oil	Electricity	Other	Total
Production	--	--	1.68	1.68
Imports	0.18	--	--	0.18
Exports	--	--	--	--
Primary supply	0.18	--	1.68	1.86
Net transformation	0.04	0.01	--	0.03
Final transformation	0.14	0.01	1.68	1.83

Although electricity is generated from a series of thermal and hydroelectric stations, production is generally low, often sporadic and clearly inadequate. Almost all of the generated power is directed towards the capital, Ouagadougou. There is no national electricity grid, although proposals are being discussed to extend Ouagadougou's system to other urban regions.

Industry

Industrial development is at such a low level in Burkina Faso at the present time that no attention has been given to investigating the impact of production on the environment. With most of the industrial activity taking place around the capital city, however, this should be a cause for some concern.

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NOTE ON DATA SOURCES

Every effort has been made to ensure that the information in this Environmental Synopsis is as detailed and accurate as possible. Wherever possible, original data sources have been used as a reference or, failing that, data have been checked against several other sources. In the absence of reliable data from the literature for the past five years, earlier sources have been used and noted accordingly. Many reports are, themselves, the result of a review of existing data and some issues may therefore be open to different interpretation. This is particularly the case for references [7] and [8].

As this review is restricted in scope and size, it cannot be expected to give a comprehensive historical or political overview of events within Burkina Faso. A number of publications are, however, recommended for further, in-depth reading of a particular topic. These include the regular country reports of the Economist Intelligence Unit [7, 23] which provide a well-balanced review of the political (historical and present) and economic situations, as does the Europa handbook [8]. A wide selection of useful statistical data are to be found in [2, 3, 4, 7, 8, 20, 22, 23, 26, 27, 28, 29, 31, 40, 41, 42, 43, 44, 45, 46]. Information on biological diversity, deforestation and wildlife issues have been gleaned from a number of IUCN publications [9, 14, 15]. Demographic, health and similar data have been obtained from a wide range of sources within the United Nations (including WHO and UNICEF).

Although various references are made to multilateral and bilateral donors in this report, no attempt has been made to provide a full coverage of their activities in Burkina Faso.

Even given such a broad coverage, however, there remain a large number of gaps in the information which cannot be completed at the present time. In Burkina Faso, environmental awareness is increasing, largely in view of the recurrent disaster years that the country has experienced in recent decades. Attitudes are gradually changing and people are becoming more aware of the need to invest in natural resource management. Still, this remains a luxury for a very large proportion of the population and the situation is unlikely to change much in the immediate future, despite the promises of the government to make sweeping improvements to national living standards.

It is therefore perhaps understandable that little has been done in the past to address environmental concerns, although rational planning of agricultural activities should be considered in the light of increasing environmental degradation. So too with issues relating to energy use and pollution, coverage of which is lacking at the present time.

One of the primary objectives of this overview, therefore, has been to highlight such issues in the hope that government and development agencies alike will take these facts into consideration when planning and implementing future projects.

ANNEX I

Vegetation Pattern of Burkina Faso (See also Fig. 3)

Vegetation data for Burkina Faso were digitised from a blueline map at a scale of 1:1 million, entitled *Burkina Faso - Formations Végétales*, prepared by the Ministère de l'Environnement et du Tourisme service de l'aménagement forestier (nd). Six land use types are shown on the source map, namely: *savane arborée*, *savane arbustive*, *fourre tigre*, *steppe (savane herbeuse)* and *mare*. These six types have been generalised into the three categories shown on this map. Protected areas were also digitised from the same source map.

Digitised data are held at the *WCMC Biodiversity Map Library*, WCMC, 219 Huntingdon Road, Cambridge, CB3 0DL, UK.

ANNEX II

Protected Areas of Burkina Faso (See also Fig. 4)

Map Reference	Name
2	Kabore Tambi National Park
3	Arly National Park
4	"W" National Park
5	Sahel Partial Reserve
6	Kourtiagou Partial Reserve
7	Singou Total Reserve
8	Pama Partial Reserve
9	Arly Partial Reserve
10	Nazinga Ranch
11	Sal Classified Forest
12	Niouma Classified Forest
13	Twesee Classified Forest
14	Totoba Classified Forest
15	Tiogo Classified Forest
16	Tisse Classified Forest
17	Kalio Classified Forest
18	Laba Classified Forest
19	Sorobon Classified Forest
20	Deux Bales National Park
21	Tui Classified Forest
22	Tere Classified Forest
23	Mare aux Hippopotames Classified Forest
24	Maro Classified Forest
25	Koumina Classified Forest
26	Beregadougou Classified Forest
27	Bounouma Classified Forest
28	Toumouseni Classified Forest
29	Bouandougou Classified Forest
30	Kongouko Classified Forest
31	Boulon Classified Forest
32	Koflande Classified Forest
33	Yendere Classified Forest
34	Diefoula Classified Forest
35	Dida Classified Forest
36	Bissiga Classified Forest
37	Koulbi Classified Forest
38	Sissiu Classified Forest
39	Ziga Classified Forest
40	Wayen Classified Forest

Protected Areas of Burkina Faso (contd.). See also Fig. 4.

Map Reference	Name
41	Nakambe Classified Forest
42	Bougouriba Forest (declassified)
43	Kapo Forest (declassified)
44	Mou Forest (declassified)
45	Nabere Partial Reserve (declassified)
46	Dan Forest (declassified)
47	Bontioli Total Reserve (declassified)
48/49	Bontioli Partial Reserve (declassified)

ACRONYMS

AVV	Volta Development Authority
BRGM	Institute for Geological Research and Mining
CCCE	Caisse Centrale de Coopération Economique
CILSS	Comité Permanent Inter-Etats de Lutte contre la Sécheresse au Sahel
CESAO	Centre for Economic and Social Studies in West Africa
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CEC	Commission of the European Communities
CNRST	National Centre for Scientific and Technological Research
CTFT	Centre Technique Forestier Tropical
CTRO	Centre Régional pour la Télédétection
DDA	Swiss Development Agency
ECOWAS	Economic Community of West African States
EDF	European Development Fund
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GNP	Gross National Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ha	hectare(s)
IBE	Institut Burkinabé d'Energie
INERA	National Institute for Agricultural Studies and Research
IRAT	Institut de Recherches Agronomiques Tropicales
IRBET	Institut de Recherche en Biologie et d'Ecologie Tropicale
IUCN	The World Conservation Union
km	kilometre(s)
kWh	kilowatt-hour(s)
MAB	Man and the Biosphere (of UNESCO)
MW	Megawatt(s)
NGO	non-governmental organisation
NP	National Park
OFNACHER	National Office for Grains
ORSTOM	Institut Français de Recherche pour le Développement Scientifique en Coopération (French Technical Cooperation Agency)
PASA	Agricultural Structural Adjustment Programme
PQDP	Plan Quinquennal de Développement Populaire
SOFITEX	Society of Fibres and Textiles
SONABEL	National Society for Electricity
SOREMIB	Société de Recherche et d'Exploitation Minière du Burkina Faso
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WWF	World Wide Fund For Nature

Titles in this series of Environmental Synopses include:

Angola	Liberia
Barbados	Malawi
Belize	Malaysia
Bénin	Mauritania
Bolivia	Mauritius
Burkina Faso	Mozambique
Burundi	Namibia
Central African Republic	Niger
Colombia	Nigeria
Comoros	Peru
Congo	Rwanda
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Dominican Republic	Sierra Leone
Djibouti	Solomon Islands
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