Vulnerability Profile of Burkina Faso

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Introduction

Burkina Faso is the 24th most vulnerable nation out of the 141 countries ranked[1] by the Global Leaders for Tomorrow Environment Task Force et al. (2002). This means the country is vulnerable to stresses, which could be disastrous at both household and national level if preventive action is not taken (see Box 1 for definitions). It is therefore important to look more closely at what the threats are, how people are sensitive to these threats, and how they deal with them. We also need to consider geographical and social variations to understand who is most vulnerable. That is the purpose of this study, conducted as a part of Sida's country strategy planning process in Burkina Faso. The aim is to help target support to increase people's resilience to stresses, thus decreasing the number of people who are, and who are at risk of becoming, poor. A vulnerability assessment, therefore, is an important cornerstone for development assistance and policy formulations for sustainable development. Many of the issues discussed here relate to the process of achieving the United Nations' Millennium Development Goals.

Vulnerability in Burkina Faso: Background

The major factors and trends discussed in this paper that contribute to vulnerability and potentially reduce sustainability of livelihoods have been identified in discussions with various representatives in Burkina Faso and through literature reviews. Most of the data for this study come from national aggregates and averages. However, it is important to point out that these figures and discussions are all based on real people, who seldom fit these averages.

According to the Human Development Index, Burkina Faso is ranked as the 5th most disadvantaged country in the world (UNDP, 2002) and 44.5 per cent of the Burkanibé live below the threshold of absolute poverty (Ministry of Economy and Finance, 2000). Its climatic trends and variability are often observed with a great deal of concern. However, the general doomsday scenario for the African drylands depends partly on a global perspective, making use of monitoring and predictive techniques that depend on large data sets. Micro-scale studies of natural resource management, on the other hand, are more likely to reflect indigenous perceptions, and to be holistic and specific to place and community (Mortimore, 1998). This assessment, however, takes a cross-scale approach and is based on secondary data.

A few general statistics are presented here (Table 1) and maps of administrative regions and population density are provided in Appendix 1. Of course, great differences exist between regional, local, household and individual levels; it is at the local level that vulnerability is critical.

1 This index includes indicators on basic human sustenance and environmental health. See Chapter 1 'Vulnerability Profile of West Africa' (this report) for a more thorough discussion of this index.

BOX 1 DEFINITIONS OF VULNERABILITY TERMS

Vulnerability

Vulnerability is the degree to which a system or unit (such as a human group or a place) is likely to experience harm due to exposure to perturbations or stresses. It is comprised of three dimensions:

Exposure

The exposure of people, places and ecosystems to stresses, perturbations, and shocks.

Sensitivity

The degree to which people, places and ecosystems are affected by stress or perturbation, including their capacity to anticipate and cope with the stress.

Resilience

The ability of the exposed people, places and ecosystems to recover from the stress and to buffer themselves against and adapt to future stresses and perturbations.

(Source: Kasperson, J.X. and R.E. Kasperson. 2001. International Workshop on Vulnerability and Global Environmental Change. Stockholm Environment Institute, SEI Risk and Vulnerability Programme, Report, 2001:1. 36pp).

Table 1 General statistics for Burkina Faso

	Average	Source
Poverty (share of population below national poverty line)	44.5 %	(1)
GNP per capita (US$)	240	(2)
GDP (US$)	12.8 billion	(1)
GDP per capita (US$)	1,040	(1)
Population (millions)	11.937	(3)
Population growth rate	2.8%	(4), (2)
Total fertility rate	6.26 children/woman	(1)
Life expectancy at birth (years)	46.11(total); 43.5 (women), 42.2 (men)	(1) (5)
Healthy life expectancy at birth (years)	36.3 (women); 33.9 (men)	(5)
Proportion of population living in urban areas (2000)	38%	(4), (2)
Average annual growth rate of urban population 1995–00	5.7%	(6)

Sources: (1) CIA 2002; (2) OXFAM 2002; (3) WRI 2002; (4) UNICEF 2002, (5) WHO, (6) UNAIDS 2000

Ninety per cent of Burkina Faso's population is employed in agriculture. Cotton and livestock make up a substantial proportion of the country's exports. Cotton alone generates around 73 per cent of Burkina's export revenues (Paré, 2001) and the country is one of the five top cotton producers in Africa. Cotton growing is expanding very fast in the south and east, where approximately one third of farmers are involved in its production. The cotton sector represents the primary source of income in the rural areas. However, raw commodity cotton is vulnerable to the volatility of world markets. As Hagberg (2000) writes, while cash crops have frequently meant increased rural wealth, this comes at the cost of widening inequalities and greater vulnerability to world markets and the weather. In Burkina Faso, cotton cropping has meant a considerable increase in women's and children's workload, however, without access to the money it generates as the male head of the family usually has sole control over

the profit (Helmfrid, pers. comm. 2002). The introduction of the ox plough in these areas has also further increased children's workload, as they have to tend the animals. A rather alarming trend is that economic stratification is being even further emphasized and increased as Sofitex (a cotton company) is now supporting only 'large growers', leaving the small-scale farmers without their support.

Unemployment is higher in the urban than in the rural areas (38 per cent in Ouagadougou and Bobo-Dioulasso and 0.9 per cent in the rural areas) (Ouattara et al., 1997). And as every unemployed person is usually unable to support their immediate family and other dependants who have moved to the urban areas, the vulnerability component of unemployment is extended to many individuals. A key factor limiting people's ability to find work outside agriculture is education levels; only 13 per cent of women and 33 per cent of men are literate in Burkina Faso.

LARGE-SCALE DISASTERS IN BURKINA FASO

Identifying the hazards and risks that may cause stress or disasters allows for preventive measures to improve security and reduce losses. In Burkina Faso recurring droughts, floods and epidemics are among the main threats (see Table 2). Poverty is closely linked to disaster vulnerability; repeated exposure to stress exacerbates poverty still further. For example, during the 1984 drought the income of the poorest third of rural households dropped by 50 per cent in some areas (UNEP/GRID-Arendal, 2002:12). In Burkina, the annual average frequency of large-scale disasters since 1970 has been 1.25 (UNDP, 2001). That frequency places Burkina Faso 8th among the 48 Least Developed Countries in number of large-scale disasters experienced.

Table 2 Large-scale disasters in Burkina Faso 1970–1998

Type of event	No. of events	Persons killed	Persons affect
Epidemics	14	9,693	90,643
Droughts/famines/food shortages	17	–	7,038,290
Floods	5	38	102,796
Insect infestation	2	–	–

Source: UNDP, 2001

VULNERABILITY AND NATIONAL DEVELOPMENT ISSUES

Burkina is a highly indebted nation. Recently the bulk of the debt has shifted from bilateral sources to multilateral loans, largely from the International Monetary Fund (IMF) and World Bank, and the country has been accepted for debt reduction under the Heavily-Indebted Poor Countries Initiative (HIPC). It could be considered a risk that 16 per cent of Burkina's GDP is comprised of aid (World Bank, 2002); aid funds virtually all public investment, making the country very dependent on other countries' donations.

Moreover, Burkina depends on large amounts of imported food and food aid, particularly in times of drought, and social development lags behind the rest of West Africa and sub-Saharan Africa. There is political awareness of vulnerability issues in Burkina; two relatively recent vulnerability studies have been conducted for the Ministère de l'Economie et des Finances

(Lachaud 1997, and Ouattara et al.,1997) (see Appendix 2 for general findings). The Poverty Reduction Strategy Paper also states that the country's long-term development objectives are based on the concepts of human security, health security, food security, environmental security and political security (Ministry of Economy and Finance, 2000), all of which will reduce vulnerability. There is also a survey of information systems, vulnerability and food insecurity maps planned for the government (Ministry of Economy and Finance, 2000).

A Famine Early Warning System (FEWS) has been set up in Burkina Faso to give the government and the NGO community time to take preventative action. USAID has also established a Famine Early Warning Systems Network (FEWS NET[2]) across sub-Saharan Africa[3]. It aims to strengthen the abilities of African countries and regional organizations to manage risk of food insecurity through the provision of timely and analytical early warning and vulnerability information. It is a multi-disciplinary project that collects, analyses and distributes regional, national and sub-national information to decision-makers about potential or current famine or flood situations, thus allowing them to authorize timely measures to prevent food-insecure conditions in these nations.

SENSITIVITY TO STRESSES

Sensitivity to stresses at finer scales—community, household or individual—depends on additional factors such as proximity and access to resources, individual characteristics and assets. Thus some people are more vulnerable than others, depending on their status and ability to cope when a shock or stress occurs. Health often links these various factors in Burkina and heavily affects sensitivity to environmental stresses.

Burkina Faso falls behind most other countries in the health of its people and the provision of health services. Pregnancy is the biggest single cause of ill-health in women (OXFAM, 2002); complications in pregnancy, such as anemia, hemorrhages, miscarriages and problematic abortions often become emergencies that commonly lead to death. Rural health services, in particular, are frequently unable to cope with such emergencies. Disease also remains a considerable factor in the lives of the Burkinabé. Malaria is the second most common killer and constitutes 23 per cent of the disease burden in Burkina Faso (CIA, 2002). Where prevalence of hunger is high, mortality rates for infants and children under five are also high, and life expectancy is low. In Burkina Faso, the healthy life expectancy at birth is 33.9 and 36.3 years for men and women respectively (compared to over 70 years of "full health" in wealthy nations) (FAO, 2002). Child mortality in Burkina is at a daunting level, with an infant mortality rate of 105.3 deaths per 1000 live births, and under-five mortality rates of 205/1000 and 216/1000 for girls and boys respectively (CIA, 2002).

Poor health in Burkina is related to extremely limited health service provision; for most people, even basic health care is minimal. Distance is a major obstacle to health provision. Patients travel an average of 10 km to the nearest health facility and considerably further in rural areas. Particularly vulnerable are the nomadic pastoralists who have reduced access to health services due to their mobility and remoteness from settlements.

2 The internet address is: http://www.fews.net/

3 FEWS NET have representatives in Burkina Faso, Chad, Eritrea, Ethiopia, Kenya, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Somalia, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe.

Epidemics

The frequency of epidemics of disastrous proportions is shown in Table 3.[4] The number of people affected and killed is substantial and indirect losses include one of the most important assets poor people have—their own and their household's labour.

Table 3 Disasters caused by epidemics in Burkina Faso 1969–2001

Year	People killed	Total affected	Disease and comments
1969	130	–	Yellow Fever; Ouagadougou and Border
1979	241	1,612	Meningitis
1981	441	3,801	Meningitis
1981	650	6,212	Meningitis
1984	0	1,000	Meningitis
1991	37	–	Diarrhoea; Cholera
1996	4,071	40,506	Meningitis
1997	2,274	17,996	Meningitis
1998	26	441	Diarrhoea; Cholera
2001	6	308	Diarrhoea; Cholera
2001	1,721	10,739	Meningitis; Meningococcal disease

Source: Centre for Research on the Epidemiology of Disasters (CRED)

(In order for a disaster to be entered into the CRED database at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported affected, a call for international assistance, declaration of a state of emergency.)

HIV/AIDS

In Burkina, the average prevalence rate of HIV/AIDS is 6–7 per cent (UNAIDS, 2000), but the urban areas are more heavily affected. This prevalence rate is often considered rather low. However, the migration of a large part of the labour force to neighboring countries has contributed to the spread of HIV/AIDS. This is therefore an important issue to flag in preventive, vulnerability reduction work. The recent large-scale famine in southern Africa has, in a most daunting way, showed how AIDS/HIV is linked to vulnerability and food insecurity (Stevens, 2002). Vulnerability is particularly high in subsistence farming systems that depend on human labour. For a poorer person infected with HIV/AIDS, malnutrition and disease form a vicious circle. Biological and social factors make women more vulnerable to HIV/AIDS than men, especially in adolescence and youth (FAO, 2001). The disease commonly strikes the most productive members of society, with critical impacts on agricultural, economic and social development. Both rich and poor may succumb, but the poor are more vulnerable to its effects. HIV/AIDS prolongs and deepens poverty over time, stripping households of their assets and depleting human and social capital. These characteristics mean that the disease simultaneously undermines both the production of food and economic access to it—dealing a double blow to food security.

Preliminary results of a recently developed model on the macroeconomic impacts of AIDS show that the impact is moderate in Burkina compared with other countries in sub-Saharan Africa (African Development Forum, 2000). However, for those households affected

4 The cholera outbreak in 2001 was in Ourgaye, in the region of Tenkodogo, and in addition, as of May 2002, 12,587 cases of meningococcal disease, including 1,447 deaths were reported to the WHO.

by the disease, AIDS expenditures are equivalent to double the per capita GDP. Individuals and families lose earning power as they face exorbitant medical costs that rapidly diminish savings. AIDS morbidity and mortality simultaneously decrease agricultural productivity and household income as labour availability declines. Furthermore, UNAIDS/WHO (2002) has estimated that in 2001 there were over 270,000 'AIDS orphans' in Burkina Faso, mostly in the urban areas.

VULNERABLE GROUPS

While identifying some groups as more vulnerable than others is a great generalization, it can still be an important tool for targeting development aid to key groups. However, it must be remembered that the vulnerability of individuals and households differs over both space and time and that local conditions need to be taken into account. For example, women are often considered more vulnerable than men. However, during times of food shortage women's knowledge of wild foods and medicines is a particularly valuable asset (Hagberg, 2001). The groups identified in Table 4 are likely to be particularly vulnerable to the stresses discussed in this report.

Table 4 Major vulnerable groups and individuals in Burkina Faso

	Major vulnerable groups	**Vulnerable individuals within all groups**
Rural Areas	Low-income households *Subsistence or small-scale farmers* *Landless peasants* *Fishers* *Nomadic pastoralists* *Sedentary herders, small-scale livestock* *Indebted households* Non-diversified farmers *Cotton growing households* Migrant workers Victims of conflicts *Refugees* *Internally displaced people* *Individuals marginalized through community and household disputes*	Women and children with extra workloads Women of childbearing age, especially pregnant and nursing mothers Children under five years old, especially infants Orphans Elderly Disabled and ill Widows and widowers Divorcees Female-headed households left behind by migrant male labourers Landless returnees Relatives who cannot receive remittances from migrants
Urban Areas	Marginal populations in urban areas *Peri-urban small-scale agricultural producers* *People living alone on small fixed incomes or without support* *Sex workers* *Unemployed* *Beggars* Migrant workers Recently arrived migrants Victims of conflicts *Refugees* *Internally displaced people* *Individuals marginalized due to community and household disputes*	Women and children with extra workloads Women of childbearing age, especially pregnant and nursing mothers Children under five years old, especially infants Orphans Elderly Disabled and ill Widows and widowers Divorcees Homeless people Street children Women and girls who are excluded from their families Relatives who cannot receive remittances from migrants

Major Environmental Stresses in Burkina Faso

Livelihoods based on agriculture, pastoralism and fishing are closely tied to environmental conditions. Environmental stresses in Burkina Faso are many and complex. To successfully reduce vulnerability we need an integrated approach based on an understanding of this complexity. Furthermore, the risks arising from natural and environmental conditions vary from year to year and place to place. Some stem from natural variability and some are driven more directly by human activity.

Climatic conditions can cause a range of problems, from local crises to large-scale disasters. Apart from the extreme weather events, there are other times when people will be particularly vulnerable, such as the recurring periods of hunger and water shortages indicated in Figure 1. This figure shows the times during the year when vulnerable people may be most at risk from environmental stresses. The 'hungry season' occurs when households are unable to secure a steady supply of food throughout the year. Hunger is often prevalent at the beginning of the rainy season when newly planted crops are not yet ready for harvest and the store of last season's crops is exhausted. Other environmental hazards, for example land degradation, are not caused directly by climatic variability but may either be worsened or initiated by it.

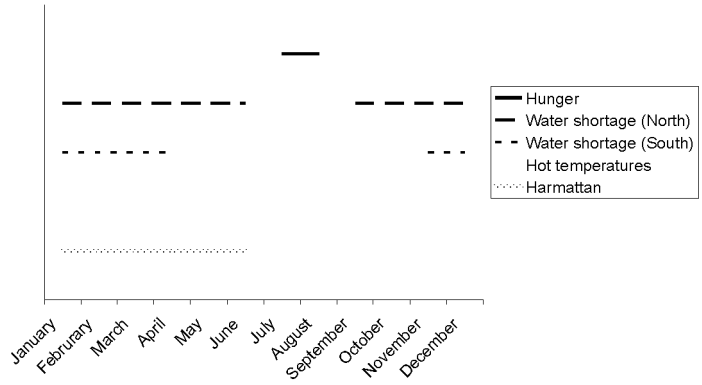

Figure 1 Frequent seasonal risks prevalent in Burkina Faso.

CLIMATIC STRESSES

Climate is one of the main contributors to people's vulnerability in semiarid regions. The African continent is particularly vulnerable to the impacts of climate change because of factors such as widespread poverty, recurrent droughts, inequitable land distribution and over dependence on rainfed agriculture. All these factors apply to Burkina Faso (c.f. Desanker & Magadza, 2001).

Burkina Faso has three major eco-climatic zones (see Appendix 3) which, in many ways, correspond with livelihood strategies. The dry season lasts about eight months in the north and five to six months in the south; the wet or rainy season lasts from June to September in the north, and from April to October in the south. However, the most outstanding problem for the country is the extreme variability from year to year in the amount, timing and location of rainfall. Other factors that exacerbate water stress are hot temperatures and winds. The most extreme temperatures generally occur in the north of the country. At the beginning and end of the wet season winds can reach speeds of up to 120 km/h and cause damage to crops, trees and

houses. The so-called *Harmattan* wind is a northeasterly wind with a desiccating effect that accentuates the impact of the high temperatures. It has its most severe effects in the northern, more treeless parts of the country where it contributes to disease and lung problems among the local population (Simporé, pers. comm.[5]).

West Africa has experienced a general reduction in the amount of precipitation over past decades (see Appendix 4). In Burkina there has been a significant shift in positions of the isohyets[6] including the disappearance of the 1,400 and 1,300 mm isohyets in the south of the country, and the appearance of the 400 and 360 mm isohyets in the north, indicating an overall fall in the amount of rainfall. Future rainfall predictions for the Sahel are unclear (Desanker & Magadza, 2001). However, climate change and changes in climate variability, through droughts and flooding, will exacerbate other environmental problems such as population pressure, land degradation such as erosion and siltation, and possible ecological impacts of land-use change on the hydrological cycle.

The greatest impact of climate change will continue to be felt by the poor, who have the most limited access to water resources. Irrespective of whether climate change will cause more frequent or more intense extreme events, it is apparent that many people are sensitive to climatic hazards. For national and international agencies, the cost of climatic hazards – impacts, recovery, and rehabilitation – may cause a shift in focus from reducing vulnerability to simply coping with immediate threats (Desanker & Magadza, 2001).

Drought

The large-scale disasters in Burkina caused by drought are listed in Appendix 5; droughts occur quite often and can last a long time. However, a drought is not always a disastrous event. An ecosystem accustomed to extreme desert conditions can survive a drought of great severity and duration, while a rainforest ecosystem may collapse after a few months of lack of rainfall. A village that has excellent storage facilities, or uncommonly good access to other resources might survive a three-year absence of rain with equanimity; one that is impoverished and isolated might collapse after a year. Nonetheless there are few rural communities in Africa that can face a drought of more than two years of very dry conditions without radical readjustment (Warren, 1996). Desiccation is defined as dry period that destroys natural or cultural communities to the point that they will take many years to recover. In ecosystems, drought can eliminate seed sources entirely, so that plant communities may take many years to re-establish when the good rains return. However, drought, desiccation and dry-land degradation never come independently but amplify each other. A village that has already lost soil fertility succumbs more quickly to a drought than one whose soils are intact. A pastoral group whose herds have been reduced by desiccation may collapse in a drought that might be barely noticed by a group untouched by the desiccation.

Table 5 illustrates the direct and indirect impacts of droughts; understanding these can help identify strategies for reducing vulnerability. Although the consequences are most easily observed in agriculture, drought impacts are felt across all sectors. As will be discussed further in the section on sensitivity, the magnitude of impacts and differences in recovery rates varies within populations.

5 Interview with Mr Jean Simporé, FEWS; Burkina Faso.
6 Lines on a climate map connecting points of equal average rainfall.

Table 5 Direct impacts and indirect consequences of drought

Impacts	Impacts of drought				
	Agriculture Food security	**Water Sanitation**	**Health**	**Infrastructure Shelter**	**Economic**
Direct	Loss of agricultural output	Deterioration of water quality	Health status (e.g. malnutrition)	Wells	Funds diverted to relief
	Loss of livestock	Deterioration of sanitary conditions		Water distribution	Business loan defaults
	Food prices	River hydrology (decreased flow)		Irrigation	Local spending
	Reduction of demand for labour				
	Food shortage				
Indirect	Household assets liquidated	Fetching water	Morbidity		Government revenue, ForEx
	Migration	Water disputes	Mortality	Loss of shelter	Inflation
	School attendance				
	Land degradation and declining productivity				Diminished spending

After: Sharma et al., 2000

According to the IPCC 2001 report (Desanker & Magadza, 2001), climate change may increase the incidence of droughts, adding stress to water resources, food security, human health and infrastructure. Changes in rainfall and intensified land use would exacerbate the desertification process, particularly in the Western Sahel where individual coping strategies are already strained, leading to deepening poverty (McCarthy et al., 2001). Adaptation to climate variability is of course both very long established and well developed in this region, but traditional systems may be insufficient to cope and may already be overextended by other factors such as internal population dynamics and external pressures. The African Development Bank and collaborators (2002) suggest the following key steps for coping with climate variability and climate change: improve governance, enhance the resilience of the poor, improve the quality of growth, and reform international and industrial country policies.

WATER STRESSES

Key water related stresses in Burkina include: too little, or too much, water, leading to droughts and floods; low access to safe drinking water; poorly developed systems for sanitation and distribution of water; and irrigation issues. Poor health, bad housing conditions and few diversification possibilities increase people's vulnerability to these water stresses.

Floods are not often mentioned as a major problem or risk in Burkina, but there have been some large-scale disasters caused by flooding in recent decades (see Appendix 5). Although Burkina Faso is generally low-lying and receives relatively little rainfall, it has quite a large hydrographic network, particularly in the southern regions. Its rivers belong to three main basins, the Volta, the Comoé and the Niger. Despite this network, only 21,000 ha of a possible 160,000 ha with irrigation potential have been developed so far. However, reduced flow

in the major rivers has been noted (Garreau, pers. comm. 2002[7]). For example, the annual hydrological regime of the Nakambe River (Yatenga/Central Plateau) changed substantially between 1955 and 1998, largely because of the construction of numerous dams, a change in rainfall regime and extensive land use changes within its basin (Mahe et al., 2002). Major rivers are highly sensitive to climate variation, and decrease in run-off and water availability affecting agriculture and hydro-power systems could increase cross-boundary tensions. Furthermore, inland fisheries could be adversely affected by reduced rainfall brought about by climate change.

Assuring a supply of water is generally difficult in both urban and rural areas in Burkina Faso. The major limitations to providing safe water and sanitation are the availability of water, funding, and the technological and engineering difficulties of extracting groundwater (Tandia, pers. comm[8]). According to government statistics, there has been a substantial improvement in household access to drinking water, but regional disparities remain. Of great concern is that 70 per cent of Burkinabé households still do not have access to latrines (Ministry of Economy and Development, and Ministry of Finance and Budget, 2001).

According to Burkina Faso's Ministère de l'Environnement et de l'Eau (2000), total water demand could increase from 110 million m^3 in 1975 to 1,200 million m^3 in 2025. Irrigation is likely to be the major increasing factor (see Table 6); however, there is no demand projected from the industrial sector. Currently there is very little demand from industries in Burkina; the only two exceptions are the brewery in Bobo (supplied by a borehole) and the sugar industry in Banfora (supplied via the irrigation network).

Table 6 Estimation of water demand in Burkina Faso

	1975		1990		2010		2025	
	(million m^3)	% of total	(million m^3)	% of total	(million m^3)	% of total	(million m^3)	% of total
Drinking water	45	41%	93	28%	197.8	23%	265	13%
Irrigation	32	30%	169	51%	560	65%	782	84%
Livestock/Pastoral	31.9	29%	69.3	21%	102.8	12%	139	4%
Total demand	110	100%	330	100%	860	100%	1200	100%

Source: Ministère de l'Environnement et de l'Eau, 2000

As already mentioned, irrigation will make major demands on water in the future. The estimates in Table 6 correspond with a projected increase from 4,500 ha (1975) to 55,600 ha (2025) being irrigated out of the potential 160,000 ha. As most of the irrigated land is located near and on the edges of the watercourses it becomes very hard for pastoralists to get drinking water for their livestock, leading to conflicts. This is also a problem for wildlife (Nianogo, pers. comm. 2002).

Estimates of future drinking water demand (see Table 7) are divided into two categories: urban/peri-urban and rural. This division assumes differences in urban and rural lifestyles and a consumption of 20 litres/person/day in 2010. However, projections for Ouagadougou/Bobo-Dioulasso are of 70/60 litres/person/day respectively. It should be noted that according to these estimates, rural Burkina would only use 15 per cent of the country's drinking water in 2025, compared to 90 per cent in 1975.

7 Interview with Mr Jean-Marc Garreau, IUCN, Burkina Faso.
8 Interview with Mr Tandia, CREPA, Burkina Faso.

Table 7 Estimation of demand of drinking water in Burkina Faso

Drinking water	1975		1990		2010		2025	
	(million m^3)	% of total	(million m^3)	% of total	(million m^3)	% of total	(million m^3)	% of total
Urban and peri-urban	5	10%	37	40%	116.7	59%	225.3	85%
Rural	40	90%	56	60%	81.1	41%	39.8	15%
Total	45	100%	93	100%	197.8	100%	265.1	100%

Source: Ministère de l'Environnement et de l'Eau, 2000

From a vulnerability perspective it is important to make sure that demand forecasts and planning do not underestimate the needs of the rural population so that the urban population's projected increased demand for drinking water does not cause too much water to be diverted from rural communities.

ENVIRONMENTAL DEGRADATION AND VULNERABILITY

Most households in Burkina Faso depend directly on natural resources. Environmental degradation thus poses a risk for farmers and pastoralists alike. Environmental degradation is an important contributory factor to both conflict and food insecurity. Degradation or depletion of natural resources, unequal distribution and population pressure can trigger competition for scarce resources, in particular arable land and water. Increasing competition for resources may spur farmers to abandon sustainable methods and exploit marginal lands in a desperate effort to secure their incomes and feed their families. Conflict becomes highly likely when this process leads to deepened poverty, widespread food insecurity, large-scale migration, sharpened social cleavages and weakened institutions (FAO, 2002).

The Burkina Faso environment is characterised by great variability; any stability is only maintained by human management. However, several unsustainable management practices are contributing to environmental degradation, thus increasing people's vulnerability through reduced productivity and resilience to stress. Marginal land is put under increasing pressure as farmers cultivate larger areas to maintain production but do little to sustain soil nutrient levels and the productive capacity of the soil. Short fallow periods and the inadequate use of fertilizers coupled with overgrazing and deforestation from firewood harvesting, cause the loss of vegetation cover and soil and water degradation (Ministry of Economy and Finance, Burkina Faso 2000). Furthermore, land clearance for extensive farming, especially in the southwest, is a key contributor to vegetation loss. The result is that more and more rural people are being drawn into the poverty spiral (Elshout et al., 2001).

Since the introduction of the ox plough the land area used for cotton growing is constantly increasing. Farmers in the south of Burkina Faso are finding it increasingly difficult to maintain soil fertility. In this area there is a discernible trend towards intensified cropping as land becomes increasingly scarce (Elshout et al., 2001). Moreover, in the cotton-growing zone of southwestern Burkina Faso, changes in land cover and land quality have been attributed to population growth. Over a single decade the population has almost doubled in this zone, mainly through large-scale migration from the more heavily populated and drought-affected north and central regions of the country (Gray & Kevane, 2001). Frequently, migrant farmers are not able to fallow their fields (Gray, 1999).

Cotton is well-known for its role in soil degradation. It was formerly an important crop on the central plateau (Elshout et al., 2001) where the soil fertility and agricultural productivity is now very low, partly attributed to the unsustainable methods used to cultivate it. Most farmers in a study of southwestern Burkina also believe that land is being degraded (Gray, 1999). They blame perceived yield reductions, increases in weeds and soil erosion on the fact that fallow and forested land are no longer available and they can no longer shift from one field to another. However, people experience degradation very differently depending on their ethnicity, wealth and locality. Farmers' cooperation is necessary for implementing soil conservation techniques; therefore their perceptions of these processes should be evaluated.

Soil degradation (or its opposite, sustainability) is bound up with the efficiency of recycling bio-productive resources and the replacement of exported bio-productivity (in crops, livestock, eroded soil) by inputs, e.g. fertilisers. Conventional representations of degradation highlight the negative impact of exporting bio-productive resources and may ignore or underestimate recycling or inputs (including those from natural processes, such as flooding). Most dryland systems are partly open — they combine the sale of products to the market with a strong emphasis on subsistence production. For example, in Burkina Faso there is an ongoing debate over whether the increased transhumance could have an overall positive effect on soils and vegetation as livestock leave manure behind. Agreements between farmers and livestock herders allow livestock to graze an area as long as the manure is left on specific fields (Nianogo, pers. comm. 2002[9]).

Trees and shrubs provide ecosystem services such as carbon sequestration, storing and transpiring water required for precipitation, maintaining soil fertility, and as habitats for a diverse array of plant and animal species. Moreover, they provide timber, traditional medicines, staple foods and drought emergency food. Any changes to these ecosystems will increase the vulnerability of the large part of the Burkina population that is dependent on forest species for subsistence needs and the fraction of the economy based on forest products. Between 1990 and 1995 the area under forest fell by 0.74 and deforestation is seemingly on the rise, due in part to the problems faced by subsistence farmers and the poor.

The use of fuelwood as the primary energy source should be seen mainly as an urban problem, as rural people generally do not have a problem meeting their energy needs (Sanou, pers. comm. 2002[10]). However, the markets created to supply the urban areas with fuelwood exert a significant pressure on forests.

Loss of biodiversity

Biodiversity loss can render many people vulnerable as it is of enormous value in providing specific products and incomes, both directly and through its contribution to ecosystem services. Biodiversity should not be confused with natural resources. It refers to all living things, not just those found useful at a specific time or place. Nor does biodiversity only refer to wildlife; it also encompasses wild and domesticated organisms across all levels of biological organization— genetic, species and ecosystem. Biodiversity is important because it offers a choice and provides alternatives to fall back on when other resources are scarce. Coping strategies, which include diverse uses of biological resources, coupled with specialization within the family, allow for flexibility in times of stress. Such strategies would clearly be impossible without

9 Interview with Aimé J. Nianogo, IUCN, Burkina Faso.
10 Interview with Mr Issoufou Sanou, SahelConsult, Burkina Faso.

access to biodiversity. For example, plant medicines are still popular in the rural areas and women usually maintain their family's knowledge of plants and their properties.

The data on biodiversity in Burkina Faso are poor. As biodiversity depends on complex relationships among a number of factors, it cannot easily be measured. However, it is likely that vegetation changes, and changes in forest composition and structure, will affect biodiversity negatively.

In Burkina there are seven mammal, two bird and two tree species classified as endangered, threatened or vulnerable. Some of the main causes are habitat loss through overgrazing, agricultural expansion and deforestation (IUCN, 2002). Although Burkina Faso is a signatory and party to many international and regional environmental agreements, the national investment in protected areas remains very low. Of the 11.5 per cent of land area classified as protected, only 1.7 per cent is strictly protected (World Conservation Monitoring Centre—WCMC[11]). The United Nations Environment Programme (UNEP) and WCMC have recorded a number of problems in these protected areas including poaching, fire, fishermen who use the ponds thereby restricting wildlife access to water, cattle grazing, wood cutting, land clearing and timber removal.

Pollution

There has been little research into pollution of water, land and air in Burkina. However, there is an obvious problem of pollution in urban areas, where water sources are heavily polluted by human, hospital, and industrial waste. In addition to making people ill, such pollution also reduces the health of aquatic ecosystems. Tanneries in particular cause severe pollution (Nianogo, pers. comm. 2002[12]). Moreover, it is likely that mining activities are a source of pollution (Khroda, 1996).

The pesticides and herbicides used in cotton farming are probably polluting both water and soils. And pesticides have killed off the insects in the protected conservation areas that border the cotton farms. For example, honey can no longer be found in these protected areas (Nianogo pers. comm. 2002). In addition, people's health is harmed as they seldom take protective measures when applying these chemicals. Plastic containers that originally contained pesticides and herbicides are being used as drinking mugs (Helmfrid, pers. comm. 2002[13]).

Thus, those who lack knowledge of how to handle toxic substances, those who lack access to safe drinking water both in rural and urban areas, and those who are dependent on polluted natural resources are made more vulnerable by pollution.

Investing in resilience and environmental sustainability

More attention to adaptation is needed to increase the resilience of natural and social systems and their productivity in order to support the livelihoods of the poor. Even though drought threatens both soil and water conservation, and increasing population and political uncertainty provide further challenges to farmers, there are examples of successful human adaptation to change from around the country. For example, to maintain the integrity of their soil, the Mossi people who inhabit the central plain have adopted such practices as creating compost pits to enhance soil fertility and building diguettes (semi-permeable lines of stone placed at right angles

11 Internet site http://www.wcmc.org.uk/nbp/
12 Inverview with Aimé J. Nianogo, IUCN, Burkina Faso.
13 Interview with Ms Sigrun Helmfrid, Department of Social Anthropology, Stockholm University, Sweden.

to the slope) to prevent erosion. Farmers in the communities of Kirsi and Thiougou invest a considerable amount of effort in improving the quality of their soils and are increasingly using soil and water conservation and agro-forestry techniques to regenerate degraded land (Lompo et al., 2000).

Whether such measures will be adopted (and the form that they take) depends on several 'arbiters of change', including farmers' knowledge, the biophysical environment (particularly rainfall and soil conditions), and the availability of labour. For this reason, each transition will be relatively unique, reflecting the interactions between people, their institutions, their political economy, and their environment. In the province of Sissili there was some concern about economic and environmental sustainability because of the widespread immigration caused by the Sahelian droughts since the 1970s. However adaptive and innovative actions have occurred as people develop new resource-use patterns to safeguard both environment and livelihood (Howorth & O'Keefe, 1999).

Burkina Faso's experience with soil and water conservation has provided a source of inspiration and practical guidance for NGOs and farmers throughout the Sahelian region (IIED, 1998). Soil and water conservation has changed the resilience of local food systems, in most cases increasing food security and reducing vulnerability. The community's capital assets have been altered in the process, with its natural capital being expanded via improved fields and its social capital via working together on soil conservation projects. A study of Dori showed that all farmers are familiar with techniques to reduce soil erosion and 96 per cent have applied one or more of these techniques. However, the main constraints to applying these measures are lack of labour, manure and mulch (Visser et al., 2003).

Interventions to mitigate land degradation need to acknowledge the complexity of agricultural production. Simply advocating techniques such as terracing, windbreaks, or the use of manure, is far too simplistic. The labour relations and the social structures that determine responses to land and its problems also need to be considered. An attempt in this direction is the '*Gestion de Terroir*', the approach to local land use management at the village level in Burkina Faso. However, Breusers (1999) argues that this approach continues to focus heavily on individual farm enterprises, which are viewed as autonomous, purely technical entities, thus failing to recognize social relations and social organization, which, to a large extent, determine land use management.

An open-minded approach to land tenure arrangements and reform is particularly important if the rights of pastoral groups are to be taken into account. This is especially so when more land is being used for permanent cultivation, reducing the land available for nomads and creating further conflicts. Demographic pressure and land scarcity in the Sudanian region have led to rapid and profound changes in modes of access to land, to such an extent that cohabitation between indigenous and migrant communities and between farmers and pastoralists has become fraught with difficulty, disrupting social relations and putting a brake on agricultural growth (Paré, 2001).

In Burkina Faso, the government has weakened the principle of individual or household usufruct rights, and relies on informal mediation to solve conflicts. This strategy probably further undermines the rights of poorer farmers or marginalized groups (including women), who cannot sustain continuous cultivation or influence the process of informal mediation (Gray & Kevane, 2001). Greater security in individual tenure among the most vulnerable is an important dimension of policy-making efforts (Gray & Kevane, 2001). This is especially

important in the in-migrating areas where land conflicts and uncertainty over rights have become more common. From a land degradation perspective it is important that (migrant) farmers feel secure and confident enough to leave the land fallow for a long period.

Food Insecurity and Environmental Changes

Most widespread chronic hunger results from deep rooted poverty. However, in any given year, between 5 and 10 per cent of the worldwide total of people facing hunger can be traced to specific events: droughts or floods, armed conflict, or political, social and economic disruptions (FAO, 2002). Many of these, unfortunately, are potential hazards in Burkina. Hunger often deprives impoverished people of the one valuable resource they can call their own: the strength and skill to work productively. In households where food security is precarious, women are often more vulnerable than men to malnutrition because of their different physiological requirements. Further, when women are pregnant or lactating, their foods need to be even richer in energy and nutrients. Teenage mothers and their babies are particularly vulnerable to malnutrition as the mother is still growing herself. Hunger in childhood impairs mental and physical growth, crippling the capacity to learn and future capacity to earn. In Burkina between 33 and 45 per cent of children under the age of five are malnourished. Malnourishment leads to moderate to severe stunting in 29 per cent of cases (OXFAM, 2002). Even mild to moderate malnutrition greatly increases the risk of children dying from common childhood diseases (FAO, 2002). Widespread hunger and malnutrition impair economic performance, not only of individuals and families, but also of nations.

The caloric need of a well-nourished adult is 2,500 kcal a day. That total increases substantially if the person is engaged in heavy and occasionally strenuous work such as farming. In Burkina, the average daily intake is 2,320 kcal/person/day. Where the deficit is more moderate people generally get enough of the staple foods. What they often lack is a variety of other foods that make up a nutritious diet. Even when poor rural families are helped to produce a greater variety of foods on their household plots, they will often sell these items rather than consume them because of their high market value. Thus their food security improves only when overall household income rises to a level where they can afford the other foods they need (FAO, 2000). The depth of hunger can be measured by the average dietary energy deficit of undernourished people, not of the population as a whole. The higher the number, the deeper the hunger. The figure for Burkina is 290 kcal/person/day, which can be compared to a range of 160–490 for sub-Saharan Africa, 130–250 for the countries in transition, and 110–160 for developed countries (FAO, 2000). The United Nations Food and Agriculture Organization (FAO, 2000) recommends that a country with a higher prevalence of undernourishment and a daily dietary energy deficit of over 300 kcal/person/day should strive to reduce the depth of hunger as a top priority.

Seasonal climate variation imposes patterns on the production and storage of food at the household level. Market prices fluctuate seasonally, rising to a peak when food is scarce. At certain times of the year this seasonal dimension to rural poverty intensifies the vulnerability of low-income households (see Figure 1). A famine crisis occurs when such vulnerability is extended, through exceptional scarcity or high prices, to a wider spectrum of the population — to the better-off households as well as the poorer ones. However, the poor households find it harder to produce a grain reserve. Their poverty also prevents them from maintaining it, as their urgent need for income, gifts, taxation, etc. constantly makes demands on it. A parallel

argument may be applied to livestock producers. Poverty of resource endowments, and poverty in income, create vulnerability to food scarcity even in good years. But the stressed situations need a trigger to extend this effect in time and space, and such a trigger, in the drylands, has usually been a major drought. Thus, famines do not occur in cycles or in trends. Predicting the failure of food procurement systems is far more difficult, and depends on social and economic processes, which are little monitored, or imperfectly understood. At the household level, the link between rainfall (and pests or disease) and output is uncontroversial. But the forces that determine actual market prices are usually hard to understand or predict.

In 1996 a large-scale famine occurred; 75,590 people were affected primarily in Bam, Kadigo, Outbritenga, Oudalan, Sanmatenga, Seno, Soum and Yatenga provinces (CRED). Encouragingly however, the trend is towards decreasing undernourishment both in total numbers (accounting for population growth) and as a proportion of the country's total population, even though it remains higher than the rest of the region (Figure 2).

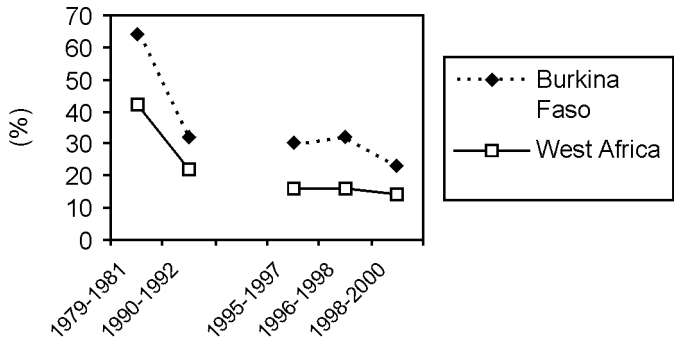

Figure 2 Trend of food security deficiencies in Burkina Faso and West Africa as proportion of undernourished people in total population. *The gap between 1992–1995 is due to lack of data.*

Sources: FAO 1999, FAO 2000, FAO 2001, FAO 2002

According to a Famine Early Warning System assessment of Burkina Faso in 2000 three provinces (Sanmantenga, Sanguié and Boulkiemdé) fall into the category 'Highly Food Insecure Areas'. In this category, even with the additional contribution of secondary activities, average households are unlikely to have enough income to buy all the food they need from the markets. Furthermore, the households here are predominantly farming-based; they had been food insecure for the three years prior to the study and many live below the national poverty line.

'Moderately Food Insecure Areas' are the provinces Oubritenga, Kouritenga, Oudalan, Passoré, Séno, Soum, Sourou and Yatenga. Here, most of their food consumption needs will be met (both farmers and pastoralists), although average households remain vulnerable to potential food insecurity shocks through their small production surpluses, lack of cash and other valuable assets upon which they can draw.

The grain harvest forecast for the 2002/03 growing season is good; in 27 of the 45 Burkanibé provinces the coverage rates are anywhere from 123 to as high as 288 per cent (FEWS NET, 2003). However, despite this promising outlook at the national level, there are certain areas of the country in which food security conditions do not look so good. In particular in the north and the Sahelian zone (Oudalan, Soum, Séno, Lorum, Yatenga, Bam, Zandoma and Passoré provinces) poor grain harvests are complicated by shortages of water, poor pasture production,

and the resulting reduction in income from livestock-raising activities. The political crisis in Côte d'Ivoire cut off remittances from Burkinabé emigrants living there, thus lowering the cash flow among many rural relatives (FEWS NET, 2003).

ADAPTATION TO FAMINE

During famines most affected people usually survive on their own without help from the relief or food aid sector. Some recent coping strategies used by dryland farmers and pastoralists facing famine include labouring for wages; gathering, processing and selling natural resources (e.g., fuelwood); liquidating assets; mobilizing social networks or claims on kin, patrons, or friends; and public begging depends on social claims (Mortimore, 1998). All these are known to households as strategies to which they may resort in normal years if need be and poor households may use them constantly. Other adaptive processes often include migrating so as to reduce local resource pressures, for example young Burkanibé men may travel south to the cities, primarily in the Côte d'Ivoire, to work on cocoa farms. Other common coping strategies are to sell vegetables and livestock. The trade in livestock also often involves migration as the prices are better in neighbouring countries, especially the Côte d'Ivoire where many people have well-developed social networks which provide knowledge of the market. Importantly from a food security perspective, these migrants may make additional demands on farmland when they return.

Diversification as an adaptation strategy

Some farmers and herders in Africa adapt to climate change and desertification by diversifying and intensifying resource use (Downing et al., 1997). Generally for pastoralists and farmers alike, diversity is a characteristic of dryland economies. Decisions need to be made continuously as environmental changes are felt several times in a year and also from year to year. For example, herd diversification is a time-honoured strategy for coping with uncertain feeding resources.

Migration – A Varying Element of Vulnerability and Security

Even though migration is an important adaptation strategy in Burkina there is a vulnerability component of migration both for those who migrate, and for those who stay behind. For example, the investment of sending someone away places a burden on the household economy. The person (often a woman) who is left at home has extra responsibility for the children and for farming; the significance of lost labour may be substantial if the loss takes place during the labour intensive months of the year. The migrant is less secure and statistically prone to be infected with sexually transmitted diseases such as HIV/AIDS, which then may be spread to the spouse. Conflicts, such as the 2002–2003 conflict in the Côte d'Ivoire, may be very hard and dangerous for migrants present in the conflict stricken area. Conflict usually hinders the expected income-generating activity and the household is unlikely to receive a good return on its investment. Research on the role of migration income in the rural economy shows that the amount of migration income in a village overall corresponds to the amount of income needed to bring the village up to a minimum level of sufficiency in foodstuffs (Cordell et al., 1996). This would explain why migration levels are more pronounced in areas of marginal production potential. However, migrants respond to both the absence of potential in the village and the

presence of urban opportunity. Physical or environmental forcing factors seem to be weak as justifications for migration. The National Migration Survey in Burkina found that over 80 per cent of men (and 13 per cent of women) interviewed gave money as the primary motive (Cordell et al., 1996).

Children are generally the most sensitive group of migrants. Migration of children from rural areas in Burkina Faso to cities and other countries happens for a variety of reasons. However, it is clear that when children are prematurely separated from their parents they are statistically much less likely to have their most basic needs, such as love, protection and education, covered. It has also been shown that the likelihood of school attendance for urban children, especially girls, in Burkina decreases with an increased distance in family relation to the household head (Kielland & Sanogo, 2002). It is estimated that 330,000 children (about half of them girls) have left their parents in Burkina. The greatest source region is the southwest, where 12.5 per cent of children 6–17 years old have left to work abroad or in urban areas. The most important recipient countries for child (6–17 years) labour migrants from Burkina Faso are the Côte d'Ivoire (73,000 Burkanibe child labour migrants), Ghana (7,000), and Benin (3,000). In addition, more than 82,000 rural children (approximately 57 per cent boys, 43 per cent girls) have migrated to work in urban areas of Burkina Faso (Kielland & Sanogo, 2002). Among the strongest and most systematic determinants for child labour migration is the fact that the child has never attended school. Systematic deception and exploitation of unaccompanied children have developed over the last decade. Professional intermediation of child labour from Mali to the Côte d'Ivoire via Burkina has been documented over the last two to three years, and several incidences of organized trafficking of Burkanibe children have also been disclosed (Kielland & Sanogo, 2002).

MIGRATION AS A COPING STRATEGY

There is debate over whether migration is a sign of stress or if it is a coping and adaptation strategy to deal with environmental and socio-economic constraints. People living pastoral lives are, of course, more or less constantly moving, but are not in constant crisis. However, as more permanent populations occupy land, pastoralists' migration patterns might be altered, potentially resulting in certain groups and individuals becoming more vulnerable. It has also been suggested that when women and children start to move it is a sign of stress. However, in Burkina this is not true as a general rule. Circular labour mobility is an economic activity with a long history in West Africa. Seasonal or subseasonal movements across rainfall gradients are a livelihood strategy to maximize investments of time and other resources. The seasonal circulation of people has provided a reliable hedge against the frequent droughts that plague the region. In the period between 1985 and 1991, 10 per cent of Burkina Faso's then 7.5 million inhabitants migrated from one province to another or abroad (Jeune Afrique Atlases, 1998), indicating the mobility of the Burkanibé population. Within the country people tend to migrate to the agricultural zones and to Ouagadougou and Bobo-Dioulasso.

Child labour migration is less often viewed as a crisis-coping mechanism or a last resort. Generally, poor rural families see it as desirable, or even a good investment, to send a child to the city or abroad to work. However, improved living standards in rural areas and reduced differences between urban and rural districts should reduce some of the incentives for child labour migration. Sida's Poverty Profile of Burkina Faso (Hagberg, 2000) concluded that migration seems to be a strategy for households to reduce poverty, more important in rural than in urban areas, among men more than women, and among the poor more than the rich.

The influence of mobility structures how people work, how they see their land and country, and also how they deal with risk. Further, for a number of reasons, mobility is significant in understanding how people and places interact to affect food security, particularly where population and environmental stress are growing the fastest. Mobility challenges how residence itself is conceptualized, with settlements composed of sedentary inhabitants. For Mossi farmers in the north-central region of Burkina Faso mobility is essential to successfully survive in and optimally exploit this complex and variable environment. Mossi farmers find a kind of security of tenure in their social relations, both with co-villagers and geographically dispersed kinsmen, which hold the promise of rights of access to land — albeit shared rights — in a pool of territories (Breusers, 2001).

Resilience in Social Support Networks

Many strategies have evolved to cope with the various types of stresses in Burkina Faso. They range from specific strategies, such as adaptation and coping with droughts, to much broader and more general ones, such as social networks. Resilience increases with diversification and access to these strategies, which mainly vary with livelihoods.

The family remains of central importance to social structures and organization throughout much of Burkina Faso, providing security, access to resources, and a network of support. This is of particular importance given the high level of involvement in migration, where help from kin for both the migrant and the migrant's remaining family is critical to making such activities a success (IIED, 1998). Coping capacity is likely to be low when people lack social safety nets to help absorb losses, such as when the wider community cannot provide assistance either formally, through emergency relief, or insurance. In such circumstances coping capacity can be built by enhancing social safety nets, aid for reconstruction and rehabilitation, insurance, and asset replenishment. Access to quality health care, education and nutrition can also ensure resilience. Growing spatial and temporal scales of adaptations may mean that only some resources are protected and only some members of the community benefit. Indeed, the word community may be inappropriate in this context because it suggests that there is a unity among a diverse group of individuals who may also be divided along age, gender, caste, ethnic and class lines. In the Sahel region, for example, any of those who migrate in search of work fail to find it, to the great detriment of those left behind (nearly all of the migrants are men trying to support their families). Those who do find employment may become part of highly competitive labour or product markets, with only small gains (or even losses) to show for their efforts. Also, adaptations themselves may be fragile and easily abandoned during times of severe social or economic unrest (Batterbury, 1999).

Conclusions

This report highlights major issues of vulnerability facing the poor in Burkina Faso. We now suggest the following issues and activities for policy action that will reduce threats, support existing coping strategies, and enhance adaptive capacity to deal with future challenges.

Preventing environmental vulnerability

Degradation of natural resources is taking place in rural and urban areas in Burkina Faso. Rural areas are suffering mainly due to deforestation, loss of soil fertility, and accelerated soil erosion. Urban populations suffer from water scarcity and pollution, while placing higher demands on the environmental resources of surrounding rural areas. Rural and urban interests should not be viewed as competing, but interlinked, so that the environmental security of the whole nation can be ensured. Overall improvements of environmental management through education and policy work can increase the resilience of ecological resources and associated livelihoods over the longer term. Specific considerations central to vulnerability reduction include:

- supporting efforts to maintain soil quality: these will enhance productivity and increase capacity to deal with environmental variation;
- planning for adequate water supply and sanitation to both urban and rural populations: this will have broad benefits in current health and productivity, and will ensure projected demand is met; and,
- integrating strategies for climate change mitigation and adaptation into the policy and planning process.

Preventing food insecurity

Food security has improved in Burkina Faso since the early 1980s. However, malnutrition and undernourishment are still a reality for many Burkanibé and there have been some large-scale famines in the country, killing many and affecting many more. The depth of hunger in Burkina is very near the guiding threshold level set by FAO indicating that food insecurity continues to be a major problem for a nation.

- Improving food security is a priority for poverty and vulnerability reduction, considering the prevalence of food insecurity and the broad array of benefits food security would ensure.

Targeting the most vulnerable

Vulnerability varies among subgroups and areas within Burkina Faso based on their exposure and coping capacities. Targeting vulnerability reduction to meet the specific needs of the most vulnerable can limit the most severe impacts of poverty and environmental stresses. Efforts to support the most vulnerable may focus on the following populations:

- Women and children: generally these are the most vulnerable people in Burkina Faso as their access to and control over resources and capital are more limited than men's and their sensitivity is more pronounced.
- Children who are migrating and working in urban areas without their parents.

Other areas and subgroups of people in Burkina are also vulnerable (see Table 4 and Appendix 2), but addressing their vulnerability often entails considering more specific issues or problems than the broad array of problems facing women.

Supporting people's own coping strategies

Providing assistance to address vulnerability means combining narrowly focused technical approaches with broader efforts in support of development and increased resilience. The process should recognize that not all adaptations are equally beneficial or sustainable, and should consider the maintenance of coping options in development plans. Features of those policies should consider the following integration issues:

- The most sustainable solution for development and environmental management may be to consider adaptive capabilities as integral features of local livelihood systems and to support them where possible, while continuing to tackle the more deep-seated causes of poverty.
- Flexibility is a key characteristic for reducing vulnerability in poor people's lives.
- Urban and rural livelihoods and the migration strategies linking these are currently part of adaptive coping strategies for many poor people. Changes to settlement and land tenure arrangements should recognise the important qualities of flexibility and diversity these connections offer.
- Vulnerability reduction is a process that needs to be incorporated in overall development planning, including the design and implementation of projects across sectors such as education, health, economic development and governance. This approach can contribute to creating new, successful strategies for coping with the challenges of environmental variability.

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Appendix 1

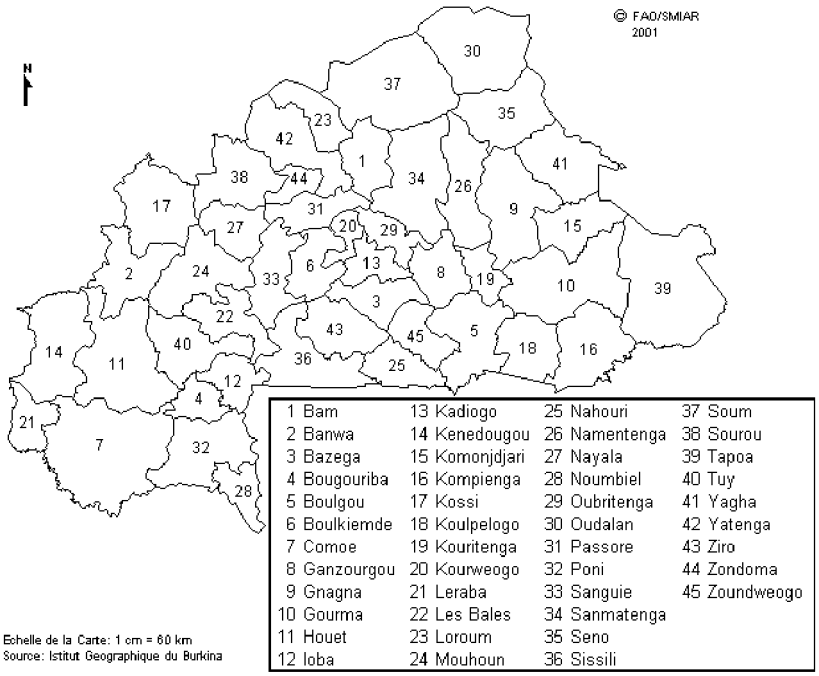

Figure A1a Administrative map of Burkina Faso

Source: FAO

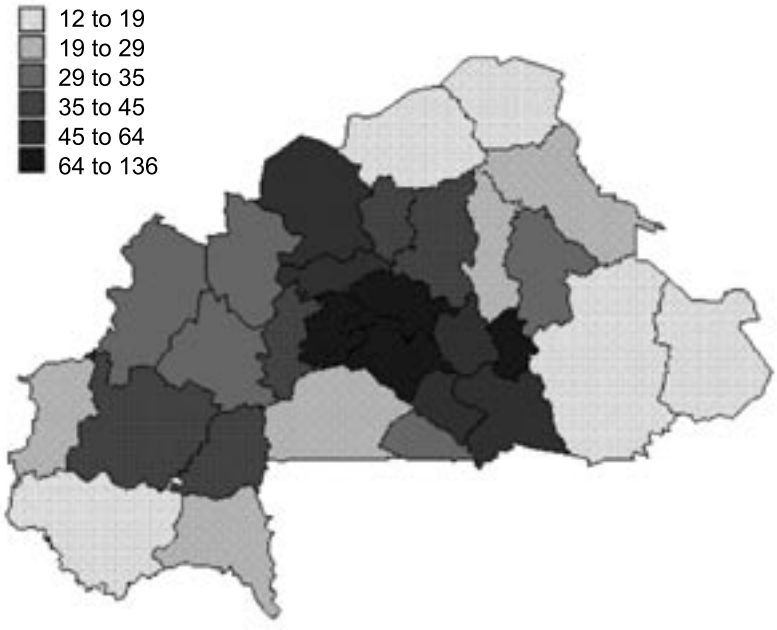

Figure A1b Population density in Burkina Faso (hab./km^2)

Source: FAO

Appendix 2

Ouattara et al. (1997) have identified the following groups as vulnerable in Burkina:

- Subsistence farming households: The results from *L'Énquête National de Statistique Agricoles* from 1993 showed that the most important limitations in the agricultural production were land scarcity, infertile soils, weakly developed technologies and equipment, and the lack of agricultural inputs. 72.7 per cent of the subsistence households do not possess any agricultural equipment. These households are mainly found on the Central Plateau and in the north.
- Unemployed: In this group all who have lost their employment (both in government and private companies) and those who have not been able to find any employment at all are considered vulnerable as they become dependent on others for essential needs.
- Households with household heads who have more than three wives. This group represents 16.8 per cent of all households in Burkina Faso; the average size of a polygamous household is 11.9 persons. In such households it is especially the women and children who are the most vulnerable and there is often a state of inequality between the wives as well as between the children. Further, the expenditures on health and education are very low in this group.
- Prostitutes: The major problems that cause vulnerability in this group are related to security, economic, social and health reasons.
- Teenage mothers.
- Women and girls who are excluded from their communities and families mainly because of accusations of sorcery, undesired pregnancies or forced marriages.
- Female headed households: In Burkina female headed households constitute 2.7 per cent of households and comprise both those households where the women never got married, where the husband is deceased or divorced as well as where the man is not present (e.g. because of seasonal migration). Here the woman has to take responsibility for both economic production (traditionally the responsibility of the man) and the domestic sphere. She thus has to support and take care of herself and the children simultaneously. A woman is generally more vulnerable in this situation as women generally have more limited access to profitable activities, are less educated (13 per cent females in Burkina are literate compared to 33 per cent of men), are subjected to cultural restrictions and social pressure.
- Widows and divorced women are the most vulnerable as traditions often prevent them from having access to the household's monetary resources.
- Young people 'in difficult situations': This group encompasses young people living in the streets in Ouagadougou and Bobo-Dioulasso and those who are not living within their biological family and who therefore often lack the security and affection needed.
- Handicapped people: handicapped people generally lose their social status and may be excluded from the community. Most handicapped people live in poverty and many need to earn a living by begging as they often are excluded from the labour market.
- Old 'abandoned' people: the traditional respect that old people used to receive is now disappearing, especially in the urban areas. In the rural areas where people move and migrate in the search of more fertile land etc., old people may be left behind.

Appendix 3

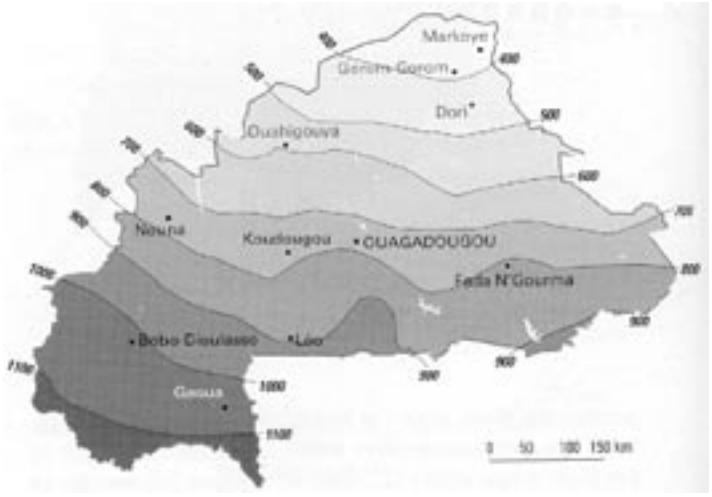

Figure A3a Mean annual rainfall (in mm) before 1970

Source: Jeune Afrique Atlases 1998

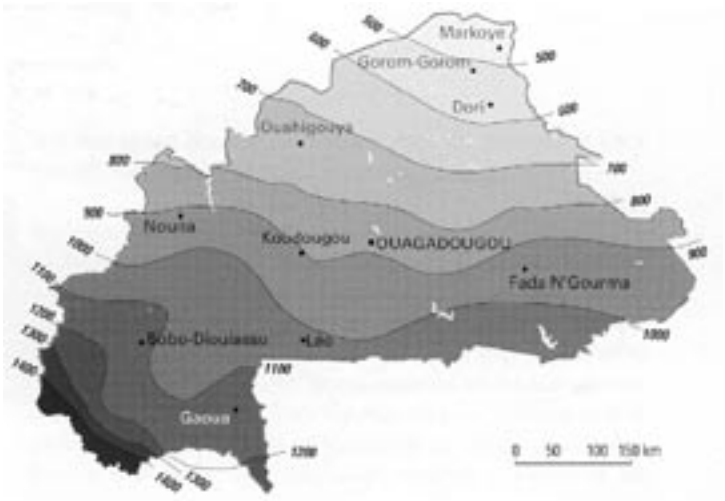

Figure A3b Mean annual rainfall (in mm) over a 30-year period 1966-1995

Source: Jeune Afrique Atlases 1998

The Sudanian zone covers the whole of the southern region and is delimited in the north by the 900 mm isohyet. It has a six-month rainy season with a maximum rainfall of up to 1,300 mm per year.

The Sudano-Sahelian zone lies between the 900 and 600 mm isohyets and covers the whole of the central region where it occupies half of the country's surface area. Its wet season lasts four to five months.

The Sahelian zone represents about 25 per cent of the country's surface area. The annual rainfall can drop as low as 150 mm and the rainy season can last less than two months.

Appendix 4

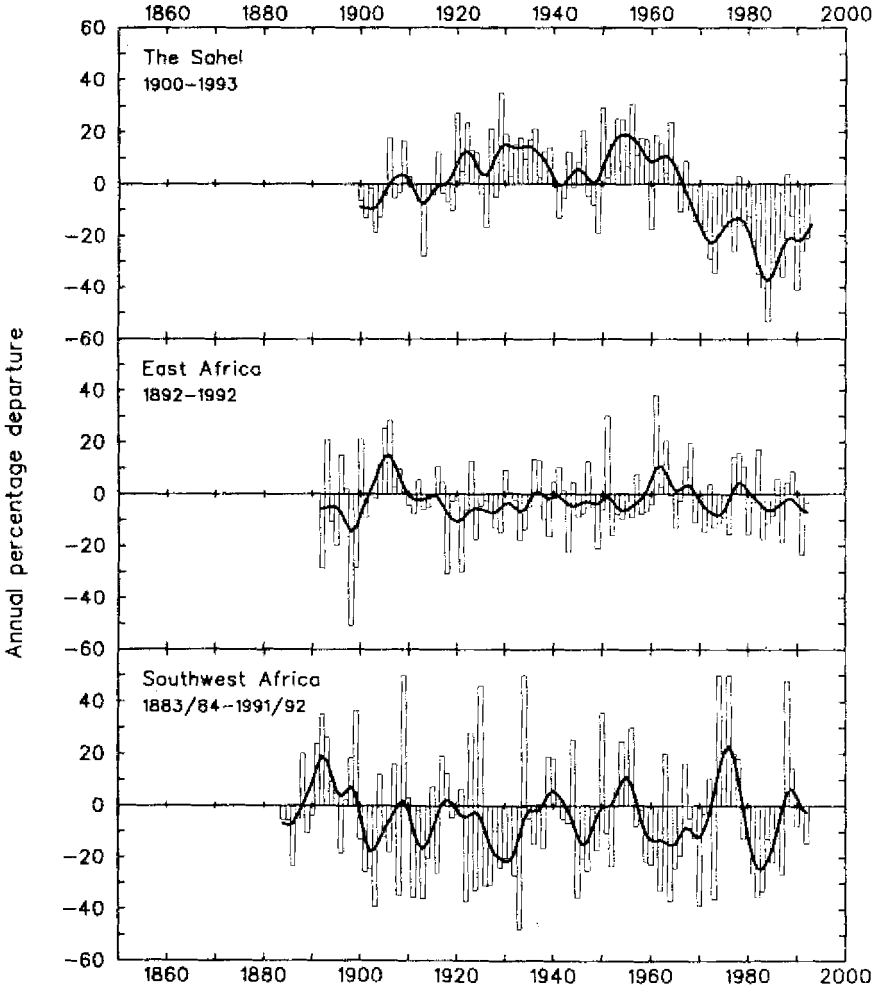

Figure A4 Annual rainfall anomaly indices expressed as percentage departures from 1951-80 average.

Source: Hulme (1996)

Appendix 5

Table A5a Disasters caused by drought in Burkina Faso

Year	Total affected	Location and comments
1910	-	Sahel (1910-1914)
1911	-	Sahel (1910-1914)
1912	-	Sahel (1910-1914)
1913	-	Sahel (1910-1914)
1914	-	Sahel (1910-1914)
1940	-	Sahel (1940-1944)
1941	-	Sahel (1940-1944)
1942	-	Sahel (1940-1944)
1943	-	Sahel (1940-1944)
1944	-	Sahel (1940-1944)
1966	-	Nationwide, Urban
1969	-	Drought/Famine; E & N of Ouagadougou
1971	-	Countrywide
1972	325,000	Nationwide, Sahel (1972-1975)
1973	325,000	Northern Section, Sahel (1972-1975)
1974	325,000	Sahel (1972-1975)
1975	325,000	Continuation of Sahel drought
1977	-	Nationwide except South west
1978	442,000	Central regions
1980	-	Food shortage
1983	1,250,000	East, north, northwest of Ouagadougou. Sahel (1982-1985)
1988	200,000	North. Successive years of crop failures.
1990	2,600,000	North and central provinces (11 provinces affected). Below average rainfall and insects lowered cereal production.
1998	20,700	Food insecurity by drought
2001	-	Plateau Central

Source: Centre for Research on the Epidemiology of Disasters (CRED)

(In order for a disaster to be entered into this database at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported affected, a call for international assistance, declaration of a state of emergency.)

Table A5b Disasters caused by floods in Burkina Faso

Year	Killed	Total affected	Location and comments
1977	-	900	Torrential rains destroying drinking water reservoirs and damaging dams, 900 homeless.
1984	0	1,500	Gorom-Gorom (North region). 1 500 homeless/affected.
1985	0	572	Banfora region. Railroads damaged.
1988	16	33,324	Mainly Comoe, Houet, Soum, Namentenga, Seno, Bam, Yatenga, Oudalan, Oubritenga, Kenedougou, Kadiogo provinces. 14 of 30 provinces affected, flooding after heavier than normal rains isolated more than 100 villages, drowned cattle, 350 houses damaged, destroyed homes and grain stores, 10 000 homeless.
1994	22	66,500	1000 families homeless and over 6 500 ha agricultural land was destroyed.
1999	6	1,560	Oudalan, North Loroum, West Tuy, Sanguie, Oubritenga Provinces. Torrential rains and flash floods, 152 families without shelter.

Source: Centre for Research on the Epidemiology of Disasters (CRED)

(In order for a disaster to be entered into this database at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported affected, a call for international assistance, declaration of a state of emergency.)

The Stockholm Environment Institute (SEI)

SEI is an independent, international research institute specializing in sustainable development and environment issues. It works at local, national, regional and global policy levels. The SEI research programmes aim to clarify the requirements, strategies and policies for a transition to sustainability. These goals are linked to the principles advocated in Agenda 21 and the Conventions such as Climate Change, Ozone Layer Protection and Biological Diversity. SEI along with its predecessor, the Beijer Institute, has been engaged in major environment and development issues for a quarter of a century.

Mission

SEI's mission is to support decision-making and induce change towards sustainable development around the world by providing integrative knowledge that bridges science and policy in the field of environment and development.

The SEI mission developed from the insights gained at the 1972 UN Conference on the Human Environment in Stockholm (after which the Institute derives its name), the work of the (Brundtland) World Commission for Environment and Development and the 1992 UN Conference on Environment and Development. The Institute was established in 1989 following an initiative by the Swedish Government to develop an international environment/development research organisation.

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This programme conducts research on environmental and technological hazards and global environmental change. Expanding on ongoing and previous work on risk analysis, risk perception, and risk management, research now also focuses on the differential vulnerability of people, places, and ecosystems. The hallmark of this programme is integrated analyses that seek to bridge the best of the social and ecological sciences. A major priority is the development of policies and initiatives that hold promise for enhancing human security, adaptive capacities, social equity, and resilient societies.

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