

Conflict and the Environment

The African Union Mission in Sudan (AMIS) military escort for UNEP fieldwork near El Geneina, Western Darfur. Intense competition over declining natural resources is one of the underlying causes of the ongoing conflict.



TOYOTA

AMIS

Conflict and the Environment

4.1 Introduction and assessment activities

Introduction

Sudan has been wracked by civil war and regional strife for most of the past fifty years, and at the time of finalizing this report, in June 2007, a major conflict rages on in Darfur. At the same time, Sudan suffers from a number of severe environmental problems, both within and outside current and historical conflict-affected areas. UNEP's assessment has found that the connections between conflict and environment in Sudan are both complex and pervasive: while many of the conflicts have been initiated partly by tension over the use of shared natural resources, those same resources have often been damaged by conflict.

This chapter is divided into three main sections:

1. **a conflict overview**, presenting a summary of the history of recent conflicts in Sudan;
2. **an overview of the role of natural resources** in the instigation and continuation of historical and current conflicts, listing the major resources of concern and focusing specifically on conflicts involving rangelands and rain-fed agricultural land; and
3. **a brief environmental impact assessment of the various conflicts**, evaluating the direct and indirect impacts of conflict on Sudan's environment.

Chronic environmental problems are covered in other chapters, though it should be noted that at the local level, the boundary between chronic and conflict-related environmental issues is often unclear.

Assessment activities

The assessment of conflict-related issues was an integral part of fieldwork throughout the country. In addition, UNEP carried out a number of specific activities, including:

- walkover inspections of destroyed military equipment in Juba, Bor and Padak, in Southern Sudan;



Visible remnants of war: abandoned armoured vehicles in Juba, Jonglei state, Southern Sudan

- viewing of unexploded ordnance (UXO) and mined areas (where walkovers were not possible) in Juba, Yei, Malakal and the Nuba mountains;
- walkover inspections of burnt and destroyed villages and forests east of El Geneina in Western Darfur, and low flyovers in other conflict-affected parts of Darfur;
- viewing of weaponry held by various armed parties throughout Sudan;
- interviews with de-mining and military experts within Sudan; and
- interviews with conflict-affected communities in Darfur, Southern Kordofan and Southern Sudan.

These activities were considered sufficient to obtain an overview of the direct impacts of conflict and related issues for most of Sudan, though UNEP was not able to carry out sufficient fieldwork in Darfur to allow for a full analysis. Moreover, UNEP chose not to investigate in detail the social and political aspects of conflicts in Sudan, focusing instead on their environmental dimension.

4.2 Overview of conflicts in Sudan

A complex mosaic

Conflicts have directly affected over 60 percent of the country for the last 50 years, and hence greatly influenced its development [4.1, 4.2]. Understanding Sudan's complex mosaic of conflicts is an essential first step in establishing the linkages between conflict and environment in the region. This section accordingly provides a brief summary of the chronology and geography of the various confrontations, together with a short account of the tactics and weaponry used. A thorough review of social and political factors might be taken into consideration in a comprehensive conflict analysis, but is outside the scope of this environmental assessment.

Tribal and small-scale conflicts

Tribal and small-scale conflicts fought only with small arms have occurred continuously throughout the history of Sudan [4.3]. No part of

the country has been exempt from such clashes, but they have been concentrated in the south, west and east of the country for the last thirty years. Their causes are generally poorly recorded, but include disputes over cattle theft, access to water and grazing, and local politics [4.3]. Many – though not all – of the large-scale conflicts in Sudan have a connection to tribal friction.

The major conflicts

The majority of large-scale conflicts in Sudan have been long-term (five years or more) confrontations between forces aligned with the central Sudanese government based in Khartoum and an array of anti-government forces. The government side has comprised conventional army and air forces, and allied local militias. The opposition has consisted of local militias which – in the case of the Sudan People's Liberation Army (SPLA) in Southern Sudan – evolved into a united resistance army with a parallel governance and administration structure (the Sudan People's Liberation Movement or SPLM).

Major conflicts have at times extended over as much as 60 percent of the territory of Sudan, principally in the ten southern states, but also in the west (all three Darfur states), the centre (Blue Nile and Southern Kordofan states), the east (Kassala state) and the north-east (Red Sea state). In total, over 15 million people have been directly affected, not including the approximately six million people currently still impacted in Darfur. Total conflict-related casualties are unknown, but estimated by a range of sources to be in the range of two to three million [4.4].

Although the government forces' weaponry has included tanks and heavy artillery, most military confrontations have been fought mainly with light weapons such as AK47 assault rifles. The opposition forces' armament has been generally light, with a small number of tanks and other heavy weapons. Only government forces have had airpower.

Landmines have been used widely in most major conflicts. Minefields have been abandoned without marking or extraction and are mostly unmapped. As a result, Sudan now suffers from a severe landmine legacy which continues to cause civilian casualties. It should be noted that there are no reports of extensive use of landmines in the ongoing war in Darfur.

Figure 4.1 Conflicts in Sudan: 1957–2006



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.



A destroyed village and badly eroded land seen from the air in Northern Darfur

There is no firm field or documented evidence of any unconventional weapons (chemical, nuclear or biological) ever being held or used in Sudan. Some local communities reported that drinking water wells had been poisoned in Darfur, but in the absence of detail and opportunity for inspection, UNEP did not investigate this issue further.

The history and current status of each of the major conflict areas is briefly described below. The geographical extent of the various conflicts as interpreted by UNEP is shown in Figure 4.1.

Darfur

Fighting in Darfur has occurred intermittently for at least thirty years. Until 2003, it was mostly

confined to a series of partly connected tribal and local conflicts [4.5]. In early 2003, these hostilities escalated into a full-scale military confrontation in all three Darfur states, which also frequently spills into neighbouring Chad and the Central African Republic.

The ongoing Darfur conflict is characterized by a 'scorched earth' campaign carried out by militias over large areas, resulting in a significant number of civilian deaths, the widespread destruction of villages and forests, and the displacement of victims into camps for protection, food and water. Over two million people are currently displaced, and casualties are estimated by a range of sources to be between 200,000 and 500,000 [4.6].



A downed fighter-bomber near Padak, Jonglei state

Southern Sudan

In the fifty years since Sudan's independence, the south has experienced only eleven years of peace. During most of the civil war, the central Sudanese government held a number of major towns and launched air attacks and dry-season ground offensives into the surrounding countryside. The opposition forces, the Sudan People's Liberation Army (SPLA) and their allies, fought guerrilla actions, besieged towns and conducted ground offensives in both wet and dry seasons. Most of the countryside, however, saw little or no military activity. Frontlines with prolonged, active fighting were confined to northern-central border regions and besieged towns. The fiercest fighting took place in the 1990s, with frontlines changing constantly and several towns being taken many times.

The conflict extended to areas in central Sudan, such as Abyei district, Blue Nile and the Nuba mountains in Southern Kordofan. Known as the 'Three Areas', these regions retain a high level of political uncertainty today. Small-scale conflict due to the Ugandan militia the Lord's Resistance Army (LRA) has also occurred intermittently in the far south even after the signing of the Comprehensive Peace Agreement in January

2005, and some instability persists in other border regions, particularly in Upper Nile.

Nuba mountains

The Nuba mountains were a SPLA stronghold in the 1990s. The SPLA held the forested regions and steeper terrain, while the open ground and surrounding plains were largely occupied by government forces. The area saw extensive fighting and aerial bombardment [4.7].

Kassala state - Eastern front

The region bordering Eritrea in Kassala state was a stronghold of the Beja people, who were allied with the SPLA. Conflict flared up in the 1990s, but a separate peace agreement between the central government and eastern forces – known as the Eastern Sudan Peace Agreement – was concluded in October 2006.

Red Sea state - Eritrean conflict

The Tokar region in Red Sea state was affected by low-level conflict between Sudan and Eritrea and local allied groups for twelve years, beginning in 1992. Hostilities ceased completely only with the signing of the CPA in early 2005.

The ongoing LRA conflict

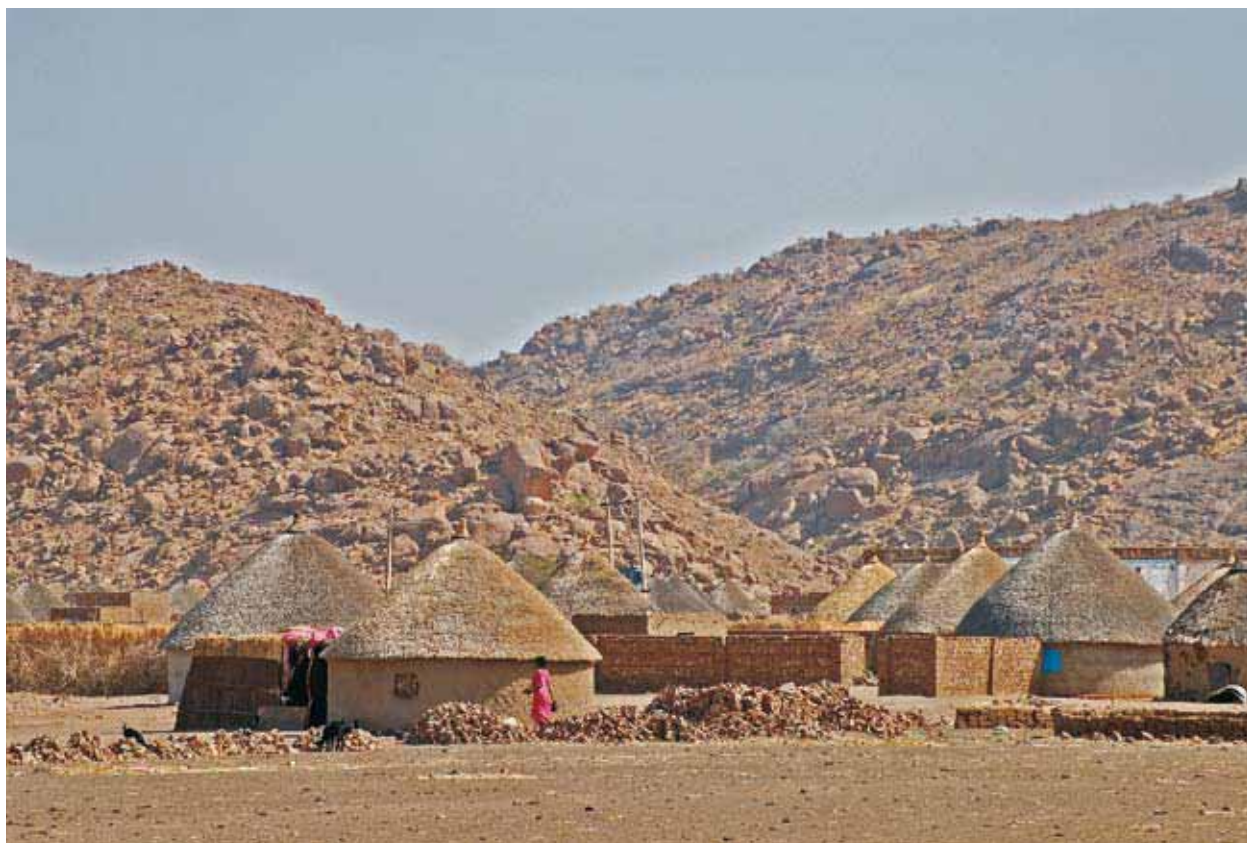
Traditionally based in northern Uganda, directly south of the Sudan's Eastern Equatoria state, the Lord's Resistance Army (LRA) has fought against the Ugandan armed forces for over twenty years. In 2005 and 2006, the conflict spread to Southern Sudan and the Democratic Republic of Congo. As of June 2007, a ceasefire is in effect but peace negotiations have stalled and sporadic conflict is ongoing.

4.3 Analysis of the role of natural resources as a contributing cause of conflict in Sudan

It is acknowledged that there are many factors that contribute to conflict in Sudan that have little or no link to the environment or natural resources. These include political, religious, ethnic, tribal and clan divisions, economic factors, land tenure deficiencies and historical feuds. In addition, where environment and natural resource management issues are important, they are generally **contributing** factors only, not the sole cause for tension.



The Nuba mountains were the scene of sustained fighting in the 1990s



The conflict on the Eastern front was fought in the barren hills of Kassala state, near Ethiopia

As noted previously, 'non-environmental' factors have been excluded from detailed examination in this assessment to allow for a tighter focus on the environmental dimensions of conflict. Also excluded is any analysis of the subsequent behaviour of the conflicting parties, except where it is directly relevant to the environment, as is the case for the targeted destruction of natural resources.

Four natural resources closely linked to conflict in Sudan

In Sudan, four categories of natural resources are particularly linked to conflict as contributing causes:

1. oil and gas reserves;
2. Nile waters;
3. hardwood timber; and
4. rangeland and rain-fed agricultural land (and associated water points).

Potential conflicts over oil, Nile waters and hardwood timber are national-scale issues. Tensions over rangeland and rain-fed agricultural land are primarily local, but have the potential to escalate and exacerbate other sources of conflict to the extent of becoming national-scale issues, as is presently the case in Darfur.

The linkages between these resources/land uses and conflict are discussed below; the fourth category is examined in more detail in a separate section, as it has strong ties to the ongoing conflict in Darfur.

Note that groundwater (on a regional scale), wildlife, freshwater fisheries and all types of marine resources are excluded from this list of important contributing causes, as there is no evidence that they have been major factors in instigating conflict in Sudan to date.

Competition over oil and gas reserves

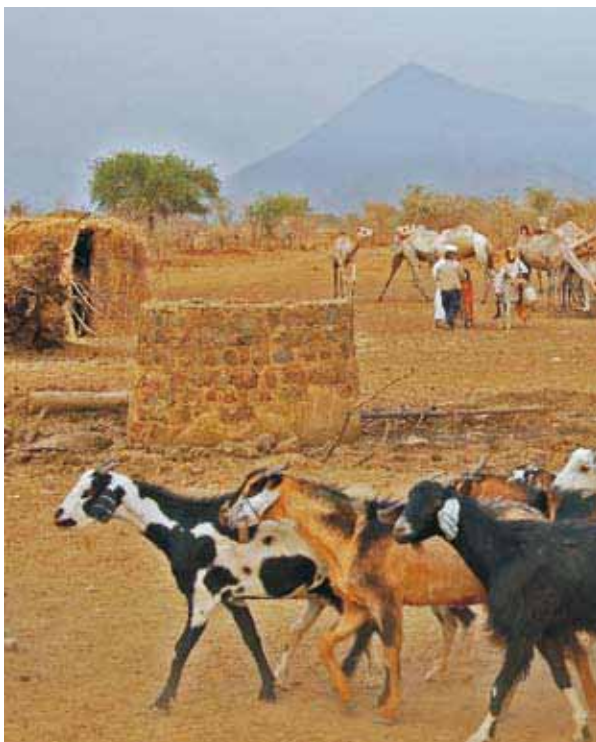
Though the major north-south conflict started well before oil was discovered in central Sudan, competition for ownership and shares in the benefits of the country's oil and gas reserves was a driving force for the conflict and remains a source of political tension today [4.4]. This is, however, considered to be primarily an economic, political and social issue, and is hence not addressed in detail in this report.

Of more relevance to UNEP, in this context, are the environmental impacts of the oil industry and their potential to catalyse conflict in the future. Consultations in central and south Sudan revealed widespread and intense dissatisfaction with the oil industry's environmental performance, coupled with the above-mentioned general concerns about ownership and benefit-sharing. In summary, the population in the vicinity of the oilfields said they felt subjected to all of the downsides of the presence of the oil industry (including its environmental impacts) without receiving a share in the benefits. Experience from other countries, such as Nigeria, shows that the root causes for this type of resentment must be addressed in order to avoid long-term instability and conflict at the local level. Part of the solution is to improve the environmental performance of the industry.

The environmental aspects of this issue are covered in a more detailed assessment of the oil industry in Chapter 7.



Camels graze in a destroyed village in Western Darfur. The trees have been cut for fuelwood and to provide the animals with fodder. Fighting over grazing land has been ongoing in Darfur since 1920 at least



Water is the most precious natural resource in the drier regions. Goats, cattle and camels all use this crowded water point in Southern Kordofan

Conflict over water rights and benefits from the Nile

Competition for the benefits accrued from the use of surface water was also an important contributing factor of the civil war, as illustrated by the Jonglei canal project (see Case Study 10.2), which was a cause as well as a victim of the conflict that flared up in Southern Sudan in 1983. The significance of this issue has not declined over time and tensions over attempts to re-start the project are still high.

However, a number of institutional safeguards are likely to prevent a re-instigation of conflict over water rights alone at the state and federal level. First, as a high profile and easily identifiable issue, it receives significant attention from GONU and GOSS leadership, as well as international assistance in the form of programmes like the Nile Basin Initiative. Second, major projects such as new dams or canals require both large investments and long periods of time, and this development process (in its modern form at least) has a range of built-in safeguards to identify and mitigate the risk of conflict. Water issues are covered in more detail in Chapter 10.

Timber and the war economy

While there is no indication that timber has been a major contributing cause of the instigation of conflict in Sudan, there is clear evidence that revenue from hardwood timber sales helped sustain the north-south civil war. Timber became part of the war economy, and there are now signs that this process is being repeated with charcoal in Darfur. Overall however, the timber-conflict linkage in Sudan is considered to be mainly an environmental impact issue (rather than a conflict catalyst). This is discussed in more detail in the next section, and in Chapter 9.

Local conflicts over rangeland and rain-fed agricultural land

Local clashes over rangeland and rain-fed agricultural land have occurred throughout Sudan's recorded history. In the absence of demographic and environmental change, such conflicts would generally be considered a social, political or economic issue and not warrant an assessment purely on environmental grounds. However, environmental issues like desertification, land degradation and climate change are becoming major factors in these conflicts. This topic is addressed in more detail in the following section.



Low quality degraded rangeland in Northern Darfur. To survive in these regions, pastoralists must travel across agricultural areas to find water and fodder for their herds, which commonly leads to conflict

4.4 Environmental linkages to local conflicts over rangeland and rain-fed agricultural land

Introduction and limits to the observed linkages

It is important to note that while environmental problems affect rangeland and rain-fed agricultural land across virtually all of Sudan, they are clearly and strongly linked to conflict in a minority of cases and regions only. These linkages do exist, but their significance and geographic scale should not be exaggerated.

That said, there is substantial evidence of a strong link between the recent occurrence of local conflict and environmental degradation of rangeland and rain-fed agricultural land in the drier parts of Sudan.

The actors of conflict at the local level: three major competing and conflicting groups

The rural ethnic and livelihood structures of Sudan are so complex and area-specific that any summary of the issue of resource competition on a national scale is by definition a gross simplification. For instance, traditional pastoralist and agricultural societies in Sudan are not always clearly separated: in many areas, societies (families, clans and even whole tribes) practice a mixture of crop-growing and animal-rearing. Nonetheless, there are some relatively clear boundaries – defined as much by livelihoods as by any other factor – between different tribes, clans and ethnic groups.

For the purposes of this discussion, UNEP has classified the hundreds of distinct rural social units present in the current and historical conflict regions into three major groups, based on livelihood strategies:



Unexploded ordnance partially buried in a pit outside Juba, Jonglei state



This mined road in Jonglei state has not been used by vehicles for a decade, but locals still walk along it to collect firewood and access farm plots

1. predominantly sedentary crop-rearing societies/tribes;
2. predominantly nomadic (transhumant) livestock-rearing societies/tribes; and
3. owners of and workers on mechanized agricultural schemes.

All three groups depend on rainfall for their livelihood. The other major rural group is comprised of farmers using river and groundwater for irrigation. To date, however, irrigated agriculture has not been a major factor in local conflicts in Sudan.

Most of the recorded local conflicts are within and between the first two groups: pastoralists and agriculturalists fighting over access to land and water. The third group, the mechanized farming lobby, is generally not directly involved in conflict, but has played a very strong role in precipitating it in some states, through

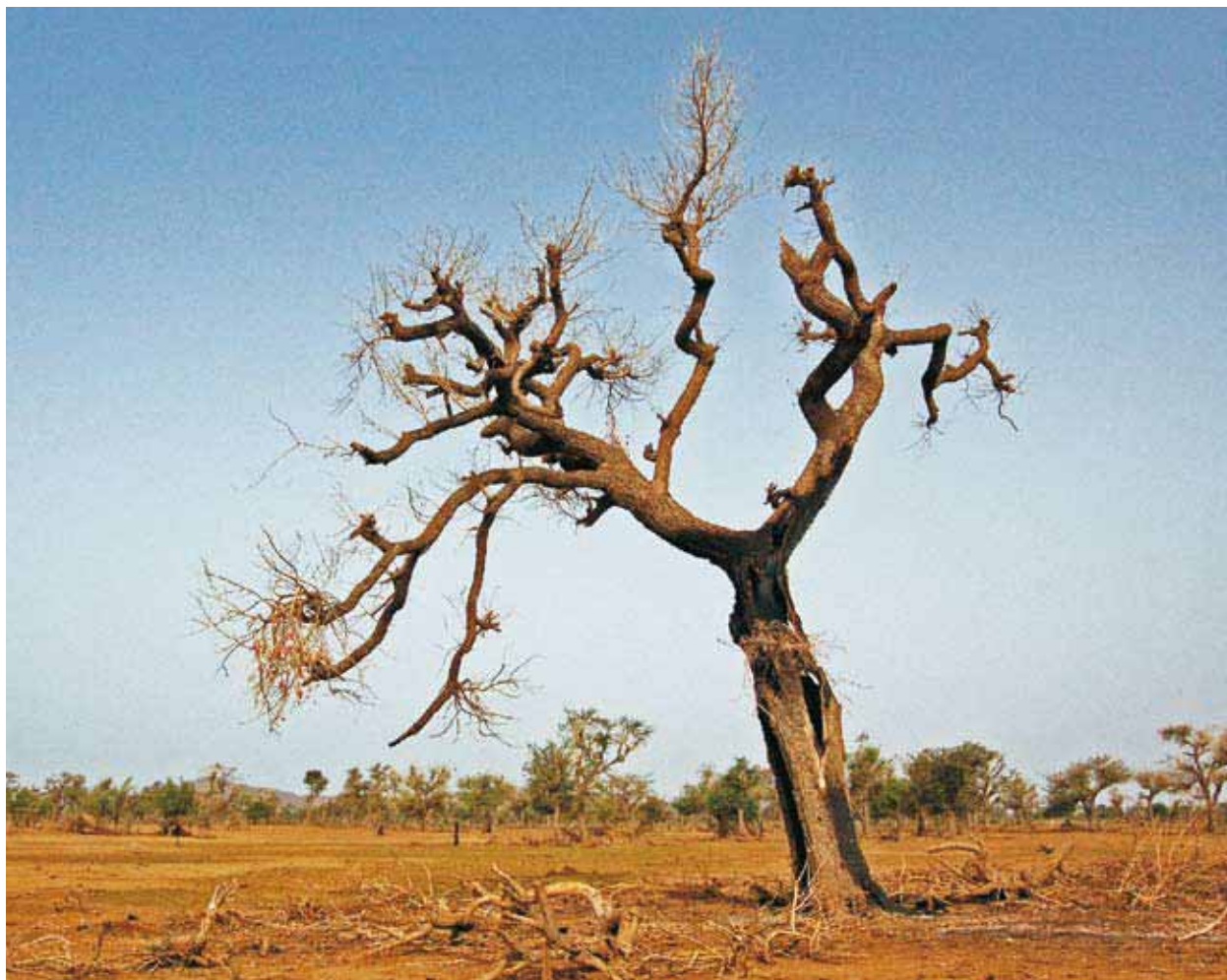
uncontrolled land take from the other two groups. In the Nuba mountains and in Blue Nile state, combatants reported that the expansion of mechanized agricultural schemes onto their land had precipitated the fighting, which had then escalated and coalesced with the major north-south political conflict [4.7, 4.8, 4.9].

The historical background: a tradition of local conflict and resolution

Violent conflict resulting partly from competition over agricultural and grazing land is a worldwide and age-old phenomenon. In Sudan – and particularly in Darfur and Kordofan – there is an extensive history of local clashes associated with this issue [4.3, 4.5, 4.10, 4.11]. A 2003 study on the causes of conflict in Darfur from 1930 to 2000, for example, indicates that competition for pastoral land and water has been a driving force behind the majority of local confrontations for the last 70 years (see Table 5).

Table 5. Causes of local conflicts in Darfur from 1930 to 2000 [4.3, 4.5]

No.	Tribal groups involved	Year	Main cause of conflict
1	Kababish, Kawahla, Berti and Medoub	1932	Grazing and water rights
2	Kababish, Medoub and Zyadiya	1957	Grazing and water rights
3	Rezeigat, Baggara and Maalia	1968	Local politics of administration
4	Rezeigat, Baggara and Dinka	1975	Grazing and water rights
5	Beni Helba, Zyadiya and Mahriya	1976	Grazing and water rights
6	Northern Rezeigat (Abbala) and Dago	1976	Grazing and water rights
7	N Rezeigat (Abbala) and Bargo	1978	Grazing and water rights
8	N Rezeigat and Gimir	1978	Grazing and water rights
9	N Rezeigat and Fur	1980	Grazing and water rights
10	N Rezeigat (Abbala) and Bargo	1980	Grazing and water rights
11	Taaisha and Salamat	1980	Local politics of administration
12	Kababish, Berti and Ziyadiya	1981	Grazing and water rights
13	Rezeigat, Baggara and Dinka	1981	Grazing and water rights
14	N Rezeigat and Beni Helba	1982	Grazing and water rights
15	Kababish, Kawahla, Berti and Medoub	1982	Grazing and water rights
16	Rezeigat and Mysseriya	1983	Grazing and water rights
17	Kababish, Berti and Medoub	1984	Grazing and water rights
18	Rezeigat and Mysseriya	1984	Grazing and water rights
19	Gimir and Fallata (Fulani)	1987	Administrative boundaries
20	Kababish, Kawahla, Berti and Medoub	1987	Grazing and water rights
21	Fur and Bidayat	1989	Armed robberies
22	Arab and Fur	1989	Grazing, cross-boundary politics
23	Zaghawa and Gimir	1990	Administrative boundaries
24	Zaghawa and Gimir	1990	Administrative boundaries
25	Taaisha and Gimir	1990	Land
26	Bargo and Rezeigat	1990	Grazing and water rights
27	Zaghawa and Maalia	1991	Land
28	Zaghawa and Marareit	1991	Grazing and water rights
29	Zaghawa and Beni Hussein	1991	Grazing and water rights
30	Zaghawa, Mima and Birgid	1991	Grazing and water rights
31	Zaghawa and Birgid	1991	Grazing and water rights
32	Zaghawa and Birgid	1991	Grazing and water rights
33	Fur and Turgum	1991	Land
34	Zaghawa and Arab	1994	Grazing and water rights
35	Zaghawa Sudan and Zaghawa Chad	1994	Power and politics
36	Masalit and Arab	1996	Grazing, administration
37	Zaghawa and Rezeigat	1997	Local politics
38	Kababish Arabs and Midoub	1997	Grazing and water rights
39	Masalit and Arab	1996	Grazing, administration
40	Zaghawa and Gimir	1999	Grazing, administration
41	Fur and Arab	2000	Grazing, politics, armed robberies



The scorched earth tactics used by militias in Darfur include cutting and burning trees in a haphazard manner

Until 1970, there is also a well-documented history of local resolution for such conflicts, through established mediation and dispute resolution mechanisms. Since then, however, legal reforms have essentially destroyed many of these traditional structures and processes, and failed to provide a viable substitute. In addition, the last thirty years have seen an influx of small arms into the region, with the unfortunate result that local conflicts today are both much more violent and more difficult to contain and mediate.

Theories of natural resource scarcity and application to local conflict in Sudan

Academic research and the discourse on the role of natural resource scarcity as a driver of conflict have developed significantly over the last decade [4.12, 4.13, 4.14, 4.15]. In light of the ongoing Darfur crisis, Sudan is a prime example of the

importance, complexity and political sensitivity of this topic. The following analysis borrows heavily from the language and concepts used by leading researchers in this field.

As a basis for discussion, the environmentally significant factors that contribute to conflict related to rangeland and rain-fed agricultural land have been divided into four groups:

- supply: factors affecting the available resources;
- demand: factors affecting the demand for resources;
- land use: changes affecting the way remaining resources are shared; and
- institutional and development factors.

While all the purely environmental factors are 'supply' issues, they have to be put into the context of 'demand' and 'institution-specific' factors.



During the major north-south conflict, the town of Wau in Western Bahr el Ghazal was a centre for the logging and regional export of teak. The trade was effectively halted by the closing of the rail link; only a small-scale local teak trade subsists today

Supply – an unreliable and dwindling resource

The noted environmental issues affecting agriculture in Sudan all result in a dwindling supply of natural resources:

- **Desertification, soil erosion and soil exhaustion** (depletion of nutrients and compaction) lower agricultural productivity and, in the worst cases, take land out of use for the long term. This has been well documented but poorly quantified in Sudan (see Chapters 3 and 8);
- **Deforestation**, particularly in the drylands, has resulted in a near permanent loss of resources including seasonal forage for pastoralists and natural fertilizer/soil recovery services for farmers. Deforestation rates in the areas studied by UNEP average 1.87 percent per annum (see Chapters 8 and 9);
- **Historical climate change** has reduced productivity in some areas due to a decline in rainfall. A major and long-term drop in precipitation (30 percent over 80 years) has been recorded in Northern Darfur, for example. The implications of such a decline on dry rangeland quality are obvious (see Chapter 3); and
- **Forecast climate change** is expected to further reduce productivity due to declining rainfall and increased variability, particularly in the Sahel belt. A drop in productivity of up to 70 percent is forecast for the most vulnerable areas (see Chapter 3).

Ever increasing demands on resources

The demand for natural resources in Sudan is uniformly increasing, due to the following factors:

- **Human population growth** is the underlying driver of increased demand for natural resources. Sudan has an overall growth rate of over 2.6 percent per annum, masking much higher localized rates. In central Darfur, for example, government statistics indicate a regional population (linear) growth rate of 12 percent per annum, from 3 persons/km² in 1956 to 18 persons/km² in 2003 [4.16]. These growth rates are indicative of large-scale in-migration, in this case mainly from the north and possibly due to environmental factors such as desertification; and
- **Livestock population and growth rates;** government officials and academics have tracked the population increase of livestock since the 1960s. In northern and central Sudan alone, it is estimated to have increased by over 400 percent between 1961 and 2004 (see Chapter 8) [4.17].

Land use changes – a dwindling share of resources for pastoralists

The horizontal expansion of agriculture into areas that were previously either rangeland or forest has been a well recognized trend for the last four decades. The northwards expansion of rain-fed agriculture into marginal areas historically only used for grazing has been particularly damaging. Three examples from the recent UNEP-ICRAF [4.18] study of land use changes illustrate a major reduction in rangeland areas due to expanding agriculture (see Chapters 8 and 9):

- In Ed Damazin, Blue Nile state, agricultural land (mainly mechanized), increased from 42 to 77 percent between 1972 and 1999, while rangeland effectively disappeared, dropping from 8.3 to 0.1 percent;
- In the El Obeid region of Northern Kordofan, rain-fed agricultural land increased by 57.6 percent between 1973 and 1999, while rangeland decreased by 33.8 percent and wooded pasture by 27 percent; and
- In the Um Chelluta region of Southern Darfur, rain-fed agricultural land increased by 138 percent between 1973 and 2000, while rangeland and closed woodland decreased by 56 and 32 percent respectively.

In addition to the loss of grazing land, agricultural expansion has also blocked livestock migratory routes between many of the widely separated dry and wet season pastures, and between the herds and daily watering points. A further complication is that sedentary farmers are increasingly raising their own livestock, and are hence less willing to give grazing rights to nomads in transit [4.19] (see Chapter 8 for a more detailed discussion of these issues).

Institutional factors – failing to rectify the issues

Agricultural institutions and environmental governance in Sudan are discussed in detail in Chapters 8 and 13 respectively. In summary, the rural environment has been impacted by a combination of ill-fated reform and development programmes, as well as legal reforms and failures in environmental governance. One key issue is the difficulty of developing and applying a practical, just and stable system of rural land tenure in an ethnically complex society of intermingled sedentary farmers and transhumants/nomads. This has not been achieved in Sudan so far.

A lack of development and livelihood options

Outside of the main urban areas, Sudan remains very poor and underdeveloped. Rural populations consequently have very few options to solve these agricultural crises, as solutions like agricultural development, improvements in pasture and stock quality, and using working capital to cover short-term needs and alternative employment are simply not available [4.19].

The net result – disappearing livelihoods for dryland pastoralist societies

The clear trend that emerges when these various elements are pieced together is that of a **significant long-term increase in livestock density on rangelands that are reducing in total area, accessibility and quality**. In environmental terms, the observed net result is overgrazing and land degradation. In social terms, the reported consequence for pastoralist societies is an effectively permanent loss of livelihoods and entrenched poverty.

Pastoralist societies in Sudan have always been relatively vulnerable to losing their livelihoods due to erratic rainfall, but the above-noted combination of factors has propelled many pastoralists into a negative spiral of poverty, displacement, and in the worst cases, conflict. Their coping strategies, which have been well documented [4.16, 4.19], include:

- Abandoning pastoralism as a livelihood in favour of sedentary agriculture, or displacement to cities;
- Increasing or varying the extent of annual herd movements where possible, with a general trend towards a permanently more southerly migration;
- Maximizing herd sizes as an insurance measure (assisted by the provision of water points and veterinary services);

- Changing herd composition, replacing camels by small animals, mainly sheep, in response to the curtailment of long-distance migration;
- Competing directly with other grazers for preferred areas of higher productivity (**entailing a conflict risk**);
- Moving and grazing livestock on cropland without consent (**entailing a conflict risk**); and
- Reducing competition by forcing other pastoralists and agriculturalists off previously shared land (**as a last resort - the proactive conflict scenario**).

Variations of all of these strategies can be observed throughout Sudan, particularly in the drier regions.



Displaced populations settle on the outskirts of existing towns, as seen here in El Fasher, Northern Darfur, where the new settlement is distinguished by white plastic sheeting. These new arrivals add to the environmental burden on the surrounding desert environment



Camel herders from the Shanabla tribe at a water point in El Tooj, Southern Kordofan. The southward migration of camel herders is a harbinger of renewed conflict in the Nuba mountains

CS 4.1 The southward migration of camel herders into the Nuba mountains and subsequent resource competition

The Nuba mountains region in Southern Kordofan provides an example of the increase in natural resource competition and local conflict that results from the combination of agricultural expansion, land degradation and the southward migration of pastoralists.

At the start of the civil war in the 1980s, cattle-herding pastoralists from the Hawazma Baggara tribe started penetrating deeper into the Nuba mountains in search of water and pasture for their cattle, due to the loss of grazing land to mechanized agriculture and drought. The rivalry that ensued with the indigenous Nuba tribe, who practised a combination of sedentary farming and cattle-rearing, contributed to the outbreak of large-scale armed conflict. Meanwhile, as some of the dry season pastures around Talodi were off-limits during the conflict years, the Hawazma had to remain in their wet season grazing lands in Northern Kordofan, exerting greater pressure on the vegetation there.

In 2006, UNEP observed the return of Hawazma Baggara to their former grazing camps in conflict zones in Southern Kordofan, for example near Atmoor. UNEP also witnessed the presence of the camel-herding Shanabla tribe in the midst of thick woodland savannah at El Tooj (now reportedly reaching up to lakes Keilak and Abiad).

This new southward migration of camel herders constitutes an indicator of livestock overcrowding and rangeland degradation in Northern Kordofan, and is a harbinger of further conflict with the Nuba. At Farandala in SPLM-controlled territory, the Nuba expressed concern over the widespread mutilation of trees due to heavy lopping by the Shanabla to feed their camels, and warned of 'restarting the war' if this did not cease.

Conclusions on the role of environmental issues in conflicts over rangeland and rain-fed agricultural land

Pastoralist societies have been at the centre of local conflicts in Sudan throughout recorded history. The most significant problems have occurred and continue to occur in the drier central regions, which are also the regions with the largest livestock populations, and under the most severe environmental stress.

As there are many factors in play – most of which are not related to the environment – land degradation does not appear to be the dominant causative factor in local conflicts. It is, however, a very important element, which is growing in significance and is a critical issue for the long-term resolution of the Darfur crisis. The key cause for concern is the **historical, ongoing and forecast shrinkage and degradation of remaining rangelands in the northern part of the Sahel belt.**

Much of the evidence for UNEP's analysis is anecdotal and qualitative; it has been gathered through desk study work, satellite images and interviews of rural societies across Sudan. The consistency and convergence of reports from a range of sources lend credibility to this analysis, although further research is clearly needed, with a particular emphasis on improved quantification of the highlighted issues and moving beyond analysis to search for viable long-term solutions.

A conference on the topic of environmental degradation and conflict in Darfur was held in Khartoum in 2004. The proceedings [4.20] illustrated the depth of local understanding of the issue. Given the situation observed in 2007, however, UNEP must conclude that this high-quality awareness-raising exercise was unfortunately apparently not transformed into lasting action.

4.5 Assessment of the environmental impacts of conflict

Introduction

This section approaches the linkages between conflict and environment from the reverse angle to the above analysis, by examining **if and how armed conflict has resulted in negative or positive impacts on the environment in Sudan.** Direct impacts, indirect impacts and

key conflict-related issues are identified and discussed in this chapter. Detailed discussion and recommendations on the various environmental issues of concern (e.g. deforestation) are referred to the corresponding sector chapter.

Definitions and impact listings

The following definitions are used for direct, indirect and secondary environmental impacts of conflict in Sudan:

- **Direct impacts** are those arising directly and solely from military action;
- **Indirect and secondary impacts** are all impacts that can be credibly sourced in whole or in part to the conflicts and the associated war economy, excluding the direct impacts.

On this basis, UNEP has developed the following list of impacts for discussion:

Direct impacts include:

- landmines and explosive remnants of war (ERW);
- destroyed target-related impacts;
- defensive works; and
- targeted natural resource destruction.

Indirect and secondary impacts include:

- environmental impacts related to population displacement;
- natural resource looting and war economy resource extraction;
- environmental governance and information vacuum; and
- funding crises, arrested development and conservation programmes.

Direct impacts

Landmines and explosive remnants of war

Landmines and other explosive remnants of war (ERW) are a major problem in Sudan. Thirty-two percent of the country is estimated to be affected [4.4], with the greatest concentration in Southern Sudan (see Case Study 4.2). As many as twenty-one of the country's twenty-five states may be impacted, although the true extent of Sudan's landmine problem remains unknown, as a comprehensive survey of the issue has not been undertaken to date.



In 1983, southern military forces sabotaged these generators powering the Jonglei canal excavator. Plans to restart the giant water project constitute a major potential flashpoint for renewed conflict

The reported and registered number of landmine casualties over the past five years totals 2,200, though again, no systematic data collection and verification mechanism exists. In addition, there is no data at all on animal casualties from mines in Sudan, but these are expected to be much higher than the human casualty rate. The impacts of landmines on wildlife would only be significant (at the ecosystem level) if individual losses affected locally threatened populations of key species.

The potential impacts of landmines and ERW can be divided into chemical and physical categories. Conventional explosives, such as TNT and RDX, found in artillery shells and mines are highly toxic and slow to degrade. While they present an acute toxic hazard if ingested, the toxic risk is considered insignificant compared to the risk of injury from explosion.

Apart from human casualties, another major impact of landmines is impeded access to large areas for people and their livestock. In Sudan, access to some areas has been reduced for decades, as they have remained mined or suspected as such since the beginning of the conflict.

In all but the driest areas, the result of reduced access has been the relatively unimpeded growth of vegetation. UNEP fieldwork, in the Nuba mountains in particular, revealed extensive areas of woodland regrowth in suspected minefields. Such regrowth can have a beneficial effect on the affected areas and associated wildlife populations, but the flow of benefits to people is usually reduced, as they cannot safely extract resources (e.g. water, fuelwood, fodder) from these sites. Despite the risks, however, UNEP teams witnessed people walking, herding cattle and gathering fuel in clearly marked minefields.



The dumping of waste on minefields and on top of unexploded ordnance creates a major safety problem (top); unexploded ordnance is loosely stacked and scattered across the area (bottom)

CS 4.2 Unexploded ordnance, minefields and deforestation at Jebel Kujur, Juba district

The Jebel Kujur massif near the city of Juba in the state of Central Equatoria (Bahr el Jabal) clearly illustrates the localized but severe impacts of conflict affecting many urban centres in Southern Sudan, as well as the environmental governance challenges facing the new government.

During the 1983-2005 conflict, Juba was a garrison town for the central government military, and was continuously under siege and frequently attacked by SPLA forces. The town itself still shows extensive scarring, and overgrown entrenchments, minefields and scattered unexploded ordnance are visible on the fringes. Deforestation and soil erosion are severe, particularly at Jebel Kujur, which originally supported a dense forest cover. A quarry is also operating at one end of the range.

In late 2006, clean-up was ongoing, but there were still minefields and areas of stacked ordnance in the foothills of Jebel Kujur. Despite the obvious risks, cattle grazing, scrap recovery and waste dumping were routinely taking place in these areas. Plastic waste was being dumped directly on top of unexploded artillery shells and rocket-propelled grenades, creating obvious serious hazards for site users and greatly increasing the future cost of de-mining and rehabilitation.

The removal of explosive remnants of war (ERW) from Jebel Kujur is a difficult but short-term activity. The greater challenges are sustainable solutions for waste management for the growing city and reforestation of the massif.

Destroyed target-related impacts

Target-related impacts refer to the effects on the environment of direct military action on targets, irrespective of the method. The physical destruction of the environment from conventional weaponry (bombs, artillery shells and mortars) principally takes the form of cratering, and damaged or destroyed buildings, trees, and industrial facilities.

Though cratering has been reported by de-mining staff in Southern Sudan, there is no indication that more than a few hectares are affected at each conflict location. Similarly, the destruction of trees by direct military action is considered negligible compared to other causes of deforestation in Sudan. No lasting environmental damage is expected either from the destruction of buildings, apart from the generation of inert solid waste as rubble.

The single most significant industrial target in conflicts to date is the Jonglei canal excavator, which was sabotaged 40 km north of Padak in Jonglei state. The rusting excavator is currently used as a nesting site by eagles and is home to several beehives. UNEP experts inspected the excavator and its surroundings, and concluded that its direct environmental impact was negligible.

Neither the oilfields in the south, nor the transfer pipeline to Port Sudan were ever successfully attacked to the extent that significant environmental damage ensued.

UNEP concludes that the absence of vulnerable industrial targets in historical conflict zones has prevented any major environmental contamination from chemical spillage, and that other target-related impacts have been insignificant in environmental terms.

Defensive works

Major defensive works such as trench networks and bunkers were noticeably absent throughout the country, but de-mining staff in Southern Sudan reported that limited defence works could be found on the outskirts of besieged garrison towns.

Southern communities gave consistent reports of government forces clearing trees from the periphery of the garrison towns to deny cover to attacking forces. UNEP site inspections of the outskirts of Juba, Malakal and Aweil certainly indicated that deforestation has occurred, but it was not possible to attribute this solely to defensive works, as several other causes of deforestation were also evident at these locations (see Chapter 9).



In many rural areas of Southern Sudan, the only direct and lasting evidence of the conflict is scattered steel scrap, such as this grenade fragment outside Juba, Jonglei state

Targeted natural resource destruction

In Darfur, the deliberate targeting of vital natural resource-related infrastructure, such as rural water pumps, has been well documented by NGOs and inspection reports from the African Union Mission in Sudan (AMIS)[4.21]. Local populations in Darfur have also reported many instances of deliberate natural resource destruction by raiding militia, whose principal targets are trees, crops and pastures. Crops and pastures are burned and trees are cut. UNEP directly observed evidence of destructive tree-cutting in destroyed and deserted villages east of El Geneina in Western Darfur (see Case Study 4.3). Aid workers have reported similar targeted tree-cutting in other parts of Darfur.

Given the lack of quantifiable data on field conditions in Darfur, it is not possible to estimate the significance of this phenomenon. UNEP can only state that it is occurring and that it will add to the deforestation problem in the region (see Chapter 8).

Indirect and secondary environmental impacts of conflict

The environmental impacts of population displacement

After civilian deaths and injuries, the most significant effect of conflict on the population of Sudan has been displacement – people fleeing conflict zones seeking security. An estimated five million people (7 to 12 percent of the estimated total population of Sudan) have been displaced to date, and less than one million have returned. The number of displaced is rising due to the continuing conflict in Darfur. The great majority of the displaced have come from rural areas and migrated to camps on the outskirts of towns and cities. Over two million have relocated to the capital city, Khartoum.

The severe and complex environmental consequences of displacement include:

- deforestation in camp areas;
- devegetation in camps areas;
- unsustainable groundwater extraction in camps;

- water pollution in camp areas;
- uncontrolled urban slum growth;
- the development of a ‘relief economy’ which can locally exacerbate demand for natural resources;
- fallow area regeneration and invasive weed expansion; and
- return- and recovery-related deforestation.

Not all displacement in Sudan is due to conflict. Drought and economic factors are also major contributing causes. For this reason, the environmental impacts of all the different types of displacement are separately discussed in Chapter 5.

Looting of natural resources - war economy resource extraction

Natural resource looting is defined as the uncontrolled and often illegal extraction of natural resources that commonly occurs during extended conflicts. In this context, natural resources are often badly impacted and also have a role in sustaining the conflict.

In Sudan, the resources in question are timber (lumber and charcoal), ivory and bushmeat. Although oil is a contested natural resource in Sudan, it is excluded from this discussion as UNEP found no evidence of significant uncontrolled, concealed or illegal extraction. The potential and actual environmental impacts of the oil industry are covered in Chapter 7.

The looting of timber occurred on both sides in the north-south conflict. The most significant extraction concerned high value timber in Southern Sudan and fuelwood for charcoal in the Nuba mountains.

In Southern Sudan, UNEP received consistent verbal reports, backed by literature [4.22], of extraction and export (regional and international) of plantation teak and natural mahogany by government as well as SPLA forces and associated militias, though extraction was limited on both sides to areas within their respective control and close to transportation corridors. Northern government forces extracted timber from Wau, exporting it north via the rail link, and from Juba and other Nile towns, exporting by barge. The SPLA exported plantation teak southwards, from the Equatoria states to Uganda.



An abandoned grinding stone in the former village of Hashaba, south-east of El Geneina, destroyed in the conflict

CS 4.3 Targeted natural resources destruction in Western Darfur

One of the defining impacts of the current conflict in Darfur has been the displacement of people from rural areas, and the destruction of villages and surrounding land by militias. During its field mission in June 2006, the UNEP assessment team, under armed escort from African Union forces, visited some of the areas south-east of El Geneina in Western Darfur. The mission found that the outlying villages had been damaged to the extent that hardly any evidence of their former existence remained. In addition to the demolition of infrastructure, the trees within village limits had been systematically cut down.

These observations from the areas around El Geneina were consistent with anecdotal information collected through interviews with IDPs in the camps of Northern, Western, and Southern Darfur.

While some trees may have been felled to provide fodder for livestock or to be sold for firewood in IDP camps, there is evidence that some were undoubtedly cut down maliciously. This is the case for mango trees, for instance, as their leaves are inedible for livestock. From a military perspective, destroying trees severs the former community's links to the land and reduces the likelihood of resettlement. The environmental consequences of the loss of tree cover include a net deficit of biomass available to the soil, as well as the loss of the trees' ability to fix nitrogen. Both result in a decrease in soil fertility.

UNEP has no data or basis on which to quantify the extent of this reported trade. It is clear, however, that it has come to an end or has at least been significantly reduced. For the northern forces, trade has been stopped by the closure of the Wau rail link and the demobilization of northern garrisons from the south, while the SPLA's extractions have been curtailed by the newly formed Government of Southern Sudan's 2005 ban on timber exports and customs controls on border roads.

In the Nuba mountains, UNEP field teams observed charcoal for sale at military checkpoints, indicating that the military may still play a role in this business in the area.

Both UNEP teams and the follow-up Darfur Joint Assessment Mission field teams found an active lumber industry in central Darfur, in historical as well as current conflict areas. While it was not possible to determine who the main actors in this trade were, it was clear that some uncontrolled logging linked to the conflict was occurring.

The elephant population in Southern Sudan was decimated during the north-south conflict. While it is likely that much of the ivory was shipped to Khartoum, which is the centre of ivory carving in the region, there is no firm evidence to identify the main actors of elephant poaching and ivory transportation. Note that while rhinoceros horn was undoubtedly a poaching target in Southern Sudan during the early stages of the conflict, this trade has stopped due to the virtual extinction of rhino in the region.

Though UNEP did not find proof of an ongoing widespread commercial bushmeat trade, local people in Southern Sudan reported that both sides in the north-south conflict had taken bushmeat to feed their forces, with the result that the larger edible mammals such as buffalo, giraffe, zebra and eland are locally extinct throughout much of the south.

In sum, the looting of natural resources has undoubtedly occurred in Sudan and has caused significant damage. However, the signing of the Comprehensive Peace Agreement has reduced the scale of such activities, though looting remains an issue for Darfur, and to some extent for the Nuba mountains.

Environmental governance and information vacuum

Conflict zones generally suffer from a lack of stable governance and limited observance of the rule of law. In environmental terms, this results in a complete lack of environmental protection as well as impunity for those, military or otherwise, who extract or process natural resources in an uncontrolled manner or cause other forms of environmental damage.

Conflict zones are also usually inaccessible for science-based data collection. In the case of Sudan, conflict-related security constraints have denied the environmental science community access to at least half of the country for over two decades. As a result, the true status of much of Sudan's environmental resources remains unknown or open to speculation, limiting rational decision-making for resource management and conservation.

Funding crises - arrested development and conservation programmes

Extended and major conflicts drain national resources and can lead to isolation from the international community. Decades of war in Sudan have helped ensure that it remain one of the world's poorest countries. Political issues have also constrained the flow of international knowledge and assistance to Sudan.

The result has been that conservation of the environment and the sustainable management of natural resources have not been regarded as priorities for Sudan since independence, and that even when they have been considered, they have generally not been sufficiently funded to bring about positive change.

The financial burden of virtually continuous warfare and the ensuing poverty can thus be considered as one of the root causes of the current state of the environment in Sudan.

Summary of the environmental impacts of conflict

The findings of UNEP's assessment of the environmental impacts of conflict in Sudan can be summarized as follows:

Direct impacts are overall minor:

- landmines and explosive remnants of war: significant;
- destroyed target-related impacts: not significant;
- defensive works: not significant; and
- targeted natural resource destruction: significant for Darfur, but currently not quantifiable.

Indirect and secondary impacts are major:

- environmental impacts related to population displacement: very significant;
- looting of natural resources: significant;
- environmental governance and information vacuum: significant; and
- funding crises: very significant.

These findings indicate that the way forward on environmental issues in post-conflict Sudan should not focus on the direct legacies of conflict (which are relatively minor). Attention should instead be paid to the indirect and secondary impact-related issues, as well as to chronic problems. This would be best achieved by integrating all of the issues into a holistic recovery programme rather than attempting to separate them on the basis of conflict linkages.

4.6 Conclusions and recommendations

Conclusion

The linkages between conflict and environment in Sudan are twofold. On one hand, the country's long history of conflict has had a significant impact on its environment. Indirect impacts such as population displacement, lack of governance, conflict-related resource exploitation and underinvestment in sustainable development have been the most severe consequences to date.

On the other hand, environmental issues have been and continue to be contributing causes of conflict. Competition over oil and gas reserves, Nile waters and timber, as well as land use issues related to agricultural land, are important causative factors in the instigation and perpetuation of conflict in Sudan. Confrontations

over rangeland and rain-fed agricultural land in the drier parts of the country are a particularly striking manifestation of the connection between natural resource scarcity and violent conflict. In all cases, however, environmental factors are intertwined with a range of other social, political and economic issues.

UNEP's analysis indicates that there is a very strong link between land degradation, desertification and conflict in Darfur. Northern Darfur – where exponential population growth and related environmental stress have created the conditions for conflicts to be triggered and sustained by political, tribal or ethnic differences – can be considered a tragic example of the social breakdown that can result from ecological collapse. Long-term peace in the region will not be possible unless these underlying and closely linked environmental and livelihood issues are resolved.

Background to the recommendations

The analysis of the linkages between conflict and environment in Sudan has so far been largely confined to academic circles. In Sudan, only USAID has explicitly integrated peacebuilding into the design of its environmental programme in Southern Sudan [4.24]. It is important that this discussion be broadened to include the government and the United Nations. International peacekeeping initiatives and implementing organizations, such as the African Union Mission to Sudan (AMIS) and the United Nations Mission to Sudan (UNMIS), should particularly take this issue in account.

In addition to political solutions, practical measures to alleviate natural resource competition are urgently needed to help contain the current conflict and present a viable long-term solution for the development of rural Darfur. Elsewhere in Sudan, efforts should be focused first and foremost on identified environmental 'flashpoints', which are specific issues that constitute a potential trigger for the renewal of conflict. The most important of these is the environmental impact of the oil industry, but there are several others, including the charcoal industry in central Sudan, the potential for ivory poaching and the development of a timber mafia in Southern Sudan.



Parched and overgrazed land surrounding a dry livestock supply dam south of El Fasher, Northern Darfur, in June 2006. Environmental scarcity and degradation are two of the important contributing factors in the Darfur crisis

Possible measures – which are listed as recommendations in this and other chapters – include agricultural policy reform, developing the timber industry, and strengthening environmental governance. Such measures should be considered vital investments in conflict prevention and resolution rather than purely environmental conservation projects.

In summary, in the context of the CPA and the ongoing Darfur crisis, the attention of the environmental sector should be focused on the following three areas in order to assist peacebuilding and conflict resolution in Sudan:

1. reducing the environmental impact of the oil industry in central Sudan;
2. promoting more sustainable agriculture and pastoralism in dryland Sudan; and
3. providing information and technical assistance on environment-conflict issues to the national and international community working on peacebuilding and conflict resolution throughout Sudan, with an initial focus on Darfur.

Recommendations for the international community

R4.1 Bring the issue of environmental degradation and ecologically sustainable rural development to the forefront of peacebuilding activities in Sudan. This will entail a major awareness-raising exercise by UNEP and the international community in Sudan, and will need to be incorporated into response strategies for bodies such as the African Union, the UN Development Group (UNDG) and the UN Department of Peacekeeping Operations (UNDPKO).

CA: AW; PB: UNDPKO; UNP: UNEP; CE: 0.5M; DU: 1 year

R4.2 Bring natural resource assessment and management expertise into the existing peacebuilding and peacekeeping efforts in Sudan. UNEP or other organizations would provide technical assistance to the existing actors in this area for the south, east and Darfur, joining in the decision-making process. This should include significant direct support to governments and to both the African Union Mission to Sudan and the United Nations Mission to Sudan.

CA: TA; PB: UNMIS; UNP: UNEP and FAO; CE: 2M; DU: 3 years

R4.3 Conduct a specific environmental assessment for rural Darfur conflict regions as soon as security conditions and political stability permit. The major conflict which flared up in northern and central Darfur in September 2006 is expected to change and worsen the situation, in both humanitarian and environmental terms. An updated, detailed assessment focusing on land quality is needed to assist in the development of an appropriate recovery plan (when the time for recovery arrives). This very technical work would be used to supplement the existing body of largely qualitative work presented in the Darfur JAM interim report.

CA: AS; PB: UNMIS; UNP: UNEP and FAO; CE: 0.4M; DU: 1 year

Recommendations for the Government of National Unity

R4.4 Undertake strategic reform of the agricultural and pastoral sector. Without resolution of the underlying rural land use problems, the issue of the links between environmental degradation and conflict will remain insoluble. This recommendation is not costed as it is essentially an internal culture and strategic policy issue for GONU.