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No Time To Waste:

Sustainable Environmental
Management in a Changing
Southern Sudan



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TABLE OF CONTENTS

1. Introduction 3
2. Waste Management and Pollution 11
3. Deforestation and Unsustainable Forest Use... 19
4. Climate Change, Drought, Desertification
and Floods..... 29
5. The Relation between Natural Resources,
Environment and Conflict 35
6. The Way Forward: Sustainable Environmental
Management in Southern Sudan 45
List of References / Colophon 48

At the invitation of the Southern Sudan Legislative Assembly (SSLA) and in close cooperation with the SSLA and the State Assemblies, AWEPA executes a Capacity Building Programme in southern Sudan.* This Capacity Building Programme serves the objectives of improving the capacity of legislative bodies in southern Sudan to respond to the challenges they face in the discharge of their legislative, oversight and representative functions. The Programme contains a mix of activities: workshops, trainings, technical consultancies, study visits, attachments to parliaments, participation in (regional) parliamentary conferences, provision of technical equipment and publications.

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Due to the combination of the lack of environmental governance and the post-conflict development boom, the environment of Southern Sudan is currently extremely vulnerable.

UNEP 2007 (Section 13.9)

1. Introduction

Sudan is the largest country in Africa, measuring approximately 2.5 million square kilometres. Southern Sudan makes up about one-third of the total land area of Sudan, covering about 640,000 square kilometres¹. According to the 2008 Census, Southern Sudan has a population of 8.2 million people, out of a total population for the whole of Sudan of 41 million². Southern Sudan is one of the richest places on earth in terms of biodiversity and ecosystem services. It is covering a wide variety of ecological zones, including woodland savannah, flood region, lowland forest, montane forest zone, and semi-desert³. Altitudes in southern Sudan range from 600 to 3000 metres above sea level. In Figure 1, the main ecological zones are depicted.

As a direct result of over 40 years of civil war, large parts of southern Sudan have been left virtually untouched. This has led to the paradoxical situation that southern Sudan has been able to safeguard its biodiversity to a large extent due to the conflict. On the other hand, there have also been many negative impacts. In addition to the

massive displacement of millions of southern Sudanese, there was also displacement of animals due to the noise of gunfire and excessive hunting in areas where soldiers and rebel forces were based. Illegal logging also took place, albeit on a limited scale due to the lack of infrastructure. During the war, illegal ivory trade was a critical force driving the regional extinction of the African elephant⁴.

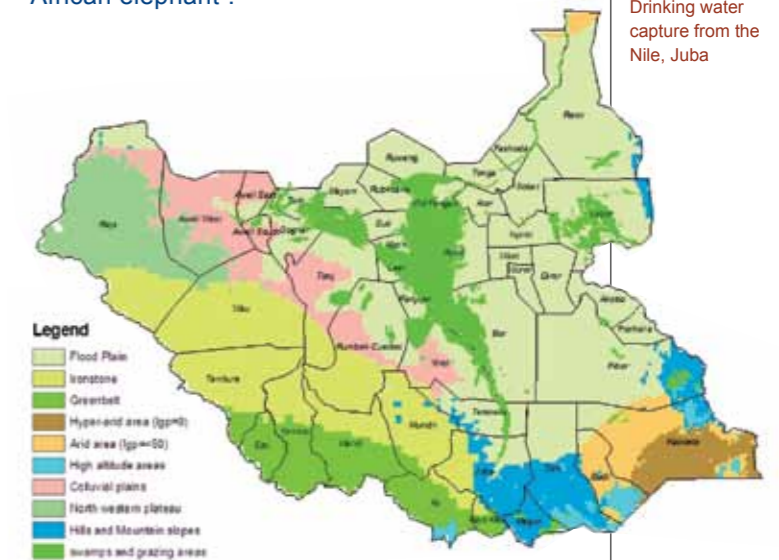


Figure 1: Southern Sudan Physiographic zones (Source: Odero 2007)

1 Odero (2007)
 2 Southern Sudan Centre for Census Statistics and Evaluation (2009); http://unstats.un.org/unsd/environment/envpdf/Country_Snapshots_Sep%202009/Sudan.pdf
 3 USAID (2007)
 4 UNEP (2007)

Photo: Drinking water capture from the Nile, Juba



a



b

On the positive side, in 2007, when the first aerial surveys in 25 years were carried out by the Wildlife Conservation Society, thousands of migrating white-eared kobs were observed in Boma National Park⁵. The census team has estimated a population of 1.3 million kob, tiang and gazelle in southern Sudan, comparable to the famous wildebeest migration in the Serengeti (Tanzania). In other areas, it was found that wildlife was thriving as well, with elephants, ostriches, lions, leopards, hippos and buffalos spotted in large numbers. There are some isolated groups of Eastern chimpanzees, mainly concentrated around Nimulé National Park⁶. However, some species are no longer found, including zebra, of which there were an estimated 20,000 in Boma National Park alone in 1982. In general, it is reported that the western part of southern Sudan is more affected than other regions. This is ascribed to the fact that the western part was more accessible than the rest of southern Sudan, where the Nile and the Sudd served as a barrier against poaching.

Box 1.1: The Sudd Wetland: Biodiversity Hotspot and Food Basket⁷

The Sudd is one of the largest tropical wetlands in the world, covering approximately 57,000 m². The largest area of Sudd can be found along the Bahr el Ghazal River, where the Bahr el Jebel (White Nile) and Bahr el Zeraf in Upper Nile and Jonglei come together. The Sudd was recently declared a Ramsar site, the designation for wetlands of global significance. It is an important breeding area for Nile ecosystem fish species, and is the largest potential source of freshwater fish in southern Sudan, with Nile perch and Nile tilapia as well-known examples. The Sudd could provide an estimated 100,000 to 300,000 ton of fish annually on a sustained basis. It also harbours high numbers of threatened wildlife, including Nile crocodile, hippopotamus, sitatunga, the endemic Nile lechwe, elephants, leopards and many bird species.

Southern Sudan is endowed with a variety of natural resources and fertile land, which is currently underexploited. There is substantial interest from all over the world to exploit these riches and convert part of the underutilised land for agro-business and mining. A “land grab” is currently ongoing in Sudan, especially from countries in the Middle East and Asia, which are looking for

land to cultivate food and biofuels to provide for their own domestic food and energy needs⁸. Combined with a strong competition over natural resources within southern Sudan, mainly between pastoralists and sedentary farmers, there is need for strongly improved environmental governance in terms of policies and legal framework.

The Government of Southern Sudan is making considerable efforts to ensure that citizens have “the right to a clean and healthy environment [and to have that right] protected for the benefit of present and future generations, through reasonable legislative action and other measures”, as stipulated in the Interim Constitution of Southern Sudan (2005). At first, environmental management was placed under the newly created Ministry of Environment, Wildlife Conservation and Tourism, but since a few years it has been transferred to the Ministry of Housing, Physical Planning and Environment. Within this Ministry, there are two departments responsible for environmental affairs: Directorate for Environmental Affairs and Directorate for Sanitation. Several

5 USAID (2007); <http://www.wcs.org/new-and-noteworthy/massive-migration-revealed.aspx>
6 Pers. comm. by local conservation NGO in Kajo Keji; also refer to: http://www.unep.org/grasp/Range_States/sudan.pdf
7 USAID (2007)
8 IFPRI (2009)

Photos:
a Traffic Juba
b Collecting plastic bottles for recycling



other GOSS line ministries have environmental responsibilities, including the Ministry of Agriculture and Forestry, Ministry of Animal Resources and Fisheries, Ministry of Water Resources and Irrigation and Ministry of Industry and Mining.

Within the Southern Sudan Legislative Assembly (SSLA), there is a Specialized Standing Committee on Land, Natural Resources & Environment⁹. Its functions include overseeing land policies and legislations, ensuring rational land use and environmental protection policies, protection, conservation and sustainable utilization of natural resources, and conservation of forests and wildlife resources.

Although in 2005 a government-led process started off developing a National Plan for Environmental Management (NPEM), this has not yet translated into environmental policies on the GOSS level¹⁰. Environmental matters were not seen as a first priority of the post-war rehabilitation. There is a serious lack of institutional capacity at all levels in government to manage natural re-

sources, as well as a lack of policy and legislative framework for biodiversity conservation. Currently, an Environmental Policy framework is being developed. An illustration of the lack of attention for biodiversity and environment can be seen from the first Statistical Yearbook for Southern Sudan¹¹. No biodiversity or natural resource indicators are included. The only data provided are on water and sanitation and solid fuel use for cooking. The chapter on Forestry does not provide any data on deforestation rates or volumes of timber harvested.

In November 2008, a three-day workshop was held to address the rising challenges faced by the Government of Southern Sudan in environmental management¹². Three Specialized Standing Committees of the SSLA, in conjunction with AWEPA, organized the workshop for participants from both the Executive as well as the Legislature. The result was the development of a work plan to address priority areas for environmental management. The following recommendations were made:

- Formulation of Environmental Policy for Southern Sudan
- Development of Framework for Environmental Law
- Development of Sectoral policies and laws
- Development of rules and regulations for implementation and enforcement
- Capacity Building training and information package.

This publication is a follow-up to this workshop. It will give an overview of some of the most pressing environmental problems in southern Sudan. In addition, a number of potential pathways for a more sustainable development are presented. The publication is based on first-hand reports by a number of Sudanese environmental experts. In addition, it is based on a number of key documents on the environment in Sudan, including the UNEP Post-conflict Environmental Assessment and USAID's Southern Sudan Environmental Threats and Opportunities Assessment, as well as policy documents and statistics from southern Sudan. It should be noted that environ-

9 Source: <http://www.sslagoss.org/home.php>
10 UNEP (2007)
11 Southern Sudan Centre for Census Statistics and Evaluation (2009)
12 AWEPA and SSLA (2008)

Photo:
Road Kapoeta –
Torit



mental data for southern Sudan are very limited. Very few data have been collected between 1983 and 2005 (the second civil war). Some recent efforts include aerial censuses by Wildlife Conservation Society and Fauna and Flora International. Overall, however, this lack of data is a serious impediment to the development of sustainable environmental management policies and structures.

In the publication, the following issues will be dealt with:

CHAPTER 2: Waste Management and Pollution

CHAPTER 3: Deforestation and Unsustainable Forest Use

CHAPTER 4: Climate Change, Drought, Desertification and Floods

CHAPTER 5: The Relation between Natural Resources, Environment and Conflict

CHAPTER 6: The Way Forward: Sustainable Environmental Management in Southern Sudan



"I want you all to be doing this clean up, not because the Government has ordered you to do it, but because you want to do it, you have to keep an eye on those who throw litter with papers, bottle, plastic. Ask them to dispose of it in the right places and not to throw it on the roads here."

H.E. Lt. Gen. Salva Kiir Mayardit, President of the Government of Southern Sudan during Juba Clean-Up Campaign, 23 November 2009¹³

2. Waste Management and Pollution

In Juba and other urban centres, there is widespread pollution due to inadequate facilities for disposal of solid waste in the towns, lack of designated dumping sites and inadequate capacities of the Payam and Boma authorities in environmental management. As a result, garbage is dumped on a large scale along the roadside. Solid waste management practices throughout Sudan are uniformly poor. Management is limited to organized collection from the more affluent urban areas and dumping in open landfills or open ground¹⁴. According to a study by the University of Juba in 2009, 64% of waste generated in Juba is collected by women. Approximately 60% of the city's population burns their waste and the remaining 40% is dumped in or outside Juba. Only 26% of the waste ends up at the open landfill at Jebel Kujur. Within the boundaries of Juba most waste is dumped around several market places scattered around the city, or dumped into canals or along the riverbank. According to the same study, 95% of the population of Juba has received no waste management services to date¹⁵.

In Juba, the only dumping site that has been designated so far is located near Jebel Korok (also known as Jebel Kujur), where both solid waste (including slaughterhouse waste) and sewage water are dumped in an uncontrolled way. Heavily polluted wastewater is flowing back into the Nile through a small seasonal tributary river. Recently, people have started to settle near this dumping site in order to make a living out of the valuable items collected on these belts, or simply looking for food. Men, women and (young) children are exposed to irresponsible labour and health conditions as they scavenge in the dump site.

Through the MDTF (Multi Donor Trust Fund), an anaerobic wastewater treatment facility is currently under construction at Roton (behind the airport). This should replace the current uncontrolled wastewater dump on the Juba-Yei road. The location of the new facility is much better, since it is downstream from Juba Town¹⁶.

Solid waste collection in Juba is formally entrusted to three companies by the Coun-

13 Source: <http://www.unmultimedia.org/tv/unifeed/d/13972.html>
14 UNEP (2007)
15 Loku Losio and Tomor (2009)
16 DUVILLA, Oxfam Novib et al. (2010)

Photo:
Open dump outside Juba



ty authorities: Southern Express Ltd. (Juba Town payam), DLO (Kator payam) and Philing Environmental (Munuki payam). These companies are supposed to collect waste 1 or 2 times a week for residential areas and on a daily basis at markets, hotels etc. They are also responsible for the collection of fees. In a County Order of January 2009, the garbage collection fee rates have been established. They range from 2-30 Sudanese pounds for households (depending on the neighbourhood), while companies, ministries and NGOs all have different (higher) rates depending on their size and the nature of the waste. A major problem is that poor households do not pay, which means that the company stops collecting waste from areas where fees are not paid. According to some clients it is the other way around; the waste collectors never collect waste and therefore the clients refuse to pay the fees¹⁷.

The Juba County Commissioner has recently given out a number of local orders to prevent waste. In January 2010, a local order was issued which bans the use

of plastic bags by citizens of Juba. In Wau, Rumbek and Yei, it is reported that people burn their rubbish and the garbage that is not burned is trucked outside of town and dumped on the land¹⁸.

In October 2009, UNEP launched a DFID-funded waste management programme to establish long-term waste management capacity in Southern Sudan. To kick-start the project, UNEP has organized a clean-up campaign in Juba, in collaboration with the Government of Southern Sudan, sister UN Agencies and local organizations. The project includes an awareness raising program to encourage the citizens of Juba to adopt an environmentally friendly attitude towards the disposal of waste in the city. The initiative was launched in Juba by President Salva Kiir on November 23, 2009. Over 16,000 volunteers helped in cleaning the city and the Keep Juba Clean Committee was established¹⁹.

17 Ibid.
18 USAID (2007)
19 Source: <http://www.reliefweb.int/rw/rwb.nsf/db900sid/EGUA-7Y3NTE?Open Document>

Photos:
a/b Open dump outside Juba
c/d Garbage dumping in Juba



Box 2.1: Waste Management in Juba: Challenges and Opportunities – by David Batali Oliver, Ministry of Housing, Physical Planning and Environment²⁰

Due to the long civil war in southern Sudan the waste management infrastructure has remained underdeveloped even in the post-conflict era. Inadequate waste management as a major component of environmental sanitation services coupled with poor hygiene practices expose the majority of the population in Juba to a persistent risk of watery diarrheal and other water-borne diseases. Effective waste management can minimize or avoid adverse impacts on the environment and human beings, leading to improvement in quality of life.

Solid waste management is a major public health and environmental concern in Juba. Piles of uncollected garbage in market and other public places sometimes get rotten and impart unpleasant odours. Open defecation is common in informal settlements and in public places where there are no toilet facilities. Waste collection services are inadequate and coverage is very low, while solid wastes mixed together (unsegregated) are dumped in open or uncontrolled dumpsites at different sites within Juba (along road sides and dried seasonal streams) and its outskirts haphazardly, thus posing a serious risk to lives of those scavenging for food and other materials.

Regarding wastewater management, there is no sewerage system (network) in Juba town. Wastewater from municipal and individual installations

is discharged in open ground along Juba-Yei, which drains into river Nile. There is no treatment of the wastewater at all before discharge.

Challenges:

- The waste sector is not given priority in the government (political) agenda
- Lack of waste management legal frameworks (policy, law, regulations etc)
- Unsanitary disposal of municipal waste in uncontrolled dumpsites due to lack of sanitary landfills
- Lack of waste management plan and strategy for Juba town
- The existing waste handling capacity in terms of collection and transportation is weak and insufficient
- Lack of recycling facilities in place
- Waste generators are not responsible for their waste from “cradle to grave”
- Inadequate annual government budgetary allocations

Opportunities:

- Development of waste management legal frameworks
- Development of waste management plan and strategy for Juba town
- Public investments in projects like sanitary landfill construction, sewage treatment plants, landfill construction etc
- Encouragement of public private partnership

(investment) in waste collection services, recycling facilities etc

- Focus on waste management opens a market for equipment suppliers
- There will be opportunity for setting up waste to energy (technology) facilities
- Capacity building for concerned institutions, especially local government in order to ensure compliance and enforcement of the anticipated legal frameworks and issue provisional orders to waste management
- Waste analysis surveys and studies on other aspects of waste management provide data which can help in decision making.

In conclusion, management of waste requires commitment, resources and involvement of the community and the private sector to work with the local government. Therefore, public private partnership is the most likely feasible option, since waste management is a municipal function.



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b
c

Recommendations

- Given the rapid urbanization and high population growth in all towns and especially Juba, waste management and pollution control will become increasingly important for a sustainable development of southern Sudan.
- The recent wave of initiatives on waste management taken by GOSS and the international community needs to be applauded and further built upon. These initiatives need to be well coordinated with UNEP in a lead role (since 2009, UNEP has established an office in Juba).
- There is a need for a Master Plan for integrated waste management in Juba, based on a three-tiered approach:
 - Construction of a sanitary landfill to replace the existing open dumpsite;
 - Re-organizing the waste collection system; and
 - Developing the potential of recycling of valuable waste materials.
- There is a strong need to create awareness about the economic value of waste (through recycling or carbon credit generation) and about the positive impacts on

public health and sanitation for the population of Juba.



“The single biggest threat to the forest in Southern Sudan is bushfires and deforestation. If the right environmental policies are not put in place soon, within a decade the situation will be as serious as in most parts of Northern Uganda. All tree cover will have disappeared, and bare land will be all that is left.”

Staff member of NGO in Yei (cited in Specht and van Dorp, 2009)

3. Deforestation and Unsustainable Forest Use

The cliché image of Sudan is of a barren land with cracked soils where people have to walk days on end to find the last piece of firewood. This might be true for some parts of Darfur or northern Sudan, but in contrast, southern Sudan is richly endowed with a diversity of natural forest and woodlands. The FAO Africover project recently mapped vegetation in Sudan using remote sensing data²¹. They are probably the best source of information at present on the status of forest vegetation in southern Sudan. The area of closed to open trees is 22.87 million hectares and the area of closed to open shrubs is 33.78 million hectares, giving a total forest area in Sudan as a whole of 56.65 million hectares. No specification has been made for southern Sudan. Natural forests and woodlands of southern Sudan cover a total area of 192,000 square kilometres or about 29% of total land area²². Forest resources are generally robust, yet in some areas they have been degraded by decades of uncontrolled fire, uncontrolled grazing and over-exploitation of valuable tree species.

The Green Belt agro-ecological zone in Western, Central and Eastern Equatoria States, which receives annual rainfall between 900-1800 mm per annum, has natural forests and woodlands with many commercially valuable tree species including mahogany (*Melicia* and *Khaya* spp.), ebony and other high grade timber species. In this area, some patches of tropical rainforest can be found, especially on the border with Central African Republic, Democratic Republic of Congo and Uganda. Woodland savannah can be found in greater Bahr el Ghazal, while the flood plains and swamps of Greater Upper Nile consist of palm and acacia dominated woodlands²³.

A study carried out by ICRAF showed that southern Sudan has lost some of its forests since Sudan's independence and that deforestation is ongoing due to the total dependence on fuelwood and charcoal as the main sources of energy²⁴. Overall deforestation rates for southern Sudan are not available, but based on a number of case studies, ICRAF concludes that between 1973 and 2006, on average there has been



a
b
c
d

Box 3.1: Deforestation in Southern Sudan: an Overview - by Emmanuela Darious Lado, Ministry of Housing, Physical Planning and Environment²⁵

Southern Sudan is endowed with vast forests that are part of the larger global forest ecosystem. Among the plentiful natural resources in southern Sudan are extensive forest resources including mahogany, teak and forest products such as Shea nuts. Although these resources have never been managed in a sustainable manner, the decrease in trade resulting from the civil war has meant that many of these resources have been left untouched.

However, teak plantation forests in Central Equatoria, Western Equatoria, and Greater Bahr El Ghazal States and mahogany forests in the Imatong Ranges in Eastern Equatoria state were haphazardly harvested during the war. Following the signing of the Comprehensive Peace Agreement, a review of the concessions concluded that the contracts issued before 2005 did not conform to best forest management and harvesting protocols, thus were annulled; but as economic activity expands in many areas, and with the increased demand for timber for the reconstruction of the South, these forestry resources are under threat of being inefficiently managed and exploited.

Southern Sudan is estimated to have lost 40% of its forest since independence and deforestation is ongoing, particularly around major towns. Deforestation is mainly driven by energy needs and clearing for agricultural land. The rural population and

large parts of the urban population are dependent on fuel wood and charcoal for energy use, which make up approximately 80% of the country's energy supply. The causes behind deforestation vary considerably from region to region, and include fuelwood and charcoal extraction, shifting agriculture, drought, bushfires, direct conflict impacts and commercial lumber extraction (Wau, Western Equatoria, Yei).

There is an urgent need to address forest management issues in Southern Sudan. If well managed, Southern Sudan can support a significant wealth-creating export industry on a sustainable basis; the teak plantation alone can generate over US\$100 million per year, and mahogany reserves could be the source of substantial hard currency as well. This forest resource could constitute an alternative source of revenue to the Government of Southern Sudan than depending entirely on oil revenues.

a 2% deforestation rate, leading to a near total loss of forest cover within 50 years.

On the other hand, according to a study cited in USAID (2007), vegetation difference analysis shows "improved" or "much improved" vegetation cover in southern Sudan between 1982 and 1999. During this period, agricultural production declined

25 Based on a paper by Bartel (undated), UNEP Sudan

Photos:
a Deforestation near Kajo Keji
b Deforestation near Kimotong
c Tropical rainforest near Maridi
d Bushfire near Kajo Keji



drastically due to the war. In addition, commercial logging came to a standstill in most parts, except the above-mentioned areas (see Box 3.1). It is suggested that these two factors are responsible for the increase in vegetation in the South.

Following the formation of the Government of Southern Sudan in October 2005, the Government took drastic measures to stop illegal logging. A Presidential Decree was issued that prohibited exports of teak and mahogany from southern Sudan and which cancelled all provisional contracts signed during the war. In 2007, a Forest Policy Framework was developed.

Forests in southern Sudan provide numerous valuable ecosystem services, including economical, ecological, and recreational values. Ecological benefits include amelioration of the soil through nitrogen fixation, and providing a habitat for the rich flora and fauna of southern Sudan. Economic benefits can be categorized into three main areas:

■ Charcoal Industry

Although the pressure on forest resources is generally greater in the northern parts of Sudan, where tree cover is less extensive, felling of trees for fuelwood and charcoal is increasing in southern Sudan as well. Charcoal has become a major problem because of the demographic growth and depletion of forest resources in large inhabited areas. Also charcoal making is an attractive economic activity and more people become involved in charcoal production. The result is ongoing degradation, competition for scarce forestry resources between communities and rising prices for charcoal. Market prices vary significantly, generally prices are higher in or near urban areas where demand is highest. During a survey in February 2009, prices of one bag of charcoal ranged from 8 US\$ (near Yei and Lanya) to 28 US\$ (in Juba). During the rainy season, prices can reach up to 45 US\$ in Juba because it is more difficult to find firewood²⁶.

There is growing demand for fuelwood in southern Sudan for the purpose of brick making, for construction of houses and

other buildings. In Sudan, most of the brick making kilns have low combustion efficiencies. They are also an important source of greenhouse gas emissions. In Darfur, where bricks are produced in a similar way, rough estimates indicate that the brick kilns are consuming over 52,000 trees-worth of wood per year²⁷. There are no estimates on the volumes of wood used for brick making in southern Sudan, so it is recommended to carry out further research and come up with alternative construction solutions. One notable example is a project of SCOPE, a local Sudanese NGO from Yei, which has introduced a sustainable brick making press from South Africa for construction of houses.

■ Timber Logging and Teak Exports by Foreign Companies

Forest plantations were first set up in the 1920s under British colonial rule. They mostly consisted of teak and eucalyptus species. Some trees have even been planted as far back as 1919 by the Church Missionary Society (UK). After the second war in 1983 broke out, these Reserves were no

26 Specht and Van Dorp (2009)
27 UNEP (2008)

Photo:
Charcoal along the
road Yei – Juba



longer maintained, and people did not exploit these forests because of insecurity, although they were sometimes used as hide-outs for citizens. During the war period, a large number of timber companies from Sudan, Uganda, India and South Africa were active in Central Equatoria. They were harvesting for exports to various destinations including Asia and Europe²⁸.

Over the last years, a limited number of logging concessions have been given out to companies. One of these companies is the Equatoria Teak Company, a UK/South-Africa based company. In 2008, they were awarded a 30-year logging licence in Central Equatoria State, after they had already become active in Western Equatoria State as well. They are mainly interested in Sudanese teak, which they export as an alternative to Burma teak for the marine decking industry. They are in the process of obtaining FSC certification²⁹. These claims need to be verified, possibly with the help of an environmental NGO. In case the company is serious about its intentions to invest in a responsible manner, it could be a future

model of good practice in the forest sector in Sudan.

■ **NTFP Harvesting: Major Opportunity for Sustainable Economic Development**

Many non-timber forest products are harvested for local use and to some extent for trade as well³⁰. This includes the Shea nut (*Vitellaria nilotica*), locally known as Lulu, which is growing abundantly all over Southern Sudan, with high concentrations around Kajo Keji (Central-Equatoria), Mundri (Western Equatoria) and Wulu (Lakes State). In some areas, Shea nut tree density reached up to 70% of the natural forest. Shea nut is a small fruit which can be pressed into oil, to be used for various purposes (e.g. for production of body lotion and soap locally). At present, Sudan produces 10,000 metric tonnes per year, while estimated production potential is 100,000 metric tonnes. Only 0.2% of total sheanut production is currently exported, the majority is consumed locally³¹.

Another example is Gum Arabic, which is one of the major export products of Sudan, mainly harvested in Kordofan and Darfur (in central and western Sudan). In Eastern Equatoria, southern Sudan there is significant unexplored potential. SNV is working with local farmers to develop the value chain for gum arabic³². The gum is tapped from two species of Acacia tree, namely *Acacia senegalensis* (white bark) and *Acacia seyal* (red bark). Many local villagers in Southern Sudan are not aware of the economic value.

A last example is honey, which is collected in the wild or from natural or locally made beehives. Increasingly, farmers are using modern beehives. There is high potential for export. According to experts, Sudanese honey is superior in quality to Kenyan honey because of the rich biodiversity³³.

28 Forests Monitor (2007); Specht and Van Dorp (2009)
29 Specht and Van Dorp (2009); also refer to: <http://www.equatoriateak.com/Environment.html>
30 Amos Miteng (2007)
31 USAID (2004)
32 GOSS and SNV (2009)
33 Specht and Van Dorp (2009)

Photos:
a Poster in Kajo Keji
b Tree nursery Yei

Box 3.4: Bushfire in Southern Sudan: an Overview – by Paul Lado Demetry, Ministry of Housing, Physical Planning and Environment

Bushfire (wildfire) is one of the challenges of man versus environment conflicts in southern Sudan. Burning is embedded in the cultural values and traditional farming systems of the people. The effects of bushfire on rural livelihoods and on the ecosystem in Southern Sudan are increasingly becoming extensive and damaging. As fire regimes vary as a consequence of landscape, climatic and human factors, estimation of risk is complex. Bushfire managers typically seek to concurrently reduce the risks posed to biodiversity, people, property, air and water in fire prone landscapes. However, techniques for quantifying these risks are lacking in Southern Sudan. There is very little in the form of published data and information concerning the frequency, intensity, duration and effects of bushfire on the environment and human welfare in Southern Sudan. In the savannah and semi-arid zones where the rainy season is short and rainfall variability is high, dryness often aggravates bushfire or triggers them off, although human activities – mainly slash-and-burn agriculture and shifting cultivation, livestock production and hunting – are the most immediate causes. Studies need to be carried out to identify areas that are most at risk of wildfires as a result of natural or anthropogenic activities. Understanding which factors causes wildfires and the historical data on the risk of human-related causes of wildfires on the environment could help inform strate-

gies for fire prevention and management in Southern Sudan.

The Directorate of Environment in collaboration with Forestry Department, Wildlife Service, and the Southern Sudan Fire Brigade should design policy actions to prevent and control bushfires that cause significant or irreparable damage to people, habitat, flora, fauna, ecological balance and human environment. Two major policies can be pursued to address the problem of bushfires in Southern Sudan. The first involves policies to reduce indiscriminate burning through community education and environmental awareness programme. The second involves encouraging prescribed burning, which appears to be the most promising and viable option in the long term because it allows local people to use fire in a beneficial way only.

Recommendations:

- Set-up a system for monitoring of forest law enforcement and governance to tackle illegal logging for timber trade and charcoal production³⁴
- Provide support to the development of capacity in the field of Reducing Emissions from Deforestation and Forest Degradation (REDD)
- Explore the economic potential of sustainable harvesting of non-timber forest products, including sheanut, gum arabic and honey
- Set-up a programme for improved control of bushfires, and develop a CDM program for reduced greenhouse gas emissions due to reduction of bushfires

34 Based on the system of Independent Monitoring of Forest Law Enforcement and Governance, as successfully applied in Cameroon and Congo-Brazzaville (see: <http://www.rem.org.uk/independent-monitoring.html>)

Natural disasters in the contrasting forms of drought and flooding have historically occurred frequently in Sudan, and have contributed significantly to population displacement and the underdevelopment of the country. A silent and even greater disaster is the ongoing process of desertification, driven by climate change, drought, and the impact of human activities.
UNEP 2007 (Section 3.1)



4. Climate Change, Drought, Desertification and Floods

Climate Change poses a major threat to southern Sudan. Drought is one of the most important climate phenomena that Sudan as a whole is facing. Recurring series of dry years has become a normal occurrence in the Sudano-Sahel region. Changing climatic conditions will lead to changes in the distribution and productivity of Sudan's natural resources, having significant repercussions for millions of people that are already living in poverty³⁵.

There is clear evidence of desertification advancing southwards³⁶. This is especially felt in parts of western and central Sudan (in particular Darfur, Northern Kordofan, Khartoum and Kassala States), but the effects of the moving desert frontier will be felt in southern Sudan as well. Since the 1930s, a 50 to 200 km southward shift of the boundary between desert and semi-desert has occurred. This is expected to continue due to declining precipitation and declining reliability of precipitation.

Based on climate scenario analyses, it is expected that³⁷:

- Between 2030 and 2060, the humid agro climatic zones will shift southward, rendering areas of the North unsuitable for agriculture. Crop production is predicted to decline by 15-62% for millet and 29-71% for sorghum. The most vulnerable groups are traditional rain-fed farmers and pastoralists. This will lead to a drop in local income and food security, exacerbating recurrent famine risks – and poverty.
- The risk of reduced groundwater recharge will have serious impacts. A water resource assessment shows that soil moisture declines under future climate change conditions. In a matter of years, water availability may be the most critical issue facing parts of Sudan, and will be further exacerbated by climate change.

Much of the evidence for these findings is piecemeal, anecdotal and/or based on site-specific data, so further research is needed.

35 UNDP (2003)
36 Desertification as defined in the UN Convention to Combat Desertification, is the degradation of land in arid, semi-arid and dry sub-humid areas caused by climate change and human activities (UNEP 2007).
37 UNDP (2003)

Photo:
Digging for water in a dry riverbed near Kapoeta



Box 4.1: Let it Rain: Climate Change in the Aweil Rice Scheme³⁸

At the Aweil rice scheme, one of the few large agricultural schemes in southern Sudan located in Northern Bahr el Ghazal State, lower levels of rainfall and lower flood levels were reported in 2006. The rice scheme manager was finding it increasingly difficult to produce a good rice crop. Based on many interviews with local people and professionals in and around Aweil, a study concluded that shorter rainy seasons, reduced levels of rainfall and lower flood levels were among the most pressing environmental issues facing the area. This situation will reduce agricultural output and livestock carrying capacity. Mitigating measures taken locally are unlikely to change the wider, perhaps global, trend, and therefore the population must adapt to those changes through environmental management strategies such as modified agricultural and range management practices.

In the same study, it was found that reduced rainfall and higher dry season temperatures were the main environmental issues in Yambio (Western Equatoria State). All over southern Sudan, people confirm that rainfall patterns have changed and that rain has become less frequent over the past decades.

Despite serious water shortages, floods are common in Sudan, including southern Sudan. They consist of two types: localized floods, caused by exceptionally heavy rainfall, and runoff (flash flooding) and widespread floods caused by overflow of the river Nile and its tributaries. The floods cause major damage to villages and urban and agricultural areas located in catchment and drainage zones. Sudan has been severely hit by a series of floods over the last years. Although floods have always occurred, the magnitude and impact have never been so severe. Especially in 2007, when an estimated 400,000 people were displaced, the floods were called “the worst in living memory in Sudan” (see Box 4.2).

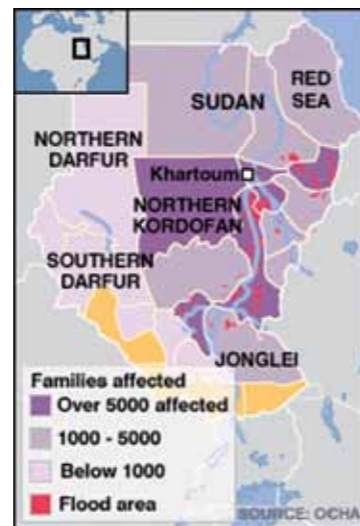
Box 4.2: Here Comes the Flood: Disaster Hitting Sudan in 2006, 2007 and 2009³⁹

Aug 14, 2006 (Sudan Tribune) – Heavy floods have forced more than 1,100 families to flee in Sudan, while the river Nile has risen to a serious level, an official said on Monday. The Nile in Khartoum was at 16.40 metres on Sunday, above its height on the same day in 1988, when scores of people were killed and hundreds of thousands lost their homes due to heavy rains and floods. Heavy floods have been common in the past few years in Sudan’s east along the Blue Nile but happen more rarely in the capital and the north, where much of Sudan’s population live.

September 4, 2007 (Reuters) – The death toll from the worst floods in Sudan in living memory rose to 122 with the death of eight people in heavy rains which swept away houses and brought down electric cables, an official said on Tuesday. The U.N. humanitarian aid agency OCHA says the flooding in Africa’s largest country has made at least 200,000 people homeless and has destroyed roads, schools and access to clean drinking water. The government says the floods have damaged or destroyed over 50,000 hectares (125,000 acres) of agricultural land and killed some 36,000 head of livestock across Sudan, where most people depend on farming and livestock for their livelihoods. On 21 July, the Government of Southern Sudan issued a flood disaster declaration in six states. The floods hit hardest in Renk County in Upper Nile.

20 Jan 2009 (ClimateChangeCorp) – More than 40,000 people have been displaced by severe floods

pushing through southern Sudan amid pleas for international help . The flooding is concentrated in the country’s southeastern Jonglei state, where the Nile River spilled over its banks and drenched the rural province last week. Also, the floods have ravaged many farms in the area, cutting off a major source of food for locals. The floods are extremely rare considering that this is southern Sudan’s dry season, and heavy rains are almost unheard of this time of year. Juba, Sudan, the nearest major city to the Jonglei province, on average receives only 5 mm of rain during the month of January.



Recommendations:

To prepare for the impacts of climate change and increased natural disasters, there is a need for:

- Increased attention for disaster risk reduction and mitigation measures
- Awareness raising of the population on the issues of climate change and disaster preparedness
- Ensuring that sufficient funding for reduced emissions from deforestation and degradation (under the REDD scheme) is channelled through civil society actors and grassroots structures, to empower local communities for the fight against desertification
- Ensuring that SSLA is regularly updated on the changing conditions regarding climatic conditions in southern Sudan so that policy implementation can be monitored and reviewed.

39 Sources:
2006: <http://www.sudantribune.com/spip.php?article17083>;
2007: <http://www.reliefweb.int/rwarchive/rwb.nsf/db900sid/LRON-76QHSR?OpenDocument&rc=1&emid=FL-2007-000093-SDN>;
2009: <http://www.climatechangecorp.com/content.asp?ContentID=5909>



Tribal and small-scale conflicts fought only with small arms have occurred continuously throughout the history of Sudan. Their causes are generally poorly recorded, but include disputes over cattle theft, access to water and grazing, and local politics.

UNEP 2007 (Section 4.2)

5. The Relation between Natural Resources, Environment and Conflict⁴⁰

The relationship between natural resources, the environment and conflict is multi-dimensional and complex. Three principal pathways can be drawn⁴¹:

- Contributing to the outbreak of conflict: attempts to control natural resources or grievances caused by inequitable wealth sharing or environmental degradation can contribute to the outbreak of violence.

- Financing and sustaining conflict: once conflict has broken out, extractive “high-value” resources may be exploited to finance armed forces, or become strategic considerations in gaining territory. In such cases, the duration of conflict is extended by the availability of new sources of financing, or complicated by efforts to gain control over resource-rich areas.

- Undermining peacemaking: the prospect of a peace agreement may be undermined by individuals or splinter groups that could lose access to the revenues generated by resource exploitation if peace were to prevail. Once a peace agreement is in place, the exploitation of natural resources can also threaten political reintegration and reconciliation by providing economic incen-

tives that reinforce political and social divisions.

Regarding the issue of control over natural resources, it is noted that 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 today⁴². The second issue, financing and sustaining conflict, can be illustrated by the exploitation of timber in southern Sudan. 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 civil war. Timber became part of the war economy⁴³. Also bushmeat was hunted to feed the soldiers fighting in the bush during the war. Regarding the third issue, control over oil fields remains a dividing factor in Sudan. A case study on the oil-rich area of Abyei shows that the combination of oil exploration, influx of returnees since the end of the war, desertification and presence of military forces are all leading to increased demand for natural resources and there-

fore also for an increased pressure on, and competition over, these resources⁴⁴.

Tribal and small-scale conflicts fought only with small arms have occurred continuously throughout the history of Sudan. Their causes are generally poorly recorded, but include disputes over cattle theft, access to water and grazing, and local politics⁴⁵. Conflicts over use of scarce resources are common in most parts of southern Sudan. Normally conflicts over scarce resources arise from incompatible interests of the users. Pressures on water and land resources have greatly increased in recent years, with increased farming and pastoralist activities, extreme climatic shocks and harsh environmental conditions. Also, conflicts involving pastoralist communities associated with resource competition, cattle rustling, and availability of small firearms are widespread and of increasing concern in southern Sudan.

The causes of resource-based conflicts in southern Sudan are varied, ranging from historical grievances, socio-economic

problems and migration for access to use of natural resources, mainly land for cultivation and grazing, and water for humans and livestock. The major causes of conflicts in the region are attributed to tensions exacerbated by the mounting pressures due to growing populations, resource depletion as a result of over-exploitation and environmental degradation.

The major resource-based conflicts in southern Sudan occur in the Nile and Sobat rivers zone in Upper Niles State between the Nuer and Dinka ethnic groups, in Central Equatoria State between the Mundari and Bari communities, in Central and Jonglei States between Mundari and Dinka and between Bari and Dinka pastoral communities.

There are a number of factors contributing to resource-based conflicts in southern Sudan:

- Lack of appropriate land tenure policies: Most of the pastoralist communities in southern Sudan still rely on traditional livestock rearing. During the dry season, the cattle owners leave their permanent settle-

ments and move with their cattle to temporary encampments close to where pastures and water are available. Eventually, they encroach into the territories of neighbouring pastoral communities. This movement often causes conflict with the host communities. Most of the pastures in southern Sudan are communally managed under traditional governance systems.

- Competition for available land: The major economic activities in southern Sudan are subsistence farming and pastoralism. These are both activities that require land for which there is competition as it becomes scarce due to other factors. This leads to increased competition for available land between farmers, pastoralists and wildlife.

- No equitable access to water resources: Resource scarcity for both pastoralists and farmers has been worsened by the prolonged periods of drought and widespread environmental degradation. As a result, during the dry season pastoralists are compelled to move temporarily towards the

Nile to the *toic* area (a lowland grassland), where large concentrations of livestock populations compete for an already dwindling resource base. The high demand for water may affect user communities downstream, thus leading to conflicts

- Climate variability: The variable rainfall patterns in southern Sudan affect availability of water and pastures. The unpredictable and low annual rainfall due to climate change in the pastoralists' areas cannot regenerate sufficient pastures for large concentrations of animals. This has led to increased migration of cattle herders in search of water and pastures, and as a result conflicts are likely to increase as well.

- Proliferation of small arms: The small arms and light machine guns are not a cause of conflict, but their proliferation from the civil wars in southern Sudan in terms of accessibility and low cost triggers conflicts. As a result, people tend to resort to violent confrontation instead of engaging in peaceful resolution of their conflicts, at-



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tributed to competition over resource use. The proliferation of small arms is seen as a driving force for cattle rustling.

■ **Weak traditional governance systems:** Formerly, the traditional administrative system (Chiefs, elders, traditional courts, etc.) responsible for governance of the community under the auspices of the local government authorities used to hold inter-tribal annual meetings for the conflict-ridden communities, especially the pastoralist and farming communities. The purpose of these meetings is to agree on allocation procedures for the available resource base. With the weak traditional governance institutions, which in most cases no longer exist, the capability to resolve and control disputes among pastoralists has been rendered ineffective.

Southern Sudan has diverse multi-ethnic groups, which include the Nilotics, Nilo-hamites, Bantu, and Sudanese ethnic groups. The Nilotic ethnic group comprises mainly of the tribes of Dinka, Nuer and Shilluk. The Murle, Toposa, Mundari and

Bari speakers form the Nilo-hamites ethnic group. Finally, the tribal groups of Azande in Western Equatoria and the Fertit tribes in Western Bahr el Ghazal constitute the Bantu and Sudanese ethnic groups. The ethnic diversity of the area creates a potential for resource-based conflict as these diverse groups have different and conflicting interests in the resource base and may claim rights over the resource. However, ethnic diversity may be an advantage in enhancing and improving natural resource management where there is competition among the user communities over the resource base. This can be an opportunity to prompt the need to grant local communities in southern Sudan rights to have control over the management of the natural resources.

Resource based conflicts in southern Sudan can be divided as follows, based on their geographical distribution:

Greater Upper Nile:

The major resource-based conflicts in this region are between the Dinka, Nuer and Murle, who are all agro-pastoralists.

Photos:
a Demining near Kajo Keji
b Warning for mines near Juba
c Grass burning near Juba
d After the grass burning near Kimotong

■ Nile and Sobat River Zones: During the dry season all the Nuer and Dinka groups migrate to this area, where there are permanent supplies of water and pastures for their livestock. In the Nuer areas the prolonged dry season may last for about five months, during which conflicts tend to increase on the Nile and Sobat Rivers Zone as the concentration of people and livestock increases, thus causing competition over the scarce grazing land, water and fishing grounds. Other conflicts occur between the pastoralist communities in the area and the nomadic group of Ambororo from northern Sudan, who have penetrated deep into areas of southern Sudan in the Upper Nile region.

■ Bentiu Area: Due to reported serious environmental degradation, oil exploitation in Bentiu has caused massive displacement of the local population from areas of western Nuer.

■ Upper Nile/Southern Kordofan Border Area: Two types of conflicts emerge in this area: firstly, on the use of pasture land and

access to water along the river Nile due to southward movement of Arab nomads to access the swamp pastures of Shilluk communities; secondly, collection of Gum Arabic by Arab traders in areas of Upper Nile state.

Northern Bahr el Ghazal State:

The Kiir (Bahr el Arab) Zone is a transitional zone linking the southern and northern Sudan. It extends from Sudan's western borders across the southern parts of Darfur and southern Kordofan to the borders with Upper Nile. It is a meeting point for the Dinka of Northern Bahr el Ghazal and the Baggara, mainly the Messiriya and the Reizagat pastoralists. The resource-based conflict in the Kiir (Bahr el Arab) area is mainly attributed to competition over grazing land and water as a result of the increased pressure on the resources of Kiir River by the concentration of human and livestock populations.

Central Equatoria and Jonglei States:

The three communities of Bari, Mundari and Dinka Bor occupy the area along the

Box 5.1: Landmines and their impact on the environment - by Isaac Woja, AWEPA Juba Office

Landmines are ammunitions that are placed under, on or near the ground or other surface designed to be detonated or exploded by the presence, proximity or contact of a person or vehicle, i.e., they wait to be activated to detonate. There are mainly two categories: 1) Anti-personnel mines, which are either blast or fragmentation mines meant to maim, and 2) Anti-tank mines.

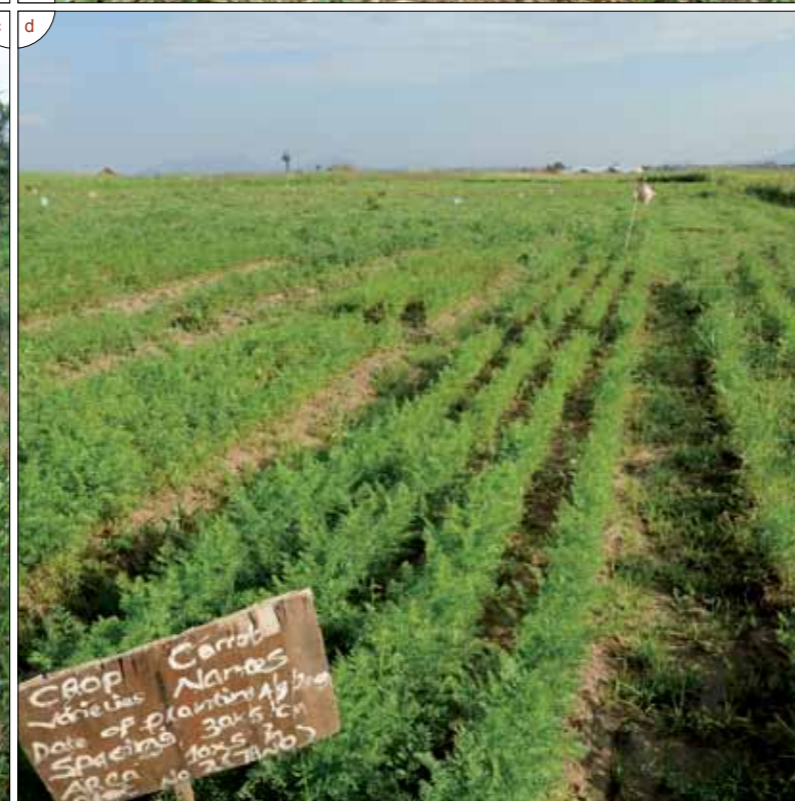
The estimated number of landmines in Sudan is 2 million, of which an estimated 1.3 million are found in southern Sudan. Although nobody knows exactly how many landmines were planted during the war time, what is known is that landmines continue to claim many human victims, many of whom are civilians. In this context the landmine

threat goes far beyond the killing, maiming and injury of thousands of individuals every year, but the loss of fertile agricultural land and access to water points are among the most serious effects in the rural areas.

Surveys done in Sudan stated that it is impossible to estimate the number of UXOs (Unexploded Ordnance). In southern Sudan the number of UXOs exceeds the total estimated number of landmines. The threat posed by UXOs is that in local economies, civilians value UXOs for their value as scrap metal or building material, while risking their life. Children may be killed or injured while playing with the items of UXO. Mine Risk Education (MRE) is an important pillar because it creates awareness in the local communities, as well as with Internally Displaced People and refugees coming into the area.

river Nile, which supports their livelihoods as agro-pastoralists in Central Equatoria and Jonglei States. Resource-based conflicts occur between the Bari and Mundari communities due to competition over use of land for grazing and farming, between Mundari and Dinka communities on access to use of resources, and between Bari and Dinka communities over use of land for grazing and farming.

In addition to the above mentioned conflicts between different ethnic groups, oil exploration is an important cause of conflict as well. Oil exploration is mainly concentrated in the central flood plains of Jonglei, Lakes and Upper Nile States. Oil exploration reportedly has significant negative impacts on the livelihoods of the local communities, especially in areas inhabited by the pastoralist communities. It has been considered as an important factor in provoking local



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conflicts. Oil exploration is not dealt with further here as it is beyond the scope of this report⁴⁶.

Recommendations

- Effective institutional arrangements for conflict resolution and clear natural resources management structures have to be established to avoid conflicts among different resource users.
- Bring the issue of environmental degradation and ecologically sustainable rural development to the forefront of peacebuilding activities in Sudan.
- Bring natural resource assessment and management expertise into the existing peacebuilding and peacekeeping efforts in Sudan, including UNMIS (United Nations Mission in Sudan) and national or international NGOs.
- Support local communities and grass-roots organizations to develop the capacity to monitor natural resource based conflicts and to develop early-warning systems for the prevention of conflicts.

46 An excellent source of information about the impacts of oil in Sudan is the European Coalition on Oil in Sudan (<http://www.ecosonline.org/>)

Photos:
a/b Tree nursery near Kajo Keji
c Maize planting, Maridi
d Crop nursery Yei



Just as environmental degradation can contribute to the triggering and perpetuation of conflict, the sustainable management of natural resources can provide the basis for long-term stability, sustainable livelihoods, and development.

UNEP 2007

6. The Way Forward: Sustainable Environmental Management in Southern Sudan

This report has highlighted the major environmental challenges that southern Sudan is facing. A shortage of potable water inhibits agriculture, animal husbandry, and human settlement in many areas. Serious health problems are caused by water-borne diseases due to lack of clean water sources and uncontrolled dumping of waste in streams and rivers. Increasing amounts of solid and liquid waste are produced in Juba and other urban centres, leading to pollution, both in towns and in and near uncontrolled dump sites. Deforestation is increasing due to slash and burn agriculture and wood cutting for charcoal production. Agricultural land is threatened by the advance of the desert. These challenges will be exacerbated by climate change. Last but not least, disputes over natural resources and grazing land are a major cause of conflicts.

This rather gloomy picture can still be turned around. Appropriate measures need to be taken to protect the environment and to ensure that the huge economic potential of southern Sudan is exploited in a sustainable way. Given the dependence of the people of

southern Sudan on the rich natural resource base, there is a strong need for all stakeholders to make sustainable environmental management a top priority. The following recommendations have been formulated based on the conclusions of this report.

Recommendations to the Government of Southern Sudan:

- Improve the policy and legislative framework for environmental management and conservation
- Build capacity at all levels of government in the field of environmental governance and natural resource management
- Improve capacity for regular recordkeeping of environmental data (beyond aerial surveys)
- Create an enabling environment for sustainable economic development
- Develop and implement appropriate Environmental Impact Assessment tools and guidelines, especially for large-scale infrastructure, agricultural and mining projects
- Preparation and Implementation of Protected Area Management Plans
- Set-up a system for monitoring of forest

law enforcement and governance to tackle illegal logging for timber trade and charcoal production

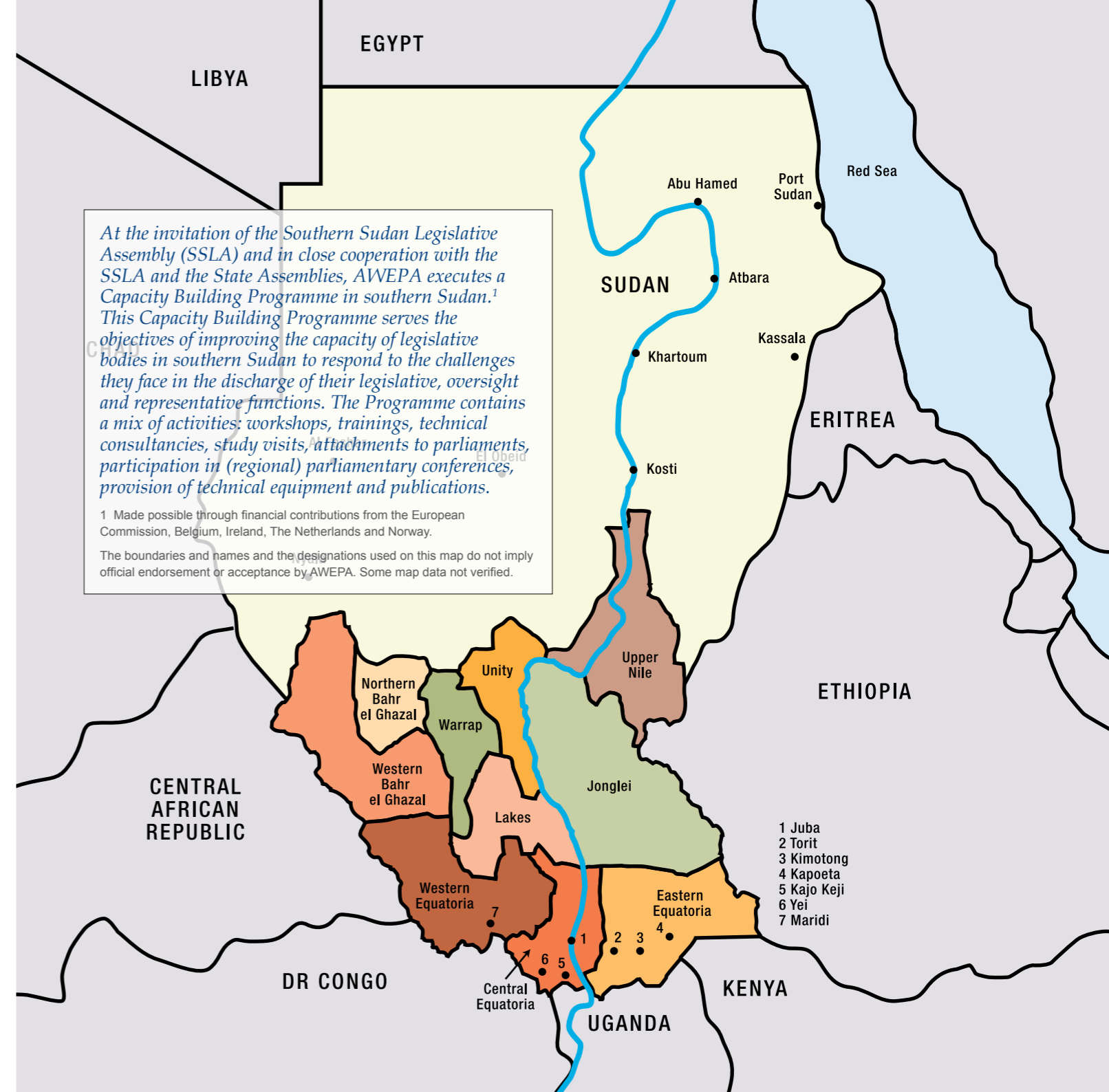
Recommendations to the Southern Sudan Legislative Assembly:

- Increased efforts for environmental laws and policies to be developed
- Disseminate information and raise awareness of the public to change environmental behavior
- Improved monitoring of government action regarding environmental governance
- Ensure that appropriate Environmental Impact Assessment tools and guidelines are developed and implemented

Recommendations to the international community (UN agencies, donors, NGOs and private sector):

- Promote sustainable economic development by supporting economic programs of both public and private sector that are based on the 3P principles (People, Planet, Profit), with a focus on development of sustainable agriculture, forestry and fisheries and of eco-tourism

- Support the Government of Southern Sudan in preparing for the influx of foreign investors in agricultural development for large-scale food production and biomass development for exports, and support them to develop policies and laws to regulate this development
- Integrate environmental management in emergency aid and development programmes
- Stimulate the development and implementation of Community Based Natural Resource Management programmes for the sustainable use of natural resources, especially forests, wetlands and fisheries
- Support to the development of capacity in the field of Ecosystem-based Adaptation to climate change and in the field of Reducing Emissions from Deforestation and Forest Degradation (REDD)



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