



UNIVERSITY OF GOTHENBURG  
SCHOOL OF BUSINESS, ECONOMICS AND LAW

## Sudan Environment and Climate Change Brief<sup>1</sup>

### Amendment to the Sudan Environmental Policy Brief (2007)

2011-02-09

This Brief builds on the previously developed Sudan Environmental Policy Brief (annexed), and aims at providing updated information related to key environmental (including ecosystem services, climate change, and disaster risk reduction) challenges and opportunities related to poverty, economic growth, peace building and governance in Sudan, since 2007. The purpose of this amendment is to, alongside the Environmental Policy Brief, be used as background information to Sida when elaborating the “Bedömningsunderlag” as a part of the Swedish cooperation strategy process.

In the Brief we attempt, to the extent possible, to use disaggregated data for the northern and southern parts of Sudan. However, as indicated in the Sudan Environmental Policy Brief (2007) data quality is poor and figures should be regarded as indicative.

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### 1. Introduction

According to data from the Population and Housing Census, the total population of Sudan in 2008 was over 39 million, of which close to 60% lives in Northern Sudan, 19% in Darfur, and 21% in Southern Sudan.<sup>2</sup> The population growth is very high (2.5%) and Sudan is one of the world’s fastest growing countries. About 60% of the total population<sup>3</sup> (83% of the population in Southern Sudan<sup>4</sup>) are rural.

In the January 2011 referendum, a vast majority (almost 99%) of the Southern Sudanese voted to secede from the north, whereby a new country is likely to be announced in July 2011. The future border, in the oil-rich area between north and south, is still to be agreed. Most of the significant oil reserves are in the south, although the export pipeline that runs to the Red Sea is in the north.

<sup>1</sup> This Policy Brief was written at the request of Sida (att: Per Karlsson and Maria Berlekom) by Gunilla Ölund Wingqvist at the Environmental Economics Unit (EEU), Department of Economics, University of Gothenburg, as part of Sida-EEU’s institutional collaboration on environmental economics and strategic environmental assessment. Comments can be directed to [gunilla.wingqvist@economics.gu.se](mailto:gunilla.wingqvist@economics.gu.se). The views expressed in this Policy Brief are those of the author and do not necessarily represent the views of Sida.

<sup>2</sup> Official census data (DRDC, 2010).

<sup>3</sup> FAO Country Profiles – Sudan, website.

<sup>4</sup> SSCSE, 2010.

## 2. Poverty, economic growth and the environment

The key environmental challenges in Sudan include: land degradation, deforestation, water scarcity and pollution, and natural disasters and climate change. ***The most important impacts include reduced agricultural productivity and substantial socio-economic costs in terms of mortality and morbidity from air and water pollution.***

The environmental challenges are often linked and mutually reinforcing, and impact on poverty, food security, long-term economic growth and the peace process. In addition, also biodiversity loss (for instance loss of wild life, mostly due to habitat destruction) and pollution to air and soil could be included in the list.

The size of Sudan's economy has grown five-fold since the onset of oil extraction in 1999. Prior to the financial crisis Sudan's economic growth was around 10%, mainly driven by the oil sector and enabled by macroeconomic stability. However, the economic growth has largely been a "job-less growth" leaving many poor people without development benefits. Due to the financial crisis the economic growth halved in 2009 and 2010, to around 5%.<sup>5</sup> The over-reliance on oil exports makes the country vulnerable to corruption, volatile global markets, and the risk of crowding out other economic sectors is large. Necessary policies, efficient institutions and good governance must be established to help diversify the economy and share the prosperity, in order to manage the economic and political risks.<sup>6</sup>

Despite the economic growth (centred around urban areas and in northern states), poverty is widespread; 40% of the total population, and 51% of the Southern Sudanese<sup>7</sup>, live below the poverty line (however, poverty rates up to 90% in Southern Sudan are reported<sup>8</sup>). There is an almost complete lack of services in parts of Sudan, very high illiteracy rates (especially in the Southern part and especially for women and girls), and the infrastructure is tattered after the many years of conflict.

Although the agricultural productivity fell (both yields per hectare and as a share of GDP, especially in northern parts) after the oil was found, the agricultural sector continues to play an important role in the country's economy. It contributes with about a third of the GDP, and employs 80% of the work force (about half of the total population). However, the ***environmental challenges, such as land degradation, water scarcity, pollution and climate change, pose threats to the agricultural productivity*** and thus food security, which remains one of the biggest challenges in Sudan: 7.5 million people (20% of the total population) are undernourished, 41% of the children are malnourished, and 43% of the children have a stunted growth.<sup>9</sup> Child mortality rate and child under-nutrition is highly correlated.

Much of Sudan is comprised of arid lands and desert; about a third of the total land area is arable. The agricultural sector is dominated by small-scale farmers, relying on rain-fed and traditional practices. Drought is common and chronic drought is one of the major climate risks facing Sudan, with reduced rainfall and increased rainfall variability, particularly in the northern parts. Ironically, also devastating floods occur during exceptionally wet periods, mostly along the floodplain areas of south-eastern Sudan. Impacts of droughts and floods include loss of life, crops, livestock; spreading of water- or vector borne diseases; reduced

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<sup>5</sup> CIA Factbook, Sudan.

<sup>6</sup> World Bank, 2009.

<sup>7</sup> SSCSE, 2010.

<sup>8</sup> World Bank (2010) states that 90% of the population in Southern Sudan earns less than \$1 per day.

<sup>9</sup> FAO Country Profile Sudan, website.

hydropower production; and damage to infrastructure. Drought is one cause of migration. Climate change is expected to add to these already existing stresses. Sudan needs to develop capacity for *disaster risk reduction* as well as *climate change adaptation*.

Thus, the *agricultural sector* is important for food security, contributes significantly to the GDP and provides important livelihood opportunities especially for the rural poor. Improved agricultural productivity is, amongst others, depending on tenure security, the ability to manage land and water resources, adapt to climate change, and improve access to markets. The lack of infrastructure is a constraint; for instance has Southern Sudan only about 100 km of paved roads<sup>10</sup>. Secure access to agricultural land (security of tenure) also for returning Internally Displaced Persons (IDPs), is a daunting task for the peace process and closely linked to the willingness to make long-term investments to improve the productivity of the property.

Lack of access to clean *water, sanitation and hygiene* (WSH) is a large cause of ill-health and child mortality in Sudan (with a graver situation in the south where 80% of the population does not have access to any toilet facility). The costs of WSH health effects and mortality from outdoor air pollution have been estimated to amount to around 4.8% of GDP in 2008 for Sudan (land degradation, deforestation, water insecurity, loss of ecosystem services or effects of climate change or disasters, have not yet been included in these cost estimates).<sup>11</sup> In addition, due to the very high dependency on solid fuels for cooking (96% in Southern Sudan<sup>12</sup>), the indoor-air pollution poses a serious health risk, especially to women and children.

*Livestock*, the main productive household asset in the south and for a significant minority in the north, have been affected by uneven distribution of water and deteriorating grazing land. The massive *deforestation*, especially in the northern parts, results in loss of valuable ecosystem services such as fuel wood, wild life, and building materials, but also regulation of water run-off and local climate. As *droughts and floods* are becoming more frequent, it is important that the ecosystems are properly managed, and disaster risk reduction together with climate change adaptation measures are of increasing importance to manage i.a. food security risks and promote livelihood opportunity options for the poor.<sup>13</sup>

Sudan is one of the countries where there are international interests in *acquiring farmland*. There are examples where these types of investments provided large and sustained benefits to the local populations. However, generally in Africa these types of investments have not reached their full potential in terms of productivity or poverty reduction due to ill defined land and resource rights, failure to protect local communities' land rights, and weak institutional capacity. Without adequate institutional capacity, there may be a risk for conflict and environmental degradation.<sup>14</sup> In order for Sudan to benefit from foreign investments in farmland, the institutional capacity should first be further developed.

### **3. Peace building and the environment**

While scarcity of water poses a risk to *i.a.* health, food security and economic growth, *water resources are also linked to the peace building process*. After secession from the north,

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<sup>10</sup> The Economist, Jan 6<sup>th</sup> 2011.

<sup>11</sup> Larsen, 2010.

<sup>12</sup> SSCSE, 2010

<sup>13</sup> UNDAF for Sudan, 2008

<sup>14</sup> World Bank, 2010b

Southern Sudan will become the 11<sup>th</sup> riparian state of the Nile basin. It is vital that the riparian states agree on utilisation, allocation and benefit sharing principles. Climate change is emphasising the need to take an integrated approach to water resource management. Ability to utilise its water resources, for instance for electricity production and irrigation, will affect South Sudan's development opportunities, but any development of the water resource will have to be negotiated and agreed with other riparian states. The stands of South Sudan on transboundary water may not be the most urgent issue to deal with, but as it may affect the power balance in the basin great care should be taken. Currently, the Southern Sudan government lacks skills and competencies on transboundary waters.<sup>15</sup>

Instability and competition, often over scarce natural resources, unbalanced development, and persistence of large spatial, regional and ethnic disparities within Sudan, are identified as key challenges to the peace-building process in Sudan. Lack of inclusive development is one of the main reasons for post-conflict relapses in the world. Therefore, it is crucial that Sudan not only sustains the rapid growth but also make it more broad-based and inclusive. The World Bank identifies *agriculture as the sector with the highest potential for economic diversification, and the engine of broad-based growth and poverty reduction; all much needed for continued peaceful development*. This means that environmental risks, such as climate change, disasters, water scarcity and land degradation, need to be managed and that a sound land tenure policy is put in place.<sup>16</sup>

The conflicts have left complex and highly sensitive issues related to land tenure and ownership. There is a risk of increased competition between returnees and the local populations for services and resources (including land). Hence, inclusive and balanced access to services (water, sanitation, infrastructure, schools, health facilities), and resources (such as land and other natural resources), is important.

The cost of civil war is immense, with both direct (human losses, health costs, destruction of capital, etc.) and indirect effects (reduced savings, lower human capital accumulation, reduced trust in society, etc). Research points to a total cost of the conflicts in Sudan of \$46 billion, which is about twice the size of Sudan's external debt. Researchers also note that economic growth is related to the ability to introduce democracy and – at least some degree of – competitive political participation combined with the ability to stay away from ethnic-based agendas that favour one group at the expense of others.<sup>17</sup> Thus introducing democracy, promoting inclusive development and broad-based economic growth is of outmost importance to the peace process, and closely linked to access to land, grazing, water and sanitation, food, shelter, electricity, etc, all which depend on a healthy and well managed environment.

#### **4. Governance and the environment**

The government of Southern Sudan has limited experience of collecting taxes or user charges, or providing public services (which largely have been provided by NGOs). The administrative foundation is very weak and not equipped to address the development challenges facing Southern Sudan. Southern Sudan has weak traditions of governance, relatively high levels of oil revenue and low levels of human capacity. These features, combined with a tension between making the best use of the most experienced civil servants and making sure that the civil service is diverse and large enough to accommodate ex-combatants, military leaders and

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<sup>15</sup> Granit et al. (2010)

<sup>16</sup> World Bank, 2009

<sup>17</sup> Bodea et Elbadawi, 2008.

different ethnic groups, the risk of failure and corruption is high. It would be a challenge also for a well developed and experienced government to manage the resources efficiently and deal with risks associated with dependence on natural resource rents. Of particular interest are the volatile revenues and the absence of a government- tax-payer relationship, which inhibits accountability.<sup>18</sup>

Measures to combat corruption is important also for natural resources, as high-value natural resources (such as oil and timber) are associated with corruption, rent seeking and lack of transparency and accountability. Corruption is perceived as the foremost problem of the government of Southern Sudan<sup>19</sup>. Accountability could be strengthened both from the demand-side (civil society, independent media, donors) and supply-side (i.a. standardised systems, trained staff, effective internal audit, independent and effective judiciary, efficient public financial management systems, etc.). Good governance structures and strong institutions combined with environmental safeguards and distributive policies are likely to enhance the opportunities to translate the oil revenues into development and diversify the economy. Effective regulation and tenure security, for communities and returning IDPs, should be implemented. Policy instruments (such as taxes, subsidies, information), providing incentives to improve the agricultural productivity and manage natural resources and the environment in a sustainable way, should be introduced.

## **5. Conclusion**

Sudan is richly endowed with natural resources, such as oil, forests, land and fisheries. The primary engine for economic growth is the oil sector. However, the country has not succeeded in transforming the natural resource wealth into broad based development, leaving large spatial, regional and ethnic disparities within Sudan. This unbalanced development is a key challenge to the peace process.

The environmental challenges, including land degradation, water scarcity, pollution, natural disasters and climate change, pose threats to the agricultural productivity and are associated with substantial socio-economic costs, in terms of for instance mortality and morbidity from lack of water, sanitation and hygiene, and air pollution. In order to enhance the agricultural productivity measures need to be taken to, amongst others, improve property rights institutions and the ability to manage land and water resources, thus adapting to climate change, and improve access to markets.

The heavy reliance on oil export makes the country vulnerable to corruption and volatile global markets. There is also a great risk that other economic sectors are crowded out. Necessary policies, efficient institutions and good governance must be established to help diversify the economy and share the prosperity in order to manage the economic and political risks. The agricultural sector is identified as the sector with the highest potential for economic diversification, and an engine for a broad-based economic growth.

Good governance, transparency and accountability are important also for managing the natural resources. Strong and competent (judiciary, property rights, auditing) institutions, effective regulatory systems, trained staff, effective financial management systems and the ability to obtain inclusive development and provisioning of services, will be important for a peaceful development in Sudan. Economic diversification and improved agricultural

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<sup>18</sup> World Bank, 2010.

<sup>19</sup> World Bank, 2010.

productivity will also require capacity to manage land and water resources equitably, efficiently and sustainably. Although these features are far from reality, especially in Southern Sudan, support to develop necessary capacities and institutions appears to be critical.

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**Annex 1: Sudan Environmental Policy Brief, December 5, 2007**

**Sudan Environmental Policy Brief<sup>20</sup>**

*December 5, 2007*

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**Introduction**

Sudan is richly endowed with natural resources such as oil, forests, agricultural lands and fisheries. However the potential for transforming this natural resource wealth into broad based economic development has not been realized. Sudan's long history of conflict, combined with irrational utilization of natural resources, has created a range of critical environmental challenges. This Environmental Policy Brief aims at briefly presenting these environmental challenges, their links to conflicts and poverty reduction and the implications for Sida supported activities in Sudan. The policy brief has been written as an input to the ongoing process to draft a new Swedish cooperation strategy for Sudan.

The policy brief is based on a desk study conducted in October-November 2007. The key source is the recent 350 page UNEP report "Sudan Post-Conflict Environmental Assessment" (2007)<sup>21</sup>. The report is based on extensive field work, research surveys and stakeholder consultations and should be regarded as an important input to Sida's overall poverty analysis for Sudan. Other sources of information for the Policy Brief, including a short Country Environmental Profile published by the European Commission, are listed in the references. Since most environment related data is very poor in Sudan figures in this report should be regarded as indicative.

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<sup>20</sup> This Policy Brief was written at the request of Sida (att: Anna Tufvesson) by Emelie Dahlberg and Daniel Slunge at the Environmental Economics Unit (EEU), Department of Economics, Göteborg University, as part of Sida-EEU's institutional collaboration on environmental economics and strategic environmental assessment. Comments can be directed to [Daniel.Slunge@economics.gu.se](mailto:Daniel.Slunge@economics.gu.se). The views expressed in this Policy Brief are those of the authors and do not necessarily represent the views of Sida.

<sup>21</sup> When no other source is indicated, the finding in the policy brief refers to the UNEP study.

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## **Key environmental issues**

Sudan is the largest country in Africa and has diverse climatic and ecological conditions. Somewhat simplified it can be divided into three main ecological zones: (i) the desert and the semi desert zones of the north (50% of the territory); (ii) the low and high rainfall woodland savannah (40%); (iii) the swamps (10%)<sup>22</sup>. Average rainfall ranges between almost nothing in Northern Sudan to about 1400 mm in Southern Sudan. UNEP identifies several important environmental issues<sup>23</sup> of which we consider the following to be most important from a conflict and poverty reduction perspective:

***Land degradation and desertification:*** loss of soil fertility and physical loss of soil due to erosion and desertification are critical issues throughout the country. Almost 30 % of Sudan is classified as desert. An estimated 50 to 200 km southward shift of the boundary between semi-desert and desert has occurred since the 1930s. Most of the remaining semi-arid and low rainfall savannah, representing approximately 25% of Sudan's agricultural land, is at considerable risk of further desertification. Desertification is projected to continue to move southwards due to climate change and changing rainfall patterns causing an estimated 20% drop in food production. Land degradation is mainly caused by overgrazing, inappropriate agricultural practices and deforestation. The rapid population growth and growth in livestock has led to a marked increased demand for lands for grazing and agriculture<sup>24</sup>.

***Deforestation:*** Rampant deforestation led to a loss of about 11% of Sudan's forest cover between 1990 and 2005. Big regional differences exist: two-thirds of the forests in north, central and eastern Sudan disappeared between 1972 and 2001. In Darfur, a third of the forest cover was lost between 1973 and 2006. Southern Sudan is estimated to have lost 40 percent of its forests since independence and deforestation is ongoing, particularly around major towns. Deforestation is mainly driven by energy needs and agricultural land clearance. The rural population and large parts of the urban population are dependent on fuelwood 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. Key causes include: i) unsustainable extraction of fuelwood and charcoal in northern and central Sudan; (ii) Pressure from Internally Displaced Persons (IDP) camps all over the country (especially in Northern Darfur); (iii) mechanized agriculture have resulted in large amount of woodland being cleared in central Sudan; and (iv) unsustainable agricultural land-use practices in Southern Sudan and Darfur.

***Water scarcity and pollution:*** Sudan is one of few countries in the world where the share of people with access to safe drinking water has declined over the past decade. This is a key cause of child mortality and poor health. In northern Sudan 70 % of the population is estimated to have access to an improved water source. However, this conceals important regional variations, ranging from 24 % in Blue Nile state and over 90 % in Khartoum state. In Southern Sudan 30% of the population is estimated to have access to safe water<sup>25</sup>. Data on water quality is very weak, but water pollution from industries, agriculture and poor sanitation

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<sup>22</sup> European Commission, 2007

<sup>23</sup> The UNEP report also discusses the issues of wildlife and protected areas, marine environment and chemical pollution.

<sup>24</sup> Sudan's population is approximately 37 million, with a high annual growth rate of 2.6 %. Livestock has increased from an estimated 28 million 1961 to 134 million in 2004.

<sup>25</sup> European Commission, 2007

is considered as an important and growing problem. Sanitation is generally very poor and in the many rapidly growing cities lack of adequate waste management and sewage treatment contribute to increasing environmentally related health problems.

***Natural Disasters and Climate Change:*** Droughts and floods have historically occurred frequently in Sudan. Despite serious water shortages, floods are common. The most devastating floods typically occur in the Blue Nile and are aggravated by deforestation and overgrazing. Droughts are frequent (mainly in the arid and semi-arid zones, representing over 50% of the total land area) and reduce soil fertility, agricultural production and food security. UNEP identifies natural disasters as one of three principal causes to the very large number of displaced persons in Sudan<sup>26</sup>.

Evidence of climate change is compelling. Since Sudan always has been exposed to climate variability and risks, climate change should be seen as an important factor that adds to existing stresses like malnutrition, water scarcity, soil erosion, desertification and bush fires. Overall, rainfall is becoming increasingly scarce and/or unreliable in the Sahel belt. Average rainfall in Darfur has been reduced by between 16-34 % comparing the period 1946-1975 with 1976-2005. This trend is likely to continue and the risk of further severe droughts, floods, more frequent dust storms and desertification is high. Climate change projections reported in 2003 to the UN<sup>27</sup> indicate rising temperature between 0,5 and 1,5 by 2030 and an approximated reduction of rainfall with 5% for the studied region (Northern and Southern Kordofan). The agricultural sector in Sudan is highly vulnerable to the predicted climate change and shortages in rainfall. Impacts include a severe decline in crop yields in the northern drier part of Kordofan (-70%) and a smaller but still significant drop in crop yields in the southern, relatively more humid part. Impacts are projected to be larger over the long term. The risk of lower productivity, together with the population pressure driving unsustainable rates of exploitations is likely to further aggravate food insecurity. A rise in temperature is also expected to expand the spatial range of diseases, notably malaria<sup>28</sup>. Other projections for Africa generally indicate similar outcomes where arid and semi arid parts are projected to suffer most. Projections on future rainfall are less certain than those on temperature rise. It should be underlined that all projections include uncertainty related to the climatic models, mitigation and adaptation.

Ultimately, the costs of climate change to Sudan heavily depend on the success of global mitigation and the country's adaptive capacity. According to the Stern review a temperature rise of 5-6 % would result in costs of 5-10% of global GDP and for poor countries costs in excess of 10%. If mitigation efforts can reduce global warming to 2 degrees at 2050 costs would be substantially lower.

The Sudanese National Adaptation Programme of Actions (NAPA) identifies three high priority sectors where urgent and immediate action is needed; agriculture, water resources and public health. The NAPA identifies several key adaptation measures within these areas<sup>29</sup>.

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<sup>26</sup> The other two causes being (i) conflict-related insecurity and loss of livelihoods; and (ii) government-sponsored development schemes.

<sup>27</sup> Republic of Sudan, 2003, Sudan's First National Communications under the United Nations Framework Convention on Climate Change. The projections use General Circulation Models, IPCC emission scenarios and scenario generating software.

<sup>28</sup> Republic of Sudan, 2007, National Adaptation Programme of Action

<sup>29</sup> Ibid

## **Poverty, Economic Development and Environment**

The environmental problems listed above are strongly linked to poverty in rural as well as urban areas. As much as 80 % of reported diseases in the country are estimated to be waterborne and a key cause of child mortality. Land degradation and deforestation have large negative impacts on food security and incomes of the rural population. In many cases women are made disproportionately worse off by environmental degradation. Increasing scarcity of fuel wood and water adds to the workload of women and in conflict zones this has had grave affects on the personal security of women.

Addressing land degradation in its various forms is crucial for the agricultural sector which constitutes around 40 % of GDP and 80-90 % of non oil export earnings. For the over 80% of the population whose livelihoods depends on small scale crop production and/or livestock husbandry, land degradation often translates into lower incomes and food insecurity.

Alongside the widespread rural poverty, Sudan is experiencing rapid industrialization and growth of the oil industry and associated service industries. Well managed, this industrialization has the potential to generate resources that can be invested in broad based economic development and in the provisioning of public goods such as improved water and sanitation. However, as experiences from many poor countries show, there is a great risk that rapid increased rents from natural resources crowds out growth in other economic sectors and fuels corruption, inequality, environmental degradation and conflicts.

There is currently an almost complete lack of structures and capacity to manage the large negative external environmental effects of the rapid industrial growth. For small as well as large scale industrial developments there are great deficiencies regarding environmental impact assessments and the implementation of measures that would reduce industrial pollution. UNEP identifies the growing environmental impact of the oil industry as an increasingly important trigger of local conflicts and urge development actors to take this issue into account.

## **Conflict and the Environment**

Some analysts have recently argued that the competition over natural resources, increasingly scarce due to climate change and land degradation, is a trigger of conflict in Sudan<sup>30</sup>. Although these are important linkages it is important to acknowledge the fact that causes of existing conflicts are highly complex and that natural resources only are contributing factors. UNEP identifies key links between four different natural resources and conflicts in Sudan: (i) oil and gas reserves; (ii) fresh water resources; (iii) hardwood timber; and (iv) rangeland and rain-fed agricultural land.

(i) Oil and gas reserves: This can be divided into two different conflicts. First, the competition over oil and gas resources was a driving force in the north-south conflict and remains a source of political tension today. Second, the vast negative environmental impact caused by the oil industry, such as oil spills, land conversion and water pollution, is a potential catalyst of local conflicts. UNEP refers to experience in other countries, such as Nigeria, and the importance to

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<sup>30</sup> One example is Jeffery Sachs' article "*Ecology and political upheaval – small changes in climate can cause wars, topple governments and crush economies already strained by poverty, corruption and ethnic conflict*", Scientific American Magazine, July 2006.

improve the environmental performances of the industry as a part of the peace building efforts in Sudan.

(ii) Fresh water resources: Water is the most precious resource in the drier regions where livelihoods are vulnerable to erratic rainfall variations. Due to increasing siltation from land degradation as well as poor maintenance, a serious decline in the water storage capacity has been documented in many areas (in Darfur and Kordofan in particular). Improved water resources management in rural areas is thus important for preventing further conflicts over access to water resources. A somewhat different water management issue involving big conflict potentials is the government of National Unity's large scale dams building program<sup>31</sup>. The Merowe dam is the largest new dam project in Africa and risks displacing more than 50 000 people. The project has created conflicts with local communities and has been criticized by international NGOs for failing to comply with minimum criteria for environmental and social assessments. The unfinished Jonglei canal project in Southern Sudan played an important role in triggering the resumption of the north-south civil war.

80 percent of Sudan's renewable fresh water resources are provided by rivers with upstream catchments in other countries. This leaves Sudan vulnerable to externally induced changes in water flows.

(iii) Hardwood timber: Revenues from hardwood timber fueled the north-south civil war economy and there are now signs that this is being repeated with charcoal in Darfur. The unmanaged mining of forest resources by the charcoal industry in the north-south boundary zone could constitute a potential trigger for renewed conflict at the local level. UNEP predicts that within five to ten years, the northern states of Sudan will only be able to obtain sufficient supplies of charcoal from Southern Sudan and Darfur, as all other major reserves will have been exhausted.

(iv) Rangeland and rain-fed agricultural land: Historically, local conflicts over rangeland and rain-fed agricultural land have occurred throughout Sudan. Continued severe land degradation in combination with climate change and increased demand for resources from a growing population and increased number of livestock are contributing to the conflict dynamics. A key cause for concern is the continued shrinkage and degradation of remaining rangelands in the northern part of the Sahel belt contributing to increasing competition over resources between pastoralists groups and sedentary farmers. Due to the difficulties faced by pastoralist societies an increase in southward migration of pastoralists is expected which brings with it risks of local conflicts over resources<sup>32</sup>. A key challenge is to develop a stable system for rural land tenure which satisfies the interests of both sedentary farmers and pastoralists groups.

### **Population Displacement and Environment**

Sudan has the largest population of displaced persons in the world with over five million internally displaced persons (IDPs) and international refugees currently living in rural camps, informal settlements and urban slums. Out of these five million, almost two million live in camps in Darfur and two million in the area of Khartoum. The principal cause of displacement in Sudan has been the major conflicts that have affected the country since its independence. Also environmental issues cause displacement as drought, desertification and

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<sup>31</sup>The plan involves more than two dozen dam feasibility studies. Some are currently being undertaken.

<sup>32</sup> UNEP mentions the Nuba mountains region in Southern Kordofan as one example where this is already occurring.

flooding force people to move. The settlements and camps are crowded and unsanitary, food and water are in short supply and insecurity is high.

The massive population displacement in Sudan has been accompanied by major environmental damage in the affected parts of the country as the high concentration of people in camps creates a high demand for natural resources. Fuelwood for cooking food, boiling water or heating is crucial for people's livelihood. In Darfur camps fuelwood is also collected for brick making which has become an important source of income. These activities create a significant environmental impact as collection of fuelwood causes severe deforestation around the camps. As a result widespread desertification is forcing people, especially women, to walk up to 15 km from camp areas to find timber. This also contributes to insecurity as women leaving the camp often are at risk of rape or other forms of violence.

Water is a scarce resource in camps and there is a need for sustainable water resource management. In Darfur the prevailing geology is highly unfavorable for storage of groundwater creating severe water shortages during the long dry seasons. Many of the wells and water points established by humanitarian projects are located near displaced person camps as these camps are often situated in arid regions. There is currently a lack of systematic monitoring of groundwater abstraction. Evidence shows that there are boreholes in camps running dry, not recovering during the wet season. Exhaustion of groundwater would cause secondary displacement for large IDP populations<sup>33</sup>.

The return process of IDPs is likely to have significant environmental consequences as it will cause pressure on natural resources and further degrade the environment in the more fragile and drier return areas. The Darfur states are three of the most vulnerable states associated with displacement and returns due to the current condition of severe land degradation and desertification and the increasingly dry climate. There is thus a need for careful assessments in order to minimize further suffering and to assure that livelihoods in return areas can be sustained.

### **Water Resources Management**

Sudan has a substantial freshwater resource base. Almost two-thirds of the Nile basin is found within its borders and groundwater reserves are also considerable. However there is a very broad disparity in water availability between different regions as well as between and within years<sup>34</sup>. The extremely low percentage of the population with access to safe water is thus generally not caused by water scarcity. It is mainly a result of mismanagement and inadequate investments in water provisioning infrastructure. Instead of investing in pro poor water infrastructure, Sudan has invested heavily in large scale irrigation schemes as well as large dams.

As much as 97 percent of total fresh water use is absorbed by the agricultural sector, mainly in large scale irrigation schemes. However, this has few benefits for the 70 percent of the population making their living from traditional small scale rain fed farming. For this vast majority of poor men and women investments in smaller scale water storage technology, water points etc could have important effects.

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<sup>33</sup> Tearfund, 2007.

<sup>34</sup> In dry years, internal water resources can fall dramatically, in severe cases down to 15 percent of the annual average.

Sudan has invested heavily in large dams which play an important role for irrigation schemes and electricity generation. As mentioned above there are advanced plans for constructing a range of new big dams. Besides the conflict potential these plans may contain, they are likely to involve large negative environmental impacts. Sudan's existing large dams have caused severe downstream environmental degradation, mainly through reduced annual river flows, removal of annual flood peaks and increased riverbank erosion. Upstream land degradation has caused sediment deposition in Sudan's existing dams which has severely hampered their performance.

The White Nile borders or flows through five of the ten states of Southern Sudan and Northern state water projects may affect the southern states and vice versa. An open and regular dialogue on Nile waters and development issues between the Government of National Unity and the Government of Southern Sudan is therefore considered critical in order to not undermine the Comprehensive Peace Agreement.

Both the Government of National Unity and the Government of Southern Sudan have ministries for water resources management. In practice, however, governance is very complex since water is also a key issue for many other ministries<sup>35</sup>.

Sudan's vulnerability to changes in water flows induced by actions in upstream countries<sup>36</sup> implies that improved water resources management is not only needed in Sudan but in other Nile riparian countries as well. Competing interests around water use could potentially trigger intra state conflicts. However, research has found that this is very rare in practice and that cooperation around shared water resources can be important for long term peace building<sup>37</sup>. Sudan is a member of the Nile Basin Initiative<sup>38</sup> and participates together with the governments of Egypt and Ethiopia in the Eastern Nile Subsidiary Action Program<sup>39</sup>.

### **Environmental Governance and Institutions**

Sudan's institutional structure for environmental governance is very weak in the light of the environmental challenges outlined in this document. An Environmental Framework Act (2001) and sector legislation with environmental components exist as well as a federal structure for environmental governance<sup>40</sup>. There is considerable scope for improvement of legislation and institutional mandates, but it is even more important to address the lack of enforcement of existing environmental legislation. While this lack of enforcement is partly

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<sup>35</sup> For major Government of National Unity projects, such as the Merowe dam, a special dams unit has been established that overlays the responsibilities of the ministries for water resources, agriculture, energy, industry and environment.

<sup>36</sup> The quantity, timing and quality of most of the Nile, Gash and Atbara river waters flowing through Sudan depend mainly on upstream countries, principally Ethiopia (Blue Nile, Atbara, Gash), Uganda (White Nile), and Tanzania and Kenya which border Lake Victoria (White Nile). These four countries all face a range of environmental problems including large-scale deforestation and land degradation. In addition, Uganda has recently increased water extraction from Lake Victoria for hydroelectric power, contributing to a significant drop in the lake's level. As a result, the currently observed changes in Nile flow rates (levels appear to be declining overall but variability is increasing) and turbidity are expected to increase over time.

<sup>37</sup> See for example Kramer, A, 2004, Water and Conflict (policy briefing for US AID)

<sup>38</sup> The Nile Basin Initiative (NBI) is a partnership between the Nile riparian countries (Burundi, D.R. Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda) that seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security.

<sup>39</sup> ENSAP is an investment program under the umbrella of the NBI.

<sup>40</sup> See chapter 13 in the UNEP report for a detailed review.

linked to shortage of funds and staff at key authorities, it also reflects the low priority given to environmental management<sup>41</sup>.

UNEP highlights the need to address the prevailing “large scale development mindset” and the effective immunity of major project developers from integrating environmental considerations. The government has traditionally prioritized a development focusing on investments in large scale projects, such as large dams, the Jonglei canal, oil production and irrigation schemes. These were all supported at the highest political level and implemented without being subjected to proper impact assessments and public consultation processes<sup>42</sup>. Many of these projects caused extensive and often unexpected environmental damage. A discussion of how to improve environmental governance must thus take broader governance and public sector reform issues into account, such as transparency, public participation and accountability.

#### Initiatives for improved environmental governance

The Comprehensive Peace Agreement and the Interim Constitution opens up some opportunities for reform also linked to environmental governance. A particularly interesting initiative is the National Plan for Environmental Management (NPEM), a process involving both the Government of National Unity and the Government of Southern Sudan which commenced in 2005. The objective is to improve environmental governance and stimulate practical cooperation between north and south. The process is supported by UNEP, the EC and the Nile Basin Initiative<sup>43</sup>. A draft plan has been produced but is still under discussion with the Government of Southern Sudan.

#### **Issues to consider**

This brief review has shown that efforts to address environmental degradation need to be part of any successful strategy for conflict prevention and long term development in Sudan. Below we have outlined a few issues we recommend Sida to consider in its development cooperation with Sudan.

#### Integrate environmental considerations in the Sudan Multi-Donor Trust Funds (MDTFs):

Sida’s support to Sudan is currently being channeled through Multi-Donor Trust Funds. Sida is encouraged to review possible environmental risks as well as opportunities for improved environmental management involved in this support. Particular attention should be paid to the need for improved monitoring of groundwater in the IDP camps and to the sustainability issues linked to the current and future return process of refugees from the IDP camps. Further issues to consider linked to the Trust Funds can be found in the UNEP report.

Continue the dialogue with Sudanese authorities, UNEP, the European Commission and other partners to identify possible interventions: Improved environment and natural resources management could form part of Sida’s support to peace building and development in Sudan.

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<sup>41</sup> Symbolically, the Higher Council for Environment and Natural Resources, which was established along with the Environmental Framework Act in 2001, with the task of coordinating environmental management efforts across sectors, has never been convened.

<sup>42</sup> Article 18 in the Environmental Framework Act states that environmental impact assessments (EIA) are required for projects likely to have a negative impact on the environment. While EIA-documents were produced for the more recent projects, they were never publicly released or integrated into the planning and design process, and therefore had a negligible effect in terms of impact mitigation or community acceptance.

<sup>43</sup> Or more specifically, the Nile Transboundary Environmental Action Project (NTEAP), which is one of the eight projects within the Nile Basin Initiative’s shared vision program (NBI-SVP).

UNEP's Post Conflict Environmental Assessment and subsequent Country Programme Strategy Paper outline several areas where development cooperation could play an important role. These areas and priorities are also linked to the National Environmental Management Plan currently being developed by Sudanese authorities (with support from UNEP and the EC). A close dialogue with these organizations is important in Sida's continued process of identifying possible intervention areas<sup>44</sup>.

Support management of shared natural resources: Experience suggests that collaboration on shared natural resources can provide an opportunity, a neutral ground, to increase cooperation and stability in conflict ridden environments. Sida should look for opportunities to support existing or new initiatives on management of shared natural resources. This can be resources such as water catchments that stimulate cooperation between downstream and upstream users (on a national or international level). Possibilities for providing this type of support through the Nile Basin Initiative could be investigated. According to UNEP increased involvement from Sida or other development agencies in the area of water resources management would be much appreciated.

Engage with the private sector to promote good governance and management of oil resources: Steps to improve transparency in the extractive sector, primarily oil, could generate substantial benefits in terms of accountability, investments in health, education and also improved environmental management. Initiatives like the Extractive Industries Transparency Initiative<sup>45</sup> that work both with government and private industry should be examined but also the possibility of using other sector initiatives or the OECD Guidelines for Multinational Enterprises as a point of departure. This is clearly a difficult area in need of a long term perspective, and it may be that DFID and other actors are better positioned for a lead on these issues. In line with the Paris Declaration, another important measure to increase the accountability of large private investors (in particular the energy, water and agricultural sector), would be to promote the use of Environmental Impact Assessments and Strategic Environmental Assessments.

Integrate climate change in existing planning, foras and development activities: Climate change will not introduce new elements or stresses for Sudan but rather aggravate a number of existing stresses. The rural poor men and women in arid and semi arid areas are likely to be most affected. Existing conflict resolution mechanisms between pastoralists and farmers are therefore of particular interest. Adaptation to climate change will above all be achieved by strengthening existing efforts to diversify the economy, improve water resources management, extension services, early warning systems and improved governance systems. Support to regional cooperation on early warning systems etc should be considered.

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<sup>44</sup> Information about key people to contact and their contact details are delivered to Sida separately.

<sup>45</sup> See for instance the Report "Oil and the Future of Sudan",



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