

# Water and Environmental Security for Conflict Prevention in Times of Climate Change



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**Global Water Institute**

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Picture : « Villagers pray along the dry banks of the Wombadru River, asking God to bring rain to Sudumta village in Bidu district of Afar, Ethiopia. This district in the northern part of the country had not seen rain in over one year ».  
*John Stanmeyer for the National Geographic Magazine, December 2013<sup>1</sup>*

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<sup>1</sup> [http://web.stagram.com/p/613895207303337148\\_7871](http://web.stagram.com/p/613895207303337148_7871)

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## Acknowledgments

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**ii. Executive Summary**

Current environmental challenges of Sub-Saharan Africa may be a source of future environmental insecurity leading to social and political conflict. With a changing climate and resources such as water becoming more scarce, there is a risk for greater competition over natural resources. Further research is needed in the area of conflict prevention strategies that encompassed measures of good governance, capacity building, resource management and information sharing in order to mitigate some of the negative impacts of climate change and environmental insecurity.

## **I. Introduction**

During the last three decades, climate change has emerged as a concept and a reality with strong socioeconomic ramifications. The United Nations Framework Convention of Climate Change (UNFCCC) defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural climate variability, observed over comparable time periods.”<sup>2</sup> Human activity in general can be seen as the main cause of climate change leading to wide- ranging and complex effects.

Climate change is not an isolated phenomenon, but can be better understood as a web of interlinked issues from melting glaciers, natural disasters, rising sea levels, floods and droughts to health and economic deterioration. Understanding these complexities and the variability of climate change today is crucial for any adaptive and mitigation strategies. This is especially the case in vulnerable regions across the world. This paper looks at how the current environmental challenges of Sub-Saharan Africa, aggravated by climate change trends, may become a source of future environmental insecurity and social and political conflict.

In some cases, issues such as deforestation, desertification, land degradation and water scarcity have crossed the threshold of irreversibility on the continent. Of course, a great deal of caution is employed when drawing lines between environmental challenges and conflict. There are complexities to identifying the level of threat. However, the environmental issues combined with other social, economic and political factors increase the potential for conflicts.

By examining three vulnerable geographical areas – Sudan/ South Sudan, the DRC and Nigeria- this paper looks at how factors that exert pressure on the environment, human security coupled with low quality of life and poor governance could lead to competition over natural resources, low economic productivity, migration, and essentially conflict. Conflict prevention, therefore, is a key to overcoming these challenges. Policy recommendations are proposed at the end as potential measures to safeguard water resources and ensure environmental security of those regions most vulnerable to climate change.

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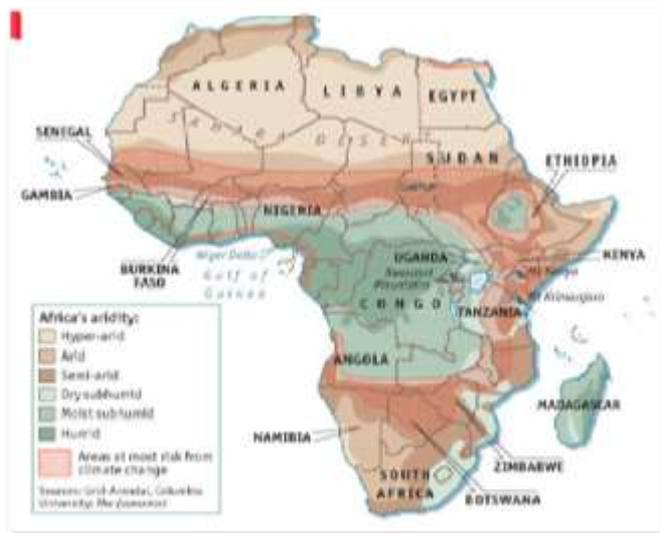
<sup>2</sup> United Nations Framework Convention on Climate Change. Article 1. 2013  
[http://unfccc.int/essential\\_background/convention/background/items/2536.php](http://unfccc.int/essential_background/convention/background/items/2536.php)

## II. Water and Environmental Security: Understanding the Complexities

### A. Understanding the complexities of climate change

Scientists have predicted that in the near future climate change will affect the world in unprecedented ways, and Africa will be one of the most severely impacted continents.<sup>3</sup> Climate change is likely to have disastrous impacts on the social, economic, environmental and political prosperity of the continent. Some estimates predict that by 2050 average temperatures will rise by 1.5 to 3°C, floods and droughts will become more common and rain-fed agriculture will be reduced by 50%. As early as 2020, between 75 and 250 million people in Africa will experience water stress due to climate change.<sup>4</sup> The poorest and most vulnerable in the region will be the least equipped to counter acute changes in climate patterns. The fear is that this may lead, among other things, to greater levels of migration, disease and conflict in the region. The map in Figure 1 shows how a large part of the African continent is at high risk of being affected by the negative impacts of climate change.

Figure 1. Africa's aridity and areas most at risk of climate change<sup>5</sup>



These areas represent parts of the continent, which have and are experiencing high rates of desertification and deforestation causing serious environmental issues such as droughts, water scarcity and land degradation.

<sup>3</sup> Valerie Ndaruzaniye. Water Security in Ethiopia. "Risks and Vulnerabilities assessment.2011. <http://www.gwiwater.org>.

<sup>4</sup> UNEP, "Fact Sheet: Climate Change in Africa- What is at Stake?" *IPCC Report Chapter 11: Regional Climate Projections*. [http://www.unep.org/roa/amcen/docs/AMCEN\\_Events/climate-change/2ndExtra\\_15Dec/FACT\\_SHEET\\_CC\\_Africa.pdf](http://www.unep.org/roa/amcen/docs/AMCEN_Events/climate-change/2ndExtra_15Dec/FACT_SHEET_CC_Africa.pdf)

<sup>5</sup> GREEN, Duncan. "What are African Countries already doing to adapt to Climate Change" Oxfam blogspot. 2010 <http://www.oxfamblogs.org/fp2p/?m=201008>

According to the Food Commissioner for food security in Mauritania, the desert is advancing by about 11km a year in Mauritania.<sup>6</sup> These valuations represent only a fraction of the complex web of issues linked to climate change.

*B. The overall complexities of environmental security*

In parallel to climate change, greater environmental degradation and natural resource injustice i.e., unequal distribution and access, has led to greater scientific and social recognition of environmental challenges. Much of current research has focused specifically on the conjunction between environmental changes and violent conflict. It has been observed that environmental issues such as the lack of access and the deterioration of the natural resources has led to tension, competition and conflict among different factions of society.

As a consequence of rising environmental distress across the world, researchers and institutions have attempted to define the links between the environment and security. According to Peter H. Gleick, “threats to security include resource and environmental problems that **reduce the quality of life** and result in **increased competition and tensions** among sub- national or national groups.”<sup>7</sup> Similarly, the United Nations Environmental Program (UNEP) defines the link between the environment and security as “environmental degradation, **inequitable access to natural resources** and the transboundary movement of hazardous materials that **can lead to conflict** and pose a risk to national security and human health.”<sup>8</sup>

NATO is another platform from which to understand the nature of environmental security threats. In a paper regarding NATO’s contribution to European Environmental Security, environmental security is defined as “a threat to national security posed by **unattended international environmental problems** and their capacity to promote conflict and **political instability**.”<sup>9</sup> The different definitions show a similar premise for understanding environmental issues in that, environmental change, in general, can lead to a decrease in the quality of life and increased tension, competition, instability and conflict. In the following,

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<sup>6</sup>. The Food Commissioner for food security in Mauritania, was invited at Aidex Conferences, Workshops and Exhibitions on 2 days in December 2013, Brussels. Four GWI staff members attended these events.

<sup>7</sup>. Gleick, Peter H. “Water and Conflict” International Security. Vol 18 N 1. 1993.

<sup>8</sup>. UNEP, “Linking Environment and Security” Regional Office for Europe: Key Activities. 2013. Available at <http://www.unep.org/roe/KeyActivities/EnvironmentalSecurity/tabid/54360/Default.aspx>

<sup>9</sup>. Butts, Kent Hughes. “NATO’s Contributions to European Environmental Security” 1993. Available at <http://www.dtic.mil/dtic/tr/fulltext/u2/a275918.pdf>

the term environmental security is defined as “the area of research and practice that address the linkages among the environment, natural resources, conflict and peace-building.”<sup>10</sup>

Insecurity caused by environmental issues, in these terms, can be understood as a cause for conflict as well as an opportunity for cooperation, conflict prevention and peace-building.

**Environmental Security:** “the area of research and practice that address the linkages among the environment, natural resources, conflict and peace-building.”

### *C. The overall complexities of water security*

Water security is an issue today closely linked to environmental security. Natural resources, such as water, show a number of threats and risks that may contribute to the amplification of a conflict. Since water is essential to life, a basic need and “fundamental to all ecological and societal activities,” water may play a role contributing to conflict that may threaten human and environmental security.<sup>11</sup> Water can be both a target and an instrument of war. For example, infrastructure such as dams used for hydropower and irrigation, desalination plants and water-conveyance systems, can be the targets during wars. Control of key water resources can also become a valuable and strategic objective during conflicts. Those who control a water source have a distinctive advantage and can manipulate the population who depend on it. Competition for access to water may even be the very cause of a conflict.

One of the main problems regarding water is the unequal distribution, poor democratic participation, and the lack of access. As shown in Figure 2 below, Sub-Saharan Africa is the most vulnerable region in the world in terms of access and use of safe drinking water.

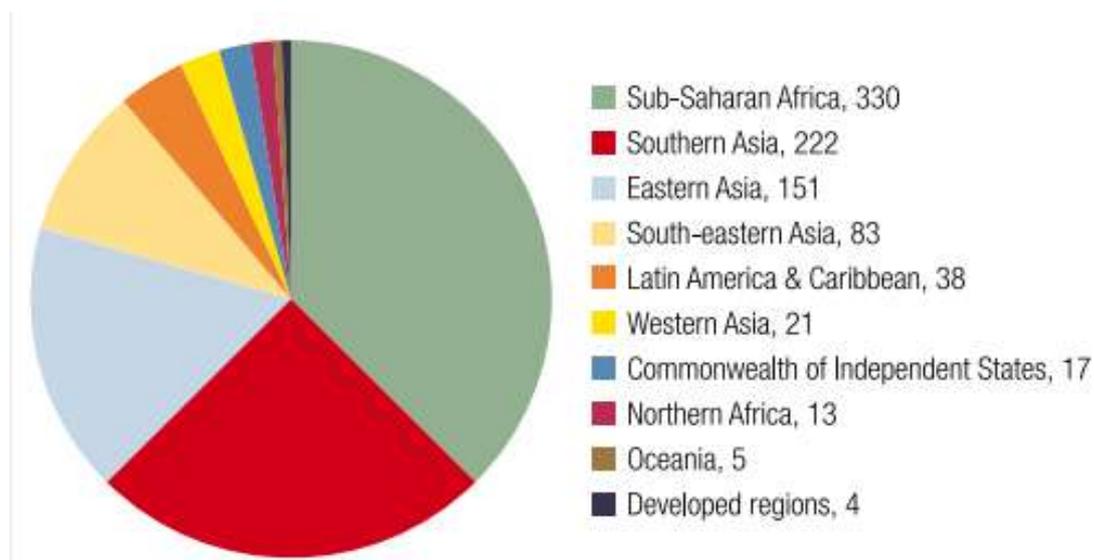
Drought and desertification in Sub-Saharan Africa have become a major concern exacerbating the issue of water security.

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<sup>10</sup> Ndaruzaniye, Valerie. “Water for Conflict Prevention” Symposium 2009

<sup>11</sup> Gleick Peter H. “Fresh Water Resources and International Security” *International Security* 18/1, 1993, p.79.

**Figure 2. Regional distribution of the 884 million people worldwide not using improved drinking water<sup>12</sup> Populations are represented in the millions**



Source: UNICEF and WHO, *Progress on Sanitation and Drinking Water*. 2010

Tensions between water-poor and water-rich regions could potentially be a source of conflict in the future between different sectors of society and neighbouring countries. In some cases, the scarcity of resources induces migration and adds additional pressure on local communities and their economy.

As it is often observed in Sub-Saharan Africa, poverty coupled with the lack of access to basic natural resources such as water can increase the risk of disaster and conflict. Poor communities are often “compelled to exploit environmental resources for survival and thereby [provoking the] so called socio-natural hazards.”<sup>13</sup> This includes the increase of natural hazards due to the overexploitation of land and resources.

According to the Pacific Institute, conflicts, instability and insecurity that arise due to water insecurity can be classified into different categories. In Figure 3 the type of conflicts, the potential actors and the reasons for the tension are outlined to elucidate the complexities of water security.

<sup>12</sup> UNICEF and WHO, *Progress on Sanitation and Drinking Water*. 2010  
[http://www.wssinfo.org/fileadmin/user\\_upload/resources/1278061137-JMP\\_report\\_2010\\_en.pdf](http://www.wssinfo.org/fileadmin/user_upload/resources/1278061137-JMP_report_2010_en.pdf)

<sup>13</sup> UNOPS, *UNOPS contribution to Disaster Risk Reduction Building resilience through infrastructure-based solutions with community involvement*, Brussels, 2012. p.3

**Figure 3. Classification of instabilities due of water insecurity<sup>14</sup>**

Qualification of conflict	Actors	Tensions
<b>Control of Water Resources</b>	State and non-state Actors	Water supply or access to water are the root of tensions
<b>Military Tool</b>	State	Water resources are used by a nation or state as a weapon during a military action
<b>Political Tool</b>	State and non-state	Water resources are used by a nation, state or non-state actor for a political goal
<b>Terrorism</b>	Non-state	Water resources are either targets or tools of violence or coercion by non-state actors
<b>Military Target</b>	State	Water resources are targets of military actions by nations or states
<b>Development Disputes</b>	State and non-state	Water resources are a major source of contention and dispute in the context of economic and social development

<sup>14</sup> Pacific Institute, *The World's Water*, <http://www.worldwater.org/conflict>. Updated 11/09.

*D. Linking environment and conflict*

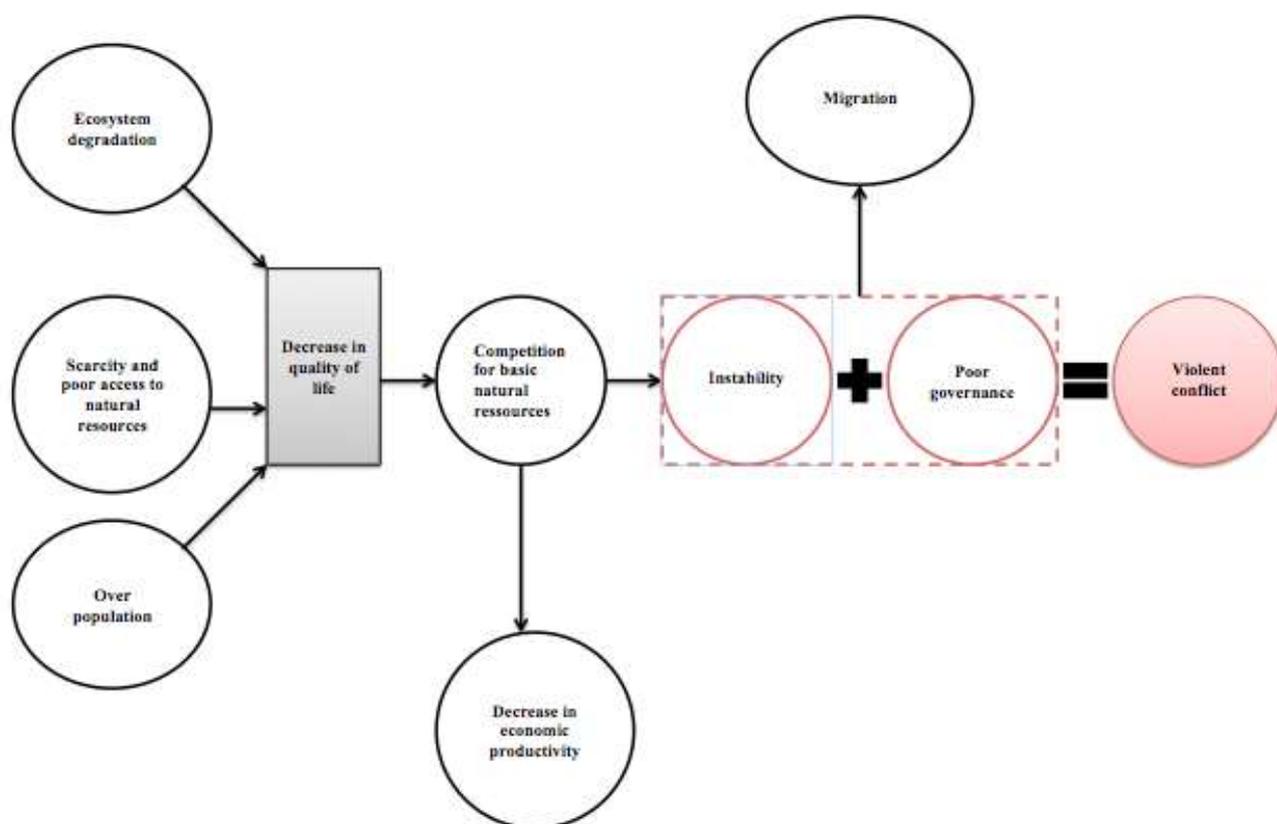
Although water security as well as human security can be considered as a sub- section of environmental security, it is crucial to deal with each one independently. The table below outlines the different dimensions of human, water security and environmental security, making clear what the different threats and risks are at different levels. As this table shows, quality of life, water availability and sustainability are at risk when there is insecurity at the different levels.

**Figure 4. Types of security**

<b>Type</b>	<b>Target</b>	<b>Source of threat</b>	<b>Risk</b>
National Security	State	International factors	State sovereignty
Human Security	Humans	Nature and poor governance	Quality of life
Water Security	Water access	Humans	Water availability
Environmental Security	Natural Resources	Humans	Sustainability

In order to better understand the interlinkages between human security, water security and environmental challenges, the GWI's Team developed the diagram bellow in Figure 5 to illustrate how environmental insecurity may, eventually, lead to violent conflict. It is important to note that this diagram does neither cover all issues from which a violent conflict may erupt, not does it assume a linear causation, but rather, it focuses on the environmental dimensions.

Figure 5. Complexities of Water and Environmental Security<sup>15</sup>



As seen on the far left, three key environmental problems are identified as major impacts on reduced the quality of life for an individual, a family or a community. The first key impact on the quality of life in environmental terms is the **ecosystem degradation**, referring to issues such as pollution, desertification, deforestation, and natural disasters, which affect human well-beings, wildlife and the overall health of an ecosystem. The second impact identified is the **lack of access and scarcity of natural resources**. This refers to as a decrease in the actual amount of natural resources available to humans as well as the distance needed to acquire these natural resources. For example, water sources running dry and people commuting long distances to collect water can significantly contribute to a poor quality of life. The lack of access to natural resources may also refer to situations in which key resources are privatized or where poor infrastructure limits utilization by a given community. The third key impact is **overpopulation**, covering issues such as overcrowding, overconsumption and unequal distribution.

<sup>15</sup> GWI's Team, Fall 2013. *Water and environmental security for conflict prevention in times of climate change*, [www.gwiwater.org](http://www.gwiwater.org).

All three of these environmental issues may negatively affect the quality of life in terms of basic human needs such as food, water, shelter, toilet, health and education. On the one hand, poor quality of life can lead to instability and struggles that may cause people to willingly or unwillingly migrate to areas where the potential for a better life is greater. Some people may be forced to move to areas where natural resources, fundamental for their survival, are more accessible. People who are forced to leave their homes due to environmental changes have, in some cases, been classified as “climate refugees”.

On the other hand, environmental issues, a decrease in quality of life and instability that comes with it, can also lead to a decrease in economic productivity. A change in climate patterns for example can strongly affect the agricultural sector and food production. Water scarcity can also greatly impact other highly water-dependent industry sectors, such as hydropower energy and irrigation systems, for instance.

Environmental challenges will have serious implications for security interests of both developed and developing nations in the next few decades. Local populations will have to adapt to new ecological realities and the frequency of conflicts in an environmental context will likely increase.

By examining three key geographical areas – Sudan/ South Sudan, the DRC and Nigeria- the paper looks at how factors that exert pressure on the environmental security of a population coupled with low quality of life and poor governance could lead to competition over natural resources, migration and low economic productivity and conflict. The last section of the paper presents steps useful for conflict prevention to mitigate the process of environmental insecurity.

## **II. Complexities of Sub-Saharan Africa**

### *A. Competition over basic natural resources (water and arable land)*

An abundance of natural resources exists in Sub-Saharan Africa. However, due to its large population, diversified environment with recurrent droughts, Sub-Saharan Africa is vulnerable to famine. Africa's challenges take sources from its geographical position with changing climatic conditions and poor access to water resources. The availability of fresh water is the most severe problem that is expected to intensify in the coming years.<sup>16</sup> In Sub-Saharan Africa, fresh water resources are unequally distributed and are depleted through overuse, poor management, and climate variability. Consequently, people do not have enough water resources to fulfill their basic needs such as water for drinking and sufficient water for farming.<sup>17</sup> The main threat of this lack of resource is that it may lead to political instability and social conflict between regions and States.

- *Model of correlation between conflicts cases and the source of conflicts: natural resources*

In order to test the relationship between political stability and environmental indicators in Sub-Saharan Africa, researchers<sup>18</sup> studied the correlation between access to improved water and political stability in 38 African countries between 1995 and 2006. They have found the following expression:

$$PSV = \alpha + \beta_1 ait + \beta_1 wit + \beta_1 awit + \mu it$$

PSV = political stability and non violence,

a = arable land per capita,

w = percent of population with access to improved water, and

aw = multivariable which accounts for the interaction between arable land per capita and percent of population with access to improved to water.

$\mu$  = regression error,

$\alpha$  and  $\beta$  = regression coefficient,

i = 38 states

t = time period<sup>19</sup>

<sup>16</sup> Gleick 2008 quoted in Richmond Krakowa Amy, Heimele Natalie, Galano Francis Galano, "Modeling Environmental Security in Sub-Saharan Africa", *The Geographical Bulletin*, 53: 21-38, 2012. p.29

<sup>17</sup> World Water Assessment Program 2006 in Panafrican Climate Justice Alliance. *The Economic costs of Climate Change in Africa*, 2009. p.16

<sup>18</sup> Richmond Krakowa Amy, Heimele Natalie, Galano Francis Galano, *op.cit.* p.29

<sup>19</sup> three time studies included in the study respectively, 1995, 2000 and 2006

The result of their study suggests that there is “a statistically significant relationship between the environmental indicators used and political stability and non-violence.”<sup>20</sup>

In essence, there is a positive correlation between access to arable land and improved water, and political stability and non-violence. When access to improved water increases, a state’s political stability and non-violence levels increased as well. States with more access to improved water are more likely to be politically stable. “When there are high amounts of arable land per capita coupled with and access to improved water, the model accurately predicts political stability and non-violence.” The model forecasts accurately political stability and non-violence in an environmental context.<sup>21</sup>

**Figure 6. Threshold for Percent of Population: Access to improved Water (w)<sup>22</sup>**

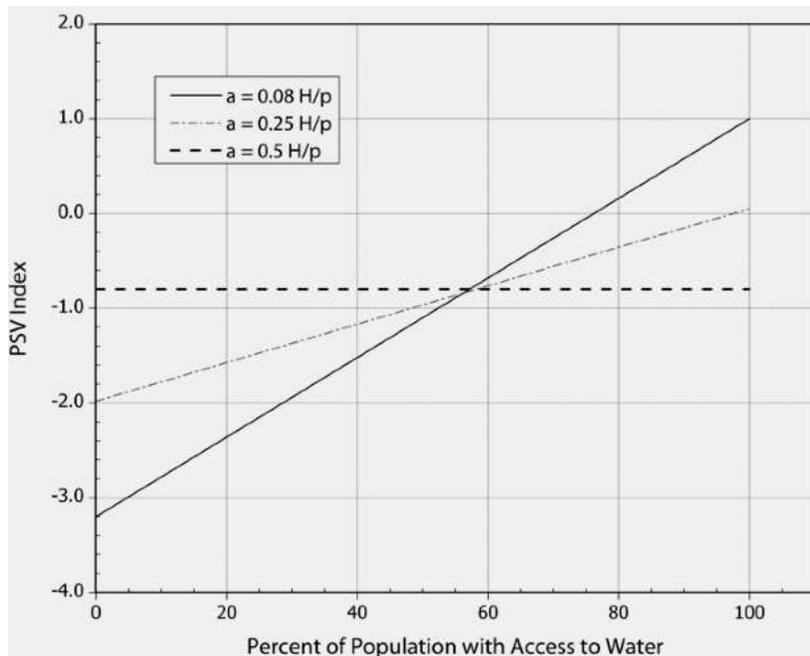


Figure 6 shows the change in both Political Stability and Violence (PSV) and the percentage of the population with access to water (w) when arable land per capita (a) is held constant at 0,08 hectares per person, 0,25 hectares per person and 0,5 hectares per person.

As it is illustrated on Figure 6, the threshold for access to improved water that has an an impact political stability is situated at 0.5 hectares per capita. The conclusion is that even when arable land per capita is low, a slight improvement in water availability will increase political stability and non-violence.<sup>23</sup>

There is therefore a need to preserve water resources as the continual increase in temperatures and variable rainfall will put additional pressure on water availability, which in turn, will exacerbate the competition for this natural resource. According to the Fifth Assessment

<sup>20</sup> Richmond Krakowa Amy, Heimel Natalie, Galano Francis Galano, *op.cit.* p.33

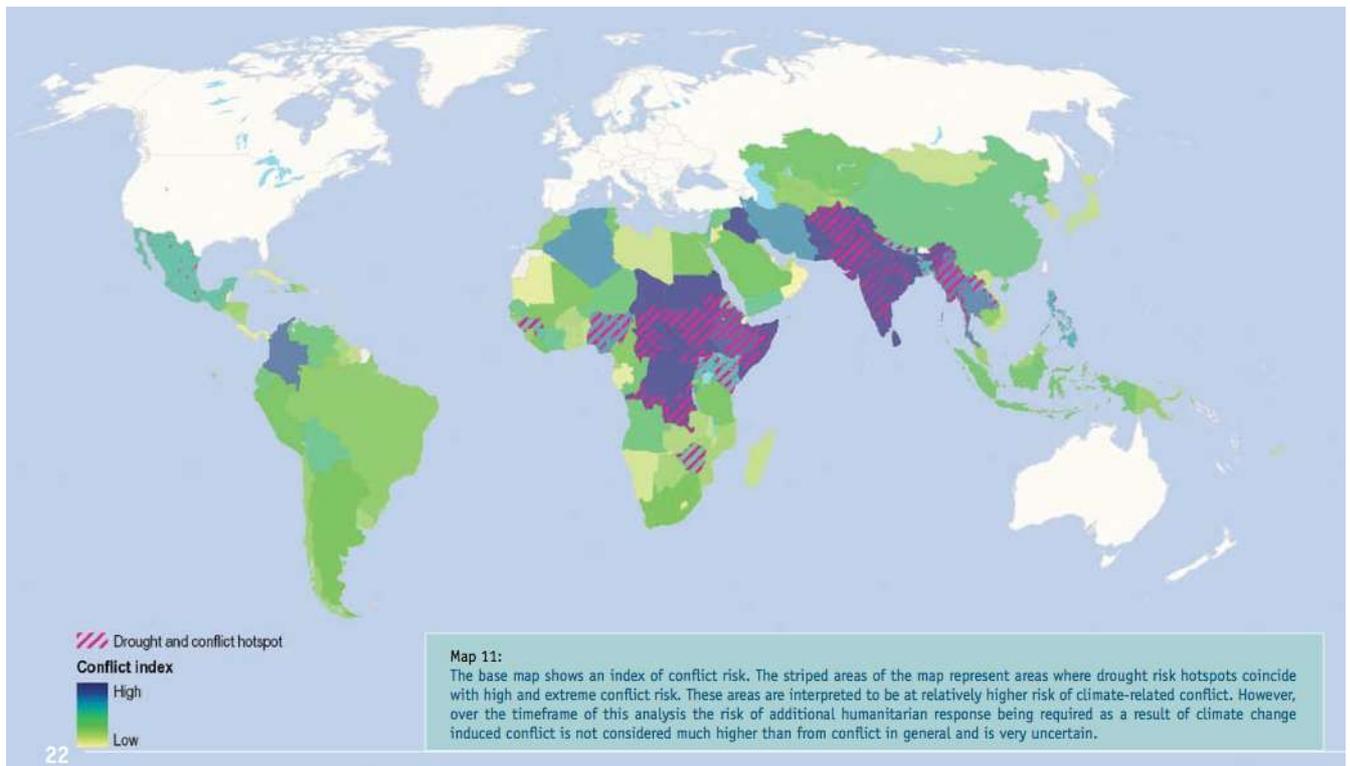
<sup>21</sup> *Ibid.*

<sup>22</sup> *Ibid*

<sup>23</sup> *Idem.* p.34

Report from the Intergovernmental Panel on Climate Change (IPCC) “human activities are causing a sustained and unequivocal rise in global temperatures.”<sup>24</sup> The rise in the global average temperature at the land and ocean surface relative to the pre-industrial period is likely to exceed 1.5° by the end of the 21<sup>st</sup> century. Dry areas will become drier and wet areas wetter, which may make the access to improved water in Sub-Saharan Africa more difficult and the impact on political stability more dire.<sup>25</sup> Figure 7 shows that Sub-Saharan Africa is renowned for its droughts and that the region is particularly threatened to climate change and future conflicts. For example, droughts are affecting access to improved water and sanitation facilities, food production and the livestock sector in the region. In Section 3, some of these issues are outlined through examining three hotspots, Sudan/South Sudan, DRC and Nigeria.

**Figure 7. Drought Risks Hotspots, Conflicts**<sup>26</sup>



### *B. Economic Dimension -Decrease in Economic Productivity*

Climate change is already having an impact on Sub-Saharan Africa’s economic productivity.<sup>27</sup> This region is particularly vulnerable to climate change as it is amongst the

<sup>24</sup> Symon Caroline, “Climate change: action, trends and implications for business. The IPCC’s Fifth Assessment report”, *University of Cambridge*, 2013. p.4

<sup>25</sup> *Idem* p.10

<sup>26</sup> CARE, *Humanitarian implications of climate change. Mapping emerging trends and risks hotspots*, Second edition, 2009. p.18

<sup>27</sup> Panafrican Climate Justice Alliance , *op.cit.*, p.9

poorest nations in the world, with a growing population and unevenly distributed natural resources. In the future, Sub-Saharan Africa is expecting to experience hotter conditions and a decrease of annual rainfalls<sup>28</sup> leading to strong negative impacts on agriculture, biodiversity and resources extractions.

- *Agriculture*

Agriculture is fundamental for most Sub-Saharan economies.<sup>29</sup> African populations depend on agriculture for food, income, employment and export-earnings. Currently, climate change is exacerbating their struggle in the sector of agriculture. In this region, the agricultural sector is underfunded. The changing climate is observed through the declining soil fertility which leads to low yields per hectare and a steep decrease in GDP obsolete infrastructure, inadequate access to basic services including the lack of knowledge and public health services, among others.<sup>30</sup> High population growth rates, especially in the rural area, intensify the pressure on agricultural production and natural resources.<sup>31</sup>

Research says that around 40% of the Sub-Saharan population is currently undernourished. By 2080 this number may increase by more than 50 million people.<sup>32</sup> For example, figure 8 shows that by 2080, African production of cereals will decline in some areas by more than 50% engendering substantial economic losses. Global food production is expected to increase by 70% to meet increasing demand from a constant growing global population.<sup>33</sup> Climate change is therefore a real threat to global food security in the years to come. Small-scale and subsistence farmers, the traditional societies and the rural poor will be the most vulnerable as they depend directly on the ecosystem for food security, traditional medicinal products and construction materials.

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<sup>28</sup> IPCC 2007 quoted in Panafrican Climate Justice Alliance, *op. cit.* p.9

<sup>29</sup> Over 60% of Africans depend directly on agriculture for their livelihoods FAO 2003 in Panafrican Climate Justice Alliance, *op.cit.* p.9

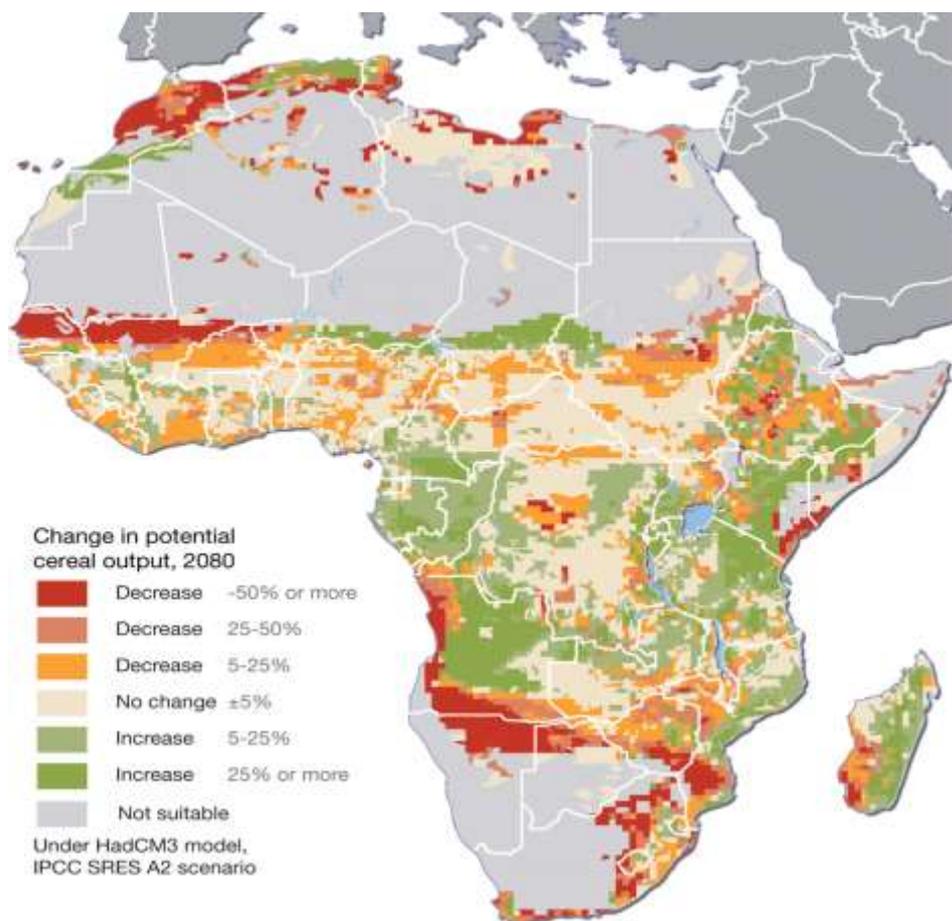
<sup>30</sup> *Idem* p.5

<sup>31</sup> Calzadilla Alvaro, ZHU Tingju, Rehdanz Katrin, Tol Richard, Ringler Claudia, « Economywide Impacts of Climate Change on Agriculture in Sub-Saharan Africa » in *International Food Policy Research Institute*, 2009. p.1

<sup>32</sup> Panafrican Climate Justice Alliance, *op.cit.*, p.12

<sup>33</sup> More than 60% of the world's population growth between 2008 and 2100 will be in Sub-Saharan Africa - FAO 2009 quoted in Panafrican Climate Justice Alliance, *op.cit.*, p.13

Figure 8. Potential Change in Cereal Production, 2080<sup>34</sup>



- *Biodiversity*

People depend on ecosystems for food, fuel and fiber production.<sup>35</sup> Climate change is causing the degradation of the Africa's ecosystem, and this has severe impacts on human development.<sup>36</sup> Humans' reactions to environmental changes may trigger behaviors such as accelerated deforestation and over-exploiting land for agriculture, possibly causing irreversible ecological harmony.<sup>37</sup>

- *Oil and mineral resources*

Current patterns of oil and non-renewable resource extraction such as gold and diamonds have a negative impact on the environment. Moreover, the illegal exploitation by criminal transnational commercial network, armed gangs, and irregular concession of resources

<sup>34</sup> Map prepared for the UN environmental project (UNEP) publication. The Environmental Food Crisis – the environment's role in averting future food crisis, 2009 in Panafrikan Climate Justice Alliance, *op.cit.*, p.14.

<sup>35</sup> Panafrikan Climate Justice alliance, *op.cit.*, p.13

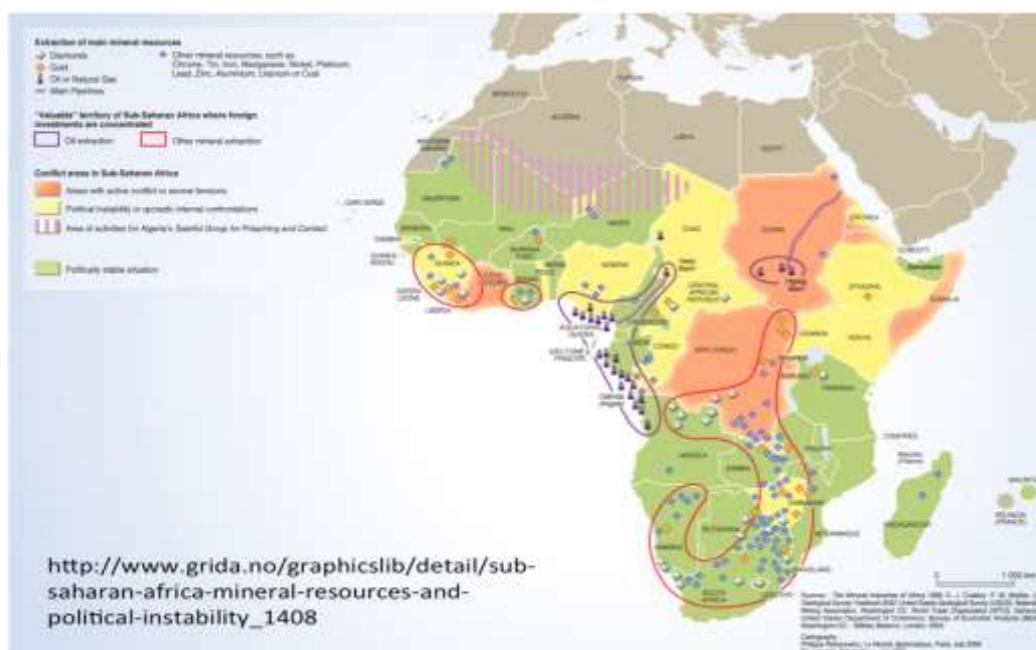
<sup>36</sup> IPCC 2007 in Panafrikan Climate Justice Alliance, *op.cit.*, p.13

<sup>37</sup> *Idem* p.14

granted by politico-military alliances causes a great threat to the preservation of the ecosystem in Africa.<sup>38</sup> For example, in Southern Africa, abandoned mine site causes a great threat to the environment and the population around. Non-sustainable exploitation of natural resources hinders the foundation for good governance, induces conflicts and generates military expenditure to the detriment of the basic needs of the population and the preservation of the environment.

The figure below illustrates Sub-Saharan natural resources potential, including oil and mineral resources such as diamonds. The impact of exploitation coming from foreign investments leads to the extraction and extrapolation of the land, which creates environmental problems and competition in the country concerned. Several active conflicts and political instability lead to social destabilization despite the presence of foreign armed forces and peacekeeping forces in the territory.

**Figure 9. Sub-Saharan Africa: Oil and mineral resources and political instability<sup>39</sup>**



Deepening poverty is also seen through unreliable institutions increase budgetary deficit, which in turn discourages foreign investments. Ineffective institutions also engender or worsen public services, fueling impunity and limit the efficiency of the institutions controlling the account of the State.<sup>40</sup> Oil and mineral exploitation provoke the loss of productive land, surface and groundwater pollution, and soil contamination. The impact of climate change and

<sup>38</sup>Richmond Krakowa Amy, Heimel Natalie, Galano Francis Galano, *op.cit.* p.22

<sup>39</sup> Grid Arenal, *Sub-Saharan Africa: Mineral resources and political instability*, 2012, www.grida.no.

<sup>40</sup> Richmond Krakowa Amy, Heimel Natalie, Galano Francis Galano, *op.cit.* p.22

the continual unsustainable extraction of minerals in many African countries is challenge hindering Africa's environmental sustainable development.

### *C. Governance*

The Africa's continent is extremely diverse. There is human diversity with more than 2000 languages, over 3000 tribes and many ethnicities divided between 54 countries.<sup>41</sup> The continent natural resources are also highly rich. This diversity and the uneven distribution between populations has unfortunately been a source of conflict across Africa.

Many countries in Sub-Sahara suffer from environmental instability when environmental change and unsustainable practices are combined with weak or failing governance.

**Weak Governance** is when a country lacks adequate institutions and financial resources to deal with non-sustainable practices at the source of environmental degradation. Vulnerable countries are, therefore, prone to environmental stress causing water and food insecurity, drought, and they suffer from economic decline, societal instability and migration.

History has shown that environmental stress often results in conflict especially when linked with poor governance.<sup>42</sup> Competition for resources due to resources shortage puts pressure on populations in need. These situations push antagonisms that emerge into violent conflicts, a trend that may exacerbate because environmental changes will continue to stress the most vulnerable regions in the world, mainly Sub-Saharan Africa.

A great number of countries in Sub-Saharan African experience poor political systems, imbalances in the distribution of wealth, and a lack of quality education. All of these issues lead to ineffective programs' development and make conflicts more likely. With continued environmental instability in weaker nations, the probability for governments, intergovernmental bodies as well as NGOs, to deal with humanitarian disasters, and ethnic and social violence, is high.<sup>43</sup>

Based on the data from the World Bank, the table below (Figure 10) indicates the 25 most poorly governed states in the world, 11 of which are located in Sub-Saharan Africa.

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<sup>41</sup> *Ibid.*

<sup>42</sup> *Ibid.*

<sup>43</sup> *Ibid.*

**Figure 10: Level of Governance 1996 - 2002 and Key Environmental Indication<sup>44</sup>**

State (Rank)	Governance Index <sup>45</sup>	State (Rank)	Governance Index
<b>Somalia (212)*</b>	<b>-2,60</b>	<b>Ivory Coast (199)*</b>	<b>-1,31</b>
North Korea (211)	-1,74	Haiti (198)*	-1,25
Myanmar (210)	-1,68	<b>Eretria (197)</b>	<b>-1,24</b>
Afghanistan (209)*	-1,64	<b>Angola (196)</b>	<b>-1,22</b>
<b>D.R.Congo (208)*</b>	<b>-1,58</b>	<b>Guinea Bissau (195)*</b>	<b>-1,18</b>
<b>Zimbabwe (207)*</b>	<b>-1,56</b>	Venezuela (194)	-1,18
<b>Sudan (206)*</b>	<b>-1,49</b>	<b>Congo (193)</b>	<b>-1,16</b>
Iraq (205)*	-1,48	Uzbekistan (192)	-1,13
<b>Chad (204)*</b>	<b>-1,47</b>	<b>Liberia (191)</b>	<b>-1,11</b>
<b>Equatorial Guinea (203)</b>	<b>-1,40</b>	Cambodia (190)	-1,08
<b>Guinea (202)*</b>	<b>-1,37</b>	<b>Burundi (189)*</b>	<b>-1,07</b>
<b>C. African Rep. (201)*</b>	<b>-1,36</b>	Laos (188)	-1,06
Turkmenistan (200)	-1,32		

\*States considered as Failed States<sup>46</sup> by the Failed States Index, 2013, *Annual special report by Foreign Policy and the Fund for Peace, www.foreignpolicy.com*

By studying the six metrics<sup>47</sup> between 1996 and 2008, the World Bank was able to quantify the degree of state stability. The number of failed state is high in Sub-Saharan Africa.

<sup>44</sup> Data from the World Bank, Kaufmann et al. 2008 in Richmond Krakowa Amy, Heimel Natalie, Galano Francis Galano, *op.cit.* p.24

<sup>45</sup> A more negative score indicates weaker governance

<sup>46</sup> Definition of Failed States: States whose domestic institutions have collapsed. NAU, *Perspectives on International Relations*, 3<sup>rd</sup> Edition, CQ Press, 2013. p.G-5

<sup>47</sup> Voice and accountability of the government, political stability and absence of violence, government effectiveness, regulatory quality rules, rule of law and control of corruption

According to the 2013 Foreign Policy and the Fund for Peace annual report, 15 to 20 of States in the most critical situation in the Failed States Index are located in Sub-Saharan Africa.<sup>48</sup>

“The large number of failed or failing states in Sub-Saharan Africa is troubling as they have large areas that are outside of effective government control and, thus, can be severely affected by humanitarian disasters, environmental stress and ethnic conflict.”<sup>49</sup>

State instability is in effect when a country lacks adequate institutions and financial resources to deal with non-sustainable practices leading to environmental degradation. Vulnerable countries are therefore prone to environmental stress causing water and food insecurity, drought, and consequently signs of economical decline, civil instability and migration may emerge.

#### *D. Migration*

The impact of climate change is exacerbating the current situation in terms of migration in Sub-Saharan Africa. The nations of this region will bear the most negative consequences of climate change as the structure of their economies is mostly based on agricultural production<sup>50</sup>. With the rising temperature and reduction in rainfalls, crop yields will be reduced, thereby decreasing employment prospects in the sector. In addition to food shortage and lack of access to fresh water and sanitation, poverty may increase. There is, therefore, a need for cooperation between political and economic institutions in order to cope with this situation and to promote human security by the creation of an environment where people can pursue a decent life.

States need to act as managers to provide access to basic natural resources and social assistance. Yet most nations in Sub-Saharan Africa lack the capacity to provide populations with these requests. Moreover, climate change will only exacerbate this incapability as the cost of providing public infrastructure will increase and the revenue of governments will decrease, due to the reduction of the revenue earned from natural resources.<sup>51</sup>

Climate change will induce water crisis and large-scale migration, and thereby reinforcing present trends of instability and conflict while at the same time drawing new lines of conflict.

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<sup>48</sup> Foreign Policy Magazine, *The 2013 Failed States Index – Interactive Map and ranking*, 2013.

[http://www.foreignpolicy.com/articles/2013/06/24/2013\\_failed\\_states\\_interactive\\_map](http://www.foreignpolicy.com/articles/2013/06/24/2013_failed_states_interactive_map)

<sup>49</sup> Richmong Krakowa Amy, Heimel Natalie, Galano Francis Galano, *op.cit.* p.22

<sup>50</sup> Cledinning Kyle, “Climate Change and Conflict: The Implications for Sub-Saharan Africa”, [www.earthreform.org](http://www.earthreform.org)

<sup>51</sup> German Advisory Council on global Change, *Climate change as a security risk*, 2008, p.116.

There are many effects linked with migration. First, migrating workers can have a good impact on their hosting countries as they make a contribution to the economic and social development of their new country. Second, if they send remittances to their country of origin, it will have a positive socioeconomic impact out there. However, there are also plenty of risks linked to migration. Migrants may be seen as a threat to national and international security. This threat is also exacerbated by the media. For example, by showing boats coming from Africa in the South of Europe, they attract a lot of attention, although numerically those boats represent only a fraction of international refugees.

People may leave their homeland because of environmental degradation or extreme bad weather. This is an environmentally induced migration that can be exacerbated in the future due of climate change. The degradation of the environment may also lead to the escalation of conflict and as a result to migration.

“The term environmental migrant is used to describe anyone who migrates because environmental changes either (1) have such an unfavorable effect on living conditions that previously achieved income levels and standards of living cannot be maintained or (2) destroy structures that are necessary for the maintenance of these levels and standards.”<sup>52</sup>

A distinction can be made between planned and sudden environmentally induced migration as a response to extreme weather.

- *Migration and conflict*

Lack of freshwater resources is a threat to human existence, and it will remain a primary reason for cross border migration in the future. Due to sudden increases in demand, massive influx of migration will put excessive pressure on scarce resources where migrants relocate, thus heightening competition and conflict over resources. Climate change-induced migration is causing vicious cycles, whereby climate change leads to drought, water insecurity, which leads to conflict, which in turn results in more internal displacement by local people (IDPs) and migration across borders. Migration puts pressures on water resources as people crowd in places where water infrastructure is not set for receiving more people, thus increasing water stress and poor sanitation, and potential social conflict, which in turn further fuels migration.

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<sup>52</sup> *Idem* p.118

Conflict is a human response to the scarcity of resources. Large scale and persistent migration can lead to asymmetry between demand and sustainable resources. Three conflict-generating mechanisms are linked with massive migration<sup>53</sup>:

1. Resources competitions between refugees and local communities,
2. Ethnicity and cultural differences between refugees and local communities and
3. Refugees as active or passive resources for parties of the conflict in case where refugee's camps are use as recruitment base or hiding grounds for combatants.

Migration does not necessarily lead to direct conflict; “the conflict potential of migration depends, to a significant degree, on how the government and people in the place of transit, destination or return, respond.”<sup>54</sup> The main problem with migration in Sub-Saharan Africa is that, most of the transit government face difficulties to cope with migration. Since Europe limits migration influx, migrants from the Sub-Sahara are left with no option but to wait in Northern Africa, working illegally, or being displaced or hired by terrorists group which cause a threat to human security.

Water and food insecurity, frequent drought, desertification and other effects of climate change will continue to pose serious adaptation challenges for the States of Sub-Saharan Africa, until wise solutions for reversing the climate's cycle are found. Competition for resources, decrease in economic productivity, weak governance and migration may lead to internal and regional conflict putting pressure on the capacity of the states along those tensions. Existing migration routes will worsen security vulnerability due to massive migration and the recruitment of migrants by terrorists groups.

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<sup>53</sup> Warnecke Andrea, Tanzler Dennis, Vollmer Ruth, “Climate Change, Migration and Conflict: Receiving Communities under Pressure?”, *The German Marshall Fund of The United States*, 2010, p.4.

<sup>54</sup> *Ibid.*

### **III. Identifying Vulnerable Areas**

According to the authors of the ACCES Vulnerability Discussion Paper on Climate Change and Security in Africa,<sup>55</sup> most Sub-Saharan countries in Africa will suffer from the environmental security consequences of climate change. In particular, “the Sahel region is considered the most threatened region on the continent.” Sudan and the Upper Nile region have been highly hot-spotted in the ACCES paper.

Another extensive study on mapping of climate change hotspots in terms of vulnerability was carried out in the *African Journal of Agriculture and Resources Economics*, which points out that Sub-Saharan Africa is a general climate change hotspot due to its high climate variability, and also due to wide-spread poverty in the region. The authors refer to Sub-Saharan Africa as “the food crisis epicenter of the world” where climate change will only make matters worse for those who are already poor and vulnerable.<sup>56</sup> For instance, about 60% of Sub-Saharan populations depend on livestock for their livelihoods. Climate change will significantly impact poor livestock keepers by altering the basic systems on which they depend. Sudan/South Sudan is a case in point.

#### *A. Sudan and South Sudan*

Sudan/South Sudan has a diverse landscape with desert in the north and tropical rainforest in the south. The Nile is the dominant geographic feature of the country making up a large part of the upper Nile basin. The Blue Nile and the White Nile, originating in Ethiopia and the Central African lakes, respectively, join in Khartoum to form the Nile River that flows into Egypt. It has been estimated that 224 million people live within the Nile basin divided between 11 countries. This represents almost one-quarter of Africa’s population.<sup>57</sup>

The situation in Sudan and South Sudan region has, in general, been considered vulnerable due to several factors that are linked to environmental challenges, such as competition for oil and gas reserves, water scarcity, desertification, drought and deforestation. Sudan/South Sudan has also been suffering from a long history of violence, ethnical conflicts and civil war. Competition for natural resources in particular has perpetuated conflict throughout the country. The genesis of the conflict in Darfur, for example, has been directly linked to

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<sup>55</sup> ACCES. *Climate Change and Security in Africa: Vulnerability Discussion Paper*. 2010 [http://www.africa-eu-partnership.org/sites/default/files/documents/doc\\_climate\\_vulnerability\\_discussion\\_paper.pdf](http://www.africa-eu-partnership.org/sites/default/files/documents/doc_climate_vulnerability_discussion_paper.pdf)

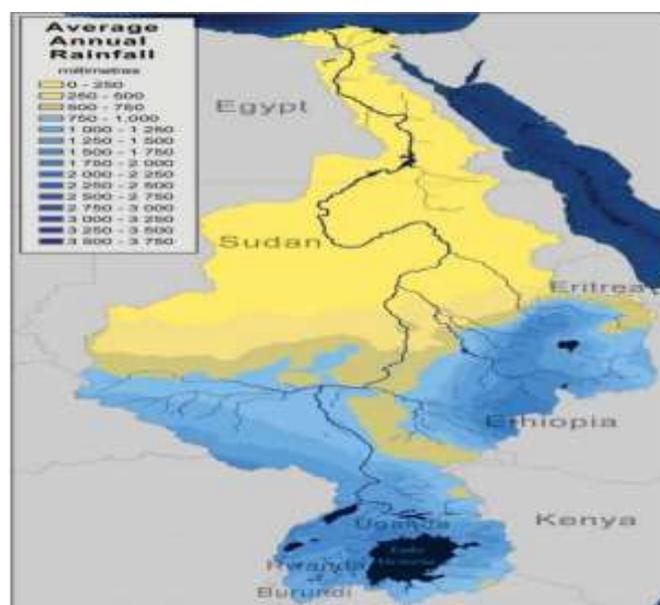
<sup>56</sup> Climate change and poverty in Africa: Mapping hotspots of vulnerability <http://ageconsearch.umn.edu/bitstream/56966/2/0201%20SI%20Thornton%20et%20al%20-%202026%20may.pdf>

<sup>57</sup> UNEP. “Chapter 2: Transboundary Surface Water Basins” *Africa Water Atlas 2010*. [http://na.unep.net/atlas/datas/sites/default/files/unepsiouxfalls/atlasbook\\_1112/africa\\_water\\_atlas\\_37-122.pdf](http://na.unep.net/atlas/datas/sites/default/files/unepsiouxfalls/atlasbook_1112/africa_water_atlas_37-122.pdf)

drought, declining water holes and the displacement of nomads, thereby ensuing competition over land between nomads and farmers.<sup>58</sup> In addition, civil war between the North and South that resulted in the independence of South Sudan was strongly exacerbated by conflicts over benefits from Nile waters and water rights.<sup>59</sup>

In the Sahel region, or Sudan more specifically, the negative consequences of climate change are most notable in terms of drought and desertification. Sudan and South Sudan have been experiencing waves of severe droughts, particularly, since the 1970s. Annual average rainfall can be as low as zero in the north of the country (Figure 11). In addition, it has been estimated that desertification could threaten to reduce food production by 20 per cent.<sup>60</sup> This would have immense consequences on the growing populations who depend on agriculture for their livelihoods. According to UNEP, 96.7% of total water withdrawal in Sudan is used in agriculture. The remaining 3.3% is used for municipal and industrial uses.<sup>61</sup> The threat to the livelihoods of farmers represents a potential rise in human, water, and food related insecurity in the region. Other observable threats to the region include current conflicts between the Sudan and South Sudan over natural resources, namely oil and water.

**Figure 11. Average Annual Rainfall across the Nile River Basin** <sup>62</sup>



Due to decades of conflict, Sudan/South Sudan has had one of the largest populations of displaced persons in the world.<sup>63</sup> Within refugee camps, there is an ongoing and alarmingly water crisis. According to the head of the International Committee of the Red Cross ICRC delegation of South Sudan, "the humanitarian situation in Yusuf

<sup>58</sup> Brown, Oli., Climate change as the 'new' security threat : Implications for Africa

<sup>59</sup> EU. Sudan: Climate Induced Changes on Water and Security. 2010

[http://www.cliwasec.eu/projects/study\\_sites\\_details.php?studysites\\_id=13](http://www.cliwasec.eu/projects/study_sites_details.php?studysites_id=13)

<sup>60</sup> UNEP, 2007, 'Sudan Post-Conflict Environmental Assessment Report', Synthesis Report, United Nations Environmental Project, Nairobi. [http://www.ssrnetwork.net/document\\_library/detail/3668/sudan-post-conflict-environmental-assessment-report](http://www.ssrnetwork.net/document_library/detail/3668/sudan-post-conflict-environmental-assessment-report)

<sup>61</sup> [http://na.unep.net/atlas/datlas/sites/default/files/unepsiouxfalls/atlasbook\\_1112/africa\\_water\\_atlas\\_175-314.pdf](http://na.unep.net/atlas/datlas/sites/default/files/unepsiouxfalls/atlasbook_1112/africa_water_atlas_175-314.pdf)

<sup>62</sup> [http://na.unep.net/atlas/datlas/sites/default/files/unepsiouxfalls/atlasbook\\_1112/africa\\_water\\_atlas\\_37-122.pdf](http://na.unep.net/atlas/datlas/sites/default/files/unepsiouxfalls/atlasbook_1112/africa_water_atlas_37-122.pdf)

<sup>63</sup> UNEP, 2007, 'Sudan Post-Conflict Environmental Assessment Report', Synthesis Report, United Nations Environmental Project, Nairobi. [http://www.ssrnetwork.net/document\\_library/detail/3668/sudan-post-conflict-environmental-assessment-report](http://www.ssrnetwork.net/document_library/detail/3668/sudan-post-conflict-environmental-assessment-report)

Batil camp in particular is extremely worrying. Conditions are dire and survival remains a struggle. Owing to the lack of clean water, people are drinking contaminated surface water".<sup>64</sup> In this situation, children are the most affected population group by water-borne diseases such as malaria, diarrhea and cholera.

The construction of dams is another major concern regarding water and environmental security in Sudan. Some people fear that these government initiatives will have both environmental implications as well as socio-economic and political implications. Plans for constructing dams may seriously undermine the surrounding ecosystem but also the livelihoods of those who live by the riverbed.

On an international level, any construction of dams may change downstream water flow patterns, causing potential conflict between Egypt and Sudan/ South Sudan. For example, construction of the Merowe dam (2003–2009) has, over the past decade, displaced tens of thousands of residents from Nubia, a region straddling northern Sudan and southern Egypt.<sup>65</sup> The disastrously conceived dam on a turbulent and forceful stretch of the Nile River has led to massive silting. This has forced the evacuation of farmers and fishermen, who, once, relied on the fertile Nile and now live on agriculturally barren lands.

#### *B. Democratic Republic of Congo (DRC) and the Congo River Basin*

The DRC is considered a vulnerable area in Sub-Saharan Africa because it is a cradle for biodiversity that is rich in raw materials and helps in the process of global climate change regulation as well as water purification.<sup>66</sup> The main geographic feature of the country is the Congo River Basin, made up of rich forest and the Congo River, the second largest river in Africa,<sup>67</sup> The river provides many benefits to the country in terms of resources, energy and biodiversity and it plays a key role in the livelihoods of millions of people in Central Africa.

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<sup>64</sup> Watson, Ewan and Clemenzo, Jean- Yves. "South Sudan: water shortages hit crisis point in refugee camps" *ICRC Resource Center*. 2012. <http://www.icrc.org/eng/resources/documents/update/2012/south-sudan-update-2012-09-20.htm>

<sup>65</sup> Reeves, Eric. "Dams Droughts, Desertification and Water Wars" *Good Governance Africa*. 2013. <http://gga.org/stories/editions/aif-13-out-of-water/dams-droughts-desertification-and-water-wars>

<sup>66</sup> Wingqvist, Gunilla Olund. *Democratic Republic of Congo – Environmental and Climate Change Policy Brief*. University of Gothenberg. 2008. p.3 <http://www.sida.se/Global/Countries%20and%20regions/Africa/DR%20Congo/Environmental%20policy%20brief%20DR%20Congo.pdf>

<sup>67</sup> UNEP. "Chapter 3: Tracking Progress Towards Environmental Sustainability" *Africa Atlas UNPEP*. 2010. p.130. [http://na.unep.net/atlas/dAtlas/sites/default/files/unepsiouxfalls/atlasbook\\_1136/Africa Atlas English Chapter\\_3a.pdf](http://na.unep.net/atlas/dAtlas/sites/default/files/unepsiouxfalls/atlasbook_1136/Africa Atlas English Chapter_3a.pdf)

Although rich in natural resources, the DRC is currently experiencing extreme poverty, weak governance and a long history of instability, conflict and violence since independence in 1960. However, between 1998 and 2003, the DRC conflict killed 5.4 million people mostly from disease and starvation, making the Second Congo War the deadliest conflict worldwide since World War II. By 2008, the war and its aftermath had millions more people displaced from their homes or sought asylum either in neighbouring countries or Western countries. It has been estimated that in a decade of conflict the country counts between 1 and 3.4 million internally displaced persons (IDPs).<sup>68</sup>

In environmental terms, the DRC suffers from issues related to the over-exploitation of mineral resources, ethnic divisions, deforestation, ecosystem degradation, poor water infrastructure and pollution. Some of the main causes for these environmental problems are the dense populations in urban areas and poor infrastructure management coupled with the overall political instability in the country.

The majority of the country is covered with forest, but it suffers from wide ranging deforestation and ecosystem degradation.<sup>69</sup> Land degradation, such as soil erosion, is a major concern affecting agriculture and food security. Land degradation is generally linked to population density. Rapid deforestation has critical and side effects on the region's climate as it not only emits the majority of the CO<sub>2</sub> in Central Africa, but it also reduces the ability of forest to maintain levels of precipitation and rainfall.<sup>70</sup>

Even though the country holds over half of Africa's water reserves, UNEP has estimated that 51 million people in the DRC, representing three quarters of the population, have no access to safe drinking water.<sup>71</sup> The country's long legacy of conflict, environmental degradation, rapid urbanization and under-investment in water infrastructure are linked to these alarmingly low rates of available drinking water. In urban areas inadequate water and sanitation availability is due to insufficient, old and overloaded networks combined with the degradation of critical

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<sup>68</sup> Wingqvist, Gunilla Olund. *Democratic Republic of Congo – Environmental and Climate Change Policy Brief*. University of Gothenberg. 2008. p.3

<http://www.sida.se/Global/Countries%20and%20regions/Africa/DR%20Congo/Environmental%20policy%20brief%20DR%20Congo.pdf>

<sup>69</sup> UNEP. "Chapter 3: Tracking Progress Towards Environmental Sustainability" *Africa Atlas UNPEP*. 2010. p.130.

[http://na.unep.net/atlas/dAtlas/sites/default/files/unepsiouxfalls/atlasbook\\_1136/Africa\\_Atlas\\_English\\_Chapter\\_3\\_a.pdf](http://na.unep.net/atlas/dAtlas/sites/default/files/unepsiouxfalls/atlasbook_1136/Africa_Atlas_English_Chapter_3_a.pdf)

<sup>70</sup> IES. *Wetland landscape: Environmental Security Assessment*. "Institute for Environmental Security". 2009. [http://www.envirosecurity.org/espa/PDF/ESA\\_DRC.pdf](http://www.envirosecurity.org/espa/PDF/ESA_DRC.pdf)

<sup>71</sup> UN NEWS CENTER. "In water-rich DR Congo, 50 million people lack clean water to drink- UN" 2011. <http://www.un.org/apps/news/story.asp?NewsID=37850&Cr=dr+congo#.Up5rHmRDtmk>

water sources and watersheds, such as the Lukunga and N'Djili catchments areas for example, which provide the majority of the drinking water for Kinshasa.<sup>72</sup> The mismanagement of natural resources in the DRC is definitely a source of instability and insecurity.

In western DRC, the Tumba-Ngiri-Maindombe wetlands are considered “the largest wetlands of international importance.”<sup>73</sup> However, the growing population is exerting great pressure on resource, land, and energy demands in the region. Unsustainable and mismanaged land use for agriculture, logging and settlements are a key challenge. This competition for resources combined with widespread poverty and diseases have significantly decreased the overall quality of life of locals. It has been estimated that at least 90% of DRC households do not have access to safe drinking water and adequate sanitation.<sup>74</sup>

At an institutional level, weak governance, widespread corruption and low educational levels have aggravated the situation. The DRC is known for its richness in minerals. Unfortunately this wealth has rarely been harnessed for its benefits but rather has been a major cause for conflict. *Transition* in an attempt to ensure that conflict minerals do not enter the illegal supply chain under control of militia groups, industrial actors, the Congolese Government and outside donors have established schemes to trace minerals such as cassiterite and coltan back to the mines of origin.<sup>75</sup>

### *C. Nigeria and Lake Chad*

The Niger delta is particularly vulnerable to climate change and conflict due its low elevation and its history of conflicts stemming from oil wealth and ethnic diversity. The country has more than 250 ethnic groups creating deep fractions among the Nigerian population. The IPCC identified Nigeria as a climate change “hot spot” due to the probability of major shifts in weather patterns and to the vulnerability of the population. The negative effects of climate change could lead to a decrease in the quality of life resulting in unstable livelihoods, economies and governments. Their “high reliance on climate- dependent economic activities such as agriculture, herding and fishing” makes the inhabitants of Nigeria particularly

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<sup>72</sup> *Ibid.*

<sup>73</sup> IES. Institute for Environmental Security. “Congo Basin- DRC Case Study on Ngiri-Tumba-Maindombe wetland landscape: Environmental Security Assessment.” *Institute for Environmental Security*. 2009. [http://www.envirosecurity.org/espa/PDF/ESA\\_DRC.pdf](http://www.envirosecurity.org/espa/PDF/ESA_DRC.pdf)

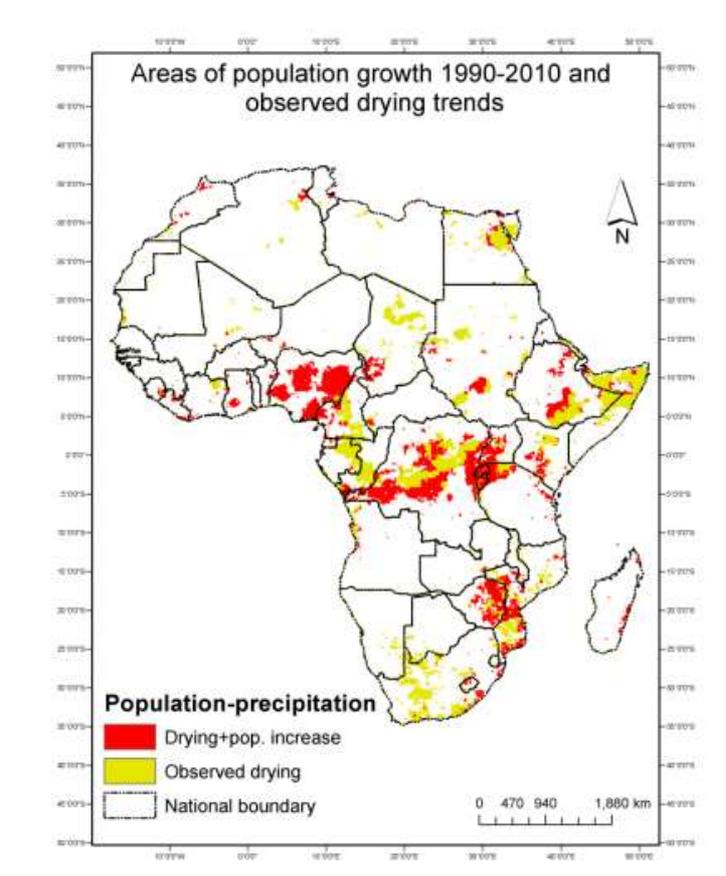
<sup>74</sup> *Ibid.*

<sup>75</sup> De Koning, Reuben. “Controlling conflict resources in the Democratic Republic of the Congo.” *Stockholm International Peace Research Institute Policy Brief*. 2010. [http://books.sipri.org/product\\_info?c\\_product\\_id=407#](http://books.sipri.org/product_info?c_product_id=407#)

vulnerable to climate change.<sup>76</sup> A change in rainfall variability for example, has led to more droughts in the north and floods in south.

In northern Nigeria, desertification spreads by 350,000 hectares every year, which affects 50 to 75 percent of the land in 10 northern states. In this, is a semi-arid region, resting at the edge of the Sahel, where many of the people are dependent on the land for their livelihood. The spreading desert affects roughly 35 million people in northern Nigeria and the region's population faces many household level challenges to adapt to their changing circumstances.<sup>77</sup>

**Figure 12. Map of Africa showing population growth and drying areas<sup>78</sup>**



Persistent drought and desertification have been identified as the primary cause of the depletion of the Lake Chad, causing conflict among the people living on the borders.<sup>79</sup> Conflicts have intensified between pastoralists, famers and fishermen who depend heavily on the lake for their livelihoods.

<sup>76</sup> CCAPS. *Vulnerability to Climate Change in West Africa*. 2012. pg. 9

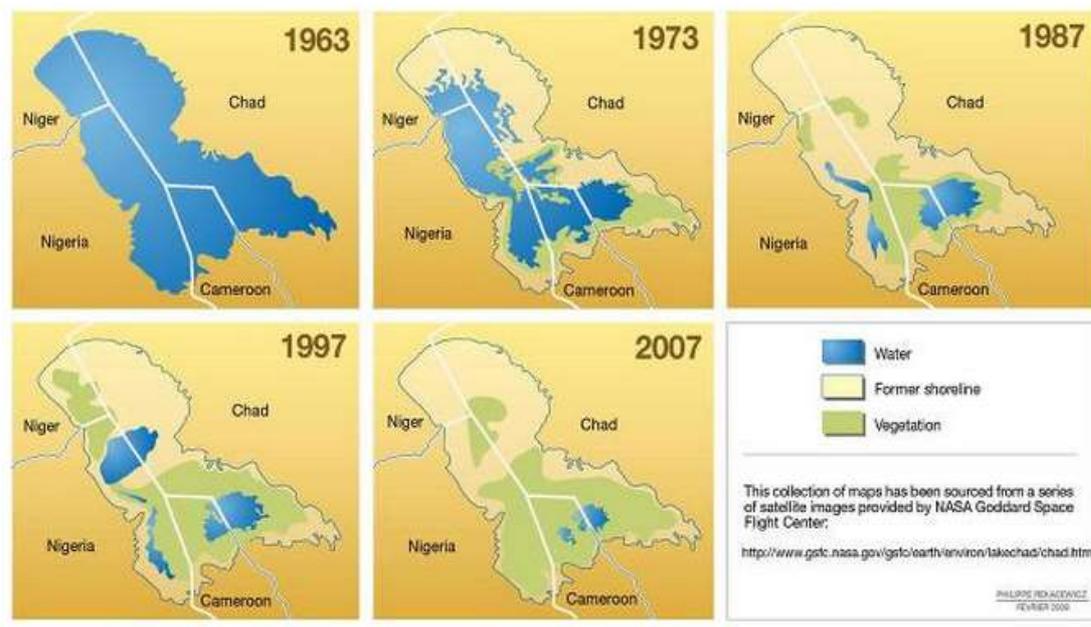
[http://reliefweb.int/sites/reliefweb.int/files/resources/original\\_2.pdf](http://reliefweb.int/sites/reliefweb.int/files/resources/original_2.pdf)

<sup>77</sup> *Ibid.* p.25

<sup>78</sup> Areas (in red) where population in 2010 had increased relative to 1990 by more than 50 people/km<sup>2</sup> and declining trends in SPI precipitation between 1979 and 2010 of more than -0.5 were observed. The areas highlighted in yellow are areas of observed declining SPI precipitation between 1979 and 2010 of more than -0.5. <http://www.archive-iussp.org/login/documents/906.pdf>

<sup>79</sup> Fagbohun, Olanrewaju. "Environmental Degradation and Nigeria's National Security: Making Connections." *Law and Security in Africa*. p. 367 <http://nials-nigeria.org/pub/OlanrewajuFagbohun.pdf>

**Figure 13. Lake Chad Depletion from 1963- 2007**



At the other extreme, the Niger delta is particularly vulnerable to floods and sea level rises.<sup>80</sup> Oil extraction has caused air and water pollution, due to the estimated 2,300 cubic meters of oil that are spilled into the Delta annually. Meanwhile, the potential for sea level rise and flooding to occur at the mouth of the Niger River, could mean that contaminated waters will spread even farther in the region and will continue to reduce the quality of life of the region's populations.

If the projected sea level rises by one meter, floods could displace 80 percent of the population. The presence of discriminated and powerless ethnic groups in the Niger Delta could be particularly problematic in the event of sea level rise or another disaster in this densely populated coastal zone.

Environmental challenges will strongly affect Lagos for example, that is lying on the coast of the Niger Delta. The total population reaches more than 15 million people and population densities reaching 20,000 people per square kilometer in some parts of the city. Lagos currently has at least 42 slum areas. Two-thirds of all Lagos residents live in slums. This means that roughly 10 million people in Lagos live in slums with high concentrations of poverty and little to no access to proper sanitation, clean water or electricity. The city's low elevation threatens to make Lagos the site of widespread flooding and displacement due to sea level rise, circumstances the population will be poorly equipped to face without substantial

<sup>80</sup> IPCC

government assistance. The FAO considers Nigeria's water use and management to be very poor by international standards.

This region has vast mineral, oil and gas deposits. The rich potential of mining in the area has led to conflicts, as armed forces have fought for control of the resources. As a result, mining has been a destabilizing factor in many of these countries rather than an opportunity for development. The same situation can be seen in the oil sector. Nigeria alone accounts for 8.7% of crude oil exports to the US. The country is the largest oil exporter in Africa.

In the past decade, Nigeria has lost around 55 percent of its primary forest to logging. This particularly rapid deforestation rate, will contribute to the region's vulnerability to erosion and floods. However, the population's high dependence of timber for fuel as well as the clearing of forests for oil extraction and mining activities will be a difficult challenge for governments to overcome.

Nigeria does not keep good data on migration, climate change related or not, yet existing figures show a serious IDP problem: conflict alone displaced three million people between 1999 and 2006, with at least 80,000 homeless at the end of 2009.<sup>81</sup>

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<sup>81</sup> Sayne, Aaron. "Climate Change Adaptation and Conflict in Nigeria" *US Institute of Peace*. June 2011. [http://www.usip.org/sites/default/files/Climate\\_Change\\_Nigeria.pdf](http://www.usip.org/sites/default/files/Climate_Change_Nigeria.pdf)

## **IV. Policy Recommendations for Conflict Prevention**

### *A. Conflict Prevention*

As it has been outlined above in Figure 5, page 13, the combination of ecosystem degradation, scarcity and poor access to natural resources and over population have led to greater stress and competition for natural resources. The diagram shows the succession of factors that link environmental issues to potential conflict situations. Although caution is used in assuming a linear causation model, the diagram can also be used to develop conflict prevention strategies. Adaptive strategies may be inserted at different phases of the model. If adaptive measures focus on reversing the negative implications of ecosystem degradation, through reforestation measures for instance, the rippling effects of deforestation and land degradation may be reversed or at least slowed down. Similarly, measures aimed at addressing the issues of climate-induced migration may relieve certain communities from additional competition for natural resources.

Measures for conflict prevention are urgently needed in Africa, where countries and people are the most vulnerable to the adverse affects of climate change. Conflict prevention to ensure environmental and water security in the years to come, will be essential for countries suffering from severe water scarcity, deforestation and other critical environmental problems. The primary focus of adaptive and conflict prevention strategies should, therefore, lay in improving **environmental governance** at all levels.

In Sub-Saharan Africa in general, governance, management mechanisms and institutions to manage environmental and water resources are either inefficient or inadequate. Sustainable resources development and management are major challenges to be addressed in the immediate and long-term future. In the case of water governance, a comprehensive and complex process should be developed taking into account a wide range of political, social, cultural, environmental, technical and economic dimensions involving all stakeholders.<sup>82</sup> In the context of increased competition over resources, clear water rights and transparent management procedures can contribute to reducing conflicts.

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<sup>82</sup> Funder, Mikkel., Ravnborg, Helle Munk. and Westermann, Olaf. "Water and conflict: Conflict prevention and mitigation in water resources management." *Danish Institute for International Studies*. 2004. <http://www.isn.ethz.ch/Digital-Library/Publications/Detail/?id=19267&lng=en>

**Capacity building** to adapt to climate change can help prevent climate-related conflicts and insecurity.<sup>83</sup> This may include measures that protect or diversify livelihoods and ensure access to and availability of natural resources. Capacity building should be developed in the context of high resource dependent activities such as agriculture and dam construction. Poor infrastructure and farming practices contribute to the misuse and deterioration of resources. Simple measures such rain-water harvesting, repairing infrastructure and better irrigation systems should be implemented.

Given the complexities of climate change and frequent conflicts in Africa, it is difficult to find accurate data that draws a direct links between the two. Data regarding vulnerability and risk analysis, therefore is key to understanding and developing adaptive strategies. The following policy recommendations are based on the climate change- environmental security- conflict nexus mainly aimed at Sub-Saharan Africa.

#### *B. Policy Recommendations*

- Improve environmental governance by strengthening key institutions

There is a need to tackle environmental security and improve governance capacity and planning at all levels. In the context of trans-boundary disputes and competition, governments should focus on regional agreements to enforce environmental protection law as a way of preserving scarce resources.<sup>84</sup> Government capacity should be improved in order to design and manage budget, and develop and enforce law that would protect vulnerable infrastructure.

In South Sudan, environmental governance is at its infancy, and here lies a great opportunity to make strong policies, legislation and institutions regarding environmental and natural resource governance from outset of policy- making.

- Protecting natural resources through improved management

It is important that Sub-Saharan African population have access to better technologies for irrigation systems and training for a better management of scarce resources, such as water. African governments should promote agro-ecological approaches to farming. They should

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<sup>83</sup> Brown, Oli., Hammill, Anne., and Mcleman, Robert. "Climate Change as the 'New' Security Threat: Implications for Africa" *Africa and Security*. 2007 <http://www.jstor.org/stable/4541915>

<sup>84</sup> Panafrican Climate Justice Alliance , *op.cit.*, p.4

bring support to smallholders, improved seed varieties and drought-tolerant stock and fertilizers.<sup>85</sup> They also need to plan for reforestation schemes.

A better management of natural resources can help population to prevent a strong and sudden decrease in economic productivity caused by climate change and population growth. By improving agricultural practices, the production of food can be done on a more sustainable way. For example in South Sudan, peace will hold only if the government in the capital of Juba helps citizens to farm by drilling boreholes and by providing other tools useful for irrigation.

The country's oil reserves, while lucrative, will eventually run out and the government must "commit fully to agriculture as the mainstay of South Sudan's economy."<sup>86</sup>

Natural resource management should be a national priority in the whole Sub-Saharan Africa.

- Increasing awareness and knowledge

There is a strong need to give people access to sufficient information on expected climate change. Reducing the uncertainty involved in future impact will help people to pro-act on a more sustainable way to climate change. It is also important to invest in education programs in order to provide future generation with the necessary skills for a better management of natural resources.

- Adequate environmental data and information

There are few databases of resource conditions available for Africa. In fact, they are generally outdated, scattered and incomplete.<sup>87</sup> In order to find concrete solutions to strive against the impact of climate change, local and international governments should have access to current data. African governments should therefore either reinforce existing research programs or initiate new ones regarding climate change and environmental security.<sup>88</sup>

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<sup>85</sup> Panafrican Climate Change Alliance, *op.cit.*, p.4

<sup>86</sup> Reeves, Eric. "South Sudan: Dams, Droughts, Desertification and Water Wars" *All Africa*. 2013.

<http://allafrica.com/stories/201307020667.html>

<sup>87</sup> IES. Institute for Environmental Security. "Congo Basin- DRC Case Study on Ngiri-Tumba-Maindombe wetland landscape: Environmental Security Assessment." *Institute for Environmental Security*. 2009.

[http://www.envirosecurity.org/espa/PDF/ESA\\_DRC.pdf](http://www.envirosecurity.org/espa/PDF/ESA_DRC.pdf)

<sup>88</sup> SAYNE, Aaron. "Climate Change Adaptation and Conflict in Nigeria" *US Institute of Peace*. June 2011.

[http://www.usip.org/sites/default/files/Climate\\_Change\\_Nigeria.pdf](http://www.usip.org/sites/default/files/Climate_Change_Nigeria.pdf)

- Facilitating local participation of all stakeholders

Local people should be able to assess and have a say in their own situation and needs. As they understand the local culture and environment they are in the best position to contribute and develop appropriate and sustainable measures. They should form social networks in order to participate in climate change planning and decision-making. They should be involved in the implementing process of adaptation strategies.

- Implementation of national programs focusing on vulnerable people

African populations in vulnerable areas will suffer the most from negative impacts of climate change. Governments should develop adaptation policies that prioritize poor people's needs in particular, such as gender equality and human rights and promote equal access to basic resources.

- International funding for climate change adaptation

Following to the IPCC 5<sup>th</sup> Assessment Report<sup>89</sup>, if there are no cuts in the emissions of developed countries of CO<sub>2</sub>, the average temperatures are likely to increase by more than 3C° from the pre-industrial level<sup>90</sup>. There are no definitive ways to eradicate climate change across a whole continent such as Africa. Thus, there is a need to focus on knowledge of local conditions. International funding for adaptation is fundamental. Africa's potential to finance the needs to address the costs linked to climate change is really uncertain. Financial means for cooperation between the North and South should be found.

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<sup>89</sup> Symon Caroline, "Climate change: action, trends and implications for business. The IPCC's Fifth Assessment report", *University of Cambridge*, 2013. P.11

<sup>90</sup> *Ibid.*

## References

- Adepoju Aderanty, "Migration and social policy in Sub-Saharan Africa", *Institute for future studies UNRISD*, 2008. 19p
- Butts, Kent Hughes. "NATO's Contributions to European Environmental Security" 1993 <http://www.dtic.mil/dtic/tr/fulltext/u2/a275918.pdf>
- Calzadilla Alvaro, Zhu Tingju, Rehdanz Katrin, Tol Richard, Ringler Claudia, « Economywide Impacts of Climate Change on Agriculture in Sub-Saharan Africa » in *International Food Policy Research Institute*, 2009. 4p.
- CARE, *Humanitarian implications of climate change. Mapping emerging trends and risks hotspots*, Second edition, 2009. 23p.
- Cledning Kyle, "Climate Change and Conflict: The Implications for Sub-Saharan Africa", [www.earthreform.org](http://www.earthreform.org)
- De Koning, Reuben. "Controlling conflict resources in the Democratic Republic of the Congo." *Stockholm International Peace Research Institute Policy Brief*. 2010. [http://books.sipri.org/product\\_info?c\\_product\\_id=407#](http://books.sipri.org/product_info?c_product_id=407#)
- Fagbohun, Olanrewaju. "Environmental Degradation and Nigeria's National Security: Making Connections." *Law and Security in Africa*. p. 367 <http://nials-nigeria.org/pub/OlanrewajuFagbohun.pdf>
- Foreign Policy Magazine, *The 2013 Failed States Index – Interactive Map and ranking*, 2013. [http://www.foreignpolicy.com/articles/2013/06/24/2013\\_failed\\_states\\_interactive\\_map](http://www.foreignpolicy.com/articles/2013/06/24/2013_failed_states_interactive_map)
- Funder, Mikkel., Ravnborg, Helle Munk. and Westermann, Olaf. "Water and conflict: Conflict prevention and mitigation in water resources management." *Danish Institute for International Studies*. 2004. <http://www.isn.ethz.ch/Digital-Library/Publications/Detail/?id=19267&lng=en>
- German Advisory Council on Global Change, *Climate change as a security risk*, 2008. 243p.
- Gleick Peter H. "Fresh Water Resources and International Security" *International Security* 18/1, 1993, p.79.
- Gleck, Peter H. "Water and Conflict" *International Security*. Vol 18 n° 1. 1993.
- GRID ARENAL, *Sub-Saharan Africa: Mineral resources and political instability*, 2012, [www.grida.no](http://www.grida.no).
- Grenn, Duncan. "What are African Countries already doing to adapt to Climate Change" *Oxfam blogspot*. 2010 <http://www.oxfamblogs.org/fp2p/?m=201008>
- IES. The Institute for Environmental Security. IES. "Congo Basin- DRC Case Study on Ngiri-Tumba-Maindombe wetland landscape: Environmental Security Assessment." *Institute for Environmental Security*. 2009. [http://www.envirosecurity.org/espa/PDF/ESA\\_DRC.pdf](http://www.envirosecurity.org/espa/PDF/ESA_DRC.pdf)
- NAU, *Perspectives on International Relations*, 3<sup>rd</sup> edition, CQ Press, 2013. 524p.
- Pacific Institute. *The World's Water*, <http://www.worldwater.org/conflict>, updated 11/09.
- Ndaruzaniye, Valerie. "Water for Conflict Prevention" Symposium 2009. <http://www.gwiwater.org/library/>
- Panafrican Climate Justice Alliance. *The Economic costs of Climate Change in Africa*, 2009. 47p.
- Richmong, Amy, Heimel Natalie, Galano Francis Galano, "Modeling Environmental Security in Sub-Saharan Africa", *The Geographical Bulletin*, 53: 21-38, 2012. 38p.
- Symon Caroline, "Climate change: action, trends and implications for business. The IPCC's Fifth Assessment report", *University of Cambridge*, 2013. 20p.
- Reeves, Eric. "Dams Droughts, Desertification and Water Wars" *Good Governance Africa*. 2013. <http://gga.org/stories/editions/aif-13-out-of-water/dams-droughts-desertification-and-water-wars>

- UNEP, “Fact Sheet: Climate Change in Africa- What is at Stake?” *IPCC Report Chapter 11: Regional Climate Projections*.  
[http://www.unep.org/roa/amcen/docs/AMCEN\\_Events/climate-change/2ndExtra\\_15Dec/FACT\\_SHEET\\_CC\\_Africa.pdf](http://www.unep.org/roa/amcen/docs/AMCEN_Events/climate-change/2ndExtra_15Dec/FACT_SHEET_CC_Africa.pdf)
- UNEP, “Linking Environment and Security” *Regional Office for Europe: Key Activities. 2013*.  
<http://www.unep.org/roe/KeyActivities/EnvironmentalSecurity/tabid/54360/Default.aspx>
- UNICEF and WHO, *Progress on Sanitation and Drinking Water*. 2010  
[http://www.wssinfo.org/fileadmin/user\\_upload/resources/1278061137-JMP\\_report\\_2010\\_en.pdf](http://www.wssinfo.org/fileadmin/user_upload/resources/1278061137-JMP_report_2010_en.pdf)
- UNOPS, *UNOPS contribution to Disaster Risk Reduction Building resilience through infrastructure-based solutions with community involvement*, 2012. 20p.
- UNFCCC, United Nations Framework Convention on Climate Change. Article 1.  
2013 [http://unfccc.int/essential\\_background/convention/background/items/2536.php](http://unfccc.int/essential_background/convention/background/items/2536.php)
- UN News Center. “In water-rich DR Congo, 50 million people lack clean water to drink- UN” 2011.  
<http://www.un.org/apps/news/story.asp?NewsID=37850&Cr=dr+congo#.Up5rHmRDtmk>
- Warnecke Andrea, Tanzler Dennis, Vollmer Ruth, “Climate Change, Migration and Conflict: Receiving Communities under Pressure?”, *The German Marshall Fund of The United States*, 2010. 12p.
- Wingqvist, Gunilla Olund. *Democratic Republic of Congo – Environmental and Climate Change Policy Brief*. University of Gothenberg. 2008. p.3  
<http://www.sida.se/Global/Countries%20and%20regions/Africa/DR%20Congo/Environmental%20policy%20brief%20DR%20Congo.pdf>

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