



BRIEFING

Climate Change Challenges for Africa:

Evidence from selected
Eu-Funded Research
Projects

April 2012

Summary

Africa, while currently responsible for a negligible amount of total global greenhouse gas emissions, is under significant threat from climate change. Changes in precipitation levels, likely increase in temperature extremes and rising sea levels will have a wide range of direct and indirect impacts on Africa.

In order to adapt to these future climate challenges, it is important for decision makers in Africa to help reduce the negative consequences for society and, in particular, to protect vulnerable groups. Referring to sound research, it is necessary to understand what the future changes to the climate are likely to be, how impacts will be distributed across different regions, the direct and indirect impacts of these changes, and the appropriate adaptation responses to these impacts. Past and ongoing projects funded through the EU's Research Framework Programmes are contributing to this understanding thus helping to improve the capacity of African institutions to make informed decisions for future adaptation to climate change.



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These projects also highlight the potential for Africa to benefit from low carbon development, and to harness the benefits associated with carbon sequestration. Investment in REDD projects in particular could allow Africa to contribute to international mitigation efforts through market-based instruments such as the Clean Development Mechanism.

This briefing explores the challenge of climate change to Africa, underlining the role of research conducted under the EU's Research Framework Programmes in understanding future climate change in Africa and

the impacts that this change might have. It highlights Africa's current vulnerability to climate change, its existing level of adaptive capacity, and the role that EU-funded research projects can play in contributing to solutions to the current situation. The briefing further discusses how certain projects undertaken as part of EU-funded research can help reduce gaps in adaptive capacity while also facilitating African access to mitigation opportunities. It is intended to help familiarize decision makers with the on-going work of the EU in addressing climate change in Africa.

INTRODUCTION

Due to its current level of economic development, Africa is highly vulnerable to the impacts of climate change which threaten to stall or reverse its efforts on food security, human health and broad-based economic growth and development by mid-century. However, Africa only accounts for a small share of global greenhouse gas emissions – just under 7% in 2005 – and has contributed even less to historic emissions.¹ An effective global agreement to limit emissions and to mitigate the impacts of climate change is, therefore, of paramount importance to Africa.²

Africa requires financial resources and technical capacity to adapt to the impacts of climate change, and to develop appropriate low carbon technologies. A recent World Bank study estimated that it will cost developing countries between US\$75 and 100 billion per year to adapt to a temperature change of approximately 2°C by 2050. For Sub-Saharan Africa, estimated annual adaptation costs are US\$14-17 billion, corresponding to roughly half the amount of Official Development Assistance provided for all of Africa in 2010.³ According to statistics published by the Organization for Economic Cooperation and Development, US\$29.3 billion in bilateral assistance was provided to Africa in 2010.⁴ Some economists predict that in order to achieve “climate resilient” Millennium Development Goals over the whole continent, Africa will require US\$100 billion a year in the 2010-2020 period with approximately US\$82 billion required for standard development assistance, and an additional US\$11-21 billion for adaptation.⁵

The EU continues to play a significant role in supporting Africa in understanding and coping with the impacts of climate change. Cooperation between the EU and Africa has been established as part of multilateral initiatives such as the European Neighbourhood Policy established in 2008 – including countries in North Africa; the Cotonou Agreement concluded between the EU and the 77 countries in Africa, the Caribbean and the Pacific; the EU-Africa Joint Strategy established through the Lisbon agenda in 2007.⁶ These initiatives are further complemented by the work of the Science and Technology for Development Programme which has been supporting research in Africa since 1983.⁷ Funding as part of this programme has resulted in the conclusion of a number of projects administered by DG Research.

Written by Jane Desbarats, this briefing explores the potential for research funded through DG Research to further the understanding of Africa's exposure to climate change, and its ability to cope with climate change impacts. The potential for DG Research funding to minimise the cost of climate change could also have implications for future policy measures forming the basis of international cooperation between the EU and Africa, financial contributions to scientific research and Official Development Assistance.

This briefing provides an overview of the impacts of climate change in Africa, possible ways to adapt and mitigation techniques such as the potential for

carbon sequestration. All sections reflect the findings of research projects and give concrete examples of what is being done to adapt to climate change in the region. The policy implications of all types of projects are provided as part of the briefing conclusions. Full project name and website details for all EU Framework Programme (FP) projects mentioned in this briefing are provided in Annex.

EU-Funded Climate Change Research in Africa

Under the EU Sixth and Seventh Framework Programmes (FP), a total of €146 million has been made available to 1241 participants for research projects in Africa. The budget allocated to the Africa 2010 call for tender, for example, was 63 million.⁸ These projects have explored the following climate change related research: mitigation and carbon sequestration potential; modelling climate change uncertainties and projected impacts; increasing knowledge base of climate change impacts; improved earth observation and monitoring; impacts on water availability; impacts of transport on climate change (and vice versa); the impact of climate change on agriculture and hence food security; impacts of climate change on health; impacts of climate change on natural resources and ecosystems; and work to quantify the cost of climate change impacts and response measures.

IMPACTS OF AND VULNERABILITY TO CLIMATE CHANGE IN AFRICA

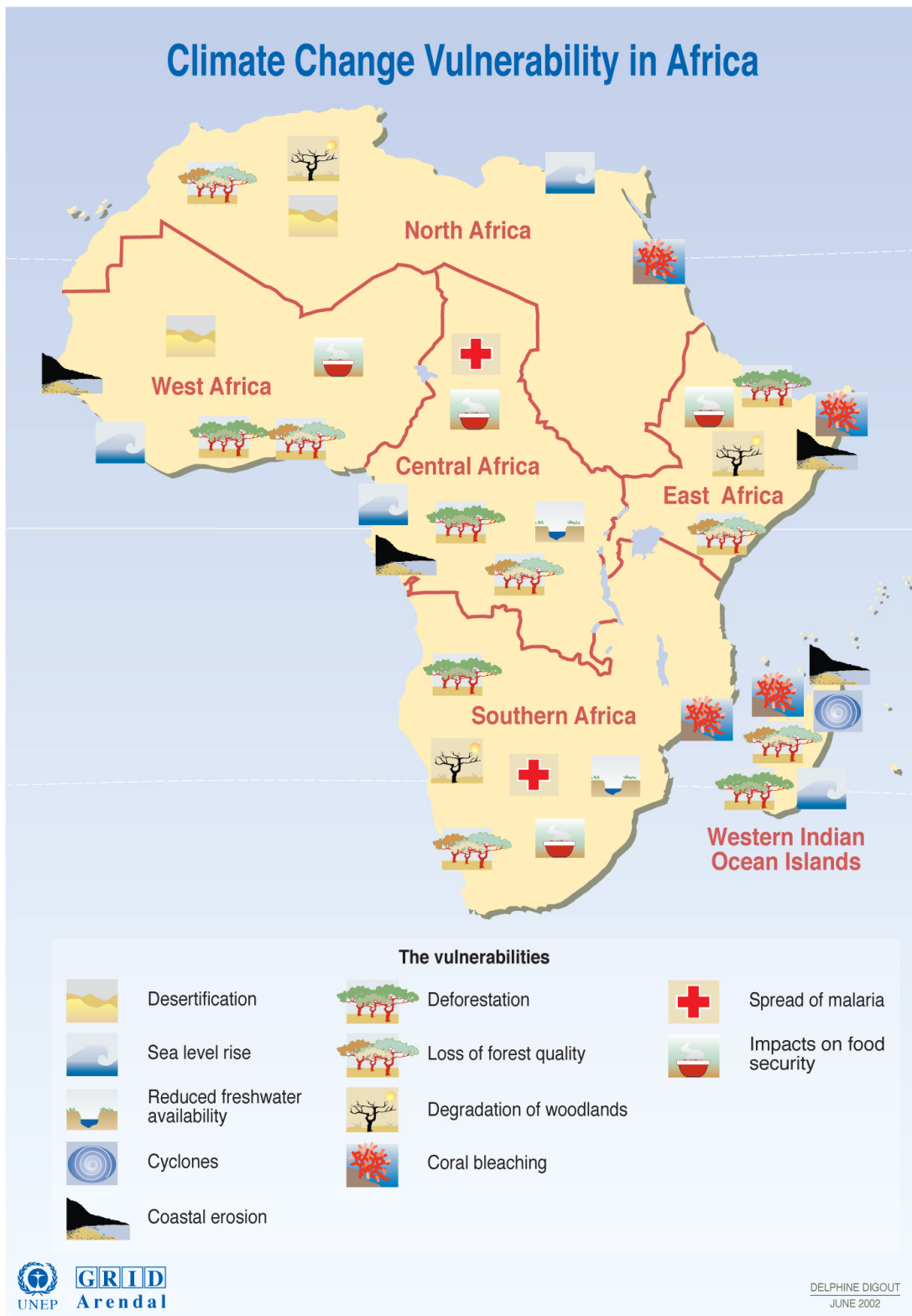
There are a number of issues to consider when describing the range of impacts of and the underlying vulnerability to climate change in Africa. In addition to regional variability, there are manifold challenges associated with the ability of current models to project the likelihood of heat extremes and precipitation events, which is expected to have secondary impacts on economic development.

The Special Report Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) shows how the likelihood of extreme weather events is expected to increase, while also illustrating the range of impacts throughout Africa.⁹ The Summary for Policy Makers released by the IPCC in February of 2012, indicates that while eastern Africa is expected to face more extreme flooding events, western and southern Africa are likely to suffer from increased drought events.¹⁰ Research completed by other climate experts emphasizes the notion that the variability in direct impacts manifests itself in a broad range of secondary or indirect impacts, that include: the increasing spread of vector-borne diseases such as malaria and dengue; sea level rise that will affect areas such as the Nile Delta, and hotter and drier conditions giving rise to desertification and declines in agricultural productivity in some areas.¹¹ Figure 1, below, illustrates more of Africa's key climate vulnerabilities. This section outlines the key impacts of climate change in Africa – drought, water scarcity and flooding, and threats to food security and health – and what DG Research projects are doing to provide a better understanding of the problems and to give possible solutions.

Drought and Water Scarcity

Increased temperatures and a greater likelihood of extreme weather events resulting from climate change will no doubt increase the threat of drought and increased water scarcity in Africa. As a way to combat this, FP projects like CLIMB, CLICO and WASSERMED have looked at improved hydrological modelling in order to assess the risk of increasing water scarcity and the threat to human security. The CLICO project looked at the risks of both drought and flooding in Sudan, noting the impact on food security, and their ability to exacerbate existing regional conflicts. Despite these challenges, the AIDA FP6 project indicated that agricultural innovation in drought-prone areas has the potential to improve crop yields.

Figure 1: Overview of Climate Change Vulnerability in Africa



Sources: Anna Ballance, 2002.

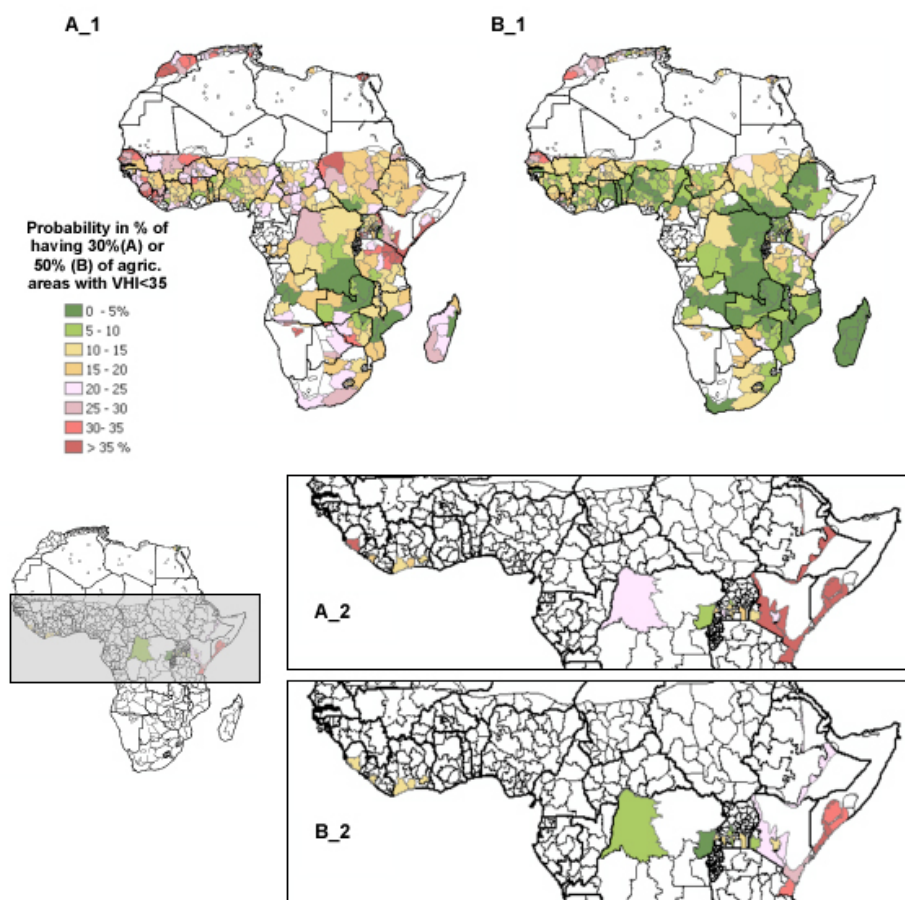
Source: Anna Ballance, UNEP/GRID-Arendal, 2002, Cartographer/Designer: Delphine Digout, Revised by Hugo Ahlenius.

Assessing Drought Risks for Agricultural Areas in Africa

The CLIMAFRICA project has developed a novel method for calculating the probability that a significant proportion of the total agricultural area will be affected by drought at the sub-national level using drought intensity indicators derived from the Vegetation Health Index. This proved to be a valid indicator for the African continent as vegetation health was highly correlated to drought events during the 1981-2009 period.

In practice, two thresholds relating to water scarcity and drought can be set: when 30% of the total agricultural area is affected by drought, a large number of agricultural households experience its consequences; when more than 50% of this land is affected, the region is faced with an extreme drought event with serious impacts on regional food security. Figure 2 below shows the probability of exceeding these thresholds. With this method several local “hot spots” of agricultural areas at high risk of extreme drought were identified. These areas are: Tensift and Centre in Morocco, Brakna in Mauritania, North Darfur in Sudan, Semenawi Keih Bahri in Eritrea, Coast and Eastern in Kenya, Manyara, Tanga, Arusha and Kilimanjaro in Tanzania, Juba Hoose, Juba Dhexe and Shabelle Hoose in Somalia, Kaabong and Kiruhura in Uganda, Southern in Sierra Leone, Gbarpolu in Liberia and Otjozondjupa in Namibia (Fig. 2-A1).

Figure 2: Empirical probability of occurrence of having more than 30% (a_1, a_2) or more than 50 % (b_1, b_2) of the agricultural area affected by drought by administrative unit (1) during the first crop season (2) during the second crop season.



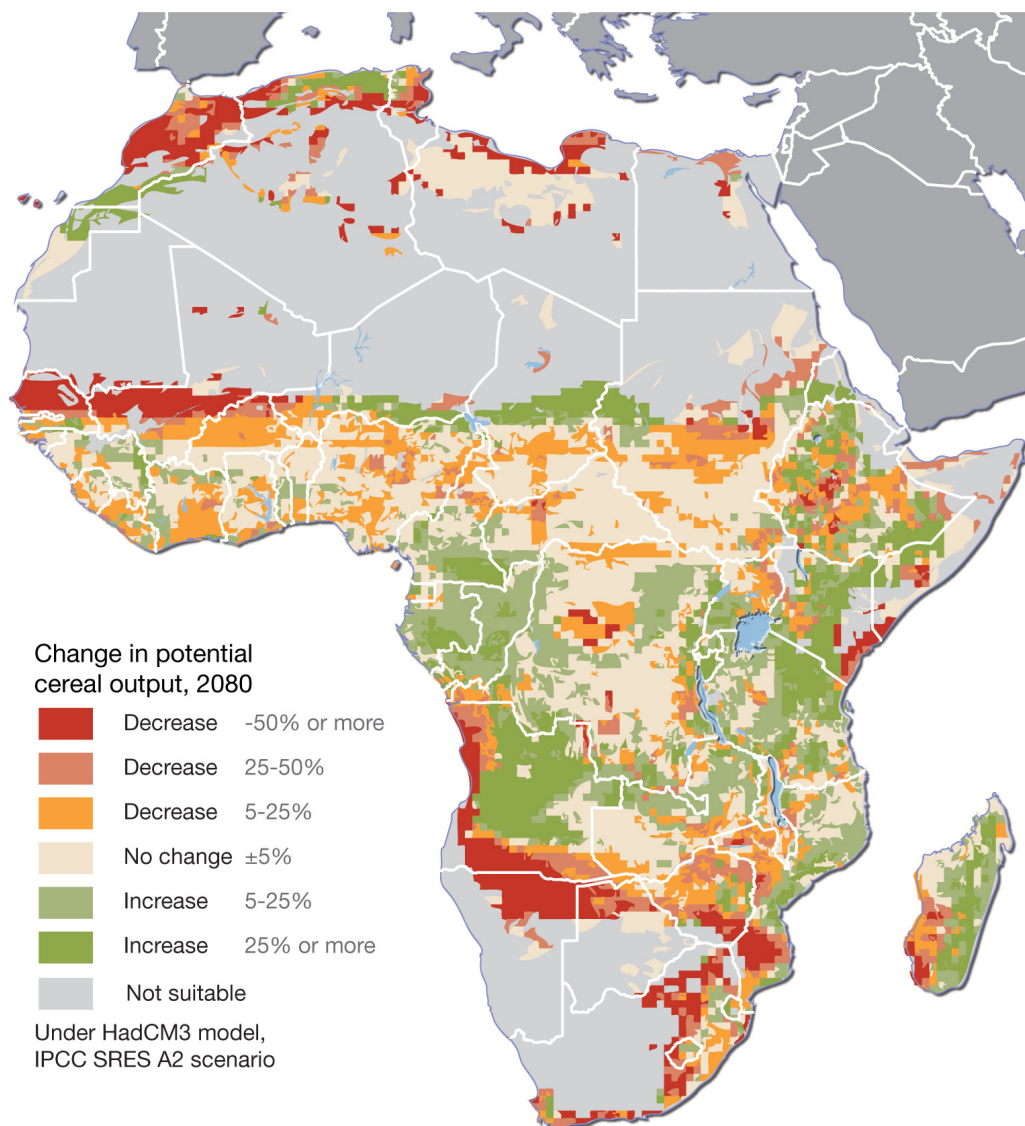
Source: Rojas O., Vrieling A., Rembold F., 2011. Assessing drought probability for agricultural areas in Africa with coarse resolution remote sensing imagery. *Remote Sensing of Environment*, 115 343–352.

Food Security

One of the indirect impacts of climate change associated with increased drought and water scarcity is the threat to agricultural production. The need to address food security in light of these impacts is highlighted by the International Food Policy Research Institute, whose research shows how climate change in Sub-Saharan Africa may decrease crop yields and increase food prices thus reducing the affordability of food and potential caloric intake, potentially resulting in increased rates

of childhood malnutrition.¹² Furthermore, scenario analysis undertaken by the Food and Agriculture Organization (FAO) indicates that by 2080, Gross Domestic Product from agriculture could decline in Africa from 2 to 9%. The FAO stresses that changes in agricultural practises will be required to respond to these impacts including changes to crop species, new irrigation techniques, the use of different fertilizer inputs, seasonal changes and sowing dates.¹³ The specific predicted changes to the production of cereals (positive and negative) are illustrated in Figure 3.

Figure 3: Projected changes in cereal productivity in Africa, due to climate change – current climate to 2080



Source: Fischer, G., Shah, M., Tubiello, F.N., van Velhuizen, H. 2005. Socio-economic and climate change impacts on agriculture: an integrated assessment, 1990–2080. *Philos Trans R Soc Lond B Biol Sci.* 2005 November 29; 360(1463): 2067–2083, <http://maps.grida.no/go/graphic/projected-changes-in-cereal-productivity-in-africa-due-to-climate-change-current-climate-to-2080>

Health

The World Health Organization (WHO) is exploring the relationship between climate change, poverty, and the spread of infectious diseases. A number of FP 6 and 7 projects also highlight the importance of developing the evidence base to support this relationship. These projects aim to provide specific examples of how the impacts of climate change throughout Africa have expanded the spread of infectious diseases to a vulnerable population. The WHO maintains that the indirect impacts of climate change on health are not the result of isolated extreme weather events, but of the gradual erosion of “natural, economic and social systems that sustain health, and which are already under stress in much of the developing world.” Vector-borne diseases such as malaria, and infections associated with under nutrition, are likely to spread with climate change affecting those who lack access to affordable food, clean water, and who are already suffering from medical conditions.¹⁴

Similarly, the HEALTHY FUTURES PROJECT pays close attention to the impact of water scarcity on the spread of vector borne diseases. The project consortium includes universities and research institutes in Tanzania, Kenya, Rwanda and Uganda, (in addition to those in the EU), and will serve to map both the spread of diseases in relation to the areas that are most vulnerable to the disease. The WETwin project developed a methodology to better integrate the prevention of water-related diseases in wetland and river basin management plans referring to the Inner Niger Delta in Mali. In the same vein, the QWECI project, involving a number of academic institutes in Senegal, Ghana and Malawi, determined that in the case of rift valley fever, the spread of the disease is facilitated by changes in standard weather patterns that can be brought on by climate change, and that the implementation of an early warning

Flooding

Climate change is also expected to increase the risk of flooding in Africa. The FP6 project CIRCE looked at climate change impacts in the Mediterranean region (including North Africa) and outlined a framework for action given the urgency of the issue. Figure 4 shows that the overall temperature in the Mediterranean is expected to increase from 2 to 4°C and levels of precipitation from 10% to 50% by the 2080s; the impacts in North Africa are expected to be greater with temperature increases in the range of 5 to 8°C.¹⁵ The vulnerability of specific areas to flooding in the following developing countries was further explored as part of individual case studies: the Gulf of Oran in Algeria, the Gulf of Gabes in Tunisia, and the Western Nile Delta in Egypt. In Algeria, the risk of increased flooding and sea level rise is complicated by the lack of effluent treatment, and the importance of three major harbours to the national economy. In Tunisia, the significance of tourism and the fishing industry is underlined, while in Egypt the relationship between sea level rise, coastal erosion and agriculture is deemed equally problematic for socioeconomic development.

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