

## NERC Template for Case Studies of Impact

### Africa Climate Exchange (AfClix)

This form has four sections that must be completed. Each has sub-text to serve as a guide to what information should be included.

| 1. | <b>Excellent Science; brief description of science underpinning the impact.</b>   |
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|    | <p>Around 19 million people in sub-Saharan Africa are threatened by severe food shortages, with over four million people currently malnourished. There are a number of factors which contribute to this food insecurity, including rapid population growth, poor infrastructure, weak governance, recurrent conflict, environmental degradation, low food production and a high dependence on rain-fed agriculture. Importantly though, the weather has a big effect on all of this, and the area often suffers extremes leading to both flooding and droughts.</p> <p>Research is enhancing our understanding of African weather and climate, yet the impact of these advances on real people's lives in Africa is often very limited. This is mainly due to communication gaps and barriers; without the mechanisms in place for effective dialogue, the latest climate science is not getting through to help inform policy. Sudan, for example, has no climate-related policies; while climate research in Senegal is limited by weak links between the national meteorological services, universities and user communities.</p> <p>Turning scientific advances into practical solutions for African communities was therefore one of the main aims of the Africa Climate Exchange (AfClix), a knowledge transfer project to facilitate the exchange of climate science and adaptation knowledge.</p> <p>Part-funded through a NERC Knowledge Exchange Fellowship, the Africa Climate Exchange has generated impact at individual, community, institutional and governmental scales, by building relationships, creating space for dialogue, and supporting the appropriate application of scientific learning to anticipate and promote resilience. It connects scientists together with humanitarian and development decision-makers and government policy makers, to address questions of mutual interest surrounding the issue of food insecurity. These include seasonal forecasting, evaluation of indigenous knowledge, and approaches to inform decision-making when faced with uncertainty. In this way, AfClix provides a mechanism of building relationships, understanding, and dialogue.</p> <p>The Africa Climate Exchange has been set up as what is known as a 'Boundary organisation'. These are organisations designed to facilitate collaboration and information flow between the research and public policy communities. However, little is known about how to set-up and create successful boundary organisations, and the types of strategies which work best in their management. It is hoped that the process of setting up and managing the Africa Climate Exchange will give insight into this and provide a framework for the creation of other boundary organisations in the future.</p> <p>An important part of AfClix, is that the director, Dr Ros Cornforth, continues to be active in research, which means she is up-to-date with developments in the area and this approach continues to generate new insights for policy-making. This helps to identify and enable the movement of fundamental science to policy and practice.</p> |

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|                  | <p>Dr Ros Cornforth from the University of Reading, UK is part-funded by the Natural Environment Research Council (NERC) as a Knowledge Exchange Fellow to lead the Africa Climate Exchange project, with additional funding from the National Centre for Atmospheric Science (Climate Directorate), the Grantham Institute for Climate Change, and the Walker Institute for Climate System Research. AfClix itself, due to the nature of its work, partners with a range of other organisations and individuals to help achieve its goals.</p>   |
| <p><b>2.</b></p> | <p><b>Science outcome/breakthrough brief description of science outcome or breakthrough that made the impact possible.</b></p>  |
|                  | <p>Since the end of 2011, the Africa Climate Exchange has been working on the ground in sub-Saharan African countries to explore how NERC science can best inform climate-related policy for improving food security. Much of this initial phase has been focussed on mapping existing institutional, socio-cultural and economic mechanisms at local, national and international levels to evaluate opportunities and bottlenecks along the climate information chain in each country.</p> <p>During the early stages of the project, AfClix identified the main communications barriers as: a lack of shared dialogue spaces between climate scientists, Non-Governmental Organisations (NGO) decision-makers and government policy-makers; a lack of understanding due to the 'language used' by the different groups involved; and a lack of understanding of the complex local issues in each area. Knowing what these communications barriers are, has helped to develop the range of activities AfClix is involved in, to be specific and useful to the communities they target.</p> <p>Finding out what the priorities of local decision-makers are has been key in this, and has helped to connect individuals and groups in order to establish effective interdisciplinary collaborations. Working together with an integrated framework across a range of scientific disciplines, geographic regions and levels of humanitarian, development and policy decision making, ensures that science can be applied appropriately to anticipate and promote resilience to a range of potential future risks in a country-specific manner.</p> <p>The gap between scientists and policy-makers is well recognised. It is difficult for the findings from science to move outside of the academic environment without engagement with communities of users. By communicating directly with organisations and individuals who are responsible for policy and action within the communities that the science is designed to benefit, AfClix has been uncovering the country-specific issues that are used to drive the targeted activities of the organisation. Likewise, this information then feeds back to either create future integrated research projects, which AfClix helps to secure funding for (through traditional and non-traditional means), or to identify existing research which could be of direct benefit.</p> <p>Securing funding for integrated research projects by writing grant proposals is something which many NGOs (for example) don't have the expertise to do. So, AfClix uses its expertise to help to do this when suitable projects are identified.</p> <p>The science embedded within the partnerships and collaborations AfClix is involved in includes: scientific tools to increase understanding of climate change and to help coordinate an effective response to its impacts, for example land-surface modelling of climate change impacts on sugar cane yield in Sudan; development of early warning systems coupled with regional monitoring; development of the research basis for subseasonal-seasonal-interannual weather and climate prediction, with an orientation towards the approach that will be needed at the national, regional, and multi-national levels to achieve the desired goals and sustain climate services initiatives.</p> |

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|                  | <p>In practical terms, AfClix activities are underpinned by the AfClix web portal (<a href="http://www.afclix.org/">www.afclix.org/</a>), which helps to match needs with solutions to help tackle climate vulnerability associated with uncertainty, and to demonstrate the benefits of climate information to in-country policy makers.</p> <p>Stakeholder needs, drawn both directly and indirectly through ongoing collaborations, inform the science questions around improving the quality, usefulness and practical application of weather forecasts in sub-Saharan Africa. Indeed, the interdisciplinary nature of the challenges surrounding food and water security, makes co-generation of knowledge through these partnerships absolutely essential. Methods, partners and approaches have been carefully selected to ensure that potential beneficiaries will have the utmost opportunity to continue to engage and inform the research. Partners in the different projects are chosen as they have expert knowledge of these issues, can facilitate further linkages and their partnership will result in direct building of in-country capacity.</p> <p>The projects supported by AfClix are unique in that they combine meteorological, agricultural, hydrological and statistical modelling skills, together with socio-economic modelling, science communications and decision-making evaluations that can work at the science-policy interface and thus make a significant impact on the African ground.</p> <p>Direct examples of the outcomes of work by AfClix, are also examples of impact, so they are described in the section below.</p>   |
| <p><b>3.</b></p> | <p><b>Impact realised to date; brief description of impacts already achieved with users.</b></p>   |
|                  | <p>Owing to little irrigation, even moderate variations in rainfall can jeopardise food security in sub-Saharan Africa. Indeed the recurrent food crises since 2010 are an ever-present demonstration of the region's vulnerability. Examples of such high impact and persistent weather events include the heavy rains in 2010 affecting the Sahel, the patchy 2011 West African Monsoon rainy season, and the heavy rains in 2012 that caused extensive flooding in the region. This flooding led to health issues, destroyed infrastructure and damaged planted fields, particularly in rice-growing areas along the Niger River and in Senegal, Chad, Benin, and Nigeria. In particular, the flooding caused an increase in the number of diarrhoea, cholera, and malaria cases, which aggravated the nutritional situation in flood-affected areas.</p> <p>The result is that many parts of the Sahel are now in a state of chronic crisis, with families struggling to recover from one disaster after another linked to extreme hydrological events (droughts or floods). Even in 'good' years, chronic food insecurity and malnutrition still exists with some 230,000 children dying annually of malnutrition. In a typical year, there are between 9 and 10 million people who are classed as being food insecure.</p> <p>The work AfClix does is making a difference because it helps to match ground-based needs with grass-roots solutions aimed at tackling climate vulnerability associated with uncertainty, and can demonstrate the benefits of weather and climate information to in-country and UK policy makers. Multiple interdisciplinary collaborations have been spawned through AfClix connecting individuals and groups and overcoming communication barriers. For example, AfClix has been engaged with developing and submitting 11 grant proposals between January 2012 and April 2013: three of those as Principle Investigator, six as Co-Investigator, and two as Research Partner. All collaborations are contributing towards the long-term aim to promote resilience in</p> |

rural communities in sub-Saharan Africa through locally relevant adaptation strategies informed by the latest climate science.

The impact of the AfClix project is realised by changing behaviour and achieving engaging interactions between organisations and individuals. This is how AfClix is making a difference. It is hoped that the work of AfClix brings together disparate communities who are not working together, into engaged communities, which can then work through solutions to issues facing each area. Behavioural changes for each stakeholder are difficult to measure in time, though.

Examples of the more measurable impacts of AfClix are wide ranging, and due to the targeted nature of the work, can best be described in a country-specific manner. Some specific examples are described below and they include examples of future impact also, as many of the projects are on-going; this list of examples is by no means exhaustive, but gives a flavour of some of the work that AfClix is involved with:

### **Sudan**

In Sudan, AfClix is setting up a new partnership between NCAS-Climate with Practical Action, climate departments in a number of Khartoum universities and the University of Oklahoma to extend the existing Niger Rainwatch project to Sudan as an early warning system for livestock herders. The strength of the Rainwatch project lies in its ability to collate data in a timely fashion and communicate a meaningful analysis through a software code that outputs the monitoring of the cumulative seasonal rainfall. This helps policy-makers by delivering science as visual and understandable rainfall products (for example graphs to indicate rainfall anomalies). The information is also relayed to rural communities through links with community leaders. AfClix is playing an important role in disseminating the outputs from Rainwatch through contacts, and online through the web portal.

Recently, a case study was prepared for the United Nations (UN), on the extension of Rainwatch. This case study has been published in 'Using science for disaster risk reduction', the report of the UNISDR (The United Nations Office for Disaster Risk Reduction) Scientific and Technical Advisory Group 2013 ([www.unisdr.org/we/inform/publications/32609](http://www.unisdr.org/we/inform/publications/32609)). This demonstrates the influence that AfClix can have on high level, international policy. Referring to this case study, Prof Virginia Murray and Dr Rosamund Southgate from Public Health England - Extreme events section, said (April 2013): "We had a teleconference with Margareta Wahlstrom, the UN Secretary General's Special Representative for Disaster Reduction today. She very much likes this case study".

Meetings with the Sudan Meteorological Authority (SMA) and the Kenana Sugar Company led to joint Masters projects evaluating rainfall trends and climate change impacts on sugar cane cultivation. These made use of the new dataset 'TAMSAT African Rainfall Climatology And Time-series' (TARCAT), which is a 29 year rainfall dataset providing 10-day total rainfall estimates, along with Kenana's valuable meteorological and agronomical dataset spanning 30 years. Accessing ground-truth data is important for evaluating climate models and forecasts, and for downscaling these into crop models for estimates of crop yields. This is both important now, and when looking forward, as it is possible to run projections for future climate scenarios. Data-sharing is very difficult in sub-Saharan Africa, and so it doesn't usually happen, therefore these projects have had a big impact on the academic community, as well as being important for building bridges between private sector and climate science. This link between the SMA, Kenana Sugar Company and the University of Reading has and will enable the building of climate science capacity.

In December 2011, AfClix also co-led a symposium with the University of Reading for 180 Sudanese academics/NGO partners, and 20 University of Reading staff on climate change in Khartoum. The result of this was the building of new partnerships, for example between the Sudan Meteorological Authority, Sudan Meteorological Society, Practical Action, Kenana Sugar Company and Ahfad University for Women. These relationships are now pivotal for the Sudan Early Warning Pilot Project, which will incorporate the Rainwatch extension project along with other early warning systems. This will be the first time ever an Early Warning System has been developed in Sudan in response to user need, with collaboration between climate scientists, social scientists, communities, government organisations and NGOs. It is also the first time these Sudanese partners have ever worked together.

AfClix has also helped strengthen the new Sudanese Meteorological Society (SUMS) through providing an online space and ongoing connections. SUMS will be an important neutral point for future climate exchanges with Sudanese policymakers and NGOs. Initial relationship building has meant that SUMS is now an active partner on the Early Warning Pilot Project, which is being implemented over the summer of 2013. SUMS is an important influence and focal point for NGOs, community-based organisations, and for academic institutions.

### **Senegal**

In one pilot project funded by the Climate & Development Knowledge Network, the Senegal Meteorological Service (ANACIM) working with the Red Cross and community leaders, is relaying weather information to a designated village contact by mobile phone. The news is then posted on a blackboard in the village and picked up by contacts from other villages or spread through local networks. AfClix is supporting an extension to this pilot, which through AfClix connections, is helping extend its reach from local to national and also other targeted countries. This information is helping to improve agricultural management as it helps farmers to better plan planting dates, choose more resilient seed varieties, and decide when to fertilise crops, so that fertiliser is not washed away but has the maximum impact it can have on crop yield. It also has an impact on communities by reducing the loss of life through flash flooding events, and builds confidence in communities to become advocates themselves for more help from civil society and government. This project has strengthened the relationship between ANACIM and communities, universities and government. Further outcomes from this strengthening of relationships have been the generation of new communication pathways for engagement, which has led to increased dialogue between users and providers, the information from which will inform future research.

In November 2012, British Ambassador John Marshall wrote the following in the daily newspaper *Le Soleil*, which is published in Senegal (translation from the original French): 'Is Meteorology an area where the UK has a special expertise? Yes, and this is an area in which we want to share our expertise. British institutions, such as the Natural Environment Research Council, the National Center of Atmospheric Science and the University of Reading, created AfClix (Africa Climate Exchange) whose objective is to provide (weather and) climate information on the timescales that matter, do and can support the local communities. In Senegal, AfClix is working with the Senegalese Red Cross to facilitate sending flood alerts to vulnerable communities.'

### **Niger**

In Niger, AfClix activities continue to unite researchers from very different areas, all with the common aim to move resilience from theory to reality and to enable policymakers to learn, adapt and respond to large-scale extreme events such as drought and flooding. AfClix is working with the West Africa regional climate body, ACMAD (West African Regional Weather Centre) on

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|                  | <p>the first Forecasters’ Handbook for West Africa (led by Prof Doug Parker at the University of Leeds) together with an international team of climate scientists and African forecasters. Forecasts from ACMAD have also been posted onto the AfClix web portal to help more individuals and organisations make use of them. Léon Guy Razafindrakoto, Head of Research, ACMAD said: ‘Many thanks for your interest in our forecast, and having posting them on AfClix. It gives us a boost to our visibility.’</p> <p><b>Tanzania and Ethiopia</b></p> <p>Coffee is Tanzania’s largest export crop, with exports bringing in \$60 million dollars each year to the economy (reported by USAID in 2009). Although rain plays an important role in the production of coffee, heavy rainfall can damage the drying of coffee, leading to loss of quality, and in extreme cases washing away the beans, causing substantial or total economic losses. Rainfall also impacts on the lives of those associated with this industry, with 350 coffee farmers and their families killed by landslides between 2010 and 2012 in the Mt Elgon district. In Tanzania, AfClix has been working together with the Centre for Agricultural Bioscience International (CABI) and the Lorna Young Foundation (LYF) as they seek to support smallholder farmers in Ethiopia and Tanzania. Both approached AfClix for help, and a proposal was developed to look at the science behind the extreme and persistent weather events that trigger, for example, the landslides in tropical East Africa, and how they are linked in time. This research will lead to a quantification of their current and future risks. In conjunction with the scientific work, there will be an assessment of the vulnerability of coffee growers, and this will be achieved by engaging with local organisations working at the community level. To best use this knowledge to improve resilience to climate-related shocks, LYF’s successful weekly radio programme linking coffee farmers in Kenya to people with climate and agricultural expertise will be extended to Ethiopia and Tanzania.</p> <p>Aspects of the work AfClix is doing in sub-Saharan Africa have been described in various news articles and case studies internationally, but to date, this is the first comprehensive case study of the project. It is envisioned that a version of this case study will be prepared for the University of Reading web site, and AfClix is to be entered for a Times Higher Education award in the International Projects section in 2013.</p> |
| <p><b>4.</b></p> | <p><b>Future Potential Impacts; brief description of further potential impacts that could be realised</b></p>   |
|                  | <p>AfClix is helping to build resilience and raise awareness to climate policy in sub-Saharan Africa. This will help save lives and livelihoods, something which it is hard to put an economic cost to. In addition, it is building the groundwork to giving governments the ability to negotiate with other countries about climate change and join the global arena of debate around this major issue which knows no international boundaries.</p> <p>Within each country, the work AfClix is involved with to stimulate engagement between different individuals and organisations will come to fruition, having many more impacts both at community and policy levels. The reach of AfClix means that lessons learnt from different countries can be shared and applied between different communities who may not have been previously engaged, and different countries facing the same issues.</p> <p>Climate science in sub-Saharan Africa is under-resourced, and often unable to be accessed, as it is not looking to address the right questions. One of reasons for constant lack of capacity and engagement is that governments don’t ‘buy-in’ and work in silos. There are lots of very important issues facing the countries of sub-Saharan Africa, and so there is a need to</p>  |

demonstrate the value of the work. Over the next few years, there will be a lot of effort put into integrated research proposals using economists to demonstrate the value of climate information and its use for mitigation and policy. This will help us to get measurable economic impact and buy-in from government, giving measurable impact on policy and practice.

One of the issues which AfClix is becoming more concerned with is capacity building for Climate Science in sub-Saharan Africa. One of the ways this is being achieved is by the provision of additional training days at the end of project workshops, specifically for students from local institutes. This will enable them to learn from the good practice of these projects, and will be a feature from now on in all project work.

AfClix has now also been invited to work with International Centre for Theoretical Physics (ICTP) in Italy to develop a new summer school on detection and attribution of extreme events. They would like to launch a yearly summer school starting in 2014 with an emphasis on selecting outstanding candidates from developing countries and developing programs that will have a sustained impact, not just as a one-off training opportunity.

Building on the successes of the Africa Climate Exchange, future potential impacts will be realised through the new International Centre for Climate Resilience (ICCR), which is being set up at the University of Reading. It is thought that the ICCR is likely to be the only team combining meteorological, agricultural, hydrological and statistical modelling skills, together with socio-economic modelling, science communications and decision-making evaluations that can work at the science-policy interface and thus make a very significant impact through for example, improved forecasts and communication systems. The remit of the ICCR will be wider than just sub-Saharan Africa, and it will seek to build networks within Africa (Ghana, Ethiopia, Kenya, Mozambique, Senegal, Sudan, Tanzania, Zimbabwe), India and Latin America (Colombia, Bolivia, Brazil, Uruguay). The aim of the ICCR will be to use a transdisciplinary approach to enable the world's poorest people living in cities and rural communities, build climate resilient futures. The idea and drive for the creation of the ICCR is as a direct result of AfClix, and it will use lessons learnt from AfClix to achieve its aims.

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