Image 1: Workshop participant playing the 'Early Warning-Early Action game' with community and civil society leaders in Senegal, November 2012. *Source: AfClix*.

CASE STUDY 5:

Watching the rains to build resilience in the African Sahel

The problem

The vulnerability of rural populations in sub-Saharan Africa to increased climate variability – in the form of drought and flood – and environmental change remains alarming, despite their centuries of experience in adapting to harsh conditions[1]. As 2012 drew to a close, 18.7 million people were threatened by severe food shortages[2]. The recurring food crises in the Sahel can be attributed to a compounding series of socio-political and weather related causes: limited access to food and basic services for the poorest, low food productivity, acute poverty, environmental degradation, rapid population growth (3% per year), weak governance and high dependence on rain-fed agriculture[3]. The importance of early warning has been underlined as a critical element for reducing vulnerabilities and improving preparedness and response to natural hazards.

The science

The 'Rainwatch' Geographical Information System was developed in the mid-2000s to monitor cumulative rainfall at nine stations distributed across, and representing fully, the economically vital southern agricultural region in Niger[4]. Its database includes historical rainfall for each station. By monitoring the rainfall deficit during each monsoon season, and factoring in assumptions of the physically possible range of subsequent rainfall, the Rainwatch project produces commentaries on the monsoon evolution and releases early warnings if drought is anticipated.

Users can view cumulative daily rainfall graphs for each station, with historical trends and extremes added to give context. Graphs can also be created to compare data from different stations in the same year or for the same station across different years (Figure 1)[5].

Rainwatch was designed to deliver science as visual and understandable rainfall products that enable stakeholders to act. Its development was informed by needs on the ground in an effort to increase interactions between local climate information users, their providers, and supporting groups.

The application to policy and practice

Rainwatch products were developed in the late 2000's. From 2011, early warnings for Niger were disseminated widely within West Africa, the United States and Europe at 10- or 15-day intervals.

To integrate the use of Rainwatch data into decision-making and practice, the Africa Climate Exchange (AfClix)[6] – a regional boundary organisation – combined technical expertise in meteorology and social science approaches to engage decision-makers (such as NGOs and government), African climate scientists and local communities in countries beyond Niger. Dialogue was opened around the use and the limitations of the data (Image 1), knowledge exchange was facilitated and networks for communication between the groups were

1 Nimir MB, Elgizouli IA for WorldResourcesReport.org. Expert Perspectives: Climate Change Adaptation and Decision Making in the Sudan. 2011. Available at: http://www.worldresourcesreport.org/responses/climate-change-adaptation-and-decision-making-sudan.
2 Cornforth RJ. The West African Monsoon 2012. Weather. 2013 (in press).
3 Genesio L, Bacci M, Baron C, Diarra B, Di Vecchia A, Alhassane A et al. Early warning systems for food security in West Africa: evolution, achievements and challenges. Atmospheric Science Letters. 2011; 12:142–148.
4 Tarhule A, Saley-Bana Z and Lamb PJ. Rainwatch: A prototype GIS for rainfall monitoring in West Africa. Bulletin of the American Meteorological Society. 2009; 90:1607-1614.
5 *Ibid.*
6 Africa Climate Exchange (AfClix). Available at: http://www.afclix.org [accessed 4 April 2013].

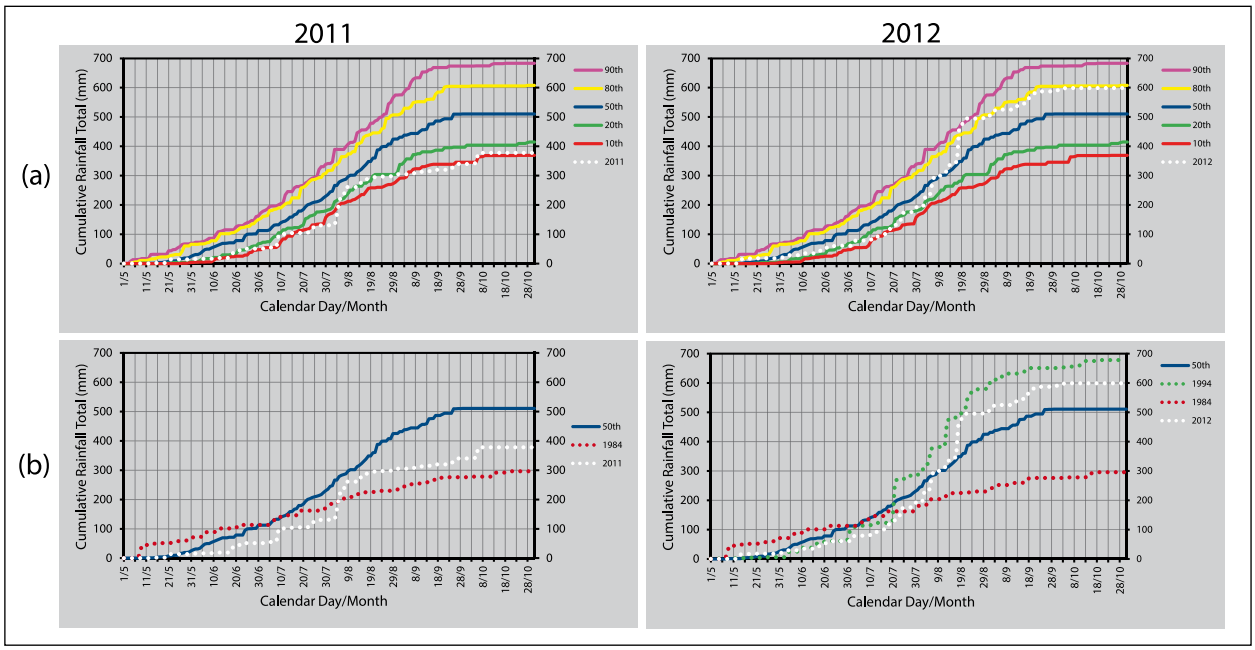

Figure 1: Rainwatch cumulative precipitation depiction for Niamey, Niger, for 2011 (the two graphs on the left) and 2012 (the two graphs on the right). The two top graphs compare the progression of the 2011 and 2012 rainy seasons (white dots) versus indicated historical percentiles for 1965-2000. The two bottom graphs compare the progression of the 2011 and 2012 rainy seasons (white dots) with the severe drought year of 1984 drought year (dark red dots), the very wet year of 1994 (green dots), and the historical median (blue dots). *Source: Boyd et al, 2013*[7].

established to extend Rainwatch to other countries in the African Sahel, including Sudan and Senegal[7]. This approach builds relationships from the national to local level and helps ensure that the Rainwatch products and warnings are designed by the stakeholders themselves according to their information needs.

Did it make a difference?

Real-time monitoring of the very dry 2011 and very wet 2012 monsoon seasons in Niger was accomplished using Rainwatch. In 2011, Rainwatch alerts warned of rainfall deficits and that "… the start of the Niger rainy season has been very poor at six of the nine stations … At some of the driest stations, the 2011 rainfall to date has been less than for the infamous 1984 drought year" (31 July 2011)[8].

The Niger government uses Rainwatch together with information from the Direction de la Météorologie Nationale du Niger (DMN), African Centre of Meteorological Applications for Development (ACMAD), and Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle (AGRHYMET) to understand monsoon development.

In the words of one senior Niger government official: "… [the] possibility of having daily monitoring as provided by Rainwatch seemed to me what the users at agricultural and livestock departments needed to use as input to provide good information for warnings." (Special Advisor to President of Niger for Water and Environmental Issues, Professor Abdelkrim Ben Mohamed, May 17, 2012). In 2011, user-friendly Rainwatch products were provided directly to the Office of the President and the DMN, to help them assess the monsoon. The DMN provides climate information to the Ministry of Agriculture, which then combines it with in-field phenological data to assess the growing season. This information is used by the Council of Ministers to issue early warnings to the Niger people[9].

Rainwatch showed that effective links between climate science and policy decision-making could influence policy and action on the ground. Even in the absence of coherent national climate strategies, individuals with the appropriate tools and methodologies – such as Rainwatch – can establish effective links via a boundary organization like AfClix, across a range of disciplines, regions, and levels of decision-making, to communicate climate risk and uncertainty effectively for action-oriented results. This framework is now being tested to support both rural and urban communities in conflict regions in Sudan[10].

7 Boyd E, Cornforth RJ, Lamb PJ, Tarhule A, Lélé MI, Brouder A. Building resilience in the face of recurring crises in the African Sahel. Nature Climate Change. 2013 (in press).
8 *Ibid.*
9 *Ibid.*
10 Africa Climate Exchange (AfClix). Available at: http://www.afclix.org [accessed 4 April 2013].