

Climate Change & Africa

Understanding how to bolster the security of vulnerable populations

By Karen Richardson, Esri Writer

A collaborative research program is using GIS to better learn how climate change, conflict, and humanitarian aid intersect to impact vulnerable populations in Africa.

The Robert S. Strauss Center for International Security and Law, based at the University of Texas, Austin, is known for addressing complex global problems with innovative ideas driven by policy-related research across many disciplines. Recently, the Strauss Center's Climate Change and African Political Stability (CCAPS) program implemented Esri technology to understand how to best manage complex emergencies in light of drought, crop shortages, and changing weather that could result from climate change.

In addition to the University of Texas, Austin, the College of William and Mary in Williamsburg, Virginia; Trinity College Dublin in Dublin, Ireland; and the University of North Texas in Denton, Texas, are collaborators on the CCAPS program. As the lead organization, the University of Texas receives funding from the United States Department of Defense through the Minerva Initiative. This initiative is a university-based, social science research program that focuses on areas of strategic importance to national security policy. Through quantitative and GIS analysis, case studies, and field interviews, CCAPS strives to produce research that can support US, African, and international policy responses.

Closing the Development Loop

The CCAPS program enlisted the help of Development Gateway, a non-profit organization that delivers information solutions to government policy workers allocating scarce resource investments, aid workers building infrastructure, and citizens who want to have a voice in the process. Development Gateway created a dynamic mapping tool that could visualize program data and show the variables that affect vulnerable populations in a holistic manner.

Climate change poses an enormous threat to the livelihoods and safety of millions of people. "However, the level of risk is not evenly spread and certainly doesn't respect national boundaries," said Jean-Louis Sarbib, CEO of Development Gateway. "To ask critical questions about how development assistance can reduce vulnerability, you need hyperlocal data on climate and also on aid-funded interventions. This is what the new CCAPS mapping tool shows in a digestible, interactive way. It will no doubt be a valuable new tool not only for researchers but also policy makers, journalists, and citizens."

Development Gateway first partnered with Esri to create an application called Development Loop for AidData. A joint initiative with Brigham Young University and the College of William and Mary, AidData captures and interprets data on aid activities around the world to support aid transparency and decision-making processes. Development Loop is a simple, easy-to-use application that allows users to add and edit their own project information, including comments, pictures, and stories, at a subnational level. This information can be viewed and shared with others both on the web and offline.

Users can view their own projects along with those of other organizations or with data on poverty rates, maternal mortality, or other important indicators. The application can also be linked to beneficiary feedback. The Development Loop prototype was built using the ArcGIS API for Microsoft Silverlight/WPF and ArcGIS for Server technology from Esri and incorporated World Bank and African Development Bank project data geocoded by the AidData partners.

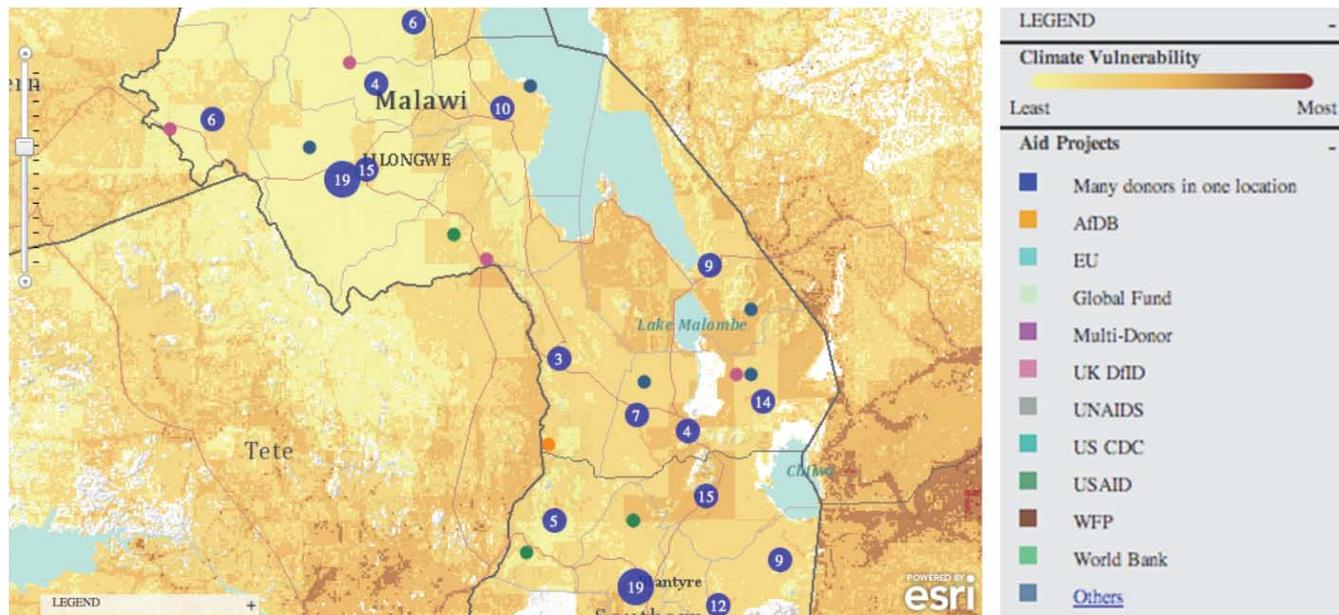
↓ Africa faces unique challenges in coping with climate change caused by its dependence on rain-fed agriculture and the fragile social and political infrastructure of many of its countries. (Photo credit: Anustubh Agnihotri, CCAPS Program)



Understandable and Actionable Data

When Development Gateway staff members began working on the CCAPS program, they felt that the same technology and workflows created for Development Loop could be applied to this project. The CCAPS program had produced data in many research areas and needed a way to layer the data to analyze how various factors work together to compound or reduce vulnerabilities to climate change. “The best way to get a really clear picture of what is going on is by looking at it on a map,” said Joshua Powell, GIS analyst at Development Gateway.

Viewing the CCAPS data on a map is very intuitive to users. “My experience is that once we sit down and show people what they are getting as part of the system, they get even more excited. The users are able to shift their thinking and understanding using what we consider to be simple tools by putting their projects on a map. By doing this, in return, they get powerful visualization that shows them where they are doing what. You can’t get this out of a table or spreadsheet.” ➔



The mapping tool allows users to select and layer any combination of CCAPS data onto one map to assess how multiple climate change impacts and responses intersect. For example, mapping conflict data over climate vulnerability data can help one assess how local conflict patterns could exacerbate climate-induced insecurity in a region. Mapping aid and climate data together helps explore whether aid interventions are targeting areas of greatest climate security risk.

Democratization of Data

By integrating CCAPS research on climate change and real-time conflict tracking with existing datasets, such as topographic maps and imagery, the goal of the CCAPS mapping tool is to provide the most comprehensive view possible of climate change and security in Africa.

“The complex pathways from climate change to security impacts have demanded new datasets to fill knowledge gaps but also new ways of presenting the data to be of most use in policy planning,” said Francis J. Gavin, director of the Strauss Center. “This mapping tool allows policy makers to analyze data from multiple sources at once, providing integrated analysis of the drivers and responses related to security risks stemming from climate change.”

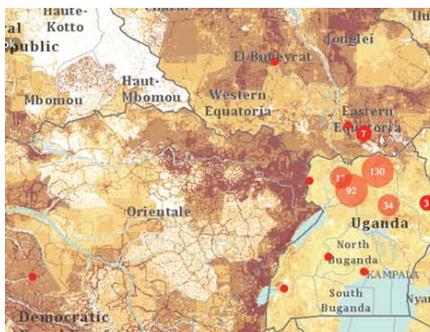
↓ Graduate students working with CCAPS used GIS to identify the regions in Africa at greatest risk from climate change, particularly as related to water resources. (Photo credit: Todd Smith, CCAPS Program)

Being able to look at this data over time and space greatly enhanced analytical capabilities of CCAPS. “The mapping tool allows users to get a snapshot of trends across these issues or drill down to get the details on particular issues or locations where they have an interest,” said Ashley Moran, CCAPS program manager. “We’re able to make large volumes of data available to a wider audience of policy makers, researchers, and citizens in a format they can use for day-to-day analysis.”

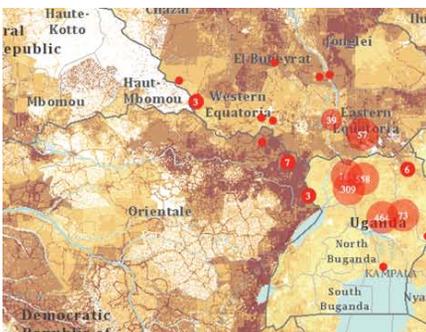
The tool is already being used in the country of Malawi for a solution that tracks and reports on the country’s external funding. Aid information is mapped along with data on climate change vulnerability and incidents of conflict. This sheds light on whether aid is effectively targeting regions where climate change or conflict pose the most significant risk to the sustainable development and political stability of the country. The mapping tool is also a significant innovation in the context of the global aid transparency movement. It represents the first effort of the sort envisioned by the Open Aid Partnership, an initiative spearheaded by the World Bank to increase the openness and effectiveness of development assistance at the subnational level.

→ Wind turbines located in southern Kenya create electricity to offset losses in hydroelectric production caused by decreased rainfall. CCAPS helped produce a wind energy atlas the Kenyan government uses to promote investment in this technology. (Photo credit: Todd Smith, CCAPS Program)

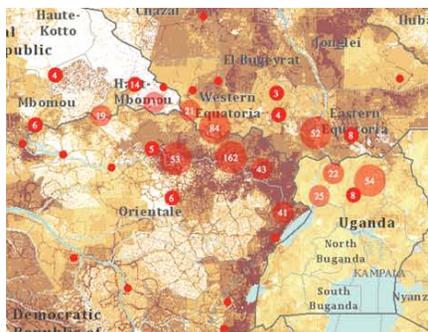




1996–2000



2001–2005



2006–2010



↑ An examination of conflict and climate vulnerability data shows that conflict events involving the Lord's Resistance Army (red areas) have gradually diffused from Uganda into areas with less stability and more climate security vulnerability such as South Sudan and the northern portion of Democratic Republic of the Congo. (Source: CCAPS Vulnerability Model, ACLED data, CCAPS mapping tool)

CCAPS and AidData will continue to release upgrades to the mapping tool throughout 2012. The current mapping tool is available to use now at strausscenter.org/ccaps/mappingtool.

For more information on AidData, go to aiddata.org.

For more information on Development Gateway, go to developmentgateway.org.

Learn more about GIS solutions for climate change from Esri at esri.com/climate.

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