

RESEARCH BRIEF – DECEMBER 2013

BRIDGING THE POLICY GAP: MAPPING CLIMATE CHANGE AND SECURITY FOR IMPACT IN AFRICA

EXECUTIVE SUMMARY

A series of new mapping tools from the CCAPS program enables users to visualize data on climate change vulnerability, real-time conflict tracking, and international aid interventions. By combining a range of scientific, security, governance, and development data, the mapping tools allow users to leverage the many disciplines and large datasets needed to investigate complex security questions. This brief assesses the new capabilities that integrated dynamic mapping brings to bear in analyzing climate change and security issues, with a particular focus on potential uses by policy planners and citizens.

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Special thanks to Josh Powell who oversaw the technical team building these mapping tools at Development Gateway.

The Strauss Center's Climate Change and African Political Stability (CCAPS) program has brought new research strategies to bear in analyzing how climate change, conflict, governance, and aid intersect to impact African and international security.¹ Through its multiple research streams, the program explores the drivers of climate insecurity, links between climate change and conflict, government responses to shocks and conflict, and the impact of adaptation aid responses.

Gaining insights into the complex pathways from climate change to security impacts has demanded new datasets to fill knowledge gaps, but also new ways of presenting data to be of most use in policy planning. In an effort to provide researchers and policymakers with extensive data produced by the program and its partners, CCAPS partnered with AidData to develop a series of mapping tools that enables users to visualize data on climate change vulnerability, real-time conflict tracking, and international aid interventions.

Such integrated dynamic mapping provides a powerful new tool for policymakers, researchers, journalists, and citizens to explore climate change impacts and responses in Africa.

By combining a range of scientific, security, governance, and development data, the mapping tools allow users to leverage the many disciplines and large datasets needed to investigate complex security questions: Where could local conflict patterns exacerbate climate-induced insecurity? Have aid interventions targeted areas where climate change poses the most significant risks to development and political stability? Where might emerging conflicts impact development projects? This brief explores the data available on CCAPS' online platforms and the analysis that can be conducted with these visualization tools.²

INTEGRATED MAPPING TOOLS

The CCAPS Mapping Tool, which uses Esri technology and received Esri's 2013 Special Achievements in GIS Award, allows users to visualize data on climate change vulnerability, conflict, and aid in Africa. Users can select and map any combination of CCAPS data to assess how myriad climate change impacts and responses intersect. The mapping tool displays several CCAPS datasets:

- The Social Conflict in Africa Database (SCAD)³ includes georeferenced data on protests, riots, strikes, coups, communal violence, and other types of social unrest in Africa from 1990 to 2011. Each record includes start and end dates, event type, location, actors and targets involved, issues of contention, number of participants and fatalities, and the government response.
- The Armed Conflict Location and Event Dataset (ACLED)⁴ tracks the actions of government forces, opposition groups, and militias in Africa, specifying the exact location and date of battle events, transfers of military control, headquarter establishment, civilian violence, and rioting. ACLED includes data from 1997 to 2013, with real-time conflict data updated monthly.
- The Malawi Geocoded and Climate Aid Dataset⁵ includes all types of aid for the 30 donors in Malawi's Aid Management Platform,⁶ geocoded and climate-coded to provide a more complete picture of how adaptation fits into development efforts within the country.
- The CCAPS Climate Security Vulnerability Model⁷ combines data on physical, socioeconomic, demographic, and political insecurities to develop a holistic model of vulnerability, using Geographic Information Systems to locate the confluence of these various sources of vulnerability.

The mapping tool also displays datasets from the World Bank and the African Development Bank (AfDB)—both geocoded by AidData. The World Bank dataset includes World Bank aid projects in all sectors from 1990 to 2011.⁸ The AfDB dataset includes all AfDB projects in all sectors approved in 2009 and 2010.⁹

By integrating the various lines of CCAPS research, as well as other existing datasets, the CCAPS mapping tool aims to provide the most comprehensive view yet of climate change and security in Africa. This diverse collection of data allows us to explore a range of interesting questions in a new, hands-on way.

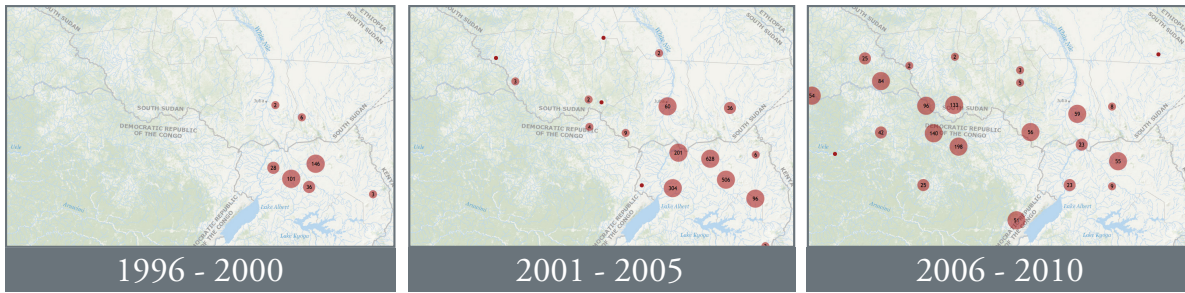
Where do protracted conflicts compound climate-related vulnerabilities?

Examining CCAPS conflict and climate security data together on the mapping tool shows how local conflict patterns could exacerbate climate-induced insecurity in a region. It also shows how conflict dynamics are changing over time and space. For example, Figure 1 shows how conflict events involving the Lord's Resistance Army (LRA) have gradually diffused across Uganda's borders. In the late 1990s, most LRA activity occurred within Uganda. LRA activity diffused increasingly into neighboring countries in the early 2000s, and by 2010, LRA activity was found throughout southern South Sudan and the northern part of the Democratic Republic of the Congo (DRC).

By combining a range of scientific, security, governance, and development data, the mapping tools allow users to leverage the many disciplines and large datasets needed to investigate complex security questions.

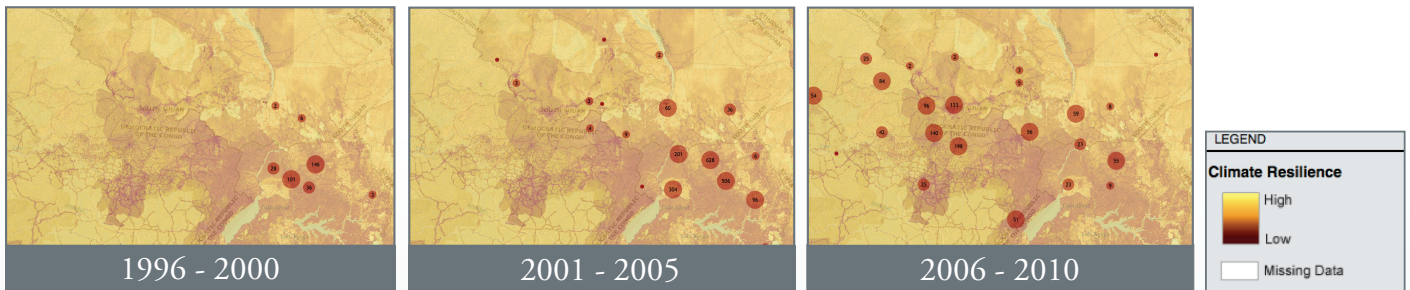
Taking the analysis a step further, the mapping tool can show how these changing conflict patterns relate to areas most vulnerable to climate change impacts. Figure 2 shows that conflict events involving the LRA have gradually diffused from Uganda into areas with less stability and greater climate insecurity like South Sudan and northern DRC. Such conflict patterns compound climate security challenges that countries face.

Figure 1. Tracking Conflict Patterns Across Time



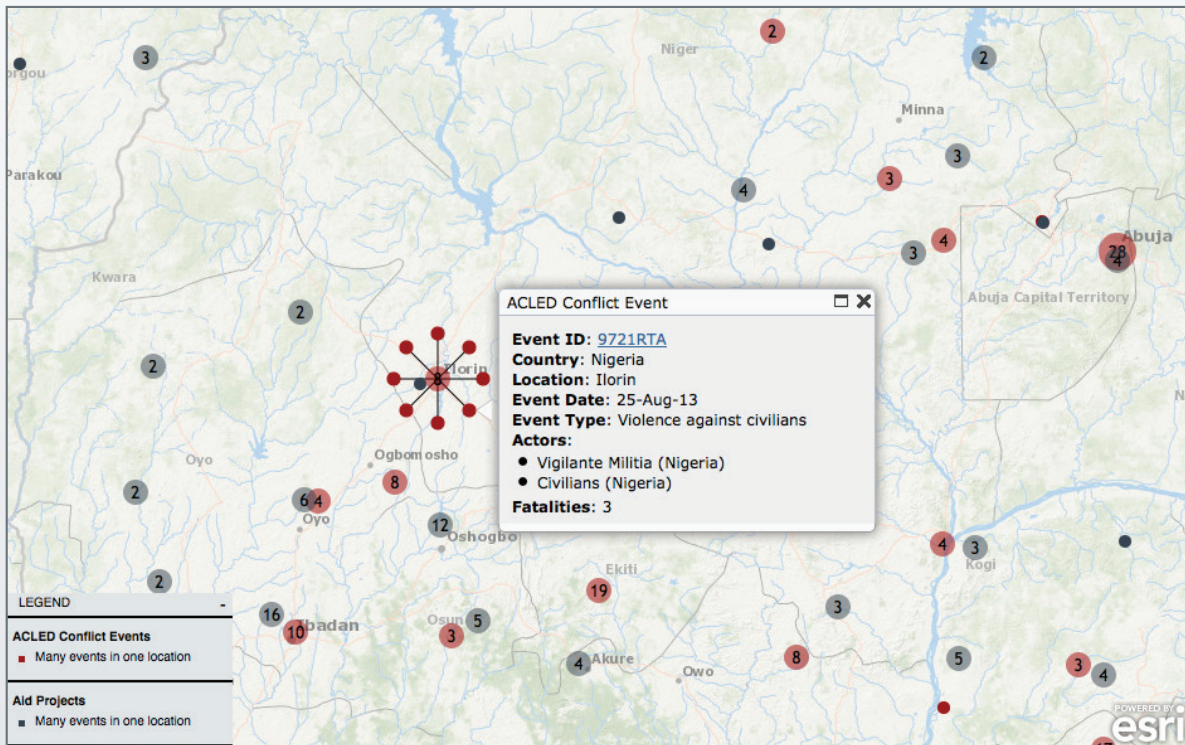
Data Source: ACLED

Figure 2. Mapping Conflict Patterns over Climate Vulnerability



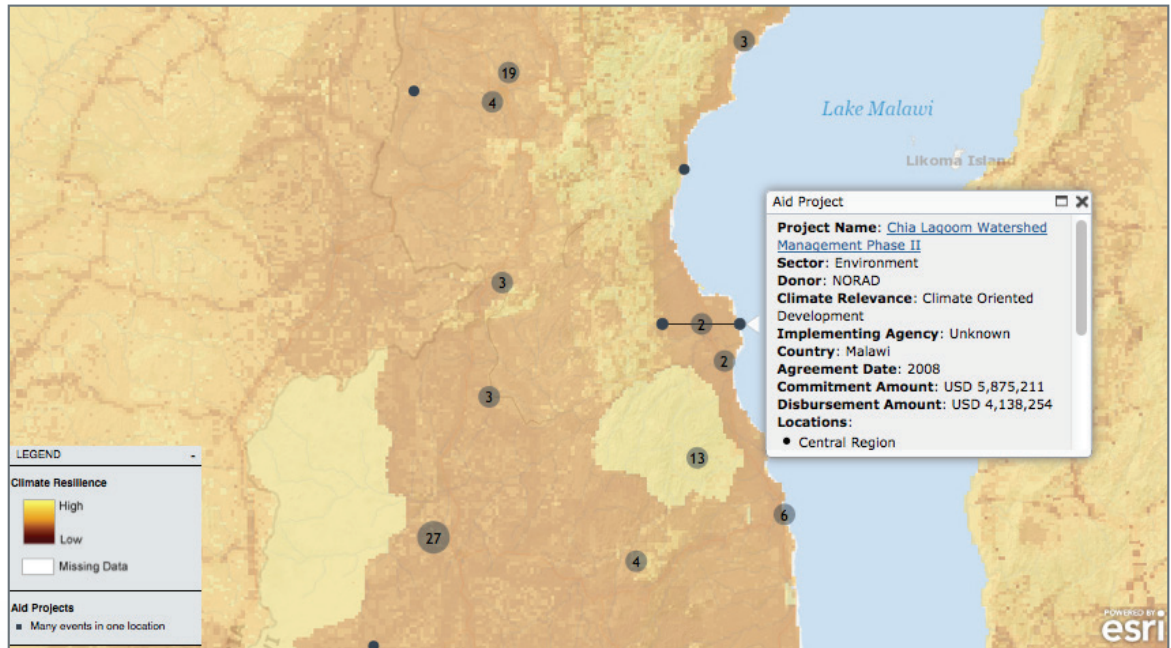
Data sources: ACLED, CCAPS Climate Security Vulnerability Model

Figure 3. Assessing the Intersection of Violence Against Civilians and Development



Data sources: ACLED, AfDB, World Bank

Figure 4. Assessing Aid Targeting in Areas of Climate Security Vulnerability



Data sources: CCAPS-AidData Malawi Geocoded and Climate Aid Dataset, CCAPS Climate Security Vulnerability Model

Which emerging conflicts could impact development projects?

Real-time conflict data collected by CCAPS partners at the Armed Conflict Location and Events Dataset, combined on the dashboard with geocoded aid project data from CCAPS-AidData, the World Bank, and the African Development Bank (AfDB), illuminate the intersection of conflict and development. Figure 3 shows how violence against civilians (in red) often coincides with aid project locations (in grey). With violence against civilians being an important barrier to development in conflict-affected countries, tracking the locations and actors involved in these events is key.

Is aid targeting areas of greatest climate security risks?

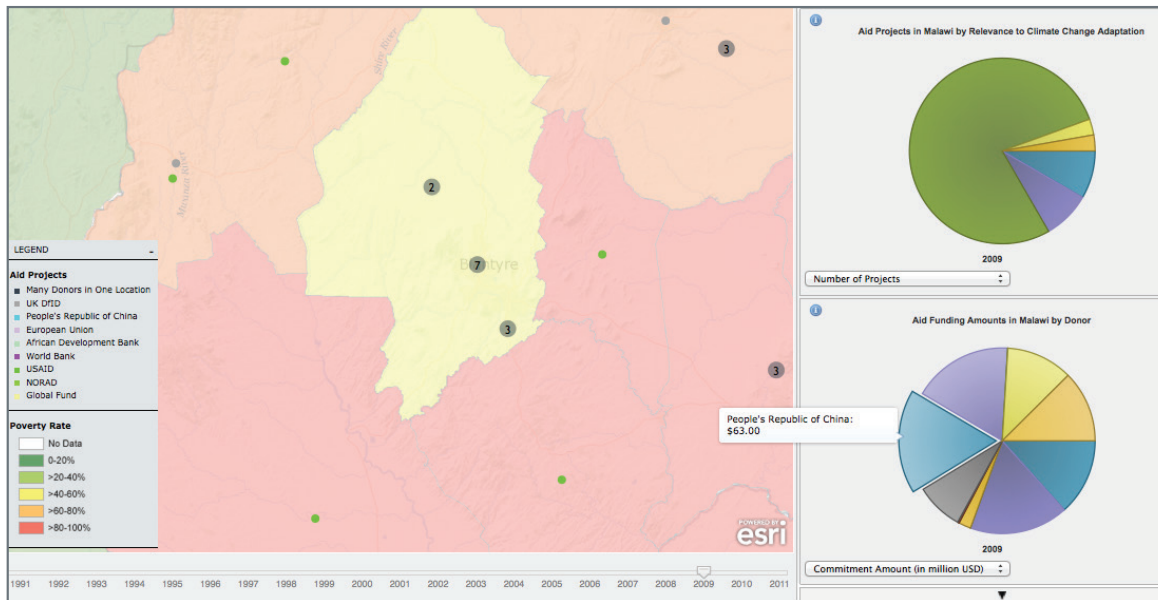
To assess how aid projects relate to areas of chronic climate security vulnerability, users can locate aid projects and layer them on climate change vulnerability data (see Figure 4). Mapping such aid flows provides a new way to assess if adaptation aid is effectively targeting the areas most vulnerable to climate change risks. For example, users can visualize where aid projects are located and see details about each aid project, including the sector targeted, donor, implementing agency, and funding amount. Layering these aid projects on top of climate security data, the mapping tool shows whether projects are located in the least or most vulnerable areas of the country.

The issue dashboards bring together mapping, trends analysis, tabular displays, and detailed new data for a comprehensive view of each area under study.

ISSUE DASHBOARDS

CCAPS and Development Gateway also produced dashboards for several thematic areas under study on the program, including aid, conflict, and climate security. The dashboards bring together mapping, trends analysis, tabular displays, and new data for a comprehensive view of each issue.

Figure 5. Aid Dashboard Offers Many Ways to Analyze Development Trends



Data sources: AfDB, AidData, CCAPS, World Bank (aid data); Harvest Choice (poverty data)

Aid Dashboard

Tracking and evaluating international aid for climate change adaptation in Africa is a key research area of the CCAPS program. The program has developed a methodology to determine whether aid activities can be considered adaptation aid, and it has also created a methodology for tracking aid for food security.¹⁰ By providing more information about the location and type of aid being directed to countries, CCAPS research aims to facilitate donor coordination and improve adaptation planning in the face of potential climate security risks.

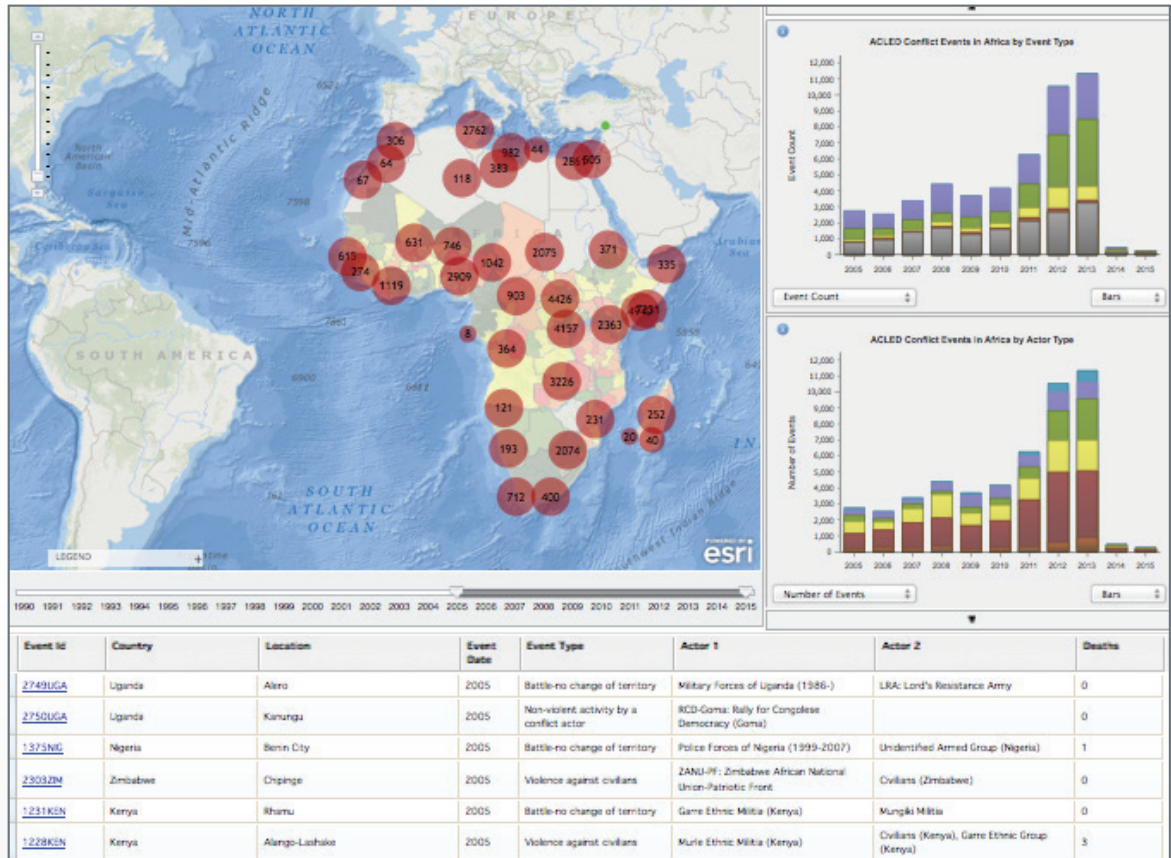
The CCAPS aid dashboard collects CCAPS climate aid research in an online tool that combines trends analysis with the most comprehensive collection of geocoded data on aid projects in Africa. The dashboard is a collaborative effort that includes geocoded aid data from CCAPS and several partner institutions. It thus currently includes three geocoded datasets: CCAPS’ new climate-coded aid data for Malawi, African Development Bank projects continent-wide, and World Bank development projects continent-wide—all geocoded by AidData. It also includes key contextual indicators, including population density from AfriPop, poverty headcount ratio from Harvest Choice, and GDP per capita from the World Bank.¹¹

Through the aid dashboard, users can explore aid spending as big-picture trends or individual project information. For example, users can analyze aid projects by the targeted sector, by projects’ relevance to climate change adaptation, or by a range of other project and donor information. Users can drill down to explore all of these projects in tabular, graph, and mapped format on the dashboard.

The aid dashboard explores aid spending as big picture trends and local project information, providing new data in a way that informs very focused questions about aid investments and impacts.

Users can also delve into funding patterns by donor. For example, Figure 5 shows that the top donors to Malawi in 2009 were the UK Department for International Development at \$63.74 million and the People’s Republic of China at \$63 million.

Figure 6. Conflict Dashboard Provides High-Level Trends and Detailed Data



Data sources: SCAD, ACLED

Conflict Dashboard

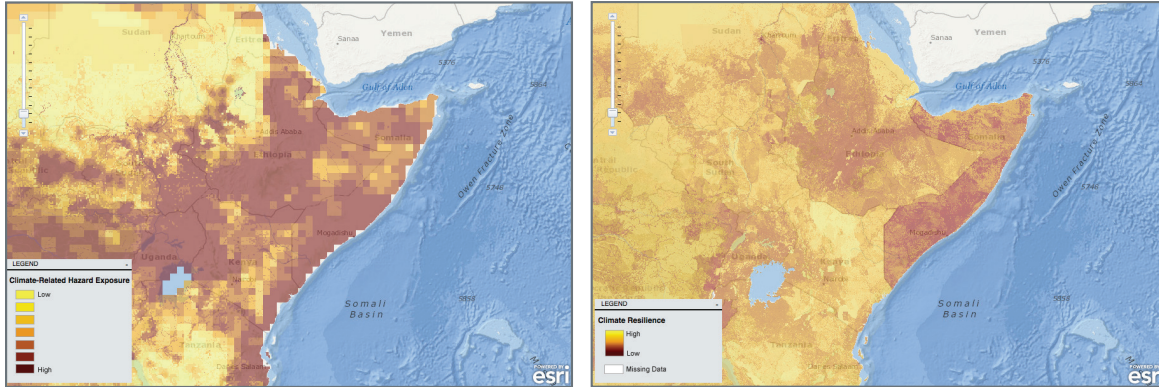
The CCAPS conflict dashboard allows users to analyze conflict by actor, event type, issue, location, and a range of other conflict dynamics in near-real time. The dashboard utilizes two conflict datasets from the CCAPS program: the Social Conflict in Africa Database, and the Armed Conflict Location and Event Dataset.¹²

Combining mapping, trends analysis, and raw data, the CCAPS conflict dashboard provides a comprehensive view of emerging and historical conflict trends in Africa. Users can also analyze how these trends relate to a range of socioeconomic factors like population density, poverty, and marginalization of ethnic groups.

The conflict dashboard puts volumes of historical and real-time data in the hands of the people who need it. Policy makers, citizens, aid workers, journalists, and researchers alike can analyze how emerging conflict patterns could impact their communities of interest.

The conflict dashboard is a key part of the program's effort to produce new research that could support policy planning and the work of practitioners and governments in Africa. It aims to put volumes of historical and real-time data in the hands of the people who need it. Policy makers, citizens, aid workers, journalists and researchers alike can analyze how emerging conflict patterns could impact their communities of interest.

Figure 7. Climate Dashboard Analyzes Vulnerability in Various Ways



Data source: CCAPS Climate Security Vulnerability Model

Climate Dashboard

The CCAPS climate dashboard provides an interactive platform where people can use the CCAPS Climate Security Vulnerability Model to explore how environmental, demographic, socioeconomic, and political factors come together to impact a community's vulnerability to climate change.¹³ Leveraging the rigorous modeling of CCAPS researchers, the dashboard allows analysis of where and how climate-related events disrupt Africa's security and development.

The dashboard shows how the four sources of vulnerability used in the CCAPS model—physical exposure to climate-related hazards, population density, household and community resilience, and governance and political violence—contribute to local areas' overall vulnerability to climate security concerns. While the CCAPS model weights each source of vulnerability equally, the interactive features of the dashboard allow users to explore how changing these weights impact the overall understanding of vulnerability.

For example, looking solely at climate-related hazards (see left image in Figure 7), much of east Africa shows chronic vulnerability to climate risks. Yet, taking climate risks, population pressures, household resilience, and governance capacity all into account (see right image in Figure 7), a more nuanced picture emerges, showing eastern DRC, Burundi, Somalia, and parts of Ethiopia more at risk, by virtue of lower household and governance capacity to respond to those climate risks.

The climate dashboard explores pressing climate security risks in a new hands-on way, allowing people to use CCAPS modeling to explore insecurities in Africa and test their own beliefs about what drives vulnerability.

In addition to reweighting the CCAPS climate security model, users can see how the model is built, learn more about how the model has been tested, and download maps produced by the model.

DRIVING NEW QUESTIONS

The CCAPS mapping tools are a key part of the program's effort to produce new research in a way that could support policy planning, as well as the work of practitioners, governments, and citizens in Africa. These are just a few of the questions the CCAPS program has been exploring, but the mapping tools are meant to spur exploration of countless more. 🌍



CLIMATE CHANGE
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POLITICAL STABILITY

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Photo Credit: Sarah McDuff

ENDNOTES

- 1 The CCAPS program, funded by the U.S. Department of Defense's Minerva Initiative, is a five-year research program based at the Robert S. Strauss Center for International Security and Law at the University of Texas at Austin, and conducted in collaboration with the College of William and Mary, Trinity College Dublin, the University of Denver, and the University of North Texas. The program analyzes how climate change, conflict, governance, and aid intersect to impact African and international security. Visit www.strausscenter.org/ccaps for more information.
- 2 All mapping tools and user guides for each are available at www.strausscenter.org/ccaps/mappingtool.
- 3 CCAPS researchers Idean Salehyan and Cullen Hendrix developed the Social Conflict in Africa Database (SCAD), available for download and as a searchable database at www.strausscenter.org/scad.html. For more information on SCAD, see Idean Salehyan, Cullen S. Hendrix, Jesse Hamner, Christina Case, Christopher Linebarger, Emily Stull, and Jennifer Williams, "Social Conflict in Africa: A New Database," *International Interactions* 38, 4 (2012): 503-511.
- 4 CCAPS researcher Clionadh Raleigh directs the Armed Conflict Location and Event Dataset (ACLED), available for download and as a searchable database at www.strausscenter.org/acled.html. For more information on ACLED, see Clionadh Raleigh, Andrew Linke, Håvard Hegre and Joakim Karlsen, "Introducing ACLED-Armed Conflict Location and Event Data," *Journal of Peace Research* 47, 5 (2010): 1-10.
- 5 The Malawi Geocoded and Climate Aid Dataset was built in partnership with the Government of Malawi, CCAPS, and Development Gateway. The dataset is available for download and as a searchable database at www.strausscenter.org/aid.html. For more information, see Catherine Weaver, Justin Baker, and Christian Peratsakis, "Tracking Climate Adaptation Aid: Methodology," CCAPS Research Brief No. 5 (Austin: Robert S. Strauss Center for International Security and Law, 2012).
- 6 Development Gateway's Aid Management Platform is an online platform that allows government officials to track development aid and monitor development projects in their countries. For more information, see www.developmentgateway.org/programs.
- 7 For more information on the CCAPS Climate Security Vulnerability Model, see Joshua Busby, Todd G. Smith, Nisha Krishnan, and Mesfin Bekalo, "Advances in Mapping Climate Security Vulnerability in Africa," CCAPS Research Brief No. 13 (Austin: Robert S. Strauss Center for International Security and Law, 2013).
- 8 The World Bank data were georeferenced by AidData and the World Bank Institute in the Mapping for Results initiative. The methodology is available at <http://maps.worldbank.org/content/about/methodology>. The data are available for download at www.aiddata.org/content/index/AidData-Raw/geocoded-data.
- 9 The AfDB data were georeferenced by AidData in partnership with the AfDB's Quality Assurance and Results Department. The methodology is available at http://aiddata.org/weceem_uploads/_ROOT/File/geocoding/UCDP_AidData_Codebook_Published.pdf. The data are available for download at www.aiddata.org/content/index/AidData-Raw/geocoded-data.
- 10 See Weaver, Baker, and Peratsakis, "Tracking Climate Adaptation Aid: Methodology"; and Abigail Ofstedahl, Elena Rodriguez, Justin Baker, and Catherine Weaver, "Tracking Aid for Food Security: Methodology and Pilot Case Study in Malawi," CCAPS Research Brief No. 17 (Austin: Robert S. Strauss Center for International Security and Law, 2013)
- 11 Descriptions and downloads for all datasets shown on the CCAPS aid dashboard are available at: www.strausscenter.org/ccaps-content/dashboard.html.
- 12 Descriptions and downloads for all datasets shown on the CCAPS conflict dashboard are available at: www.strausscenter.org/ccaps-content/conflict.html.
- 13 Description, methodology, and downloads of model shown on the CCAPS climate dashboard are available at: www.strausscenter.org/ccaps-content/climate-vulnerability-model.html.

HOW TO ORDER THIS PUBLICATION

To order a copy of this document, contact the CCAPS program at 512-471-6267 or ccaps@strausscenter.org. Please reference the document title and publication date.

This material is based upon work supported by, or in part by, the U. S. Army Research Office grant number W911NF-09-1-0077 under the Minerva Initiative of the U.S. Department of Defense.

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