MEETING SUMMARIES

PARTICIPATORY RESEARCH WORKSHOP ON SEASONAL PREDICTION OF HYDROCLIMATIC EXTREMES IN THE GREATER HORN OF AFRICA

BY TSEGAYE TADESSE, DEBORAH BATHKE, NICOLE WALL, JACOB PETR, AND TONYA HAIGH

Africa is highly vulnerable to adverse impacts of climate change such as increased temperatures, reductions in precipitation, and increased climate variability. In many regions, such as the Greater Horn of Africa (GHA), the effects of these changes are compounded by rapid population growth, high poverty levels, dependence on rainfed agriculture, and low adaptive capacity. Given the great uncertainty in climate projections for the GHA, early warning systems that are robust to evolving climate conditions could be a critical component of successful adaptation and mitigation strategies.

Improved performance and application of seasonal forecasts is a critical no-regrets climate adaptation strategy. But in many parts of the world, including the GHA, many forecast systems perform poorly, forecasts are not always tied to user needs, and systematic forecast evaluation and comparison is lacking. Additionally, research related to understanding how forecasts influence the outcomes they are designed to predict is needed. Experts and decision-makers often have many challenges in understanding prediction models and products, interpreting model differences, and implementing those model products for societal benefits.

NASA IDS: SEASONAL PREDICTION OF HYDROCLIMATIC EXTREMES IN THE GREATER HORN OF AFRICA (THE FIRST PARTICIPATORY RESEARCH WORKSHOP)

WHAT: Sixty participants, including experts from seven countries from the Greater Horn of Africa (GHA) and project coinvestigators from the United States, met to discuss seasonal prediction of hydroclimatic extremes across the GHA, engage decision-makers in the assessment of information requirements, and use feedback to orient prediction models to address user needs. Perceptions of current climate change impacts in the GHA were assessed using pre- and postworkshop surveys. Participatory research was conducted through small group discussions on water, agriculture, impacts, and data sharing.

WHEN: 11–12 August 2014

WHERE: Addis Ababa, Ethiopia

AFFILIATIONS: TADESSE, BATHKE, WALL, PETR, AND HAIGH—National Drought Mitigation Center, University of Nebraska–Lincoln, Lincoln, Nebraska
CORRESPONDING AUTHOR: Tsegaye Tadesse, NDMC/UNL, 816 Hardin Hall, 3310 Holdrege Street, P.O. Box 830988, Lincoln, NE 68583-0988
E-mail: ttadesse2@unl.edu

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WORKSHOP OBJECTIVES AND METHODS. Through a National Aeronautics and Space Administration (NASA)-funded collaborative project, under NASA's Interdisciplinary Research in Earth Science (IDS) program, the National Drought Mitigation Center (NDMC) is working to understand and (where possible) extend the predictive time horizons for extreme drought and flood in the GHA. Collaborators in this project include the U.S. Geological Survey Famine Early Warning Systems Network, The Johns Hopkins University, University of Wisconsin–Madison, International Research Institute for Climate and Society (IRI), NASA, and GHA local experts.

This project is expected to improve and implement new and existing climate- and remote sensing–based agricultural, meteorological, and hydrologic drought and flood monitoring products (or indicators) that can enhance preparedness for extreme climate events and climate change adaptation and mitigation strategies in the GHA. Diverse approaches are being used for seasonal prediction, such as dynamical global models, regression-based models using observed surface and atmospheric variables, hybrid dynamical–statistical models, and machine learning methods. Product development will benefit from participatory research that includes local experts and decision-makers. The small group iterative process is designed to solicit actionable information on quantifying and communicating model uncertainty, identifying and extending prediction time horizons, and disseminating forecast products.

Project leaders, investigators, collaborators, and decision-makers convened the first planned participatory workshop in Ethiopia in August 2014 with 60 participants. The objectives of the workshop were to present the scope of the project, engage the decision-makers in the assessment of information requirements, use feedback to reorient prediction model development to address user needs, initiate dialogue between managers and scientists on how to increase the usefulness of hydroclimatic model predictions in the GHA and on how to deliver the information for easy use, and identify stakeholders who would use the climate prediction information that will be produced over the next two years. (Workshop presentations are available online at http://drought.unl.edu/NewsOutreach/Outreach/Workshops/NasaEthiopia.aspx.)

The workshop included small breakout groups discussing two main topic areas: 1) agricultural and water impacts and 2) data gathering and sharing. Participants were asked to consider the main ideas in the research project: climate hazard impact, information sharing and exchange, specific information needs, and relevance of climate information in different sectors. Additionally, participating experts and decision-makers (from different sectors and institutions) received pre- and postparticipation surveys to measure knowledge, attitudes, and use of drought/flood prediction and climate information. Finally, participants were also asked about local perceptions of current climate change impacts in the GHA. The survey was filled out by 28 workshop participants, with approximately 75% representing the host country of Ethiopia.

PERCEIVED CLIMATE IMPACTS. Virtually all survey respondents (93%) perceived that climate change was impacting their country. Respondents were asked whether they have seen or heard about positive or negative community impacts (e.g., natural resources: water quantity/quality, financial: agricultural productivity, built: number of water wells, political: water rationing or conflict, cultural: changes in the types of festivals, social: population migration, and human: overall health and disease) to a predefined list of 63 different resources, assets, and activities due to climate change and extremes. These impacts were mapped to an integrated conceptual framework, known as the Community Capitals Framework, developed to analyze the health of a community and its capacity for economic development (Flora and Flora 2008). This framework resulted from observations that sustainable and successful communities leveraged seven types of assets or capitals: natural, cultural, human, social, political, financial, and built.

Workshop participants reported impacts across all seven capitals. The greatest number of perceived impacts was to natural, built, and financial capitals and the lowest to human and cultural capitals (Table 1). Although the impact list was not comprehensive and the final analysis is incomplete, these results suggest that the GHA is already experiencing impacts to all of the community assets needed to foster economic development and sustainability and build adaptive capacity to current and future climate change. In written survey comments and verbal statements made throughout the workshop, participants supported these findings by stating that limited measures are in place for adaptation and mitigation and that a need exists for developing risk-based planning approaches and establishing a platform to build capacity, especially for ongoing socioeconomic development.

TABLE 1. Survey results.

Type of capital (assets)	Number of perceived impacts			Top three perceived impacts from those listed in the survey
	Yes	No	I do not know	
Natural	218	8	35	Biodiversity, water quantity, insect manifestations
Built	211	9	34	Water wells, energy projects, dams, water and climate monitoring equipment (tied for third)
Financial	205	6	50	Agricultural productivity, number of people in poverty, food costs
Political	176	6	74	Political or water-use conflicts, climate adaptation (tied for first), water-related policy, satisfaction with governmental leadership
Social	170	8	55	Population migration, social networks and organizations, public awareness of climate/water issues (tie for second), public services
Human	156	5	71	Health/disease, quality of life, education and skills, size of labor force, access to medical treatment (three-way tie for third)
Cultural	136	16	80	Sustainability practices, local foods and cuisines, gender- and age-based roles

CLIMATE RESOURCES. Workshop presenters described the climate and adaptation resources that are currently available for use in the GHA. Institutions that are involved in generating, processing, and packaging and delivering these resources currently include NASA; the National Oceanic and Atmospheric Administration (NOAA)'s Climate Prediction Center (CPC); IRI; the Food and Agriculture Organization; the Climate Hazards Group at the University of California, Santa Barbara; the Regional Center for Mapping of Resources for Development; the Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre; the International Water Management Institute; IGAD Drought Disaster Resilience and Sustainability Initiative; and national meteorological and hydrological services in the GHA countries.

GAPS, CHALLENGES, AND OPPORTUNITIES. In breakout sessions, workshop participants said they used weather and climate information for relief and humanitarian aid after disaster occurrence, in estimating or forecasting agricultural production, and in reservoir operations and flood management (e.g., drainages). They said they currently used globally available online climate information such as daily, decadal, monthly, seasonal, and annual prediction related to general early warning systems, as well as climate information flows before, during, and after disasters. These types of information are not specific to the GHA region, individual countries, or sectors.

Group 1: Water, agriculture, and impacts. Gaps and needs were discussed extensively. In the agricultural sector, decision-makers said they need information such as the onset and cessation of rainfall, land preparation, variety selections, crop protection (e.g., pesticide applications), and postharvest assessments. Participants asked for more information related to rainfall, streamflow, runoff, climate variability impacts, land-use/land-cover change, and seasonal data, and they asked for real-time data, as available. Information still needed includes better records of rainfall, crop water requirements, evapotranspiration data, sunshine hour data, wind data, and higher-resolution satellite-derived vegetation indices data. The needs of each economic sector should drive the parameters of the spatial and temporal resolution of climate information. Information is needed at both regional (GHA) and local scales.

Participants also recommended that future modeling efforts include climate variability (including extremes) and climate change models, as well as scenarios that take food, land-use changes, water (quantity and quality), and population growth into account. These should be continually fine-tuned from user feedback, since population increases, land degradation, and water management practices that deal with increased runoff are constantly changing in GHA countries.

Participants reported seeing climate impacts including economic losses, ecosystem disturbances, and physical damages in multiple sectors including agriculture, water, health, and financial (markets). Better investment in forecasting facilities could help build more resiliency and better management practices in multiple areas.

Group 2: "Indigenous knowledge" for better weather forecasting and data sharing. Participants in this group pointed out that many local community members do not accept or trust meteorological data and model output and that indigenous knowledge should be integrated with modern forecasting methods and products. They recommended the continued enhancement and establishment of weather stations as a way to build local capacity; they also recommended downscaling global and regional climate projections. Risk-based planning and the ability to select data for a specific area of interest are also gaps that need to be addressed.

Improved data/information delivery is crucial as the current data are uncertain, have poor resolution, and are not integrated between sectors. Most climatic information or data are collected, stored, processed, and disseminated by the national meteorological and hydrological services in the GHA countries. Information is currently shared among institutions through regional meetings, conferences, workshops, website posts, publications, newsletters, and reports. Climate information is disseminated to the general public using TV, radio, bulletins, phone text messages, and various social media outlets. Most climatic information or data are collected, stored, processed, and disseminated by the GHA national meteorological and hydrological services. Participants asked for a way to bring together key institutions and a central database of information. For this purpose, they would like to see local, national, and regional meetings and dialogue that includes end users of the data.

RECOMMENDATIONS AND NEXT STEPS. Workshop participant responses will be used to determine the next steps of the seasonal prediction of the hydroclimate extremes project. In terms of adaptation strategies, survey respondents indicated that this project will be helpful in creating awareness, coordinating efforts among researchers/institutions, combining indigenous knowledge with new technology, and in training local farmers and adding to their irrigation technology. Furthermore, they hoped that this project could help in supplying higher-resolution data and information for developing action plans for mitigation and resilience in communities.

In conclusion, the participatory workshop format provided valuable insights into current climate-related impacts and needs related to data and decision-making. Participants would like to be engaged at all phases of the project. The project team plans to conduct future follow-up surveys, interviews, focus groups, and additional workshops to elicit more feedback from stakeholders as the project advances.

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