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Regional areas of focus: Africa, Asia, Caribbean, Central America, Europe, and the Pacific

Topical areas of focus of the Center for Health and the Global Environment (CHaNGE): CHaNGE collaboratively develops and promotes innovative, systems-based approaches to understanding and managing the risks of global environmental change, focusing on improving individual and community health and well-being in a changing environment. The Center conducts research and policy analysis, education and training, and technical assistance and capacity building that integrates health, environment, and social sciences. The Center’s research agenda includes:

- Modeling future health risks as climate and development continue to change; identifying the magnitude and temporal and spatial patterns of change to inform effective risk management.
- Increasing understanding of how communities and nations can use data on environmental variables to manage risks.
- Designing and implementing adaptation policies and measures to prepare for and cope with the risks of climate change in a multi-stressor environment, taking into consideration vulnerable regions and populations.
- Estimating the health co-benefits of policy options to address global environmental change, particularly mitigation options to reduce the emissions of greenhouse gases.
- Developing and evaluating program and policy approaches/interventions to manage the impacts of global environmental change on health, including implementation strategies.

The Center for Health and the Global Environment includes Kristie L. Ebi, Ph.D., MPH; Jeremy J. Hess, M.D., MPH; and Cory W. Morin, Ph.D. Kristie Ebi has been conducting research and practice on adaptation to the health risks of climate variability and change for more than 20 years, and Dr. Hess has more than a decade of experience with health adaptation in the U.S. and in India.
Selected recent activities:

USAID Adaptation Thought Leadership and Assessments

Working with Chemonics, International on the USAID Adaptation Thought Leadership and Assessments (ATLAS) project. The project aims to synthesize best practices, guide missions and their partners to the right tools for assessing risks and evaluating adaptation options, while also building capacity to translate this information into adaptation investment decisions and actions at the country, sector, and program levels that prioritize trade-offs for development programming. Dr. Ebi is providing summaries and analyses of the health risks of climate change in Africa, with a particular focus on Mozambique. Tasks include a summary of Africa-specific linkages between climate variability and change and human health; summary of Africa-specific policy and governance issues addressing the health risks of a changing climate; analytic assessment of climate and health risks, including a hot spot analysis for Mozambique.

Technical Assistance on Health Adaptation in the Greater Mekong Subregion

Providing technical assistance on health adaptation for the Asia Development Bank project supporting regional capacity development for Strengthening Resilience to Climate Change in the Health Sector in the Greater Mekong Subregion (Cambodia, Lao PDR and the SR of Vietnam) with the aim to reduce vulnerability to climate-induced health risks, especially for vulnerable populations, including the poor, migrants, and ethnic minority groups in the GMS. The outcome of the project will be enhanced capacity of participating countries and health agencies in climate change adaptation and is to be achieved through three outputs: (i) improvement of knowledge and understanding of the relationship between climate change and human health; (ii) strengthening of human resource skills in coping with climate change adaptation in the health sector; and (iii) sharing of knowledge products shared and promotion of advocacy.

WHO Vulnerability and Adaptation Assessments in the Health Sector

In collaboration with WHO, wrote guidelines on conducting vulnerability and adaptation assessments in the health sector <http://www.who.int/globalchange/publications/vulnerability-adaptation/en/> and guidelines on conducting the health component of a national adaptation plan <http://www.who.int/globalchange/publications/guidance-health-adaptation-planning/en/>. We helped establish and conducted mid-term and terminal evaluations for the WHO/UNDP GEF project “Piloting climate change adaptation to protect human health”. The countries involved were Barbados, Bhutan, China, Fiji, Jordan, Kenya and Uzbekistan. These countries were chosen because they included small island nations (Barbados and Fiji), drought-prone countries (Jordan and Uzbekistan), and countries with mountainous regions where vectorborne diseases could change their geographic range with climate change (Bhutan and Kenya). China was included because it faces a wide range of potential challenges with climate change that could adversely affect human health.
Review of Multinational Health Adaptation Projects in Low- and Middle-income Countries

Project reports, program and project evaluations, and related documents, such as communication materials, were reviewed and synthesized for the first five years of implementation (2008–2013) of multinational health adaptation projects in low- and middle-income countries worldwide, including the WHO/UNDP GEF project; countries funded by the Millennium Development Goals Achievement Fund (MDG Fund) that included a health component; these were China, Jordan and the Philippines; and a WHO Regional Office for Europe (EURO) project “Protecting health from climate change: a seven-country initiative” funded by the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The countries included were Albania, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia and Uzbekistan. The goal of the review and assessment was to document lessons learned and good practice examples from health adaptation pilot projects in low- and middle-income countries to facilitate assessing and overcoming barriers to implementation and to scaling up. Results were published in a WHO document on Lessons learned on health adaptation to climate variability and change: experiences across low- and middle-income countries <http://www.who.int/globalchange/publications/health-adaptation-climate-change/en/>.

Six themes arose from the review:

- More effective projects had a clear vision of how the adaptation project fit within country development goals and had strong country ownership;
- More effective projects focused on the policies and measures needed to facilitate a country’s vision of what being adapted to climate change would look like;
- Successful projects either had capacity in climate change and health or built it before project implementation began;
- Institutionalizing managing the health risks of climate variability and change is one basis for resilient health systems;
- Multi-sectoral collaboration was key to success; and
- Adaptation projects can facilitate mitigation.

Applications to Least Developed Country Fund for Health Adaptation Projects

Working with WHO Regional Offices in the South East Asia and the Western Pacific, applications were developed for the Least Developed Country Fund for health adaptation projects. The Project Identification Form was approved for a six-country project covering Bangladesh, Cambodia, Lao PDR, Myanmar, Nepal, and Timor Leste. Full proposals are under development that will cover strengthening institutional capacities to effectively integrate climate risks and adaptation options in health sector planning and implementation; enable effective decision-making for health interventions through generation of information and improved surveillance and/or early warning systems; enhance climate resilience in health service delivery; and promote regional cooperation and knowledge exchange for scale-up and replication of interventions, and for effectively integrating H-NAPs into ongoing NAP processes.
Approval is pending for the four LDCs in the Pacific (Kiribati, Solomon Islands, Tuvalu, and Vanuatu).

**Training Materials on the Health Risks of Climate Variability and Change**

Working with the WHO Regional Offices in the South East Asia and the Western Pacific, and with other technical experts, training materials were created on the health risks of climate variability and change.

**Creation and Use of Process-Based Models to Assess the Risk of Mosquito-Borne Diseases**

The Dynamic Mosquito Simulation Model (DyMSiM) is a coupled entomological-epidemiological model that simulates mosquito population dynamics, pathogen incubation and transmission dynamics, and human infection status using meteorological data as a driver. In collaboration with partners at the National Aeronautics and Space Administration (NASA) we are using this model to develop a forecast system for Aedes aegypti transmitted pathogens in Caribbean countries using real-time weather forecasts. The goal is to produce weekly predictions of disease caseloads so that vector-control and public health agencies can better implement transmission intervention strategies.

DyMSiM has also been used with partners at NASA, the National Center for Atmospheric Research (NCAR), and other Universities to estimate the seasonal risk of Zika virus transmission in the southern United States. Using historic climate data for 50 major cities in the southern US to drive the model, simulations of Ae. aegypti populations in conjunction with travel data helped identify the seasonal and spatial variation in Zika virus transmission risk.

**Developing Resilience to Extreme Heat in India**

Since 2011, an international coalition including the Ahmedabad Municipal Corporation (AMC), the Indian Institute of Public Health-Ghandinagar (IIPH-G), the Natural Resources Defense Council (NRDC), and the University of Washington (UW) has been working to strengthen resilience to extreme heat in Ahmedabad, the largest city in Gujarat state in India. The work was spawned by a severe heat wave in Ahmedabad in 2010 that was associated with a dramatic rise in all-cause mortality. At the same time, the leaders of Gujarat state had articulated concern about climate change and were interested in positioning the state at the forefront of mitigation and adaptation activities for South Asia.

In this context, the coalition worked on needs assessment and capacity building in the public health and health care delivery sectors, research into epidemiology of heat illness in the region, and developing an extreme heat early warning system and municipal heat action plan. The work was funded by the Climate Knowledge Development Network (CDKN) and the United States National Institutes of Health. The coalition held a series of workshops as well as focus groups and a study of vulnerability factors in slum communities. This work led to publication of a series of information briefs highlighting important components of adaptation to extreme heat in Ahmedabad and to scholarly work on vulnerability to extreme heat among slum dwellers.

Building on this local knowledge and momentum and incorporating best practices from heat early warning systems in other regions, the coalition developed and implemented South Asia’s
first heat early warning system in Ahmedabad. The system was piloted in 2013 and fully implemented in 2014. During the period in which the heat early warning system and action plan have been in place, all-cause mortality during extreme heat events has dropped significantly. A broad coalition including municipal leaders, public health and medical experts, and community groups, were essential to the project’s success. Other cities in India have taken notice of the programming and its impacts, and the coalition is now supporting other cities including Nagpur and Bhubaneswar. The coalition has also served as a resource to the Indian National Disaster Management Authority (NDMA) and the Indian Meteorological Department (IMD) to advance heat resilience efforts nationally.
ANNEX 1: SELECTED REFERENCES FROM 2006 TO PRESENT RELEVANT TO MANAGING THE HEALTH RISKS OF CLIMATE VARIABILITY AND CHANGE

KRISTIE L. EB


**Jeremy J. Hess**


