

JOINING FORCES IN A GLOBAL FLOOD PARTNERSHIP

BY T. DE GROEVE, J. THIELEN-DEL POZO, R. BRAKENRIDGE, R. ADLER, L. ALFIERI, D. KULL, F. LINDSAY, O. IMPERIALI, F. PAPPENBERGER, R. RUDARI, P. SALAMON, N. VILLARS, AND K. WYJAD

Flooding can take place almost anywhere in the world with significant consequences for the environment, economy, and society. In regions with strong seasonal rainfall patterns such as monsoons, some seasonal flooding can be an integral and important part of agricultural activity, providing a regular source of nutrients and irrigational input (Banerjee 2010); however, floods in general produce very large negative socioeconomic impacts in both the developed and developing worlds, including situations that are life threatening and damaging for the biosphere, environment, social life, and economy, with negative and long-lasting consequences in particular in developing countries. Floods affect more than 500 million people worldwide every year, and about 122,000 people have been killed related to flood events in the last decade. United Nations University (UNU) estimates floods might impact two billion people by 2050, of which a disproportionate number live in Asia. According to a 2003 report of the World Water Council, flood and drought losses increased

FOURTH WORKSHOP OF THE GLOBAL FLOOD WORKING GROUP

WHAT: More than 90 scientists, end users, and decision-makers in the field of flood forecasting and detection, flood hazard and risk assessment, as well as response actions met to formalize and launch a Global Flood Partnership aimed at building a framework for global flood risk assessment and real-time flood mitigation and response.

WHEN: 3–6 March 2014

WHERE: Reading, United Kingdom

globally tenfold (inflation corrected) over the second half of the twentieth century, to a total of around 300 billion U.S. dollars (USD) in the 1990s. According to the United Nations International Strategy for Disaster Reduction (UNISDR) and statistics from insurance companies, the socioeconomic impact of

AFFILIATIONS: DE GROEVE, THIELEN-DEL POZO, AND SALAMON—European Commission, Joint Research Centre (JRC), Ispra, Italy; BRAKENRIDGE—Dartmouth Flood Observatory, Boulder, Colorado; ADLER—University of Maryland, College Park, College Park, Maryland; ALFIERI—European Commission, Joint Research Centre, Ispra, Italy, and Forecast Department, European Centre for Medium-Range Weather Forecasts, Reading, United Kingdom; KULL—Global Facility for Disaster Reduction and Recovery, World Bank Group, Geneva, Switzerland; LINDSAY—National Aeronautics and Space Administration, Washington, D.C.; IMPERIALI—European Commission, European Community Humanitarian Office, Brussels, Belgium; PAPPENBERGER—Forecast Department, European Centre for Medium-Range Weather Forecasts, Reading, United Kingdom,

and College of Hydrology and Water Resources, Hohai University, Nanjing, China, and Department of Geography, Bristol University, Bristol, United Kingdom; RUDARI—CIMA Research Foundation, Savona, Italy; VILLARS—Deltares, Delft, Netherlands; WYJAD—United Nations World Food Programme, Rome, Italy

CORRESPONDING AUTHOR: Jutta Thielen-del Pozo, European Commission, Joint Research Centre (JRC), Via E. Fermi 2479, TPI22, 21027 Ispra (VA), Italy
E-mail: jutta.thielen@jrc.ec.europa.eu

DOI: 10.1175/BAMS-D-14-00147.1

In final form 11 December 2014
©2015 American Meteorological Society

floods is increasing at an alarming rate—the driving factors being population increase, urbanization, land-use changes, and changes in the frequency and intensity of events. Global solutions are needed to increase prevention and preparedness regarding floods. Therefore, during this meeting, a Global Flood Partnership was launched, aiming at improved flood management worldwide in the future.

NEED FOR GLOBAL SOLUTIONS TO INCREASE PREVENTION AND PREPAREDNESS. Without adequate warning and preparation, recovery from future flood events is expected to become more costly and prolonged than would be necessary if appropriate preparedness, prevention, and adaptation measures were in place.

In developed countries, hydrological assessment and flood warnings are usually very useful. In Europe, for example, hydrometeorological information and early warning systems save hundreds of lives and avoid between 460 million and 3.6 billion USD of disaster losses per year (Hallegatte 2012). The potential for similar benefits for developing and less developed countries is estimated between 4 and 36 billion USD per year. However, several countries do not have adequate national flood monitoring and forecasting systems in place yet. These systems require a significant budget to set up and maintain monitoring networks, IT capacity, specific hydrometeorological knowledge, appropriate institutional structures, and training programs as well as collaboration between countries in the case of shared transboundary river basins.

A report of the United Nations (UN) Millennium Development Goals (“The Future We Want”; www.un.org/en/sustainablefuture/) specifically highlights the importance of early warning systems as part of effective disaster risk reduction at all levels and promotes strengthening partnerships as a vehicle to achieve effective and global solutions. Similarly, the Sendai Framework for Disaster Risk Reduction 2015–2030 promotes “risk assessment and early warning systems [as] essential investments that protect and save lives, property, and livelihoods, contribute to the sustainability of development, and are far more cost-effective in strengthening coping mechanisms than is primary reliance on post-disaster response and recovery” (www.unisdr.org/we/coordinate/hfa). The importance of early warning is again reflected in the development of the Post 2015 Framework for Disaster Risk Reduction that will replace the Hyogo Framework for Action in 2015. It highlights how important it is to “continue to strengthen early warning systems and

tailor them to the needs of users, including social and cultural requirements” (www.wcdrr.org/). The global humanitarian community has recognized that in view of global challenges including population growth and climate change, better risk analysis and more effective systems to respond, including more sophisticated risk models and triggers as well as forums to share analysis and address risks, are needed [Office for the Coordination of Humanitarian Affairs (OCHA) 2014].

THE FOURTH WORKSHOP OF THE GLOBAL FLOOD WORKING GROUP. The Workshop of the Global Flood Working Group has been a forum for scientists, end users, and decision-makers to discuss needs, challenges, and progress toward global applications of forecasting and monitoring floods. With increased availability of in situ and remote sensing data, new generations of weather prediction and flood forecasting models, global flood forecasting, and detection systems have now become reality, with a number of examples operating continuously in a preoperational setup. These systems are able to provide information useful for operational response and flood risk management. Some examples rely on the output of global or regional weather forecasting models, enabling an extension of the forecast horizon to upcoming hazardous flood events. An accepted forum where knowledge, expertise, data, and tools for flood risk assessment and mapping can be shared between scientists and end users is essential when trying to address floods at the global scale.

The Global Flood Working Group began at a workshop in 2011. It consists of emergency response practitioners, risk professionals, and researchers in remote sensing, meteorology, and hydrology that develop and possess experimental tools to operationally monitor and forecast flooding globally. It is currently the only international forum where global flood monitoring is dealt with in an interdisciplinary manner. Over the last few years, this community identified existing research groups working on global flood monitoring and modeling, fostered interdisciplinary collaboration, noted requirements for better flood information in diverse user communities, and provided experimental flood warning and mapping information to international and national institutions.

The 2014 workshop demonstrated significant progress with regard to high-resolution flood monitoring and an inundation modeling applicable to continental and global scales. With improved computational capabilities as well as high-resolution raster digital elevation models becoming increasingly available and data volumes becoming manageable,

simulating dynamic flood inundations globally is becoming computationally feasible within reasonable time frames. Establishing scenarios that could then be used for decision-making when flood forecasts indicate the exceedance of critical thresholds is becoming a real and exciting possibility.

In addition, a focal shift between simple hazard assessment and integrated risk assessment, taking into account local exposure and

vulnerability, has been recognized by several scientific contributions at the workshop. Decision-makers including international aid organizations are particularly interested in impact-oriented information in contrast to purely scientific “discharge exceedance” or inundation information.

The potential for providing reliable international predictive capacity was demonstrated during the workshop. However, it is the real-time and operational implementation—in particular the production of easy-to-understand impact forecasting services—that is lacking. During working groups and plenary discussions, the participants discussed the challenges and benefits of a global flood partnership in support of improved flood forecasting, monitoring, and subsequent decision-making across different levels.

LAUNCH OF THE GLOBAL FLOOD PARTNERSHIP. Bringing together the discussions in a final plenary discussion, the participants voted for the launch of a Global Flood Partnership with immediate effect. The workshop participants agreed on the benefits to disaster responders, and in particular international humanitarian and civil protection organizations, of making available the best tools and information to adequately prepare and coordinate actions for major disasters that necessitate international support in order to augment domestic capacity. The added value of complementing improved in-country capacity with global infrastructures was unanimously recognized (see Fig. 1).

The five essential pillars of such a partnership were discussed as follows:

- Flood service and toolbox: Existing, reusable open/nonopen source tools as well as gaps in existing tools will be identified and further devel-

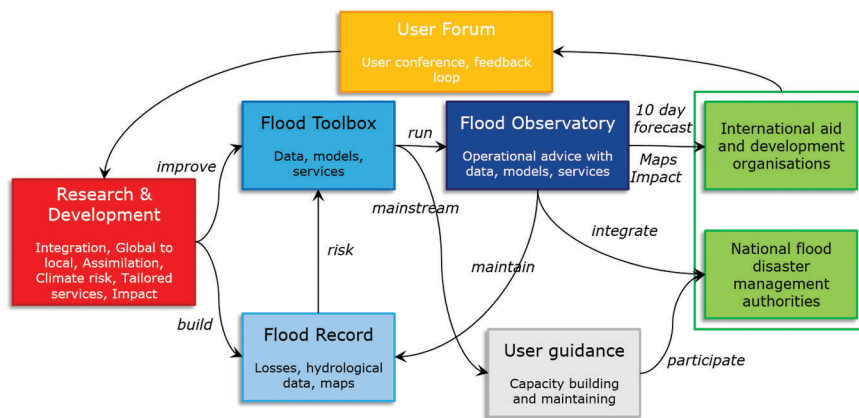


FIG. 1. Schematic view of the different pillars and elements constituting the Global Flood Partnership.

oped in collaborative research and development. Coordination of research and development activities, sharing of best practices, and use/development of standards can lead to value-added systems based on user feedback. Flood forecasting or monitoring systems can be run continuously to provide operational services that are dedicated to providing hydrological or impact information to humanitarian responders. A commitment toward running the services during a pilot phase of three years is one of the prerequisites for a service becoming part of the pillar. Services already subscribed cover flood detection, forecasting, flood extent mapping, risk mapping, impact evaluations, and river discharge monitoring [www.globalfloodsystem.com/; www.gdacs.org/flooddetection; <http://flood.umd.edu>; www.floodmodeller.com; www.globalfloods.com; www.deltares.nl/en/facilities/idlab-integrated-service-facility; Dartmouth Flood Observatory (floodobservatory.colorado.edu)]. The registration for services is ongoing (<http://portal.gdacs.org/Global-Flood-Partnership/Global-Flood-Toolbox>).

- Flood Observatory: To bridge the gap between science and practitioners, the partnership will run a collaborative analysis service called the Flood Observatory. Using the global flood tools and services in a daily roster, a brief analysis of forecast and detected floods will be made available to decision-makers in civil protection and international aid organizations. In addition, a visualization platform will be established to collect, integrate, and analyze different services and to disseminate information to all stakeholders in the partnership.
- Flood record: The aim of the flood record pillar is to document and record the occurrence and

impact of floods with enough detail to understand flood risk for early warning or medium-term planning. Based on existing global and regional archives (including the Dartmouth Flood Observatory record), the partnership will develop and maintain a better historic flood record based on best practices (e.g., standards for recording disaster losses) to describe and record floods and their associated losses.

- User guidance and capacity building: An important effort of the partnership will focus on enabling developing and less-developed countries to improve their own capacities by offering access to data, models, and, most importantly, expertise from the partnership. The partnership will establish mechanisms to transfer knowledge and systems collected in the flood toolbox and data produced in the Flood Observatory to flood-prone developing countries. These may include the exchange of staff, summer schools organized by technical partners, or dedicated in-country training programs.
- User forum: Communication and networking among scientists, flood management authorities at the national level, international relief organizations, and international risk managers are core elements of the Global Flood Partnership. Yearly user conferences are one tool to ensure the mutual understanding, sharing of experience, and teaming up of experts in dedicated projects across disciplines, sectors, and continents.

An open data policy, where partners have access to data, tools, and services, was considered to be a cornerstone of the partnership. Regarding the distribution of forecasting information, it was accepted that the partnership must respect national mandates for issuing warnings and therefore forecasts must be made available to relevant authorities upon request but only after registration.

Bringing together the scientific community, service providers (satellite, weather, and hydrology), national flood and emergency management authorities, humanitarian organizations, development agencies, and donors in an operational partnership was recognized as a novel initiative to provide operational, globally applicable flood forecasting and monitoring tools and services, complementary to national capabilities, for better predicting and managing flood disaster impacts and flood risk. Furthermore, it was made clear that the partnership would strengthen the sharing of hydrometeorological data and information, foster in-country capacity building, and improve flood risk management models and products across different authorities and decision pathways.

The launch of the Global Flood Partnership was very much welcomed by the participants and perceived as an opportunity to achieve better flood management worldwide. Progress on the partnership can be followed online (<http://portal.gdacs.org/Global-Flood-Partnership>).

REFERENCES

- Banerjee, L., 2010: Effects of flood on agricultural productivity in Bangladesh. *Oxford Dev. Stud.*, **38**, 339–356, doi:10.1080/13600818.2010.505681.
- Hallegatte, S., 2012: A cost effective solution to reduce disaster losses in developing countries: Hydro-meteorological services, early warning, and evacuation. The World Bank, Sustainable Development Network, Policy Research Working Paper 6058, 20 pp. [Available online at <http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-6058>.]
- OCHA, 2014: Saving lives today and tomorrow: Managing the risk of humanitarian crises. United Nations Office for the Coordination of Humanitarian Affairs OCHA Policy and Studies Series, 93 pp.