

# Reducing flood devastation in the Nile Basin

A regional cooperation effort coordinated by the Nile Basin Initiative (NBI) has created a credible system that links multiple stakeholders to work together to address flooding and its impacts. The Flood Preparedness and Early Warning (FPEW) project that ran until 2010 operated in Egypt, Ethiopia, and Sudan. It created a regional flood preparedness and early warning program which is ongoing, reducing the risk of flood devastation for over 2 million people in the region.

Supported by the NBI through regional cooperation and data sharing:

An ongoing flood preparedness and early warning system benefits Ethiopia, Sudan, and South Sudan.

**350,000** people across the region receive early warning messages during flood season and daily alerts in flood prone areas.

**1.7 MILLION** more people across the region benefit indirectly from these alerts and messages, and are better able to reduce their risk of flood devastation.

Warnings and alerts are used by local communities, relief organizations and governments.

As a result, there is less risk of flood devastation for over **2 MILLION** people. Continued scale-up of these activities is demonstrating the potential to significantly broaden the reach of these impacts.

## Floods in the Nile: A historical perspective



Historically, flooding of the Nile was an annual event that was received with much celebration by those living in the downstream reaches of the river. They relied on the Nile for water, and the silt carried by the swollen river fertilized their depleted soils and improved their harvests. But the story was not all positive.

The tons of fertile sediment washed down from the hills upstream have caused gradual land degradation there, negatively impacting agricultural productivity. Meanwhile, the floodplains of Ethiopia and Sudan continue to experience increasing frequency and severity of flooding, especially now as climate change takes its toll.

### Complacency is costly

The eastern Nile region (which includes Egypt, Ethiopia, South Sudan, and Sudan) is characterized by highly variable river flows, making it prone to floods and droughts, with devastating effects on lives and property. Floods have real consequences for poverty and food security. They reduce agricultural production, decrease incomes, increase risks of sickness and disease, disrupt education, and damage public infrastructure and private assets.

It is estimated that the annual average damage from flooding is over US\$25 million in the riparian rural settlements of the Blue Nile and the main Nile area (especially Fogera and Dembiya, areas around Lake

Tana). In 2006, floods across Ethiopia resulted in 700 deaths and displaced 242,000 people.

Most of the annual runoff volume from rainfall in the eastern Nile, which contributes about 85% of the total Nile river flows, occurs between July and September. It is during this high rainfall period that the Blue Nile, winding its way from the Ethiopian highlands, causes havoc in the floodplains of Ethiopia and Sudan. Flooding is a transboundary problem which requires upstream-downstream cooperation to effectively address it. For example, Sudan's flood early warnings can only be effective with information from the Ethiopian highlands.

## A regional response

The Eastern Nile Subsidiary Program (ENSAP) was designed to address the challenges faced by eastern Nile member states, and to help them work together to utilize the unique potential of their shared resource. It is implemented by the Eastern Nile Technical Regional Office (ENTRO).

The FPEW project was designed by ENSAP to respond to the recurrent flood problems. The goal of the project was to reduce human suffering caused by frequent flooding, while preserving the environmental benefits. Its emphasis was on enhancing regional collaboration and national capacity in flood risk management, including activities on flood mitigation, forecasting, early warning systems, emergency preparedness, and response.

The project ended in 2010, but it established the relationships for joint action through its strong focus on networking, communication, information management, capacity building, and institutional strengthening in flood preparedness. The approach is highly cooperative. FPEW brought together relevant national government offices in Ethiopia and Sudan, local governments, relief agencies, and community members. The established national flood coordination units (and regional units in flood-prone areas in Ethiopia) strengthen communication and ensure coordination of flood-related activities across the eastern Nile.

According to Teshome Atnafie, Director of Irrigation and Drainage in Ethiopia's Ministry of Water, Irrigation and Energy: *"We work as one people in sending alerts to and from flood-prone areas. We work very closely with our counterparts in Sudan."*

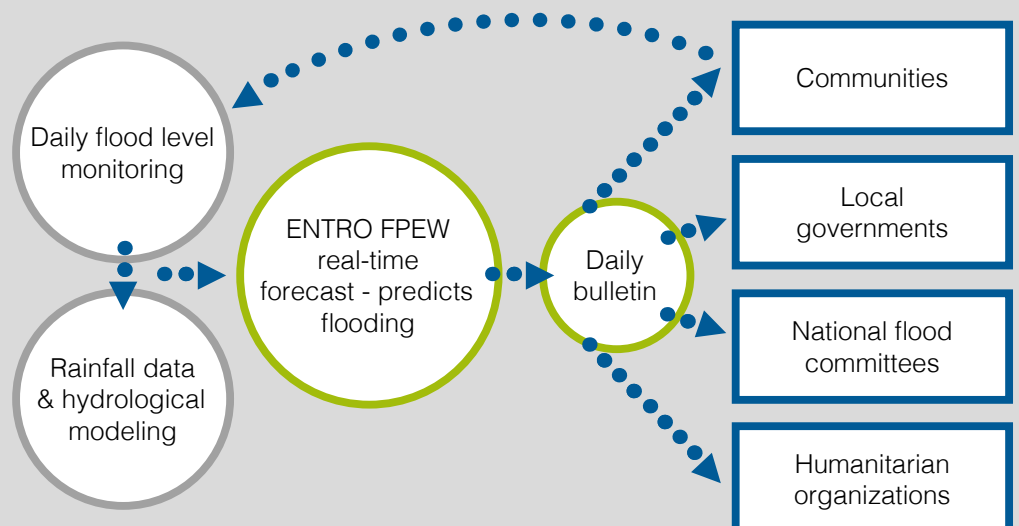
In September 2013, ENTRO facilitated a regional flood forum in Sudan, involving all these stakeholders, to assess and analyze the causes of the 2013 flood, which was most severe in Sudan. The forum discussed possible improvements to flood forecasting capabilities and recommended additional flood preparedness activities. It also supported preparation of community flood preparedness action plans and flood early warning surveys.

Complementing work on flood forecasting, the NBI takes an integrated approach to the regional flood problems – both in its watershed management programs and in hydrological monitoring activities. Watershed management interventions upstream help to better retain water and reduce extreme and flash floods. This contributes to reducing the magnitude, duration and severity of floods downstream. Regional level monitoring contributes to improved data quality for forecasting and early warning, and helps build an understanding of downstream consequences

## How the forecasting works

ENTRO conducts daily monitoring with three-day lead-times to produce forecasts. Rainfall and hydrological data is used to model and predict flooding with greater accuracy.

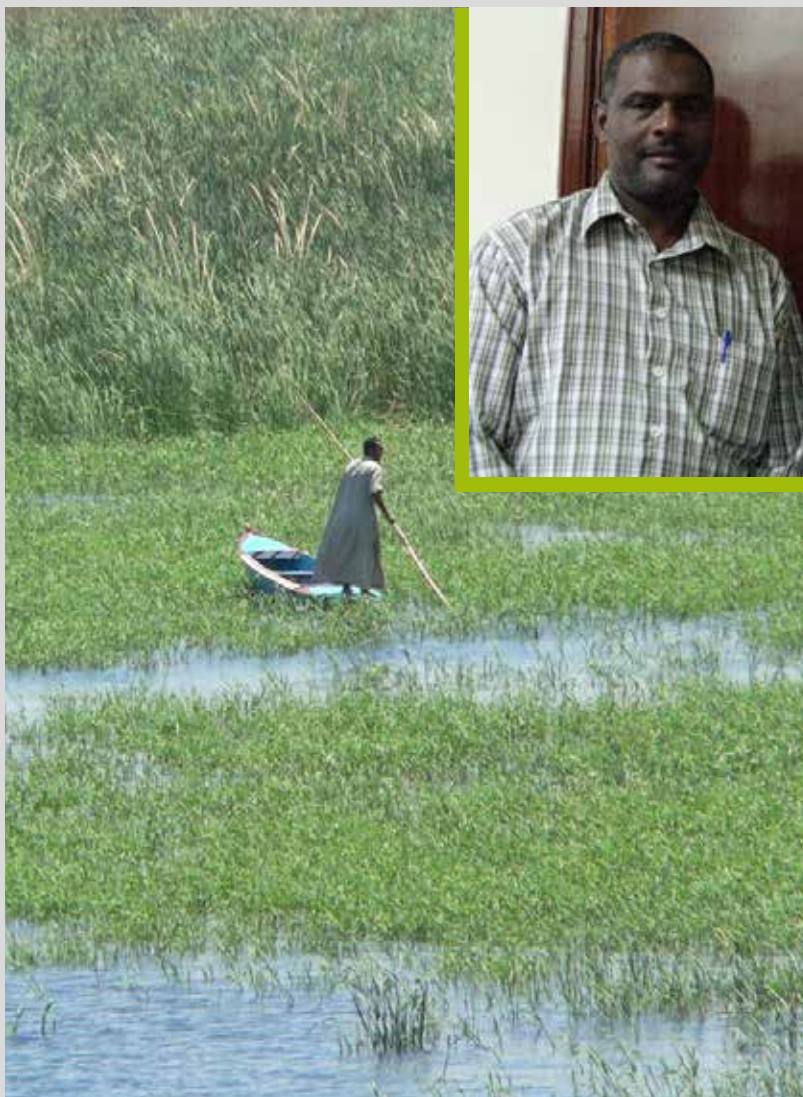
Daily, weekly, and seasonal flood forecast reports are generated and disseminated to different users at different levels through the ENTRO web portal, email, and mobile phone messaging.



## How the forecasting works continued...

The information generated is sent to ministries of water resources (and universities collaborating with ENTRO) in Ethiopia, South Sudan and Sudan. In Ethiopia, the forecasts are used by the Ministry of Water, Irrigation and Energy to provide early warning information to local government (woreda) authorities to aid in flood preparation and response. In Sudan, the information is forwarded to the national flood committee, which uses it to enrich its own analysis and alerts. In addition, Sudan's National Nile Water Directorate receives a daily bulletin during the flood period, which they have increasingly used to avert destruction from flood events. After the close of FPEW, ENTRO developed flood early warning models for South Sudan, which are also now included in its bulletins.

The system is continually evolving, and feedback on how it is working is integrated by ENTRO to ensure the system becomes increasingly effective. The information is used by the governments and by relief agencies to target their response efforts in times of flood. The system of cooperation and early warning systems was effectively used during the 2013 flood season to alleviate flooding problems and reduce human suffering.



Moses Ambaw, early warning expert and floods focal person for ENTRO in Bahir Dar, Ethiopia, explains how the system works:

*"Previously, the villagers used sticks to determine dangerous rise in water levels. The project introduced the use of a colored (red, amber, green) bar system for forecasting. Villagers were trained to analyze what each level means so that they can forward accurate alerts. The pilot project area has also been provided with 68 mobile phones for distribution to community members in strategic locations. They are given phone credit during the rainy season, so that they can alert other 'woredas' of looming floods and if necessary, to move to higher grounds. The information is sent to parallel offices so that they can prepare the appropriate alerts for forwarding to risk areas."*

*Moses adds, "So far, the project has prepared various awareness-creation materials, constructed at least eight emergency shelters, and provided tents. In the event of floods, we link those requiring evacuation to relief agencies. We also address disease and sanitation issues. Flood incidents are more frequent but, the level of disaster and devastation has gone down."*

These flood early warning system tools are also helping people to face climate change. Interacting with the Nile Decision Support System (a comprehensive data-analysis framework jointly developed by the NBI and Nile countries) and ENTRO's climate tools, they help to develop and agree on 'climate-changed flood scenarios', reflecting recognition that flood disasters are intensifying across the region due to the impacts of climate change. These scenarios consider the potential future patterns of flood volumes, timings, and duration.

## Real results

The NBI has already achieved significant success with its flood preparedness and early warning systems. Achievements to date include:

- Improved risk mapping. FPEW has improved the mapping of flood risks for local communities and is helping to ensure that flood alerts and warnings are received on the ground.
- Early warning alerts. Daily forecast bulletins give early flood warning alerts to thousands of community members in Ethiopia and Sudan through mass media (print and radio), allowing better preparation for floods.
- Greater reach. An increasing number of organizations (including United Nations bodies) now request advanced copies of the daily forecast bulletins to plan their relief efforts.
- Better resources. ENTRO has developed a flood embankment design and maintenance manual, and engineers have been trained on its use through FPEW's flood coordination units.
- Improved technology. ENTRO is in the process of fine-tuning a mobile and web application to increase access and to enhance communication between local communities and relevant government officials.
- A replicable system. The FPEW model has been replicated in the Awash River basin in Ethiopia and Sudan, and is being replicated in other Nile sub-basins.

Through FPEW, early flood warnings currently reach around 150,000 vulnerable community members in Ethiopia and 200,000 people in Sudan, and the forecasting indirectly benefits nearly 2 million people. Replication of FPEW in the Awash valley means another 4 million people will be able to access early warning messages. Through these bulletins, the citizens of the Nile can better understand and prepare for floods. While the FPEW system continues to evolve, devastation from flooding is on the decline.



Regional flood experts visit sites which are using red/amber/green poles for flood warnings.



## Regional impact for long term protection

FPEW is recognized as one of the most promising responses to the recurrent flooding challenges facing the riparian countries of the Blue Nile. The early warning system has reduced vulnerability of people living in the eastern Nile to the negative impacts of floods, and there is improved dialogue and coordination among member states and regional partners in addressing transboundary flood issues. The project, and the ongoing work arising from it, has:

- **Enhanced regional coordination capacity:** National flood coordination units in the eastern Nile regularly share information and data that has contributed to a reduction in devastation from floods.
- **Strengthened institutional linkages:** National governments work closely with regional governments, relief agencies, and local communities, enhancing ownership of the system and processes.
- **Protected lives and property:** The dynamic flood forecasting warning and communication system has improved disaster and emergency preparedness and response.
- **Empowered communities:** Local people enjoy a greater sense of well-being and control as they engage with others through the FPEW system. The forecasting tools are used to alert neighbors and government agencies for prompt action.

Together with governments' activities, ENTRO's daily forecasting bulletins and capacity-building activities have meant that **flood-related devastation has been reduced despite increased levels of flooding**. This makes the case for continued scaling-up of these activities to broaden the reach of these positive impacts.

This note forms one of a series of briefing notes prepared to mark the completion of the Nile Basin Trust Fund (NBTF). The Nile Basin Trust Fund was opened in 2003 at the request of Ministers responsible for water affairs in the Nile countries, and was administered by the World Bank on behalf of ten donors.

The series of briefing notes highlight the achievements of the Nile Program, a set of projects and sub-programs that have been supported by Nile riparian countries, the Nile Basin Trust Fund and other donors in parallel to the NBTF, largely implemented by the Nile Basin Initiative (NBI).

### NBI Member States



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