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DISASTER REFUGEES AND FLOOD EARLY WARNING IN BANGLADESH



Principal Investigators: J. Craig Jenkins, Department of Sociology, C.K. Shum, School of Earth Science, and Joyce Chen, Agricultural, Environmental, and Development Economics

Climate change is widely recognized as a national security threat because it could cause widespread displacement of people fleeing areas ransacked by extreme weather events.

Bangladesh is one of the world's most vulnerable countries, with more than 150 million people, many living in poverty in low-lying regions subject to floods, droughts, and storms. Up to 15 million people could become climate refugees by 2050, the United Nations estimates.

To address this issue, Craig Jenkins, C.K. Shum, and Joyce Chen are piloting a flood and drought early warning system in three regions of the country. The purpose is to help people adapt and plan for extreme weather events so they can stay in place rather than flee the country.

Working with leaders of the Flood Early Warning project at the Department of Hydrology, Bangladesh Water Development Board, researchers are using multi-platform, multi-sensor, and near-real time satellite data to monitor floods, droughts, and severe river bank erosion.

The project includes a partnership with Planet Labs, a private company with satellites that can provide high-resolution images of the entire globe 24 hours day. Data from climate and weather satellites operated by NASA, European Space Agency, and Japan Aerospace Exploration Agency will also be used to create early warnings of floods, drought, and severe river erosion.

The pilot project will cover three regions of Bangladesh:

- the **coastal area**, which contains 45 million people, one-third of whom are below the poverty line, vulnerable to monsoons, storm surges, flooding, salt-water intrusion, severe river erosion, land subsidence, and sea-level rise
- the **northwest**, prone to flash floods driven by heavy monsoonal rains and ice melt from the Himalayas, as well as drought



during the dry season

- the **central region**, prone to severe river erosion during heavy monsoonal floods, which can elevate river levels 15 to 20 feet.

These challenges greatly affect agricultural production, with 15 percent of crops nationwide lost to flooding, the same amount lost to drought, more than 30,000 people displaced from their homes, and more than a third of the country's land area flooded during monsoons each year. Severe river erosion can erode 500 to 1000 meters of land in just a few weeks.

Making matters worse, Bangladesh is vulnerable to severe storm surges with at least one or two cyclones per year and a high-category storm at least once a decade. Such storms can take a long time to recover from: At least 1.2 million people are still internally displaced by Cyclone Aila, a Category 1 storm with maximum sustained winds of 110 km/hr that occurred in May 2009.

During the pilot project, researchers will work with 15 to 20 water management organizations and local governments to test the utility of warning signals. To be effective, the system must provide accurate information distributed widely in time for people to respond.

The time frame can differ depending on the risk. For example, households in low-lying areas need about a week to prepare for a major flood. Typically they can move farm animals and household goods to higher ground while sending children and the elderly to stay with relatives.

Severe river erosion, by contrast, requires warning of several weeks so people can reinforce points of vulnerability or plan for evacuation, while drought requires notification months in advance so people know where to plant crops and what areas may require irrigation.

The early warning system will use the internet and cell phones to distribute information. Eighty percent of households in Bangladesh have access to cell phones, and all government agencies have access to the internet.

If the pilot succeeds, researchers will pursue further funding from USAID, the Global Resilience Challenge, from which **Jenkins received** a \$200,000 grant last year, and NASA.

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