

FloodSMS - Early Detection and Warning of Catastrophic Flooding via SMS

NiJeL – Community Impact Through Mapping
ekgaon technologies – One Village One World

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Introduction

One sixth of the global population lives in the potential path of a 100-year flood, many in developing countries with increasing mobile phone penetration. Many developing nations have seen cell phone usage quadruple in the last decade, and large numbers of poor rural villagers have access to a cell phone through a reseller nearby. Using this extensive mobile phone network, NiJeL (<http://nijel.org/>) and ekgaon technologies (<http://www.ekgaon.com/>) propose to build FloodSMS, a modular flood early warning application, which will push SMS messages to people downstream of a flood event in real time. A flood early warning SMS application like FloodSMS could reach most people in the path of a flood with access to a mobile phone, and give them time to get their possessions, their livestock, and their families out of the way of catastrophic flood. This application could be applied globally, and with simple inputs, it could be used anywhere where SMS messages can be received.

This project will create a flood early warning application, which will push SMS messages to people downstream of a flood event giving them up to 24 hours advanced warning. We intend to pilot this project in the Terai region of Nepal-India. The project area comprises of rural and urban settlement as well as agricultural land, and a number of settlements situated on both the banks of the rivers in the project area are usually flooded during rainy season. An extreme flooding event in 1993 killed 1,029 people, affected 400,000 people, damaged 25,000 houses and destroyed 40,000 hectares agricultural land. The most recent flood event in the region was in 2007, which affected the region severely.

FloodSMS Features

Using inputs from stream gauges (if available), satellite remote sensing of river discharge and flooding, and the local topography and hydrology, we propose to create a GIS-based application that will interpret these inputs and automatically blanket an area with a high probability of flooding with early warning SMS messages. This application could give poor rural villages in large parts of the world up to 24 hours of advance notice that a flood event is coming, and will be flexible enough to work with basic inputs and be independent of cell phone providers. As a pilot project, we intend on working with our colleagues at ekgaon technologies in the Terai region straddling the Nepal-India border focusing on the Rohini and Bagmati river basins.

Upon implementation, FloodSMS will have the following key features:

- **Using Real-time Stream Gauge and Remotely Sensed Data to Trigger SMS Warning Messages** – This project will build a modular flood early warning application, which will push SMS messages to people downstream of a flood event in real time. Real-time

stream gauges will be linked to a database that connects to a GIS back end including hydrological models that will determine when and where flood hazard potential exists based on stream gauge readings. To augment the stream gauge data, or where real time stream gauges are not available, FloodSMS will use satellite remote sensing of river discharge to trigger early warning SMS messages. While the NiJeL team has professional experience working on natural hazards and the risks they represent, we expect to partner with hydrologists and satellite remote sensing experts in India and across the globe to ensure that we are following best practices in determining flood probability based on stream gauge and satellite imagery inputs.

- **Alerting vulnerable populations utilizing SMS** – FloodSMS will be flexible and will be able to work with FrontlineSMS (<http://www.frontlinesms.com/>) or with cell providers to deliver SMS alerts. FrontlineSMS can be utilized to subscribe individuals to the alert system via an incoming SMS message from individual cell phones. Incoming SMS messages will be received by a local mobile phone tethered to a computer running FrontlineSMS, and those messages will be instantly available for review. FrontlineSMS will also return a SMS message with an alert when a flooding event is impending. When cell providers can assist with the delivery of flood alerts, they can deliver the alert SMS to subscribers or broadcast an alert around a cell tower in the area of a flood event.
- **Advertise, educate, and deliver culturally appropriate messages** - FloodSMS will deliver SMS messages with simple instructions on how to respond to a flood alert. Partnerships with local humanitarian groups and governments will be necessary to ensure that the alert is culturally appropriate. The system will be flexible to handle multiple languages. Local groups can assist in advertising and education campaign aimed at the vulnerable population so that individuals will know how to respond when an alert is received.

About NiJeL

NiJeL has worked with a number of NGOs, around the world to develop participatory mapping applications that capture and deliver information to the organizations and the people they serve. NiJeL worked with Beatitudes Center DOAR to create an online mapping application that shows in real-time the locations of homebound elders who need volunteer assistance. We also teamed up with Community Outreach and Advocacy for Refugees, a Tempe-based advocacy and service organization supporting resettled refugees, to create the Refugee Resource Map: a community based-mapping tool that can assist the refugee community and their providers in finding relevant resources. All the work we do relies on GIS-enabled databases and flexible applications that can be used in a wide range of cases.

In addition to our expertise in GIS and other mapping technologies, members of NiJeL's team also have significant science and natural hazards backgrounds and advanced degrees in geosciences. In the past, our team has worked on earthquake hazards in the San Francisco Bay Area and the measuring the human response to volcano hazards. Members of the NiJeL team also have expertise working with remote sensing satellite imagery, specifically in climate and urbanization studies. We plan to apply this expertise to satellite remote sensing of river discharge and flooding for FloodSMS.

About ekgaon

ekgaon technologies – One Village One World: ekgaon strives to provide farmers, villagers and local tradespeople with access to the information and communication services and tools they need to be able to contribute their knowledge to the modern world. As a part of this project, ekgaon will help facilitate connections to local groups in our pilot project area, the Terai region of Nepal-India.