Exploring Citizen Science as a Novel Data Source to Improve Real-Time Urban Flood Modeling

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Objective

The research will directly empower and engage local citizens in flood event reporting and response, and explores a concrete model for what it would mean to have a "**smart and connected community**" for minimizing flood risk. Here, we present our research framework, process of data assimilation, procedure to operationalize finer resolution urban flood prediction, and preliminary work on hydrodynamic models.

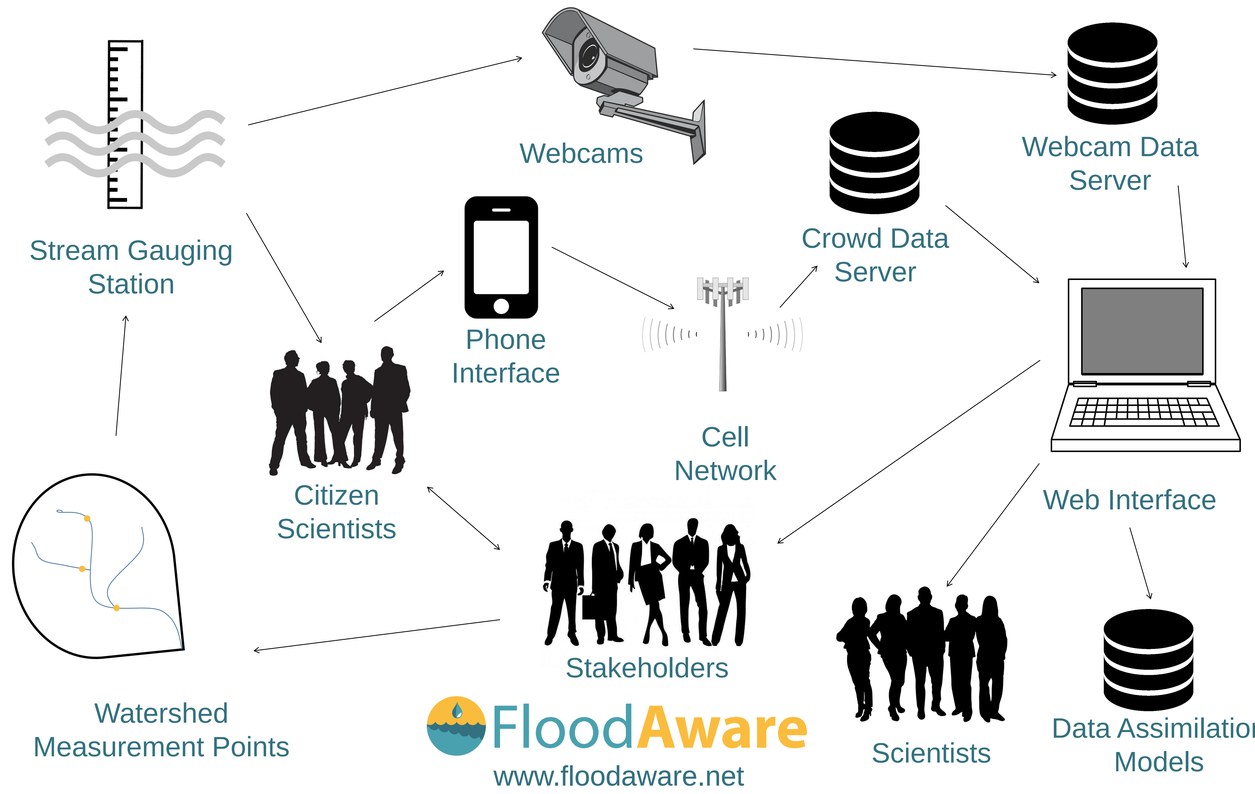
Background

Globally, flooding is the most costly natural hazard. The vast majority of flood risks to life and property are concentrated in our cities; yet, the observation and forecasting of streamflow and floods in the United States is mostly focused on relatively large rivers. With urban flood risks projected to rise with increasing extreme precipitation events and changing land use, the ability to sense, understand, and predict urban flooding is critical.

About the Project

FloodAware is a multi-university project to assess effectiveness of several real-time flood detection, reporting, and communication technologies for cities and local communities.

Integrated Flood Stage Observation Network (IFSON)

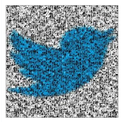


Data Assimilation

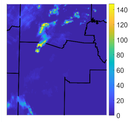
Flood Gauges: Provide a low-cost measurement tool for flood cams and crowd hydrology.

Flood Cam: Provide real-time data at a low cost but at fixed locations and potential visibility challenges.

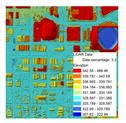
Crowd Hydrology: Provides low-cost, site-specific data engaging the community but low participation.



Social Media: Provides free, real-time data across a large area but low number of relevant posts.

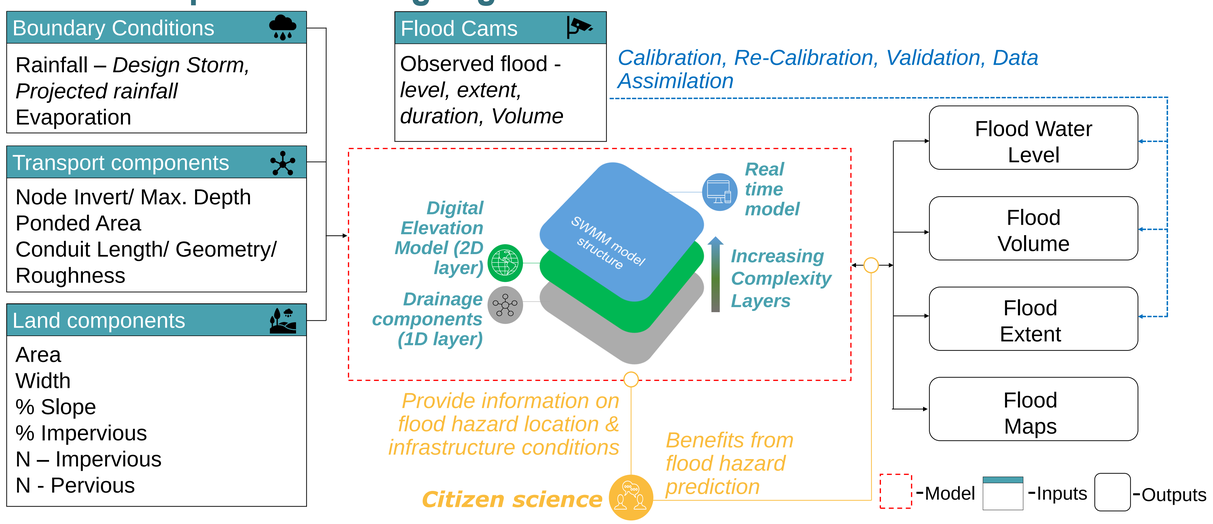


Radar Rainfall or Rain Gauges: Provides high resolution 2 min rainfall from radar measurement.



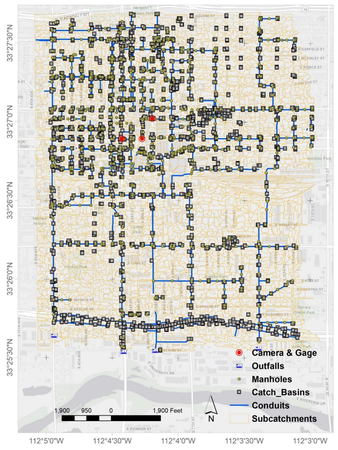
High Resolution LiDAR and DEM: LiDAR derived digital elevation model (1ft res.) where possible.

Operationalizing High Resolution Urban Flood Prediction

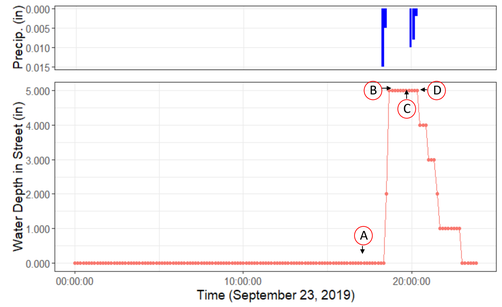


Preliminary Hydrodynamic Model

We developed a coupled one-dimensional and two-dimensional, pipe and overland flow model with the Environmental Protection Agency's Storm Water Management Model for Phoenix and Flagstaff, AZ.



Existing Model in Downtown Phoenix



Rainfall and Water Level on Street at Central & Washington in Phoenix

Flood Cam Images from September 23rd, 2019