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Science for Society

Ready for anything

Luis Wilfrido Atienza
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lw.atienza@gmail.com

The Philippines is extremely prone to natural disasters. Roughly 20 typhoons enter the Philippine area of responsibility every year, and these can cause widespread damage and destruction. The most notable recent example is Typhoon Yolanda, which resulted in over 6,000 fatalities and cost billions of pesos in damages. Such havoc could have been reduced if more thorough and modern measures had been taken to prepare the affected areas for the storm.

As a way to modernize the country's disaster response system, the Philippine government decided to leverage science and technology led by a diverse range of the country's most talented scientists and engineers. This effort was called the Nationwide Operational Assessment of Hazards, or Project NOAH.

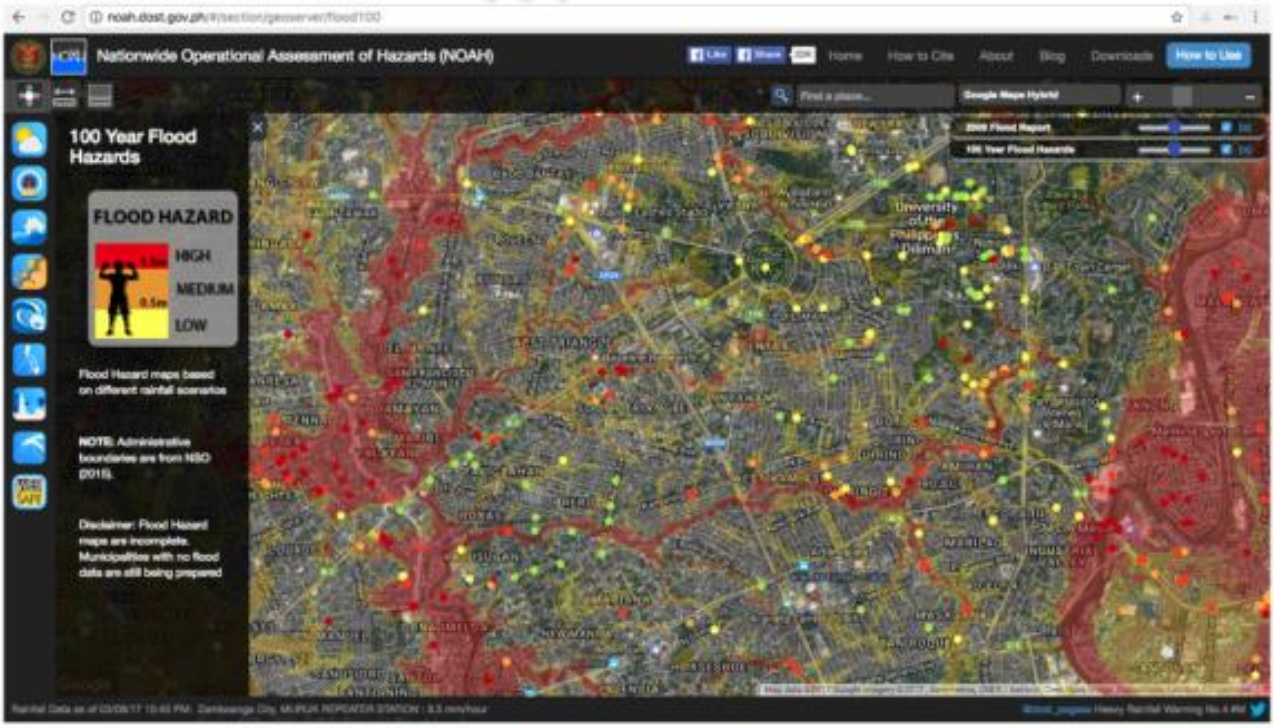
Work on Project NOAH began in 2012 and brought together work from teams of scientists, engineers, and researchers from different government agencies and academic institutions. These teams deployed state-of-the-art technology to sense weather conditions throughout the country, used high-resolution mapping methods to visualize possible hazard areas, and integrated all these streams of data into forms that are understandable and accessible to the general public.

The chance of rain all around the country is estimated by using satellite data, image-processing algorithms, and historical data. This is calculated every 30 minutes for major cities, and these calculations are over 80% accurate. This is an invaluable tool for disaster preparedness but can also be used by farmers and fishermen, whose livelihoods can depend greatly on weather conditions.

Hundreds of remote weather sensors have also been installed throughout the country: 872 automated rain gauges to detect when it rains and how hard the rain is; 21 automated weather gauges to detect rainfall, as well as wind speed and direction, air temperature, humidity, and pressure. These automated sensors are solar powered and designed to withstand rough weather, and the data they record are wirelessly transmitted to central servers every 15 minutes.

Stand-alone water-level monitoring sensors use echolocation to measure constantly the water levels of rivers. These are used to monitor rivers closely during periods of heavy rain. These sensors were initially tested along the Marikina River, and there are now over 400 of these sensors monitoring rivers all over the country. The data from these sensors were combined with local knowledge about flooding patterns to create an early flood-warning system for areas near rivers.

Researchers have also employed a technology, light detection and ranging, or LiDAR. This technology functions by firing lasers at a certain area of land and measuring how long it takes for the light to bounce off a surface and return to a sensor—similar to how bats use echolocation to find their way in the dark. A massive LiDAR project has been undertaken to create up-to-date flood hazard maps for the entire country. These maps are high-resolution and can give detailed flood hazard warnings up to the barangay level. This will help people get involved



Flood maps, like this one showing Quezon City and Marikina City, are publicly available on the internet.

with disaster preparedness by making them aware that they may be living in flood-prone areas.

Comprehensive maps, such as the ones generated by LiDAR combined with data from a wide variety of sources, including automated weather sensors and PAGASA (Philippine Atmospheric Geophysical and Astronomical Services Administration), are used to create comprehensive flood simulations. These are powered by the Hydrologic Engineering Center's Hydraulic Modelling System, a simulation system developed in the United States. These help us visualize floods and flood risks in near-real time.

Ordinary citizens can also be involved in flood reporting through Project NOAH's crowd-sourced flood-reporting platform. Through nababaha.com, individuals can report flooding in their area. All these data are collected to create a thorough picture of floods in major cities.

Similarly, storm-surge simulations have also been created, this with the same technology used by the Japan Meteorological Agency. These simulations can help predict areas that will be the most heavily damaged in coastal areas. This technology was tested during Typhoon Ruby in 2014, and it helped greatly reduce the number of casualties from the storm.

An important component of all these data gathering and monitoring projects is making this information accessible to the people who need it. Project NOAH also involved developing tools that allowed all these sources of data—from sensors, to crowd sourcing, to flood- and storm-surge simulations—to communicate with one another and come together in a comprehensive picture of the weather situation at any time, anywhere in the Philippines.

This information is made public on the Project NOAH websites (noah.dost.gov.ph and noah.upd.edu.ph). Project NOAH also involves bringing the information to the people on the platforms they use most frequently, including radio, SMS (Short Message Service), as well as social media platforms such as Twitter and Facebook.

Project NOAH is a great example of how science and technology respond to urgent and relevant problems and provide concrete solutions that save lives. It also shows the great need for resources in science and technology. The project combined the efforts of many different teams working on different projects, many of which required a large amount of money and support, such as the LiDAR mapping, covering the entire country, or the installation of remote sensors in far-flung places throughout the Philippines.

An overview of Project NOAH was also published by researchers from the National Institute of Geological Sciences of the University of the Philippines Diliman. This was published in the Journal of Environmental Sciences and represents a significant Filipino contribution to global research

and development on natural disaster risk reduction and management.

REFERENCE

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Luis Wilfrido Atienza graduated from the Ateneo de Manila University, with a BS in Biology, and a minor in poetry. He currently works as a copywriter for a sustainable agency, and spends some of his free time writing about science.