CASE STUDY

PetaBencana.id – Indonesia

SUMMARY

"Selfies save lives" This is the motto of *PetaBencana.id*,[11] a tool that combines data from hydraulic sensors with citizen reports over social media and civic applications, including via Twitter, to produce real-time flood maps in Jakarta – and soon, other cities in Indonesia. These web-based, publicly accessible maps now provide the best available flood information for the government and residents. *PetaBencana.id* started as *PetaJakarta*, which focused on only the city of Jakarta, but is now scaling to cover more cities in the country.

11. See *www.petabencana.id.*

THE PROBLEM

Greater Jakarta is the world's second largest megacity, and experiences regular flooding during the seasonal monsoon. Forty percent of Jakarta is below sea level, and is sinking by up to 6 cm per year. Climate change and sea level rise can only worsen this situation in the coming years. Flooding has a serious impact on the 30 million residents of the Jakarta area, as well as its business activities and government services. Furthermore, rapid urbanisation and population expansion over recent years have intensified Jakarta's exposure and vulnerability to flooding risks.

The complex water system of this large metropolitan area and the tropical weather conditions make it hard for technical government agencies to model the floods. As a consequence, risk managers lack sufficient accurate information to target emergency interventions and support populations, and citizens lack adequate knowledge of the situation as it develops.

AN INNOVATIVE SOLUTION

Jakarta has one of the highest concentrations of Twitter users in the world. When flooding occurs, the flow of information from social media networks precedes official warnings and more closely reflects reality on the ground. However, such information can also create confusion if not properly channelled. The developers of *PetaBencana.id* recognised that citizens of Jakarta regularly seek and share relevant information on social media, in order to adapt to traffic disruption, school closures and other adverse effects of flooding on their daily activities, and realised an opportunity existed to make use of this data.

PetaBencana.id draws upon this wealth of information from "human sensors", and complements it with scientific data from hydraulic sensors, to construct real-time models and maps of flooding. This innovative approach builds on the widespread use of social media and is founded on the premise that citizens have access to the most accurate information regarding flooding conditions at the local level. *PetaBencana.id's* maps are widely used to inform citizens, emergency responders and government agencies during flooding emergencies.

But how does PetaBencana.id work in practice? The system is programmed to react when someone in Jakarta tweets the word "banjir" (flood) and tags @PetaJkt. *PetaBencana.id* automatically replies, and asks them to confirm the tweet with geotagged photos. The platform then combines all incoming reports with official data from the city government to build an up-to-the-minute, online flood map. The maps are then made publicly available to both citizens and public authorities. This innovative tool is powered by "CogniCity", [12] a free and open source software (FOSS) app to produce visualisations at the megacity scale using social media information. *Petabencana.id* was its first practical application.

12. See *https://youtu.be/O7VDjjeEdN8.*

Flooding in Jakarta.

Screenshot from Twitter report to PetaBencana.id.

One of the strengths of *PetaBencana.id* is the partnership established between academia – the project is led by the Urban Risk Lab at MIT – the non-governmental organisation (NGO) *PetaBencana.id* and the government. The Jakarta branch of the National Disaster Management Agency (*Badan Nasional Penanggulangan Bencana* – BNPB) supported this project from its early design phase, working closely together to ensure that *PetaBencana.id* would contribute effectively to BNPB's operations. During the co-design phase, the software designers carefully mapped BNPB's Standard Operating Procedures for monitoring flood events, activating emergency plans and warning the population, in order to integrate *Petabencana.id* into existing processes and data flow lines.

Building trust among the partners proved essential to gaining access to official data, thereby making *PetaBencana.id* a better tool. *PetaBencana.id* integrates data from multiple government platforms, enabling the system to efficiently crosscheck and corroborate reports, and assess and analyse connectivity between different infrastructure systems including water, transport and energy.

Map from local Jakarta version of PetaBencana.id.

NOVELTY

PetaBencana.id is the first online tool to produce real-time maps of urban flooding, driven by social media reporting. It represents a major advance on previous static PDF maps, which were produced every six hours. It significantly improves service quality by gathering and disseminating accurate real-time flood data, which is immediately made accessible to government and the general public.

IMPACT AND RESULTS

In 2016, the project's Twitter feed for Jakarta (@PetaJkt) had more than 50 000 followers and received nearly 10 000 tweets providing flood information to the platform, underlining the significant involvement of Jakarta citizens. Furthermore, since 2015 BNPB has used the platform as part of its daily emergency management operations, representing a breakthrough in information exchange with citizens. In support of this innovation, the Governor of Jakarta has called on residents to report flooding as part of their civic duty.

REPLICABILITY

PetaBencana.id is based on CogniCity free and open source software, the code for which is readily available online.[13] Initially developed for Jakarta, its expansion to other cities in Indonesia, including Bandung and Surabaya, is ongoing. Other countries such as Australia, India and Viet Nam are partnering with the MIT Urban Risk Lab to replicate this innovation for major cities facing flooding risks. Both the United State Federal Communications Commission and the International Federation of the Red Cross and Red Crescent recommended *PetaBencana.id* as a model for disaster information crowdsourcing platforms, which could also be expanded to other disasters.

CHALLENGES AND LESSONS LEARNED

PetaBencana.id developers emphasise the importance of building comprehensive and long-term partnerships among co-users to ensure the sustainability of such systems, government buy-in and trust among partners. This collaborative approach to design and development has enabled *PetaBencana.id* to produce positive outcomes for citizens and policy makers, as all parties benefit from their mutual and collaborative participation. It is also important to promote participation among citizen, as their contributions constitute the backbone of this social media-based innovation. Building trust among the partners proved essential to gaining access to city data.

13. See *https://github.com/smart-facility/cognicity-server.*

City of Jakarta incident control room