Selfies Save Lives

— Digital Strategies for Flood Response in Indonesia

by Mahardika Fadmastuti, Geographic Information Coordinator, PeteBencana.id

ASEAN is home to 625 million people and 725 million smartphones; this statistic means that, on average, each person in the ASEAN region owns more than one smartphone. [1] With a population of over 257 million residents, Indonesia is home to 112 million active internet users.[2] The internet is accessed from both urban and rural areas. Smartphones—or what should be called *portable computers*—allow people to access applications and information from any location, connecting residents of various socioeconomic positions to the internet.[3] In 2016, a report from *We Are Social* claimed that 66 million Indonesian residents access the internet through mobile devices.[4]

Indonesia is also home to the highest number of Facebook users worldwide, accounting for 6% of total active Facebook users, or 106 million people.[5] The *Jakarta Globe* recently reported that Indonesia has the highest number of Instagram active users in the Asia Pacific region.[6] DKI Jakarta, the capital city of Indonesia, also claims the title for the most active Twitter users; 2.4 percent of global tweets originate from Jakarta.[7] As Indonesians share their numerous status updates through social media as a form of self-actualization and socialization, they also disseminate situational details to inform others about what is happening in their location; this form of communication is especially intense during disasters.

Recognizing these residential habits, formal institutions and humanitarian agencies regularly monitor social media feeds in order to respond to emergency situations, including floods. In the event of a disaster, however, residents do not only rely on help from government agencies or NGOs. As they spread their messages through various internet platforms, residents also use this information to self-organize, avoid danger, and reduce risk together—what Indonesian's call *Gotong royong*, or support through mutual aid.

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[1] Simon Kemp, "Digital in 2016", *WeAreSocial*, January 27th, 2016. https://wearesocial.com/uk/special-reports/digital-in-2016

[2] Indonesia Ministry of Communication and IT, "*Pengguna Internet Indonesia Nomor Enam Dunia* (Indonesian Internet Users is the World's Number Six), 24 November 2014; https://kominfo.go.id/content/detail/4286/pengguna-internet-indonesia-nomor-enam-dunia/0/sorotan_media.

[3] Simon Kemp, "Digital in 2017: Global Overview", *WeAreSocial*, 24 January 2017; https://wearesocial.com/special-reports/digital-in-2017-global-overview.

[4] Ibid.

[5] Ibid.

[6] "Instagram has 45 million users in Indonesia, the largest in Asia Pacific," 23 July 2017; http://jakartaglobe.id/news/instagram-45-million-users-indonesia-largest-asia-pacific/.

[7] Waleed Aly, "Welcome to Jakarta, the World's Number One Twitter City", RN Drive, 29 May 2013; http://www.abc.net.au/radionational/programs/drive/social-media-in-indonesia/4720678.

Part 1 / Humanitarian Convergences

Urbanization Theory and Current Situation in Big Cities

Although urbanized areas attract increasing populations into dense *centers*, the impacts of urbanization affect and depend upon much larger territories; *urbanization* can not be defined by administrative boundaries. Urban centers are not stand-alone entities; they are dependent on a vast network of surrounding ecologies and create extended resource networks well-beyond the borders of cities. As greater demand is placed on the center to accommodate growing populations, the center continues to sprawl. And, as growing populations begin to move into areas bordering the center—often choosing to commute to the center for work—new developments arise to support economic and social life while the urban center amalgamates its surrounding areas through further processes of urbanization.

Climate Change in the Tropics

Extreme weather events in Asia have become more frequent in recent decades. Floods, fires, sea level rise, typhoons, heavy rains and landslides are some of the most common disaster events. Marine and coastal ecosystems in Asia are likely to be affected by sea level rise and temperature increases.[8] The rise of water temperatures and changes in water flows will be followed by dam construction, canalization, and more land-use changes as people try to cope with climate change.

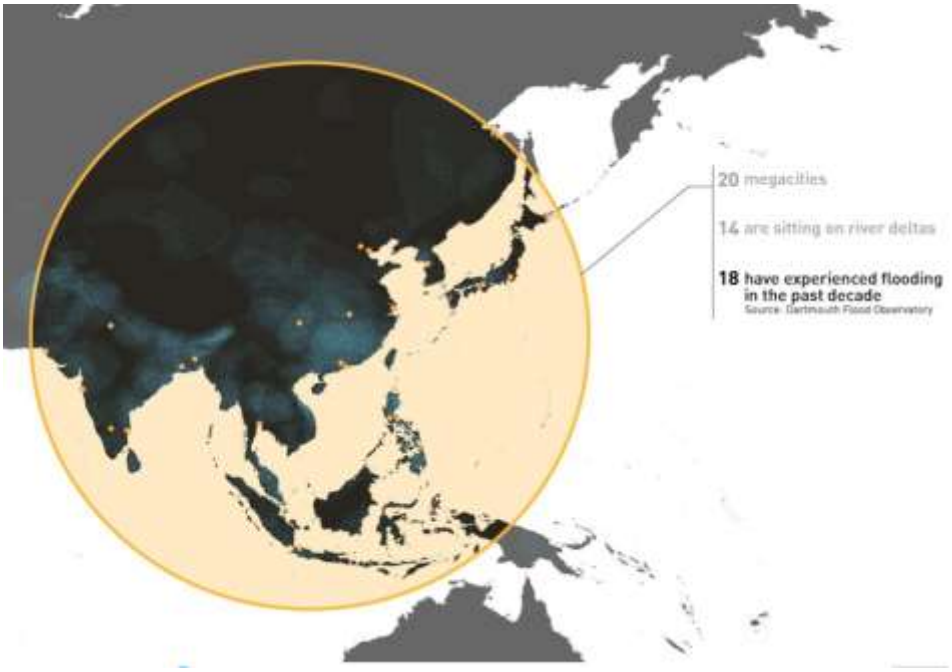

Fig. 1.1. Map of flooding megacities in East and Southeast Asia; data from Dartmouth Flood Observatory.

Impacts on Human Societies and Nonhuman Ecologies

[8] IPCC, 2014. https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/WGIIIAR5_SPM_TS_Volume.pdf

According to research from the Dartmouth Flood Observatory, of the 20 megacities in East and Southeast Asia, 14 are sitting on river deltas and 18 have experienced major flood events in the past decades. [Fig. 1.1] However, not all of those major flood events are only occur because of increasing rainfall in Asia. Floods are also getting worse in Asian cities because hydrological infrastructures cannot handle storm *intensification*. For example, a May 2017 flood event in Guangzhou, China (one of the 20 largest Asian megacities), occurred because the river burst its banks, affecting 8,600 people.[9] In January 2013, residents of Jakarta, Indonesia, faced a major flood that occurred as a result of infrastructure failure; the reason for the flooding was the collapse of the Latuharhari dam, which eventually flooded critical transit infrastructure, many neighborhoods, and a main road to the national palace.[10] [Fig. 1.2] With these examples in mind, it is clear that flood modeling cannot predict infrastructure failures (whether for the riverbed or the canalized sections of river) that result from increasingly *intense* precipitation.

Fig. 1.2. Flooding in Jakarta's Central Business District in 2013; photo shared by Twitter user @LukeMunns.

Social Media Population: #memedensity & #gifgeneration

With increasing access to internet services, megacity residents are able to easily share their statuses, comments, reflections, and observations through various formats including videos, images, and GIFs. As residents compete for the accumulation of 'likes' from their peers, social media posts are becoming increasingly varied and creative. The *meme*—an image, video, piece of text, etc., typically humorous in nature, that is copied and spread rapidly by internet users, often

[9] Richard Davies, "China - Thousands Evacuate Floods in Guangzhou," 8 May 2017; http://floodlist.com/asia/china-guangzhou-floods-may-2017.

[10] "Indonesian Capital City Hit by Deadly Flooding," 17 January 2013; http://www.bbc.com/news/world-asia-21054769.

with slight variations—is a viral format that has become extremely popular among millennials. People love to share an amusing edited image or a GIF as a comment on a current issue as an expression of humor. For instance, the meme of Susi Pudjiastuti, the Indonesian Minister of Marine and Fishery, elegantly asked to drown captain Jack Sparrow's ship from *The Pirates of Caribbean* movie as it enters Indonesian waters went viral on social media when the movie was first launched in Indonesia. [Fig. 1.3]

Fig. 1.3. Meme in comic of *Pirates of Carribean* movie scene with the Indonesian Marine and Fishery minister; photo shared by instagram @komikjavid.

However, as far as the internet spreads in the world, the meme and gif generation will continue to exist. Human brain is easier to remember a visual rather than a lettering. With the high statistics of people using cellular phone and social media, this number will continually growing as technology and internet capacity are increasing.

Indonesian people as high internet population, love taking selfie. Even during flood event, people are not willing to leave their gadget. They keep *online* even though they are stuck in flood! However, their informations are shared rapidly and massively through social media. Everything is online now. Aware or not, the netizen shows detail information through their selfie for example we can see the flood height, address, traffic condition, and many more from their photo. [Fig. 1.4]

Fig. 1.4. A man sharing situational update during a flood in Jakarta using a mobile phone; courtesy of Ariel Shepherd.

Part 2 / Info-Geographies of Disaster in Indonesia

Geography of Humanitarian Response Indonesia

The 2015 *World Disaster Report*, published by the International Federation of Red Cross and Red Crescent Societies, notes that investment in capacity development has long term returns in cases where it is driven by real local needs, where local actors are active in program design, and where cultural values are incorporated. According to the report, while local actors could benefit from support to become more resilient, it would be useful to leverage existing traditional local knowledges for humanitarian response.

With 17,000 islands, Indonesia is home to a vast plurality of cultures. Additionally, Indonesian regions cannot be defined merely as either 'rural' or 'urban' because the same contiguous territories are often stretched across different provinces or administrative districts; such various administrative compositions mean that responses to disaster events are also varied. According to the census by National Statistics Agency, Indonesia has more than a thousand ethnic groups in 34 provinces; extrapolating from this, we could assume that Indonesia has hundreds, possibly even thousands, of cultural communities that take form in response to emergencies.

Traditional Responses to Emergency: 'Gotong Royong'

Across every region in Indonesia, social life is heavily invested in community values; the term *gotong royong* describes the widespread cultural practice of communities readily helping each other. This practice spreads beyond daily life into mutual aid and support during critical emergency situations. For example, in the event of disaster, it is not uncommon for communities to self-organize and create open kitchens, where residents can find shelter and share meals together. Even without any formal support from government agencies, these community-based practices are embedded within the local culture and people are willing to help and share to relieve each other's difficulties.

In order to control the flow of time-critical information during emergencies, government agencies have developed Standard Operating Procedures (SOPs) that mandate how data is gathered from and disseminated to the public. However, these institutionalized procedures can fail to account for the habitual ways in which different social groups respond to disasters.

'Gotong Royong' Goes Digital

With the widespread penetration of social media in Indonesia, mutual aid, or *gotong royong*, can now operate on a digital level as well. As people update their situations on digital media, local leaders also monitor these platforms to enable better coordination and response, especially during emergencies. The easy access of mobile phone and social media is now a key part of localized *gotong royong* practices that prevent and, when necessary, respond to emergencies.

Harnessing this form of humanitarian response, PetaBencana.id—an open source platform developed in collaboration with the Urban Risk Lab at MIT—gathers, sorts, and visualizes disaster information from a variety of social media and instant messaging platforms by listening for certain keywords. Yet, it is not just about open data and access to information; PetaBencana.id also helps to democratize decision-support tools in emergency situations as it maps social media feeds in real-time. By sharing this information related to flood situations, users are not limited to the top level of government agencies, but every resident is empowered directly. Neighborhoods are no longer forced to wait for daily disaster updates from a centralized authority, but share information laterally in real-time. [Fig. 2.1]

Fig. 2.1. The kids are accessing PetaBencana.id via smartphone.

Part 3 / Humanitarian Trajectories

Open Data & Open Source Software for Transparent Government

Extensive bureaucratic procedures, where emergency reporting SOPs are dependent on a chain of institutions, often result in delayed response times. During the 2013 flood event in Jakarta, for example, resident reports of flooding were first passed to neighborhood leaders (*Rukun Tetangga*), community leaders (*Rukun Warga*), sub-district leaders (*Kelurahan*), district leaders *(Kecamatan*), and the city mayor; they were then confirmed by the emergency response command center. Every six hours, the command center would then send an update to the DKI Jakarta Governor, who was responsible for dispatching this information to the rest of the city. As delayed informational updates complicate and often obstruct efficient, accurate response decisions, these procedural flows of information proved cumbersome during the flood emergencies.

Flood updates are spread much faster through social media. [Fig. 3.1] During the 2014-2015 monsoon season in Jakarta, there were thousands of tweets mentioning flood (or *banjir*) in the greater Jakarta area. PetaBencana.id, powered by Cognicity Open Source Software, listens for these flood mentions on social media, engages users via the *BencanaBot* (Disaster Bot), then visualizes confirmed replies on a web-based, real-time map. In this way, residents, NGOs, communities, and government agencies have access to the same flood information at the same time. The platform streamlines existing flows of visualized flood data, while also collecting new, real-time resident reports.

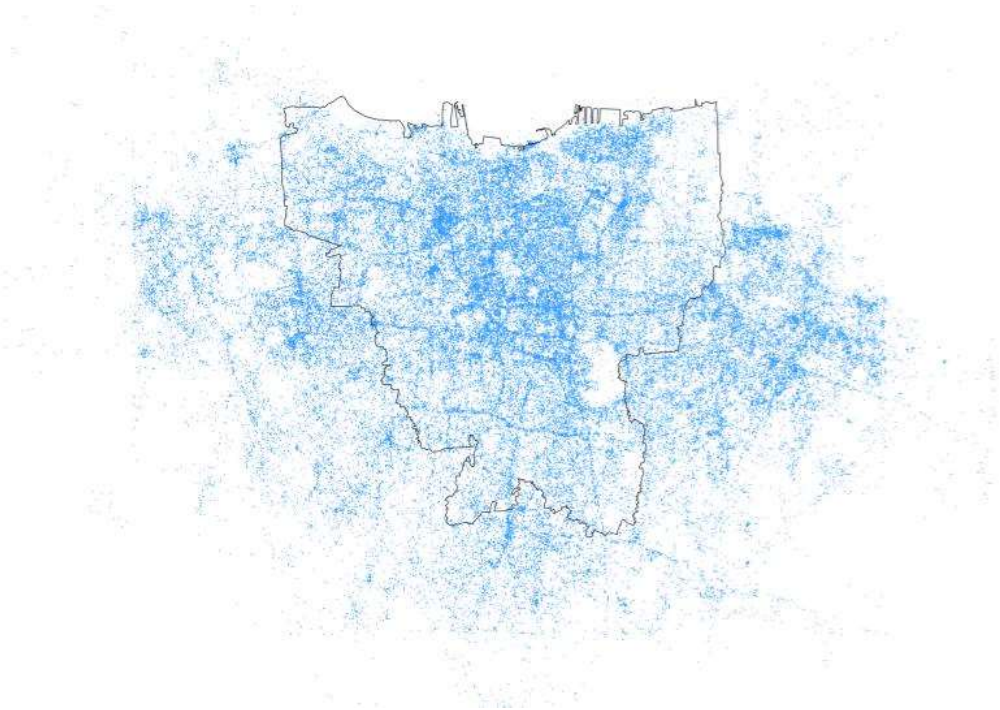

Fig. 3.1. Twitter point location data from 2013-2014 mentioning #flood and #banjir - Twitter Data Grant.

With this agile yet powerful digital architecture, PetaBencana.id can be accessed through any devices, including those with limited access to data. It promotes transparent government and builds more trust in emergency agencies as response times to flood events improve. The selfies that are taken by residents from the flooded area also are validated from the command center in real-time. PetaBencana.id shows that the local behavior of taking selfies helps link formal and informal data sources while enabling communities and agencies to coordinate rescue efforts and save lives with better response times.

Chatbots Killed the App Star

In a recent *Business Insider Indonesia* article, Matt Rosoff noted that for the last five years, the average number of apps on mobile phones have remained the same, but the time spent on those apps have increased to an average of 41 hours per month in 2015.[11] Mobile messaging apps serve hundreds of millions of monthly active users.[12] Chat groups have become an increasingly popular means to organize and co-ordinate among different social circles. It is not uncommon in Indonesia to see messaging apps organized into chat groups of families, communities, and multiple types of friend circles. Chat groups extend to business circles as well and are commonly employed as a

[11] Matt Rosoff, "The App Explosion is Over", *Business Insider Indonesia*, June 1st, 2016. http://www.businessinsider.co.id/average-number-of-apps-vs-time-spent-2016-5/?r=US&IR=T#9ROteSb7u17pWphe.97

[12] "Messaging Apps are now Bigger than Social Networks", *Business Insider Indonesia*, September 20th, 2016. http://www.businessinsider.com/the-messaging-app-report-2015-11/?IR=T

means of professional communication. During emergencies, such groups are almost always also used to coordinate response efforts.

PetaBencana.id is designed as a *medium-agnostic* platform that can be programmed to listen to specific keywords from a variety of social media platforms, local apps, and instant messaging services in order to gather emergency data. In this configuration, residents just need to do what they have been doing all along: take selfies and upload them on any social media site, app, or instant messaging platform. Research studies have shown that during emergencies, residents are less likely to adopt new applications and use the ones they are already using with more frequency in order to stay up to date with information. The software's ability to listen and gather reports across a variety of platforms eliminates the time required to train people how to use new apps (*if* such a training is even possible) to report emergencies.

In order to increase engagement and interaction with users, PetaBencana.id built *BencanaBot* [DisasterBot]—a chat bot integrated into social media and messaging applications. With the aim of 'de-credentializing' and simplifying the process of flood reporting, *BencanaBot* invites users to submit a detailed report through a link of cards if they are currently experiencing flood. [Fig. 3.2] The cards are designed to be a one stop card to report about flooding so whenever residents mention the keyword 'flood' or 'banjir' through social media and instant messaging applications, *BencanaBot* will send a link that direct users to the cards.

Fig. 3.2. PetaBencana.id flood report cards.

Designing for Disaster Co-management in the Age of Attention Ecologies

By crowdsourcing critical updates of disaster events, PetaBencana.id helps to democratize decision-support tools by enabling local communities to monitor and help each other avoid danger and reduce risk together. Because residents are controlling the status of flood in their neighborhood through accessing PetaBencana.id map, we describe the process of information integration (from formal and informal sources) as as form of AI-assisted civic co-management. Working within the reality of cultural habits in the age of digital attention ecologies, the platform helps humanitarian response overcome the obstacles of centralization while retaining a systematic and coordinated source of information for agencies and residents.

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- Name of Presenter : Mahardika Fadmastuti
- Author Affiliation : Geographic Information Coordinator, PetaBencana.id
- Mailing Address : Jl Sumbing No 17, Kel. Guntur Kec. Setiabudi, Jakarta Selatan, Indonesia
- Email Address : dika@petabencana.id
- Telephone number : +(62) 856 92774678
- Fax number : -
- Author Photograph : (attached)
- Brief Biography :

Mahardika Fadmastuti is a geographer, the Geographic Research Coordinator of PetaBencana.id; a real-time open source platform that sort, gather, and visualize on the ground information; which initiated by Urban Risk Lab at Massachusetts Institute of Technology. Fadmastuti conducts and coordinates research regarding flood and socio-geography carried out by researchers from various academic disciplines. She was a GIS Specialist at Australia-Indonesia Facility for Disaster Reduction. She is currently a master student at the Graduate School of Environmental Science, University of Indonesia.