Case Study: InaSAFE for Flood Contingency Plan Development in Makassar City, South Sulawesi

Background

Makassar city of South Sulawesi province is an area that experiences flood every year. To improve flood preparedness, the Makassar Disaster Management Agency (BPBD Makassar) developed flood contingency plans for Makassar City in 2013. This effort was supported by the Australia Indonesia Facility for Disaster Reduction (AIFDR) and the South Sulawesi Provincial Disaster Management Agency (BPBD South Sulawesi). This planning process is in line with AIFDR's goal to strengthen contingency planning in the region and serves as a follow up to an earlier contingency plan development training[1].

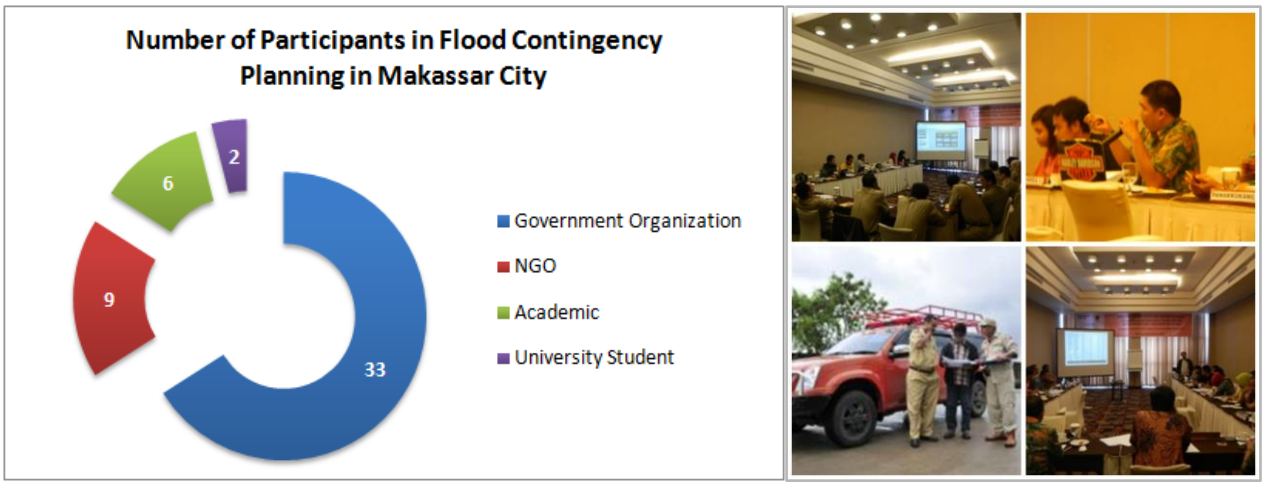

Figure 1. Participants in the Makassar Flood Contingency Plan Development Process

The process was participated by 50 people representing different government agencies including BPBD Makassar, BPBD South Sulawesi, stakeholders from academic institutions, National Search and Rescue Agency (BASARNAS), Indonesian Red Cross, Fire Department, Provincial Development Planning Agency (Bappeda), Health Agency, Education Agency, Public Work Agency, POLRI, and several NGOs. Disaster contingency plan development is a long process and it is important that stakeholders were committed to participate in the entire series of events.

[1] The prior training was conducted in 2012 using OpenStreetMap, QGIS, and InaSAFE with participation from BPBD staff and South Sulawesi disaster management stakeholders.

Implementation

The flood contingency plan development process consisted of six stages:

1. Socialization
2. Collecting required data, such as hazard and exposure data
3. Training and conducting workshops on contingency plan development
4. Updating the contingency plan document as data continues to change and evolve
5. Public consultation
6. Finalization of the written contingency plan document

The implementation process was started with a socialization meeting, which was held on 30 May 2013. At this stage, the goal was to build a shared commitment and equal understanding between different stakeholders.

Once the stakeholders were committed to contribute to the contingency plan development process, they were invited to contingency plan scenario development training and workshop, which was held on 27 to 30 August 2013 and focused on using open source GIS applications such as OpenStreetMap (OSM), QGIS 2.0 and InaSAFE 2.0. These applications would be useful for collecting, managing, and analyzing spatial data. The training and workshop aimed to increase knowledge on general concepts related to contingency plan development among all stakeholders involved in the process.

On 28-30 January 2014, the team conducted data collection and build the hazard and exposure data, by improving the current data provided by a number of agencies and trying to capture the frequency and impact of flood in Makassar city. In general, the activity implemented was a field survey for verification and validation of hazard and exposure data (both building and infrastructure) in flood affected areas using GPS and Field Papers[2].

Once the survey data was collected, it was inputted into OSM using Java OpenStreetMap (JOSM) editor and uploaded to the OSM server as exposure data. Moreover, some data from the field survey was also processed using QGIS to produce the latest flood hazard data for QGIS analysis.

A draft of flood contingency plan document was developed by early February 2014, based on the data that had been updated in the previous process using QGIS 2.0 and InaSAFE 2.0. The QGIS application was used to process data and produce maps needed to support the flood contingency plan in Makassar City. InaSAFE was used to obtain the size of the affected population, the infrastructure affected, and the amount of relief items to be distributed. Once this draft was finished, the next process was a public consultation to collect input and

[2] The base map to conduct field surveys with satellite imagery or OSM maps background made in the fieldpapers.org website. Field papers can be used as a replacement of GPS.

response from stakeholders, before the finalization of the flood contingency plan document.

Result

This activity had successfully produced the official Flood Contingency Plan document in Makassar City, which was recognized by the Mayor of Makassar, Moh Ramdhan Pomanto on 17 November 2014. This document is highly needed to prepare for potential disaster, especially flood and reduce uncertainty through the scenario development and projected needs for emergency response. In addition, it is also used as a source of important information to determine policies and strategies, in order to ensure effective, efficient and well-coordinated implementation of emergency response to flood.

The scenario outlined in the document were made based on geoprocessing analysis in QGIS and InaSAFE. InaSAFE analysis produced the scenario of building that would be potentially affected and population that potentially would need to be evacuated, as well as the minimum relief requirements for the evacuated population. Specifically, the geoprocessing analysis was used to determine the affected infrastructures and facilities, such as land use, infrastructure, economic assets (market, supermarket, industrial buildings, warehouses, hotels, offices, and ports), social and cultural assets (educational institutions, places of worship, health facilities, government buildings, nursing homes, and landfills), and security assets (police and security posts).

Furthermore, the participants have mapped and collected information of buildings and infrastructures in flood affected areas in 6 sub district (Biringkanaya, Tallo, Tamalanrea, Manggala, Rappocini, and Panakkukang Sub District) in Makassar City using OSM. The recommendation for evacuation shelters was determined based on field survey, interviews with informants in each Sub District that were affected by flood. The evacuation routes were determined based on field survey, interview with informants, identification of the existing evacuation route that was built by BPBD of Makassar City as a reference of the latest evacuation route, and identification of areas that are not affected by floods (secure area).

Figure 2. The result of a "buildings affected" analysis using InaSAFE 2.0

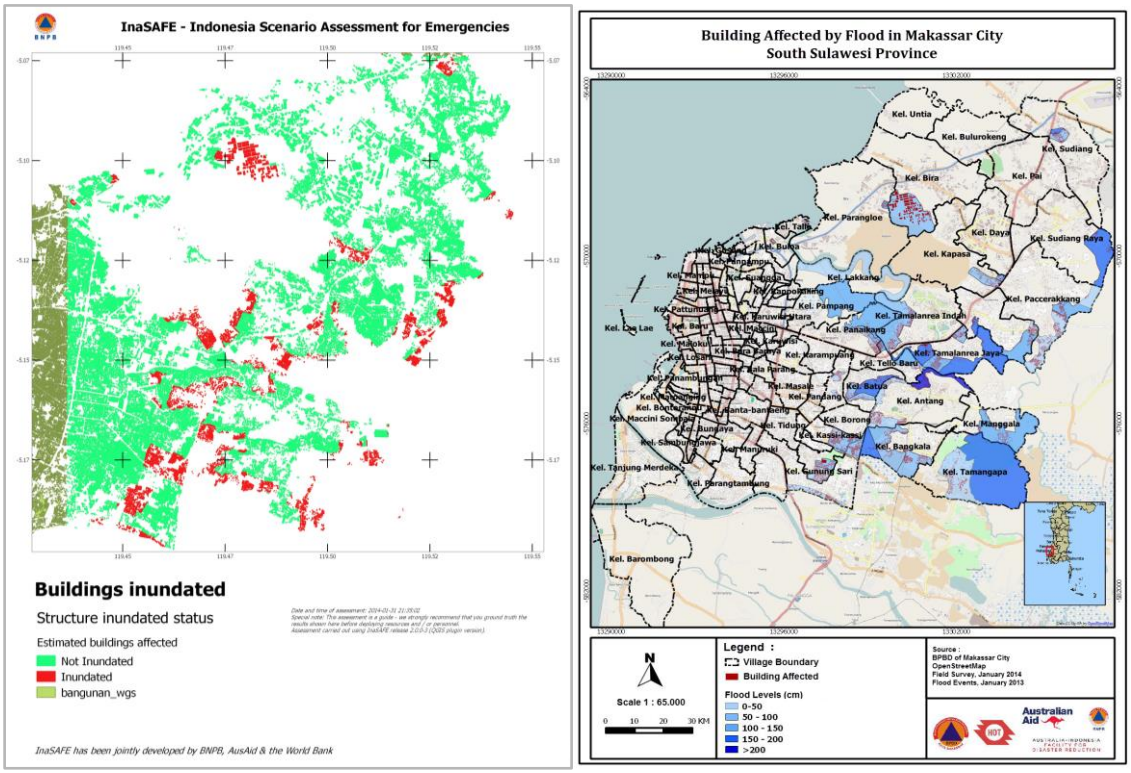

Table 1. Buildings that are Affected by Flood

No	Type of Building	Buildings Affected	Number of Buildings
1	**Total of Buildings**	**12.152**	**95.060**
	Building Category		
2	Bank	0	41
3	Building	12.045	93.554
4	Government Office	2	29
5	Hospital	0	40
6	Commercial Building	1	47
7	Place of Worship	26	117
8	Public Building	2	113
9	Residential	27	328
10	School	26	302
11	University	6	102
12	Terrace	0	83
13	Others	16	249

Lessons Learned

- Stakeholders cooperation was crucial to ensure conducive working process. Throughout the implementation, the stakeholders involved cooperated very well in developing the flood contingency plan document by working through all six stages of the process. They also formed a drafting team, which consisted of the representatives of each stakeholder. The drafting team was grouped into three based on the nature of institutions represented, such as representatives of BPBD, representatives of sector/cluster (shelter, planning, SAR, health, education, infrastructure, and logistic), and representatives of academic. Such drafting team was created to facilitate the coordination between agencies when drafting documents of contingency plan.
- Changes of participants during different activities might slow the implementation because each new participant would need time to catch up with the previous process. It would be recommended that the participants representing agencies should remain the same person from the beginning to end.
- Taking time to ensure that all equipment could work properly is important to ensure smooth implementation. During data collection process, a group could not record the survey data by GPS because the equipment was damaged. The respective group had to repeat the entire process on the next day.
- The process of InaSAFE analysis could be implemented smoothly, without any bugs or crashes, because the coverage of the processed data was limited to city instead of province, thus it was not very complex and heavy. As the coverage gets larger, a more complex technical issues should be expected.
- It is recommended to have a follow up similar events for the same participants.