4. Indonesia

4.1 Background

Indonesia is the world's largest archipelago comprising 17,000 islands that stretch over 5,000 miles along the equator, with a total coastline exceeding 81,000 km. Of these, only 6,000 islands are inhabited. It lies from 6°08' north latitude to 11°15' south latitude and from 94° 45'east longitude to 141°05' east longitude, between the Asian and the Australian continental plates. The five main islands are Sumatra, Java, Kalimantan, Sulawesi, and Irian Jaya. Two of the islands, Kalimantan (known in the colonial period as Borneo, the world's third largest island) and Irian Jaya are shared with Malaysia and Brunei, and with Papua New Guinea, respectively.

Indonesia is hot and humid most of the year round. It has two distinct seasons – the dry season between June and September caused by the easterly monsoons and the wet season between December and March caused by the westerly monsoons, which bring the rains. The condition of the current seasons depends on dynamics, such as Sea Surface Temperature (SST), Southern Oscillation Index (SOI) and other local parameters.

Natural hazards and disasters

Major natural hazards experienced by Indonesia are earthquakes, tsunamis, volcanic eruptions, forest fires, flood, and technological failures. Indonesia lies in one of the most unusual areas in the world, encompassing a major juncture of the Earth's tectonic plates. These factors make it most susceptible to seismic and volcanic activity.

Floods

Annually, waters inundate the western and central parts of Indonesia. The western part of Indonesia is wet with medium to high rainfall intensity while the eastern part is drier with high temperature in the dry season. Overflows of shallow rivers during monsoon rains flood South Sumatera, Jambi, Riau, West Sumatera, North Sumatera and Aceh.

The floods of year 2000 caused by continuous rain drenched the southern part of Belu District, West Timor. The affected area is flat and low-lying and forms the major rice growing area. About 20,000 people were affected and 100 houses destroyed.

ENSO events significantly influence the rainfall intensity in Indonesia, where many areas receive below normal rainfall. During these El Niño warming events, the probability of forest fires and droughts increases in the region. From 1877 to 1997, 93 percent of drought years have been linked to El Niño events. Several studies show a clear positive correlation between normalized Indonesian rainfall anomalies and SOI.

4.2 Institutional Arrangements for Early Warning

BAKORNAS PBP[11], the national disaster management coordinating body, chaired by the Coordinating Minister for People's Welfare and with members from different disaster response and disaster-related Ministries, is responsible for formulating disaster management policies, rendering guidance and providing directives. It compiles disaster reports from SATKORLAK PBP for submission to the President. SATKORLAK PBP coordinates the implementation of disaster management while SATLAK PBP executes the actions. SATLAK PBP is the most active body in charge of direct delivery of early warning to the public in the event of floods and other hazards.

During the previous flood disaster, SATKORLAK PBP of Jakarta established SATLAK PBP (Implementation Unit for Disaster Management at the District Level) in the five districts for an integrated disaster response, with fixed procedures to coordinate all functional departments of the government (Armed Forces, Department of Health, Social Affairs, Public Works, National Search and Rescue) and the community.

Figure 4.1 adopted from Jakarta Government's website, illustrates the organizational structure of SATKORLAK PBP as the non-structural *ad hoc* body responsible for handling disaster management at the provincial level.

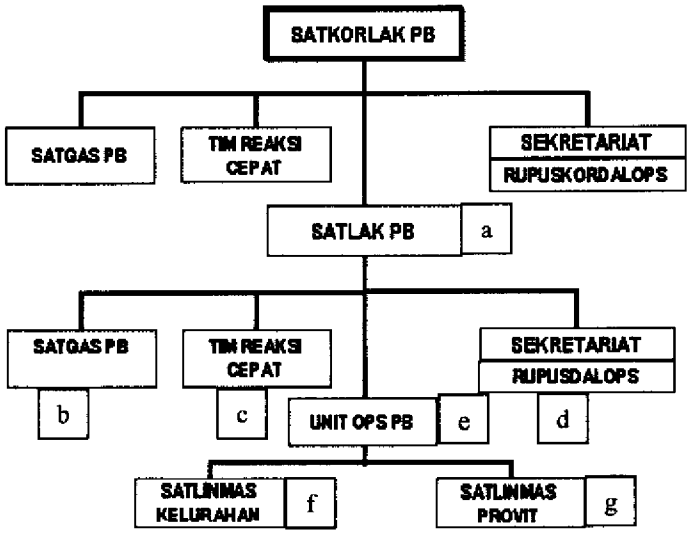

Figure 4.1. Organizational structure of SATKORLAK PBP of Jakarta, which handles disaster management at the provincial level

a) SATLAK PBP (Implementation Unit), chaired by the Mayor/Head of District, implements any kind of disaster management efforts as directed by SATKORLAK PBP.

b) SATGAS PBP (Special Task Force), led by an officer appointed by the chief of SATLAK PBP, implements the tasks in field sites with the help of volunteers

[11] PBP· 'P' has recently been added to the acronym PB Presidential Decree No. 3 of year 2001 expanded the scope of BAKORNAS to cover internally displaced persons (IDPs), adding the P (*Pengungsi*) to its acronym. BAKORNAS PBP

c) Tim Reaksi Cepat (Quick Response Team) was established to rapidly assess the extent of damage and analyse the need in the disaster area (collect and process data on medical aid, water supply, food aid, housing or resettlement, communication, and transportation).

d) SEKRETARIAT/RUPUSDALOPS (Center for Activity and Coordination of Disaster Management), assigned to coordinate all administrative works of SATLAK PBP, follows up all incoming reports by sending warning or information on disasters to the public as fast as possible. The Secretariat also prepares an emergency operation strategy

e) UNIT OPS PBP (Operational Unit for Disaster Management), set up as the command coordinator controlling the implementation of all decisions made, reports the condition in the field to the RUPUSDALOPS

f) SATLINMAS KELURAHAN (Team for the Protection of the Village Community) mobilizes all possible associated governmental officials within the region, and also involves the community, Indonesian Red Cross, NGOs and other concerned community-based organizations

g) SATLINMAS PROVIT (Team for the Protection of Vital Objects/Projects) works to protect vital objects/projects within the area. It is chaired by the local chief of HANSIP (Civil Defense) or local chief of SATPAM (Civil Security Forces) with members coming from appointed individuals working in the disaster related projects.

To anticipate the recurrence of flood disaster, SATKORLAK PBP (Jakarta) has planned to conduct the following programs regularly:

- Further assessment on the flood-prone areas, in close collaboration with Jakarta's Meteorological and Hydrological Forecasting Bureau
- Developing a strategy for better resources mobilization and evacuation programs (e.g. identification of better evacuation spots)
- Capacity building for SATKORLAK's members (e.g. training)
- Training for local community (e.g. self-preparedness training)
- Better coordination with city planning agency in terms of supervision
- Intensifying the maintenance of river basins, water gates and dams

4.3 Hazard Detection

4.3.1 Seasonal Forecast

The Bureau of Meteorology and Geophysics (BMG), Indonesia prepares two seasonal forecasts every year. The dry seasonal forecast is prepared in early March, while the wet season forecast is prepared in early September. The seasonal forecasts are conducted in areas called Seasonal Forecast Areas (SFA), where there is a clear difference between wet and dry seasons (monsoon type).

Deterministic statistical models were used prior to the year 1990 for preparing seasonal forecast. Since 1990, BMG applies the stochastic models that include Auto Regression Integrated Moving Average (ARIMA) combined with deterministic models. Since the last two years, RAINMAN software developed in Australia used the ARIMA models to prepare seasonal and monthly forecasts. The ENSO parameters that include Sea Surface Temperature (SST) and Southern Oscillation Index (SOI) are also important variables used to prepare seasonal forecasts.

4.3.2 Flood Detection and Observation in Jakarta

POSKO (Coordination Center), located at the Governor's Office from where all SATKORLAK PBP's (Provincial Coordinating Body for Disaster Management) components are coordinated, operates a round-the-clock surveillance of Jakarta. The Armed Forces provides a helicopter for daily air surveillance.

Rainfall and river height data are collected from water gate stations throughout Jakarta and from volunteer observers. The "water gate observer," who is under the SATLINMAS KELURAHAN Unit, operates up to 24 hours per day, measuring river heights in meters above the zero gauge (the low flow level of the stream). Originators of flood warning also come from Jakarta's Meteorological and Hydrological Forecasting Bureau. There are particular circumstances where members of the public who detect a possible flood might alert POSKO.

4.4 Hazard Warning

Data input is compiled for preparation of a flood-warning message through POSKO. The message includes the following information:

- Type of flood
- Time and place of occurrence
- Effect of the flood
- Steps that should, or have already been taken
- Maps of flood-prone areas

4.5 Warning Dissemination

4.5.1 Seasonal Forecast

For dissemination of the seasonal weather forecast BMG provides a published document of seasonal forecast with the format that consists of:

- General forecast of total rainfall intensity for wet and dry season
- Seasonal forecasts for the 101 Seasonal Forecast Areas (SFA) that consists of the onset of seasons, comparison between the onset and average, and rainfall characteristics during the related season.

4.5.2 Floods

POSKO disseminates the information and warnings to those who may be affected by the flood and those who need alerting so that they may respond appropriately. Recipients of warnings normally seek confirmation of the warning before they respond, and the media (primarily radio, secondly television) can be effective as confirmation sources.

The media clearly plays an important role in preparing the public for flood and are key channels of information and communication about flood. POSKO, therefore, relies upon media broadcast to disseminate their forecast and to warn the public of floods. Extensive briefing on radio, TV and newspapers are conducted to give a summary of existing conditions and predictions of river heights at key locations.

Informal personal and community networks can also be highly effective in disseminating warnings, both through oral (mosque announcements, mobile patrol vehicles and public gatherings) and written communication (villages' news boards, simple pamphlets and Internet).

4.6 Community Level Flood Warning System

4.6.1 Mirit Sub-District, Kebumen, Central Java

Mirit, located in the district of Kebumen, Central Java Province is very prone to floods, affecting about 16,000 people. Most of the area lies in the southern coast while some part is located in the mountainous range. There are about 12 villages that are vulnerable to floods, some of which are below sea level resulting in longer inundation period. Underlying causes that make Mirit prone to floods include:

- Conversion of natural forest into monoculture plantation, agriculture and even clear cutting.
- Poor design and quality of infrastructures due to the lack of consultation with the community during construction
- Poor and un-integrated land use spatial planning and management from the upstream to downstream areas.
- Lack of awareness on the part of the community on sustainable water and land management.

Since 1982, floods have frequently hit Mirit. The floods of year 1992, early 1999 and end of 2000 are considered the most severe in which the Bonorawan villages were affected the most causing extensive socio-economic and physical infrastructure damage. The average crop loss to the farmers was 80 percent. Other livelihood practices such as fishing, livestock rearing and crop farming have been inadequate to earn a living. Recurring floods have also caused extensive damage to the irrigation network. Dykes often collapsed and water channels silt up. Houses and public services such as roads, schools and health centers were damaged.

On the socio-cultural side, conflicts between farmers during the dry season were not unusual. Poor design of the water management has caused some parts of the area to be in bad need of water when the other parts have surplus water. Many young people of Mirit have fled the area and crime rate has increased.

4.6.2 Flood Warning System

The community serves as an important part of the early warning system as it provides useful information on level of rainfall and its duration in the upstream areas. Four villages of Mirit, i.e. Pujodadi, Tlogorejo, Rowosari and Pathukgawemulyo, were responsible for the operation and maintenance of the communication units. Those villages were at the highest risk of flood during the previous period of flooding.

The Banorawan Farmers Association (PPB) established the flood Early Warning System for communities of Mirit, Kebumen, and Central Java during the flood of year 2000. EWS included 4 units of two-way radio communication equipment of 1.5 Watt. Two of the units

were supported by Oxfam GB Indonesia, while the other two were contribution from the communities who were supporting the activities of the association.

The system was operated with the official license from the Amateur Radio Communication Service (RAPI) of Kebumen district at 142.100 Mhz. On this frequency, the receiving power of the system could effectively cover the whole coverage areas of PPB. Without relay support, PPB could manage the communication with radio communication activities at the upstream areas in Wonosobo district.

PPB has been applying the warning system on the possibility of floods during the monsoon period since the end of 2001 where the southern part of Mirit (Pathukgawemulyo dan Pathukrejomulyo) was already inundated. After a report of torrential rain during the previous night in the upstream area, PPB immediately carried out preparedness activities, passing on and disseminating the information on water level, coordinating with government officials at sub-district and village level to evacuate villagers before the river water inundated both villages.

Supporting coordination between PPB
During the dry season, the EWS has been utilized in supporting effective coordination between chair of PPB with the village coordinators or potential members in the coverage area of PPB. Potential members of PPB also made use of the equipment for exercising how to use radio communication. When the paddy field was in need of irrigation water, PPB conducted coordination with the Irrigation Service Office of Kebumen district and arranged the supplies and distribution of water to the villages in need.

Building alliances
This system also contributed to build the capacity of PPB in strengthening alliances. Direct communication with the communities in the upstream area in Wonosobo by means of radio communication has generated an alliance for management of information on flood risk. This system also allows a broader alliance for other external organizational issues.

Precautions in using the EWS
Information gathered through the community EWS should be carefully understood and interpreted. On one occasion, after PPB received information on the increase of the intensity and duration of rain, there was an effort for evacuation of villagers in Pujodadi on the fear that flood will hit the area. However, there was no flooding in the area. Such cases decrease the confidence of the community on the organization and the EWS.

Careful oral dissemination of information needs to be done since distortion of information is likely to happen by using this system.

Recommendations and improvement
Learning from the experience in using EWS, PPB identified the need to develop the system to become a more effective one while maintaining the existing system as the main source of information on flood risk from the upstream area.

For this purpose, PPB has explored the possibility for developing the system into a Community Radio. The plan for development of this system has also taken into account the following consideration:

- The internal needs of the organization to: enhance performance of organization, strengthen organizational existence, and increase coverage of work and alliance
- To add to entertainment function
- To serve as the media for campaigns at local level
- To provide the means for community development as in line with the regional-global issues