

## **GAMA-InaTEK CENTER OF EXCELLENCE OF TECHNOLOGICAL INNOVATION FOR DISASTER MITIGATION**

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Climate Action, Community Service, Education, Featured Article, Industry, Innovation and Infrastructure, Research, Slider, Sustainable Cities and Communities

*Delivering excellent research, education, and community services to support the development of mitigation techniques, technological and innovative leaps of infrastructure, institutions, and communities against disasters and extreme events for sustainable development*

### **WHO WE ARE**

Situated at the meeting point of three major tectonic plates, Indonesia has to cope with the constant risk of natural disasters, including earthquakes, volcanoes, floods, and landslides, to name a few. Center of Excellence of Technological Innovation for Disaster Mitigation (GAMA-InaTEK) Universitas Gadjah Mada strives to reduce this risk by promoting disaster mitigation research, particularly on landslides, floods, and volcanoes. We work to develop mitigation techniques and appropriate technological innovation against the impact of potential disasters for sustainable development with the priority of environmental sustainability. This center was originally founded as “Disaster Mitigation Team of Faculty of Engineering” following an earthquake that struck Yogyakarta in 2006. After Mount Merapi erupted in 2010, the team renamed it “Task Force (Satgas) of Disaster Mitigation”. Since 2017, it has become “GAMA-InaTEK.”

Past successes of the center’s research team, which is led by Professor Teuku Faisal Fathani, include building a landslide early warning system equipped with a ground movement detector that has been recognized as a national and global reference. Currently, we continue to develop this system to be applicable for other types of geological disasters such as floods, flash floods, and volcanic eruptions.

Our team includes 30 experienced researchers who specialize in various fields related to disaster mitigation. We work closely with National Authority for Disaster Management (BNPB), Regional Authority for Disaster Management (BPDB), Indonesian Ministry of National Development Planning (Bappenas), Ministry of Home Affairs (Kemendagri), Ministry of Village, Development of Disadvantaged Regions, and Transmigration (Kemendesa PDTT), Ministry of Research, Technology and Higher Education (Kemenristek Dikti), and State Minister of Public Works and Public Housing (KemenPUPR).

### **GAMA – EWS: AN EARLY WARNING SYSTEM FOR LANDSLIDES**

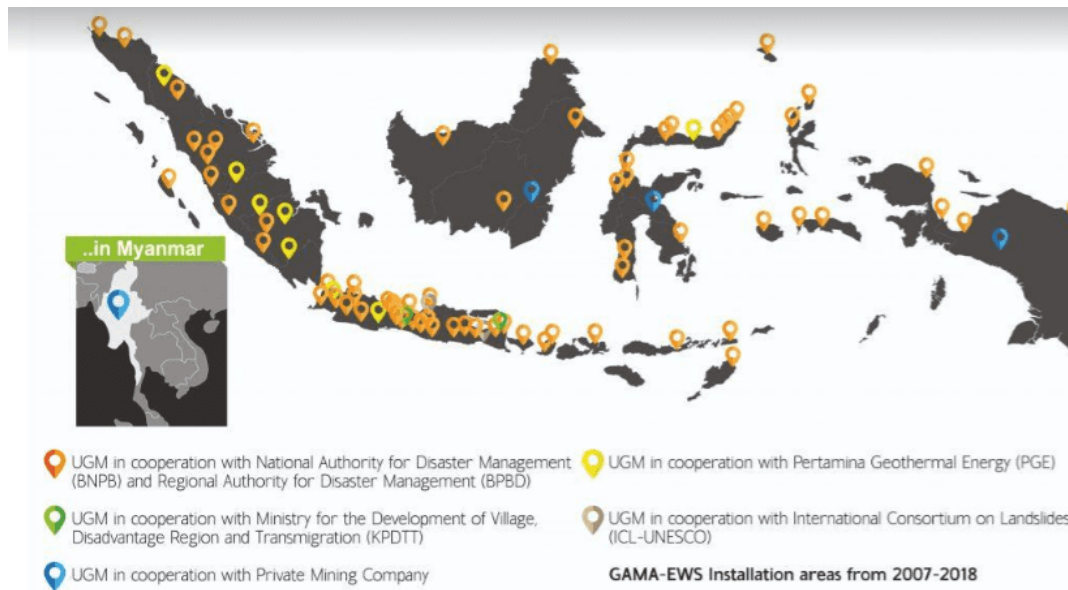
Innovative technology to monitor cracks, slope inclination, and rainfall amounts has made it possible to apply a real-time early warning system of landslide hazard threats across Indonesia. Landslides are one of the deadliest and most common natural disasters in the world. Each year the global death toll due to landslides is thousands. The National Disaster Management

Agency (BNPB) recorded 3753 landslides that have occurred from 2010 to 2018 in Indonesia and caused 1661 fatalities. It is estimated that 40.9 million people in Indonesia live in landslide-prone areas. Landslides can start in slopes that are already vulnerable to movement by rainfall, changes in groundwater, erosion, earthquakes, volcanic activities, human factors, or a combination of these factors. In Indonesia, landslides typically occur during the rainy season in mountain areas, hills, steep slopes, and cliffs.

In response to landslide hazards, early warning system is a critical component to reduce the vulnerability of communities at risk. To help with preventive efforts, our team, led by Professor Teuku Faisal Fathani, has developed Gajah Mada Early Warning System (GAMA-EWS) that can predict landslide events and support disaster preparedness in our community. GAMA-EWS works by detecting ground shifts and movements using various types of sensors such as rain gauge, extensometer, and tiltmeter. It is connected to alarm devices to respond to rainfall and surface deformation. The slope movement is digitally recorded and the data is stored online. When the ground moves, the system notifies local residents via SMS and pop-up messages during caution-alert-evacuation mode.

### GAMA – EWS IS SAVING LIVES AND PROTECTING COMMUNITIES

GAMA-EWS has assisted in preventing landslide fatalities. On 7 November 2007, the system detected a landslide in Banjarnegara, Central Java four hours before it occurred, allowing a total of 35 households to evacuate on time. On 28 November 2016, GAMA-EWS has saved 100 households in Aceh from a landslide event as well as flash floods, on the same day we were giving evacuation drill to the local residents. The system managed to send alerts five hours before the incident. So far, GAMA-EWS has been installed in over 32 provinces in Indonesia and exported to Myanmar.



We have worked with BPDB in initiating activities to develop GAMA-EWS and disaster warning signs throughout Central Java. With support from BPNB, we installed the system for both landslide and floods from May 2019 to November 2019.

## COMMUNITY PARTICIPATION FOR SUSTAINABLE DEVELOPMENT

Community participation plays a crucial part in successful disaster management. We offer supporting programs to equip the community with the capacity to prepare and respond before, during, and after disasters. These include public education and consultation, public participation in developing the system, and training and evacuation drill. Our hope is that GAMA-EWS will continue its contribution to building disaster-resilient communities across Indonesia.

### OUR AWARDS

Our team was awarded an International Program on Landslides (IPL) Award by the IPL UNESCO in Rome, 2011. We were recognized for developing community-based landslide early warning system and education program for sustainable development in landslide vulnerable areas through student community services. In further recognition of the work done by the team, we have also been named “World Center of Excellence on Landslide Disaster Reduction” and “Member of the ICL Board of Representatives” by IPL UNESCO since 2011. Our landslide early warning system has become an international standard as published by the International Organization for Standardization: ISO 2237 “Community-based landslide early warning system”. We received patents for our sensors as well from the Ministry of Law and Human Rights (no. IDP000038351, no. IDP000038434, no. IDP000038787, no. IDP000038968, no. IDP000039806).

### OUR RESEARCH

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