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# FLAMINGELD (FLASH FLOOD MITIGATION WARNING SHIELD) AS RISK REDUCTION OF LOSING THE VICTIMS' PROPERTIES AND LIFE

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## ABSTRACT

Indonesia is a high-risk natural disaster country. Flash floods are one of the disasters that causes property loss and even lead to death. Approximately 63.7 million of the population in Indonesia live in high-risk areas. FLAMINGELD is designed for three statuses (Ready, Responsive, and Monitoring). The increased water generates hydrostatic pressure on the horizontal rods and lifts vertical rods that are arranged with slab like plates. As the water rises the barrier is lifted to form a 90° angle. In this state, the barrier will block the water stream. As the water level decrease, the sealing gasket will be released automatically enabled the barrier to close. On “Ready” status FLAMINGELD is focused on blocking the flow of the floods from 0° (closed condition) to 90° (open condition, perpendicular). On “Responsive” status FLAMINGELD is focused on sounding the standby signal alarm as the angle exceeds 90°. On “Monitoring” status FLAMINGELD can be monitored progressively in real time by the users from IoT based mobile application. It is intended as a longer-range interaction that makes it simpler for the users when they are inside or outside the house. The presence of FLAMINGELD can be a solution to prevent flash floods in Indonesia.

**Keywords:** flamingeld, flash flood, mitigation, warning system

## 1. INTRODUCTION

Natural disasters these days showed an expanded frequency of catastrophic events worldwide. More than 90% of fatalities brought about by natural disasters occur in developed countries (Sutopo, 2004). Indonesia is a disaster-prone area and vast majority of the population lives in areas of high mortality risk from natural disasters. Indonesia's National Disaster Management Agency recorded that 148.8 million of the population live in earthquake-prone areas, 5 million in tsunami-prone areas, 1.2 million population in high-risk of volcanic eruption areas, 63.7 million population in flood-prone areas and 40.9 million people live in areas prone to a landslide (BNPB, 2017). Currently, hydro-meteorological<sup>1</sup> disasters showed an expanding pattern. Flash floods are one of the hydro-meteorological disasters which demonstrated a critical effect on life and properties. The major factor of flash floods is initiated by outrageous rain intensity. As indicated by data and case-studies on disasters in Indonesia, flash floods could damage the victim's material and lead to death. Flash floods could be a serious issue in certain regions in Indonesia. The presence of technology can be the right solution to anticipate flash floods in Indonesia.

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<sup>1</sup>The hydro-meteorological is a disaster caused by meteorological parameters (rainfall, humidity, temperature, wind)

The hydrostatic pressure principle is emphasized and implemented in this technology. FLAMINGELD is designed for three statuses (Ready, Responsive, and Monitoring). On “Ready” status, FLAMINGELD is enabled to manage the floods by blocking airflow from entering the victim’s house. This is proposed to save the victim’s properties and objects from damaging during this incident occurred. On “Responsive” status, FLAMINGELD is enabled to alert stand by alarm signal so that the victims leave immediately and evacuate themselves from the location and notify rescue workers. This is intended to anticipate if the frequency of rainfall is increasing or as if the water level is not in normal condition. This treatment is a form of special handling that can cause casualties. The heart-breaking condition that generally happens during a flash flood disaster is the loss of life as a result of the victim sleeping soundly at night without realizing their surroundings. Responsive status can be a solution to this problem. On Monitoring status, FLAMINGELD can be monitored progressively in real-time by the users from IoT-based mobile application. It is intended as a longer-range interaction that makes it simpler for the users when they are inside or outside the house. This Monitoring status can assist users to make the right decision to evacuate their properties and reduce pre-disasters and post-disasters loss. FLAMINGELD is composed of the aluminum base material.

Aluminum is a lightweight metal that has good corrosion resistance (Surdia T, 2005). Aluminum is chosen as the primary material to resist corrosion caused by the floods. The fundamental structure of FLAMINGELD comprises of four components, specifically: (Plate, hollow rod, hinge) that are made of 304 stainless steel and an EPDM (Ethylene Propylene Diene Monomers)<sup>2</sup> rubber material gasket<sup>3</sup>. The plates supported by two hollow rods arranged vertically and horizontally. These two hollow rods are connected to hinges so that can move up and down. The increased water generates hydrostatic pressure on the horizontal rods and lifts vertical rods that are arranged with slab-like plates. As the water rises, the barrier is lifted to form a 90° angle (perpendicular, maximum) and activates the rubber gasket for automatic sealing. In this state, the barrier will block the water stream. As the water level decreased, the sealing gasket will be released automatically enabled the barrier to close. On “Ready” status, FLAMINGELD is focused on blocking the flow of the floods from 0° (closed condition) to 90° (open condition, perpendicular). On “Responsive” status, FLAMINGELD is focused on sounding the standby signal alarm as the water pushes the barrier and the angle exceeds 90°. This treatment is expected as anticipation to reduce the property and life losses. On “Monitoring” status, FLAMINGELD equipped with a mobile application, will send the latest conditions of the FLAMINGELD device and the current situation in real-time. Data will be integrated through the internet before and after the flood’s disaster.

## REFERENCES

1. Melia, M.R., 2019. Total Korban Tewas Banjir dan Longsor di Sulawesi Selatan 68 Orang. Accessed on 18th April 2019 (<https://m.detik.com/news/berita/d-4402397/total-korban-tewas-banjir-dan-longsor-di-sulawesi-selatan-68-orang>)
2. BNPB. 2017. Data Informasi Bencana Indonesia. Accessed on 19th April 2019 (<http://dibi.bnpb.go.id/dibi/>)
3. Larsen, M.C., Conde, M.T.V., Clark., R. A. 2001. Landslide Hazards Associated with Flash-Floods, with Examples from the Dexember, 1999 Disaster in Venezuela, Coping with Flash Floods. Kluwer Academic Publisher.
4. Surdia, T. 2005. Pengetahuan Bahan Teknik. Jakarta: PT Pradnya Paramita.
5. Sutopo, L. 2004. Teknologi Benih. Jakarta: PT Raja Grafindo Persada.

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<sup>2</sup>EPDM rubber material is a type of synthetic rubber and made from ethylene, propylene and a diene monomer that enables crosslinking

<sup>3</sup>A gasket is a mechanical seal which fills the space between two or more mating surfaces, generally to prevent leakage from or into the joined objects while under pressure

6. Utama, Lusi., Afrizal Naumar. 2015. Kajian Kerentanan Kawasan Berpotensi Banjir Bandang dan Mitigasi Bencana pada Daerah Aliran Sungai (DAS) Batang Kuranji Kota Padang. Jurnal Rekayasa Sipil. Vol 9(1): hh 21-28.



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