

technical solutions



Indonesian Red Cross Society (PMI)

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The Flood Early Warning Early Action System (FEWEAS)

Keywords

Early warning, early action, flood, new technology.

Introduction

Half of Indonesia's population of approximately 141 million people lives on the island of Java. It is the most populous island on Earth. Java is home to several river systems, of which the most significant are the Citarum river and the Bengawan Solo. Due to changing climate and environmental conditions, these river systems are prone to flooding, with huge implications for the lives of the millions of people who live along them.

The Community Flood Resilience (CFR) programme is a collaboration between the Indonesian Red Cross (Palang Merah Indonesia, PMI), the International Federation of Red Cross and Red Crescent Societies (IFRC), and Zurich Insurance. To assist communities to protect themselves against floods, CFR, along with other government and non-government partners, joined up with Institut Teknologi Bandung



Figure 1. Every year flooding in Java displaces people and destroys assets and livelihoods.

(ITB), a local academic institution, to develop a Flood Early Warning Early Action System (FEWEAS) to predict and monitor rainfall and flooding. Due to its relevance, accuracy, and ease of use, the FEWEAS is now widely used by local governments, policy makers and water authorities as well as PMI staff and volunteers and people living near the Bengawan Solo and Citarum river basins.

The river systems

297 kilometers long, the Citarum river is one of West Java's largest rivers. It serves 44.5 million people in West Java province, provides water to the capital Jakarta, irrigates agricultural land, supports fisheries, feeds industrial production, and drives hydroelectric power plants that supply Java and Bali.

The Bengawan Solo is 600 kilometers long and runs through Central and East Java, from Mt. Lawu to the Java Sea. The river is shallow and not navigable; however, it remains a source of hydraulic power and supplies drinking water to the population as well as water for farmers and industry, and is a livelihood source for the local fishing industry.

Problem and context

Every rainy season, typically from October to March, Java witnesses at least one significant flood. Floods cause much damage: they harm crops and the economy, destroy infrastructure, displace communities, close schools, imperil livelihoods, and can spread diseases.

Several factors make flooding more likely. They include: changes in land use; population growth and density; deforestation; waste management; and prolonged or more intense rainfall. Moreover, due to climate change, flood events are more frequent and severe. Being an archipelago, Indonesia is particularly vulnerable to the impact of climate change, which, in addition to increasing rainfall, may trigger prolonged droughts and other extreme weather events as well as changes in sea level and vegetation patterns.

How

To address the risks arising from floods, and recognizing that most Javanese have access to the internet or mobile phones, the CFR programme developed the Flood Early Warning Early Action System (FEWEAS). It predicts flood events, facilitating early action in response. This internet based application complements a variety of community-based preparedness and mitigation systems that keep communities in the river basins safe and strengthen their resilience to flood events.

After an analysis of potential service providers, the CFR programme asked the ITB to support development of the app.

The first FEWEAS was designed for the Bengawan Solo River in 2015. The development and launch of the system took approximately nine months. The second FEWEAS, for the Citarum river, was launched in December 2017.

The partnership developed a website interface for Android- and iOS-based systems that can be used by a range of stakeholders, including government officials, policy makers, technical weather specialists, farmers and fisherfolk, PMI staff and Community Based Action Team (SIBAT) volunteers, and of course the communities themselves. Developed by ten ITB graduates and two professionals, the application gives updates on the state of the river and its potential to flood. It provides highly accurate information in real time as well as forecasts. The information is processed from data observed by Perum Jasa Tirta, which uses automatic water level and rainfall recorders at several points along the river. From this data, combined with data from NOAA's satellite, the FEWEAS team created weather, climate, and flood models. The data and models generate: ten-day weather and rainfall forecasts; information on alert status, water levels, and inundation; hourly flood pre-

dictions for up to three days (short period) and ten day flood predictions for up to five years; and a village-level warning system. The underlying aim was to enable communities living along the Bengawan Solo and the Citarum river to take appropriate action to protect themselves and to strengthen their flood resilience.

The online version can be accessed here: <http://feweas.jasatirta1.co.id/>. The application can also be downloaded for Android phones at the google play app store.

Based on the information FEWEAS provides, PMI branches and local communities can plan and implement short- and medium-term preparedness and mitigation activities with more confidence. FEWEAS' medium-term predictions are useful for farmers and fisherfolk and facilitate changes to the seasonal calendar. The programme's longer-term prediction capacities enable policy makers to make informed decisions about land allocation and climate change.

How the project has promoted resilience: case-study

PMI Provincial and District staff and volunteers are using the FEWEAS to monitor floods along the Bengawan Solo in East Java, and along the Citarum river in West Java.

PMI staff and volunteers as well as some officials of the government's disaster response agencies have been trained to interpret the data FEWEAS produces. Early warning can trigger early action, thanks to an innovative website and a handy app that can be used by local people to predict and monitor flooding events in their local communities. Early warning enables PMI to alert and evacuate 'at risk' communities and schools, using safe evacuation routes, before floods pose a serious risk to life.

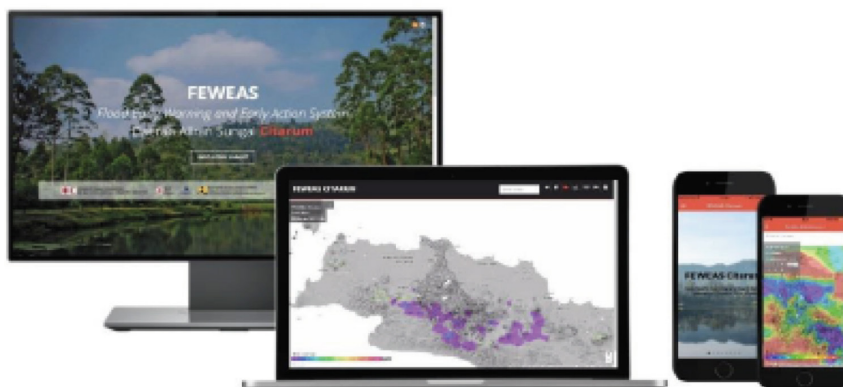


Figure 2. The application FEWEAS can be accessed from any internet based device.

To support FEWEAS, the CFR programme established a coordination centre in each PMI office, equipped with computers and communication tools. Staff and volunteers in the coordination centres monitor the prediction and precipitation data produced by FEWEAS along the Bengawan Solo and the Citarum river.

Cost

Project costs are dependent on academic and technical partner cost structures. In the specific case of the FEWEAS in Java, analysis, design, development, and implementation costs for all partners engaged equalled 60,000 CHF. The investments made have the potential to directly benefit 44.5 million people in West Java and 16 million in East and Central Java.

How we work

Strategy 2020 voices the collective determination of the International Federation of Red Cross and Red Crescent Societies (IFRC) to move forward in tackling the major challenges that confront humanity in the next decade. Informed by the needs and vulnerabilities of the diverse communities with whom we work, as well as the basic rights and freedoms to which all are entitled, this strategy seeks to benefit all who look to Red Cross Red Crescent to help to build a more humane, dignified, and peaceful world.

Over the next ten years, the collective focus of the IFRC will be on achieving the following strategic aims:

1. Save lives, protect livelihoods, and strengthen recovery from disasters and crises.
2. Enable healthy and safe living.
3. Promote social inclusion and a culture of non-violence and peace.

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Saving lives, changing minds.



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