

Asia-Pacific E-Resilience Toolkit

The Asia-Pacific E-Resilience Toolkit offers insights into a spectrum of available ICT tools and best practices that may benefit policymakers in the Asia-Pacific region to enhance e-resilience and disaster risk management.

June 2017



Access more than 75 tools and best practices from all over Asia and the Pacific and learn more on official websites & publications.



Filter tools by various specifications ESCAP sub-region, hazard type, e-resilience component and disaster risk management phase.



Access the toolkit from mobile devices, in addition to traditional desktop devices, featuring search-engine-indexing-friendly pages.

I. Introduction

Information and communications technology (ICT) has been widely recognized as an indispensable development enabler that contributes to and accelerates achievement of Sustainable Development Goals (SDGs). In particular, SDG9 that encompasses building resilient infrastructure is highly relevant in the context of ICT for sustainable development. Resilience is defined as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. Considering the significant progress in the field of ICT and its heightened potential to strengthen the adaptive capacity of critical infrastructure and systems, e-resilience has gained traction in Asia and the Pacific.

E-Resilience is defined as the ability of ICT systems to withstand, recover from and change in the face of an external disturbance such as a natural disaster. In addition, e-resilience is concerned with utilizing ICT for societal resilience. The surge in interest in e-resilience is closely linked with the fact that the Asia-Pacific region is the most disaster-prone region in the world. Over the period of 2005-2014, disasters have affected 1.4 billion people in the region with US\$ 523 billion caused in economic damages, according to research conducted by the Economic and Social Commission for Asia and the Pacific (ESCAP)¹.

Moreover, the Global Risks Report 2017² notes how technology is reshaping physical infrastructure and concludes that a greater interdependence among ICT infrastructure networks is increasing the scope for disasters to cascade across networks and affect society in unanticipated ways. While natural disasters may not be avoided completely, countries can reduce the risks posed by disasters on the lives and livelihoods of people in the region. To this regard, ICT is attributed a critical role in all phases of disaster risk management (DRM) and has applications in risk prevention, risk reduction, preparedness and response, and recovery.

¹ ESCAP (2015). Asia-Pacific Disaster Report 2015. Available from: www.unescap.org/publications/asia-pacific-disaster-report-2015

² World Economic Forum (2017). Global Risks Report 2017. Available from: <https://www.weforum.org/reports/the-global-risks-report-2017>

By means of an extensive analysis, in the E-Resilience Toolkit a spectrum of available ICT tools is reviewed in the context of e-resilience, and concrete policy recommendations are offered that may benefit policymakers and DRM professionals in the Asia-Pacific region and beyond. In recognition of the need for concerted regional efforts of utilizing ICT to minimize disaster risk, ESCAP has been at the forefront of promoting e-resilience through the Asia-Pacific Information Superhighway (AP-IS), a regional broadband connectivity initiative mandated by ESCAP member States. The AP-IS aims to be a catalyst to develop seamless regional broadband networks, improve their affordability, reliance, resilience and coverage, and thereby narrow the digital divide in the region. E-resilience, one of the main four pillars of the AP-IS, is imperative as ICT supports vulnerable communities, other critical infrastructure and a wide range of socioeconomic activities.

In support of the AP-IS and enhancing e-resilience in the region, ESCAP has published various papers that may benefit policymakers and ICT & DRM professionals in Asia and the Pacific. In 2016, e-resilience research has focused on China³, Philippines⁴, Mongolia⁵ and Sri Lanka⁶, while in 2017 a paper on resilience of SMEs in Central Asia⁷ was published.

Hence, the Toolkit aims to enhance the capacity of member States to capitalize on ICT developments, reduce disaster risk and contribute to the achievement of SDGs as laid out in the 2030 Agenda for Sustainable Development.

II. Tools and Best Practices

The Asia-Pacific E-Resilience Toolkit will be available on the Asia-Pacific ICT & DRR Gateway, through **drrgateway.net/e-resilience** where it will be continuously amended and enriched through inputs and suggestions from member States, partner organizations, as well as the ESCAP secretariat. An abridged list of the 80 tools and best practices currently included in the web-based version of the Toolkit is presented on the subsequent pages.

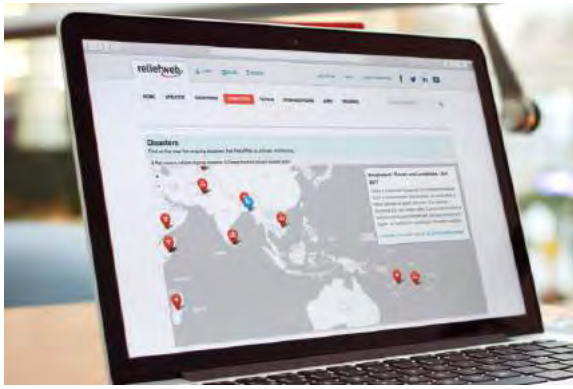
³ Available from: <http://www.unescap.org/resources/building-e-resilience-china-enhancing-role-information-and-communications-technology>

⁴ Available from: <http://www.unescap.org/resources/building-e-resilience-philippines-enhancing-role-information-and-communications-technology>

⁵ Available from: <http://www.unescap.org/resources/building-e-resilience-mongolia-enhancing-role-information-and-communications-technology>

⁶ Available from: <http://www.unescap.org/resources/building-e-resilience-sri-lanka-enhancing-role-information-and-communications-technology>

⁷ Available from: <http://www.unescap.org/resources/building-resilient-digital-economy-fostering-smes-central-asia>



ReliefWeb Humanitarian Information Platform

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔍 Know Your Risk, Humanitarian Response, Policy & Regulation, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏠 UN Office for the Coordination of Humanitarian Affairs (OCHA)

ReliefWeb is a web-based humanitarian information source on global crises and disasters. It is a specialized digital service of the UN Office for the Coordination of Humanitarian Affairs (OCHA). ReliefWeb provides reliable and timely information, enabling humanitarian workers to make informed decisions and to plan effective response. ReliefWeb collect and deliver key information, including the latest reports, maps and infographics and videos from trusted sources. Additionally, ReliefWeb is also offers information and training programs, helping humanitarians build new skills. ReliefWeb's editorial team monitors and collects information from more than 4,000 key sources, including humanitarian agencies at the international and local levels, governments, think tanks and research institutions, and the media. The content that is most relevant to global humanitarian workers is identified and collection, and in turn distributed through various channels - the reliefweb.int website, social media networks and mobile apps and API - so that humanitarian workers can access key content anywhere anytime.



Haze Gazer Indonesia Crisis Analysis Tool

- 📍 South-East Asia
- ⚡ Wildfires
- 🔍 Humanitarian Response, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏠 Pulse Lab Jakarta, BNPB, BPBD

The forest and peatland fires, which occur on an annual basis in Indonesia, affect the entire South-East Asia region resulting in extensive environmental destruction and threatening livelihoods. To better support affected populations, the Government of Indonesia is looking for more timely and effective means of tracking and managing the impact of fire and haze events. In response, Pulse Lab Jakarta has developed Haze Gazer, a crisis analysis and visualisation tool that provides real-time situational information from various data sources to enhance disaster management efforts. The prototype enhances disaster management efforts by providing real-time insights on the locations of fire and haze hotspots; the strength of haze in population centres; the locations of the most vulnerable cohorts of the population; and most importantly, the response strategies of affected populations, including movement patterns and in-situ behavioural changes. Haze Gazer uses advanced data analytics and data science to mine open data, such as fire hotspot information from satellites and baseline information on population density and distribution, as well as citizen-generated data, including the national complaint system in Indonesia called LAPOR!, citizen journalism video uploads to an online news channel, and real-time big data such as text-, image- and video-oriented social media. The tool is currently being tested with and improved based on feedback from disaster management practitioners. Haze Gazer has the potential to enable Indonesia's local (BPBD) and national (BNPB) disaster management authorities to target their interventions and to align their efforts with those of affected populations to increase community resilience.



Guidelines for Establishing Disaster Loss Databases

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔍 Policy & Regulation
- ⚠️ Preparedness and Response, and Recovery
- 🏠 UNDP Asia-Pacific

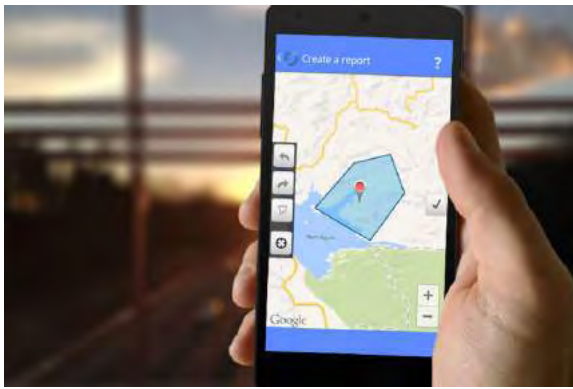
This Guidelines and Lessons for Establishing and Institutionalizing Disaster Loss Databases report from 2009 documents the experiences of the UNDP Regional Programme on Capacity Building for Sustainable Recovery and Risk Reduction in implementing disaster loss databases using the DesInventar methodology. The DesInventar is based on a relational database structure and a disciplined expert assisted structure for data collection and classification that permits the homogeneous capture, analysis and graphic representation of information on disaster occurrences and losses. The report provides step-by-step guidelines for developing a disaster loss database, based on the regional programme's experience. The report identifies and documents the processes adopted in each of the tsunami affected countries during the implementation of the disaster loss database. The report discusses and draws key challenges, lessons and good practices from the implementation of disaster loss database in each of the tsunami affected countries. The report gives the background on UNDP and the regional programme, and discusses disaster loss databases in the context of disaster risk reduction (DRR).



PreventionWeb Disaster Risk Reduction Platform

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔍 Know Your Risk, and Policy & Regulation
- ⚠️ Risk Prevention, Risk Reduction, Preparedness and Response, and Recovery
- 🏠 United Nations International Strategy for Disaster Reduction (UNISDR)

PreventionWeb is a participatory web platform for the disaster risk reduction community, with a primary purpose of facilitating an understanding of the subject of disaster risk reduction (DRR) and the work of professionals in this area by providing current news and views on the topic, and tools for exchange and collaboration. PreventionWeb provides information and data on various countries in the Asia-Pacific region. In addition, background material on the Sendai Framework and specific hazards is being offered. In particular, PreventionWeb contains publications, education materials, country and regional reports, maps, data and statistics, events information, as well as a collaborative environment to get in touch with others in the disaster risk reduction community. Access information on Asia and Oceania directly, learn more about hazards and find risk datasets.



Mobile4D Disaster Alert System for Lao PDR

- 📍 South-East Asia
- ⚡ Floods, and Extreme Weather
- 👤 Know Your Risk, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 Capacity Lab, University of Bremen

In case of natural disasters such as floods and extreme weather, a fast and secure flow of information is essential for citizens to be able to cope with the situation. Mobile4D is a disaster information and alerting system based on smartphone technology to allow both for timely notification of affected stakeholders and easy and barrier-free crowdsourcing of disaster information on the local level in Lao PDR. Mobile4D consists of a mobile application for the Android operating system, as well as a web-frontend to enable different administrative layers to send out warnings and provide further information (such as safety advice and contact information for questions/help), as well as a disaster management server that handles incoming warnings and sends out notifications to those in danger. The mobile application also allows for reporting disasters at the place they occur.



Sai Fah Flood Game Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Floods
- 👤 Know Your Risk, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏢 UNESCO Bangkok, Opendream

Sai Fah: The Flood Fighter is a mobile application that challenges players of all ages, but particularly children, to learn how to protect themselves and those around them from floods. Players learn flood safety lessons as they encounter flood hazards, from live electrical current to dangerous wildlife. Sai Fah: The Flood Fighter, the first mobile application developed by UNESCO Bangkok and Opendream, was built to raise awareness around flood safety issues following the 2011 deluge in Thailand. Sai Fah has been downloaded by nearly 100,000 users in 140 countries in 4 languages: Thai, English, French and Bahasa Indonesian. The mobile application is available for download on both iOS and Android operating systems and is free of charge. UNESCO Bangkok has also developed a similar application in the context of earthquakes and tsunamis.

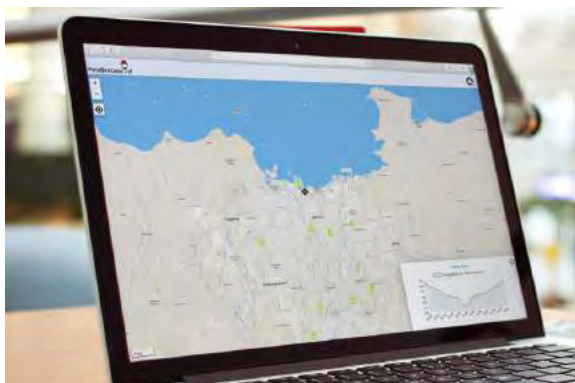


Tanah Tsunami & Earthquake Game Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, and Tsunamis
- 👤 Know Your Risk, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏢 Red Cross/Red Crescent GDPC, UNESCO Bangkok, Opendream

Tanah: Earthquake and Tsunami Fighter is a fun action packed game (mobile application) that makes learning about disaster risk reduction actions interesting and engaging for people of all ages, but particularly children. This game is a result of the collaboration between the Red Cross/Red Crescent Global Disaster Preparedness Center (GDPC), UNESCO Bangkok and the developer Opendream with funding support

from USAID. With more than 20 exciting and challenging stages, Tanah: The Tsunami and Earthquake Fighter, has been developed to engage users to learn how to protect themselves from earthquakes and tsunamis, providing key survival lessons for all phases of disaster – preparedness, response and recovery. The game is available in English, Bahasa Indonesian and Thai with additional languages to come through generous support from the GDPC, USAID and other partners. The mobile application is available for download on both iOS and Android operating systems and is free of charge. UNESCO Bangkok has also developed a similar application in the context of floods.



PetaBencana Indonesia Emergency Response Platform

- 📍 South-East Asia
- ⚡ Floods, and Extreme Weather
- 📍 Know Your Risk, Humanitarian Response, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🏢 MIT Urban Risk Lab, USAID, BNPB Indonesia

PetaBencana.id is a project initiated by the Urban Risk Lab at MIT as a free platform for emergency response and disaster management in Indonesia. It is a tool that combines data from hydraulic sensors with citizen reports over social media and civic applications, including via Twitter, to produce real-time flood maps in Jakarta and other cities in Indonesia, including Surabaya and Bandung. The platform adopts a “people are the best sensors” paradigm, where confirmed reports are collected directly from the users at street level in a manner that removes expensive and time-consuming data processing. This framework creates accurate, real-time data which is immediately made available for users and first responders. PetaBencana.id gathers, sorts, and visualizes data using specially developed CogniCity Open Source Software - an enterprise-level platform for emergency response and disaster management - to transform the noise of social and digital media into critical information for residents, communities, and government agencies. In 2016, the project’s Twitter feed for Jakarta (@PetaJkt) had more than 50,000 followers and received nearly 10,000 tweets providing flood information to the platform, underlining the significant involvement of Jakarta citizens, according to a case study.



EWS 1294 Early Warning System Cambodia

- 📍 South-East Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Wildfires, and Extreme Weather
- 📍 Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 People in Need & National Committee for Disaster Management, Cambodia

The EWS 1294 early warning message dissemination dashboard has been developed by People in Need for the National Committee for Disaster Management (NCDM) of Cambodia. The system provides NCDM with the ability to send voice based alerts in the event of a natural disaster in Cambodia. Hence, through the EWS 1294 system warning messages are directly to the mobile phones of people at risk. First piloted in 2013, the system has now expanded to cover more than 200,000 households in seven provinces, including many of the most vulnerable areas of Cambodia. People in Cambodia can simply register for the system by dialing the free call 1294 and follow the prompts to register province, district and commune. After all, early warnings allow people to prepare themselves, their families, and their livelihoods for the oncoming danger. This could mean evacuation to the nearest safe site, or staying in their homes and securing their most important possessions; the extra time to prepare can often mean the difference between life and death. In order to strengthen the existing Early Warning System, People in Need has now developed an automated flood sensor named Tepmachcha, designed by the DAI Maker Lab with funding from USAID’s Development Innovations project. Tepmachcha is a solar-powered, GSM-enabled, sonar-based stream gauge, built on open-source technology. The device uses ultrasonic sound waves to measure the height of the water and sends this captured data

over the mobile phone network back to a centralised web application. If a dangerous ‘warning’ level of water is detected, the system automatically sends out a mobile alert message via People in Need’s Early Warning System. Learn more in about the system in an article on UNICEF’s website



HandsUp Community Help Request Platform

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 💡 Communication with Citizens
- ⚠️ Preparedness and Response
- 🚩 HandsUp

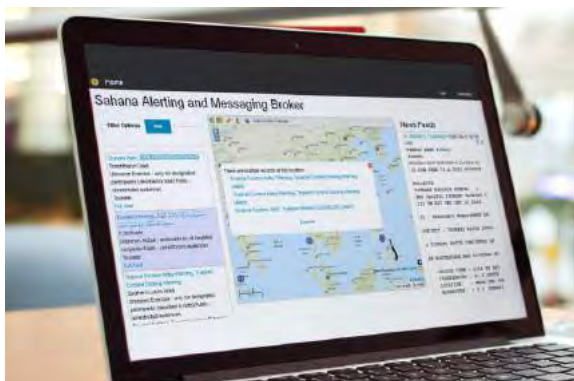
HandsUp is an online platform that aims to connect communities affected by disasters with people and organizations that can help. In the Asia-Pacific region, the platform currently (as of June 2017) aims to help vulnerable communities in Nepal, Sri Lanka and Fiji. Through the web-based platform, someone in a disaster-affected community can fill out a short help request form containing location and details on what is needed. In turn, helpers such as aid organizations and individuals can search for requests in their local area, based on the kind of help they are able to offer. Helpers can then message requesters privately and move forward.



DEWN Disaster and Emergency Warning Network Sri Lanka

- 📍 South and South-West Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Wildfires, and Extreme Weather
- 💡 Humanitarian Response, and Communication with Citizens
- ⚠️ Risk Reduction
- 🚩 Disaster Management Centre, Sri Lanka and Dialog Telekom

Disaster and Emergency Warning Network (DEWN) is an emergency message system in Sri Lanka that enables the disaster centre to use Sri Lanka's largest mobile service provider to send mass alerts as well as more specific warnings customized by region. It can also be used to warn emergency workers before mass alerts are sent out. The DEWN system uses widely available mobile communications technologies such as short messages service (SMS) for early warning and cell broadcast (CB) and its purpose is to provide a cost effective but reliable mass alert system. In May 2017, the system was used by Sri Lanka's Disaster Management Centre to warn people in various parts of the country about rising water levels, floodings and landslides. Learn more about DEWN in a paper by GSMA (2015) or an article on ReliefWeb (2017).



SAMBRO Sahana Alerting and Messaging Broker

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 💡 Policy & Regulation
- ⚠️ Risk Reduction
- 🚩 Sahana Foundation

Under a well-developed disaster management system, the Disaster Management Organization(s) of a respective country should be aware of and should map every significant emergency incident or risk in the country. Disseminating such information among multiple agencies with disparate systems can be complicated. Noting that a platform that incorporates the Common Alerting Protocol (CAP) standard may be more likely to interoperate with national and international warning systems, and that the CAP content standard lays out emergency policies and procedures for streamlined information sharing among multiple agencies, international organizations such as the WMO (World Meteorological Organization), ITU (International Telecommunication Union) and OASIS (Organization for the Advancement of Structured Information Standards) are promoting the adoption of common warning standards. Against this backdrop, the Sahana Alerting and Messaging Broker (SAMBRO) is essentially a Sahana Eden template designed for Multi-Agency Situational-Awareness. Moreover, it adopts the CAP standard for Sahana to interoperate with other warning systems. The objectives are to deliver the SAMBRO platform to share a common operating picture to improve coordination among multiple-agencies and to enable system administrators, implementers, emergency managers, and other users to easily adopt SAMBRO into their emergency communication practices.



Glacial Lake Inventory of the Hindu Kush-Himalayas Region

- 📍 East and North-East Asia, South and South-West Asia, and North and Central Asia
- ⚡ Glacial Lake Outburst Floods
- 📍 Know Your Risk, Network Planning, Contingency Planning, and Policy & Regulation
- ⚠️ Risk Prevention, and Risk Reduction
- 🏠 International Centre for Integrated Mountain Development (ICIMOD)

The Hindu Kush-Himalayas (HKH), extending from the Hindu Kush of Afghanistan and Pakistan in the northwest to the Hengduan Mountains in southwest China in the east, is one of the most heavily glacierized areas in the world. Glaciers and glacial lakes in the Hindu Kush-Himalayas have been essential natural resources providing fresh water to about one third of the world population. In the HKH, as well as in many other parts of the world, glaciers are shrinking and glacial lakes are being formed. Besides being a significant natural resource, glacial lakes could possibly be sources of natural disasters generating massive floods and debris flows causing extensive damages downstream such as loss of lives, livelihoods and infrastructures. There are many examples of such incidences in the HKH region when loss of lives and properties had occurred due to glacial lakes outburst floods (GLOFs) caused by breaching of moraine dams damming the lakes. Against this backdrop, the International Centre for Integrated Mountain Development (ICIMOD) undertook Glacial Lake Inventory of the HKH Region using satellite images. Lakes were mapped covering five major river basins of the HKH region namely Amu Darya, Brahmaputra, Ganges, Indus, and Irrawaddy and numbered those lakes accordingly. In summary, there are 20,482 glacial lakes mapped during the inventory preparation which covered an area of about 4,320 sq. km in the region.



Nepal Flood Risk Assessment Platform

- 📍 South and South-West Asia
- ⚡ Floods
- 📍 Know Your Risk, Network Planning, Preparedness, and Policy & Regulation
- ⚠️ Risk Prevention, and Risk Reduction
- 🏠 International Centre for Integrated Mountain Development (ICIMOD)

Disaster loss data are helpful in understanding the cost and impact of disaster events, and thus helps make informed policy decision to formulate and implement effective disaster management plans. The Nepal Multi Level Risk Assessment For Flood system built on open source architecture provides interactive interface to analyze historical disaster event and loss data base to draw policy relevant information. The disaster event data is sourced from Ministry of Home Affairs (MoHA) of Nepal which has been consolidated as reported

by local chapters present in districts and village development committees. Some level of quality check on data has been done prior to assimilation in the system. The system provides an interface to see disaster trends (event frequency, people killed, and estimated economic loss) for specific type or all disaster type between 2000 to April of 2014, at district or VDC level. Along with the bar chart, user can view statistics in tabular form or map form both by point and choropleth symbology. In addition to above three elements, Disaster Damage Index (DDI) based on combination of all the three elements can also be viewed on the map to aid in prioritization process. The system is publicly accessible over the Internet.



Bhutan Forest Fire Detection and Monitoring System

- 📍 South and South-West Asia
- ⚡ Wildfires
- 📍 Contingency Planning, and Preparedness
- ⚠️ Risk Reduction
- 🏠 International Centre for Integrated Mountain Development (ICIMOD)

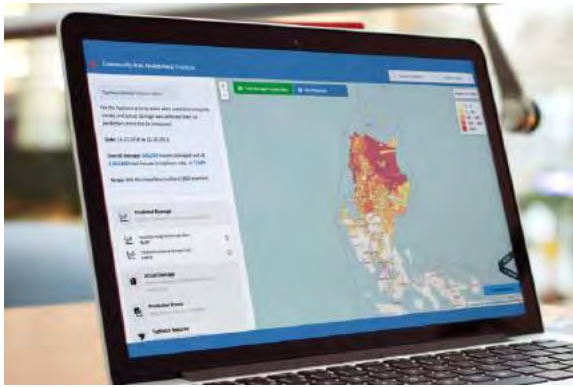
For Bhutan, there is a clear need for reliable and time-effective information on forest fires. To this regard, satellite imagery has found to be useful in fire detection and monitoring, and burnt area assessment on near real-time basis. To this regard, the International Centre for Integrated Mountain Development (ICIMOD) has developed a forest fire detection and monitoring system for Bhutan in close collaboration with the Department of Forests of Bhutan. The system facilitates data acquisition, processing, and reporting of fire location information in an automated manner. Hence, the interactive online mapping application allows visualization of active fire locations on any given day along with dzongkhag level fire count statistics. The system is publicly accessible over the Internet. A user is able to select a certain time period to view the fire events using a time-slider tool.



Nepal Earthquake Recovery and Reconstruction Information Platform

- 📍 South and South-West Asia
- ⚡ Earthquakes
- 📍 Network Planning, Contingency Planning, and Policy & Regulation
- ⚠️ Preparedness and Response, and Recovery
- 🏠 International Centre for Integrated Mountain Development (ICIMOD)

In April 2015, Nepal experienced a massive earthquake that affected a majority of the country's districts and in which thousands of people lost their lives, with many more injured and left homeless. The Ministry of Home Affairs (MoHA) Government of Nepal, in close collaboration with the International Center for Integrated Mountain Development (ICIMOD), and the technical support from the Environmental System Research Institute (ESRI) has developed and deployed the Nepal Earthquake 2015: Disaster Recovery and Reconstruction Information Platform (NDRRIP). The NDRRIP acts as a unified hub for earthquake-related information for use by government ministries and departments and other stakeholders engaged in disaster recovery and reconstruction. The information platform contains key facts and figures, as well as interactive maps, charts and infographics. In particular, high-resolution interactive satellite imagery enables before and after visualization. The platform is hosted by ICIMOD and publicly available over the Internet.



Philippines Community Risk Assessment & Prioritization Portal

- 📍 South-East Asia
- ⚡ Typhoons / Cyclones
- 📍 Know Your Risk, and Humanitarian Response
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇳🇱 Netherlands Red Cross

When a natural disaster strikes, it is critical to relieve those individuals suffering. However, it may not be able to reach all people in need at the same time and a prioritization has to be made. To address this, the Community Risk Assessment and Prioritization portal offers a data-driven overview of areas most in need. The portal, developed by the Netherlands Red Cross, currently consists of community risk assessments for the Philippines, as well as a prioritization index model with regard to typhoons for the Philippines. To construct the latter, pre-disaster indicators from the community risk assessment are combined with post-disaster data on rainfall and wind speed to predict the geographical spread of damage, and thus the prioritization of disaster relief. This data-driven model has already been applied for typhoons in the Philippines in 2016, including Haima (October 2016) and Nock-Ten (December 2016). The Netherlands Red Cross has plans to include floods, earthquakes and other disasters in the near future, including for other countries such as Nepal.



Guidelines for Disaster Response Partnering between Aid Providers and Mobile Network Operators

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, and Wildfires
- 📍 Network Planning, Contingency Planning, and Humanitarian Response
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇸🇰 GSMA

The guidelines “Building Effective Partnerships In Complex Environments” published by GSMA Disaster Response and telecom operator SoukTel is a resource to help mobile network operators join forces with non-governmental organizations (NGOs) rapidly and effectively in times of disasters. As it is key to save lives and reach vulnerable communities when a disaster strikes, cooperation between organization is critical. The guide offers a checklist and best practices gathered from consultations with mobile operators and NGOs. This is particularly relevant given that a shift towards the digitization of aid has led to mobile technology becoming a central component of assistance. The ubiquity and scale of mobile networks means they have become attractive delivery channels for many forms of humanitarian assistance in times of disaster.



INNONENT Portable Mobile Telecommunications Base Station

- 📍 East and North-East Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, and Wildfires
- 📍 Network Planning, and Humanitarian Response
- ⚠️ Preparedness and Response, and Recovery
- 🇰🇷 INNONENT, Republic of Korea

INNONENT, a Korean ICT device and software company, developed a portable backpack-type mobile base station (backpack LTE) with a wireless backhaul device, which can be applied to a national disaster safety-net. This device can be applied in disaster-situations where communications networks are destroyed and/or disconnected. The backpack-type base station is portable so that it can be used instantly without separate installation. Under TV white space (TVWS) or satellite backhaul, communications services are available, covering long distances of over 8km. The technology is built to disperse traffic overload in network systems. Moreover, the base station is equipped with a touchscreen and Web-UI. Photo credits: INNONENT



Google Person Finder Platform

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, and Wildfires
- 👤 Humanitarian Response, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🚩 Google

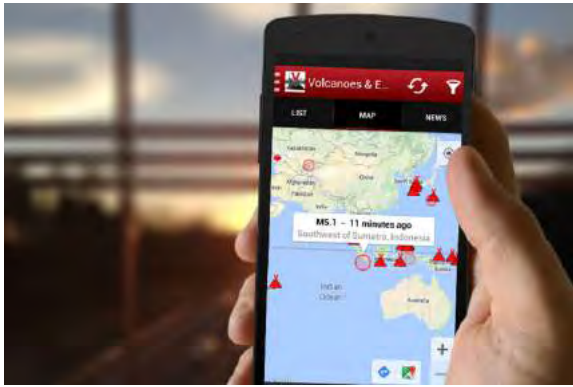
Google Person Finder is a web application that allows individuals to post and search for the status of relatives or friends affected by a disaster. The program also lets press agencies, non-governmental agencies and others contribute to the database and receive updates by using the Person Finder application programming interface (API). In addition, websites can choose to embed Google Person Finder as a gadget on their own pages. Google Person Finder is open source software meaning that any developer can create their own instance of Google Person Finder after a disaster. Person Finder has been launched in over 40 languages. It was developed in response to the Haiti Earthquake which occurred in 2010. Users can get access to the website through smartphones or computers and seek information on loved ones' whereabouts. Along with Google Earth, this program has contributed to several missing persons being found during and in the aftermath of several disasters, such as the Japan Earthquake in 2011.



DART Tsunami Forecasting System

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Typhoons / Cyclones
- 👤 Preparedness
- ⚠️ Risk Reduction
- 🚩 United States National Oceanic and Atmospheric Administration (NOAA) - Center for Tsunami Research

DART is composed of real-time tsunami monitoring systems that are positioned at strategic locations (including Australia, Guam, India, Russian Federation and Thailand) throughout the ocean and play a critical role in tsunami forecasting. To ensure early detection of tsunamis and to acquire data critical to real-time forecasts, NOAA has placed Deep-ocean Assessment and Reporting of Tsunami (DART®) stations at sites in regions with a history of generating destructive tsunamis. In the Asia-Pacific region, such DART stations are placed in various countries, including Australia, India, Russian Federation and Thailand. In Guam, the United States NOAA Center for Tsunami Research (NCTR) is working with NOAA's National Ocean Service (NOS) to conduct a tsunami hazard assessment study for the Island of Guam. NOS has provided new bathymetric survey data for Guam, and the NCTR is developing numerical computer grids that can be used with a tsunami inundation model to compute tsunami impact for different sections of Guam. Testing the stability and accuracy of the grids with such tsunami computer model is a vital step in the development of reliable grids to be used in tsunami warning, education and evacuation. Real-time data can be accessed through a web-based platform. Photo copyrights: DART / NOAA.



Volcanoes & Earthquakes Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, and Volcanic Eruptions
- 📍 Know Your Risk, and Preparedness
- ⚠️ Preparedness and Response
- 🚩 Volcano Discovery

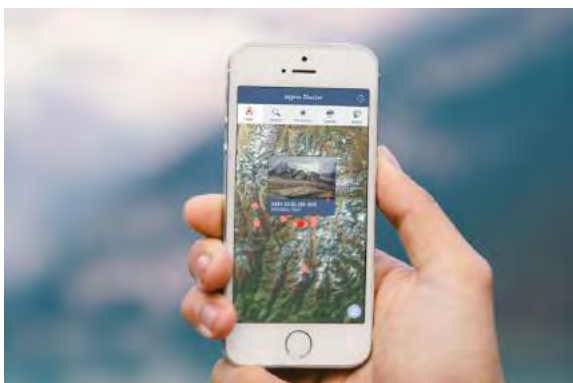
The Volcanoes & Earthquakes smartphone application shows the latest earthquakes and active volcanoes on a map and as list. A user can filter the data shown in various ways, e.g. by magnitude or age of earthquakes, the distance from one's location, the status of volcanoes and so on. Hence, the application has the potential to enhance awareness of vulnerable communities in Asia and the Pacific with regards to earthquakes and volcanic eruptions. With regard to volcanic eruptions, among others, users can: see currently erupting volcanoes on a map, receive volcano alerts (through push notifications), and receive volcanic ash advisories. With regard to earthquakes, among others, users can receive earthquake alerts (with customized notifications), a map of tectonic plate boundaries, recent earthquakes, and submit experience reports alongside location. Data presented in the application are continuously being collected and updated from various public sources, mainly international agencies such as USGS, GFZ, EMSC, as well as volcanodiscovery.com. The application is currently available only on the Android mobile operating system.



Arko Philippines Typhoon Application

- 📍 South-East Asia
- ⚡ Floods, Typhoons / Cyclones, and Extreme Weather
- 📍 Preparedness, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🚩 Pointwest Technologies Corporation / NOAH

The Philippines is hit by several typhoons a year. Most of the time, these cause major flooding that can be a danger to people's life and livelihood. Against this backdrop, the smartphone application Arko aims to address the need of Filipino citizens for more information during times of major rains, typhoons and floods. By accessing the extensive databases of Project NOAH and DOST, Arko enables a user up-to-the-minute updates on rainfall and other weather conditions in close proximity or chosen location. Flood Mapping: Using data from previous floods (like Ondoy), Arko shows users which areas are prone to flooding so they may be avoided, or designate a safe zone where evacuees can go to during floods. Remote Monitoring: Arko allows users to check on how flooding and/or rainfall is in other areas. This feature is targeted at those who worry if a family member, loved one or friend is doing fine despite the weather. Weather Advisory: By connecting with Project NOAH, PAGASA and DOST's various weather monitoring facilities, Arko gives users updates on the weather. The Arko smartphone application is available on iOS and Android operating systems.



WGMS World Glacier Monitoring Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, and North and Central Asia
- ⚡ Glacial Lake Outburst Floods
- 📍 Communication with Citizens
- ⚠️ Risk Reduction
- 🚩 WGMS and UNESCO

The World Glacier Monitoring Service (WGMS) and UNESCO jointly launched the Glacier smartphone application. This information system aims at bringing scientifically sound facts and figures on worldwide glacier changes to decision-makers at governmental and intergovernmental levels as well as reaching out to the general public. The WGMS Glacier App provides a map interface based on satellite images that display all the observed glaciers in the user's proximity. Basic information is provided for each glacier, including photographs and general information on size and elevation. Graphs with observation data illustrate the glacier's development, along with information on latest principal investigators and their sponsoring agencies as well as detailed explanations of the measurement types. Additionally, a text search allows the user to filter the glacier by name, country, region, measurement type and the current "health" status, i.e. if the glacier has gained or lost ice over the past decade. A compass shows the closest observed glaciers in all directions from the user's current position. The smartphone application is available for both iOS and Android operating systems.



GLONASS Navigation Satellite System

- 📍 North and Central Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔍 Know Your Risk, and Humanitarian Response
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 Information and Analysis Center for Positioning, Navigation and Timing, Korolyov, Russia

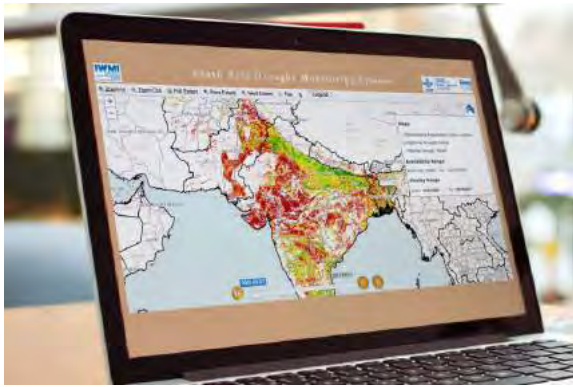
The Global Navigation Satellite System (GLONASS) is a space-based satellite system operating in the radio navigation-satellite service and used by the Russian Aerospace Defence Forces. It provides an alternative to GPS and is the second alternative navigational system in operation with global coverage and comparable precision. Access to satellite space systems lends important capabilities to global disaster rescue operations, as the satellites can provide important functions such as weather warnings, telecommunications, positioning and navigation. This may be useful in tracking of vehicles and shipments of relief supplies, as well as real-time positioning and navigation for responders.



Philippines Nationwide Operational Assessment of Hazards (NOAH)

- 📍 South-East Asia
- ⚡ Floods, Typhoons / Cyclones, Tsunamis, Landslides, and Extreme Weather
- 🔍 Contingency Planning, and Preparedness
- ⚠️ Risk Reduction, Preparedness and Response, and Recovery
- 🏢 University of the Philippines

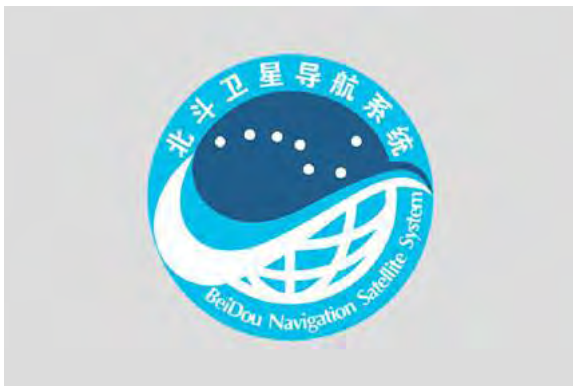
The University of the Philippines Nationwide Operational Assessment of Hazards (UP-NOAH) is a multidisciplinary research center housed in the UP National Institute of Geological Sciences with the goal of helping reduce the impacts of hazards. It seeks to assist the country in disaster risk reduction and management, climate change adaptation and mitigation efforts and related activities through research, development and extension services. The UP-NOAH website gives users options to check the following maps: Barangay-level flood hazard maps (for major river basins) Storm surge hazard maps (for all coastal communities) Landslide hazard maps (for the entire Philippines) Debris flow hazard maps Those maps are largely official maps used for the reconstruction and rehabilitation of Super Typhoon Yolanda (Haiyan) affected areas. The maps also offer information layers on important infrastructure such as schools and hospitals.



South Asia Drought Monitoring System

- 📍 South and South-West Asia
- ⚡ Droughts
- 🔍 Know Your Risk, Preparedness, and Policy & Regulation
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 International Water Management Institute (IWMI), Sri Lanka

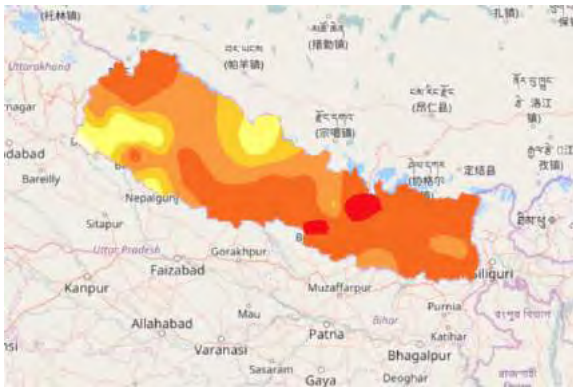
The South Asia Drought Monitoring System (SADMS) was established in 2014 and provides weekly maps that reflect drought conditions in South Asia. The system uses numerous drought indices, including the Integrated Drought severity Index and Soil Moisture Index, to monitor and assess drought conditions. The system and its outcomes are imperative to the decision-making process. In particular, drought conditions have a negative impact on agriculture. Through the South Asia Drought Monitoring System, IWMI could monitor drought's impact on agriculture. Through the SADMS website, IWMI garnered the freely available satellite imagery to improve drought monitoring and drought prediction. Through the South Asia Drought Monitoring Systems, policymakers and relevant stakeholders are able to: Explore the spatial condition of ground vegetation throughout the South Asia region, at the level of specific districts in respective countries and at the level of specific pixels of 0.5 by 0.5 km. The default spatial image shows the distribution of drought conditions over a district, sub-district administrative boundaries if any exist and some landmarks, including rivers/canals, roads and or settlements. A similar approach is followed for other drought indices. The Integrated Drought Severity Index (IDSI) calculations integrate satellite-based observations of vegetation conditions and climate data and other biophysical information such as land cover/land use type, topography and river basin details. Create the on-line time-series graphs of drought-related vegetation characteristics and study the deviation of those from the long-term mean for a district or pixel. The graphs can be built for a time period selected by the user, allowing the developing deficits of vegetation density and vigor to be detected and quantified on-line. Once the district is selected on the front page of the DMS, the default time series graph appears showing the long-term average Vegetation Condition Index (VCI), Temperature Condition Index (TCI), Precipitation Condition Index (PCI) and the current VCI, TCI and PCI time series. The start of the plotting period can be interactively selected at this point and the time series graph re-plotted. Similarly, other indices can be examined at this stage by clicking the appropriate link on the screen and accessing the on-line database. Download images of drought indices "IDSI" or "SPI" for South Asia for inclusion in various reports or presentations. These images may be previewed before downloading.



Beidou Navigation Satellite System

- 📍 East and North-East Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, and Droughts
- 🔍 Know Your Risk, Network Planning, Preparedness, and Policy & Regulation
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🏢 China National Administration of GNSS and Applications

The Beidou Navigation Satellite system is used to monitor natural disasters occurring in the Peoples Republic of China. In recent years, after natural disasters, such as forest fires, earthquakes and floods, communication networks were broken. This has a negative impact on communications and disaster recovery. As a response, the Chinese Government has expressed the need to establish a reliable communication network system, which primarily relies on the Beidou system combined with other communication technology. Based on that, the Chinese Government aims to set up a management system for emergencies. The system is designed to achieve two-way communications, images and data transformation, and location identification. This will ensure that policies made by headquarters could be fully implemented by field teams. According to the website, the Beidou System will be used to monitor geological disasters for the State Grid of Corporation of China. The satellite system offers a platform that is able to collect and coordinate all sorts of information, including images, data, and location details, supporting both policy-making center and post-disaster first responders. The system offers the opportunity to use relevant geographic data to design routes in advance as a way of disaster preparation.



Nepal Government Geo-Portal

- 📍 South and South-West Asia
- ⚡ Earthquakes, and Droughts
- 📍 Know Your Risk, and Preparedness
- ⚠️ Preparedness and Response
- 🏠 Ministry of Home Affairs, Government of Nepal

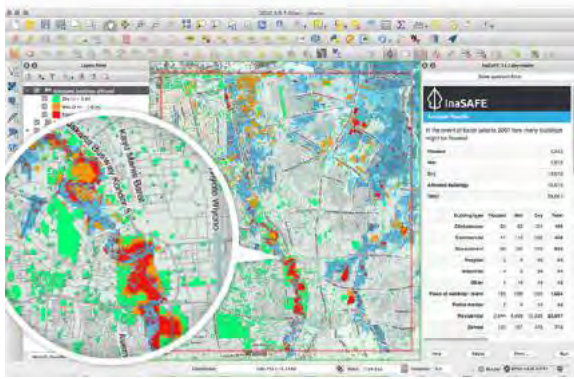
Nepal is a landlocked country in South Asia that is highly vulnerable to earthquakes. In order to better understand seismic risk and build resilience, the World Bank and GFDRR, in collaboration with the Government of Nepal and the Open Data for Resilience Initiative have provided a data sharing portal that offers maps and map layers relevant to disaster risk management. Maps on the portal include relevant information on earthquakes, drought and other hazards.



Pacific Catastrophe Risk Assessment and Financing Initiative

- 📍 Pacific
- ⚡ Earthquakes, Typhoons / Cyclones, Tsunamis, and Extreme Weather
- 📍 Know Your Risk, Preparedness, and Policy & Regulation
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏠 SOPAC/SPC, World Bank, ADB

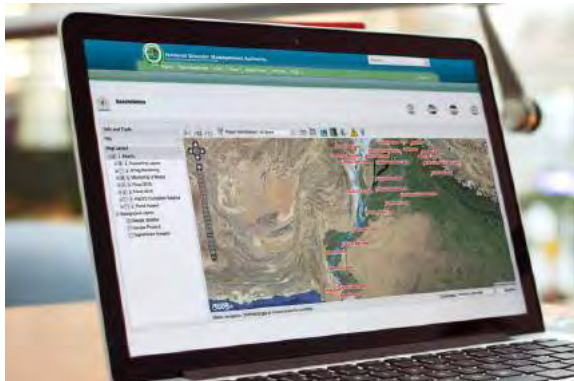
The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) aims to provide the Pacific Island Countries (PICs) with disaster risk modeling and assessment tools. It also aims to engage in a dialogue with the PICs on integrated financial solutions for the reduction of their financial vulnerability to natural disasters and to climate change. The initiative is part of the broader agenda on disaster risk management and climate change adaptation in the Pacific region. PCRAFI is a joint initiative of SOPAC/SPC, World Bank, and the Asian Development Bank with the financial support of the Government of Japan, the Global Facility for Disaster Reduction and Recovery (GFDRR) and the ACP-EU Natural Disaster Risk Reduction Programme, and technical support from AIR Worldwide, New Zealand GNS Science, Geoscience Australia, Pacific Disaster Center (PDC), OpenGeo and GFDRR Labs. The Pacific Disaster Risk Assessment project provides 15 countries with disaster risk assessment tools to help them better understand, model, and assess their exposure to natural disasters. It builds on close collaborations between the Secretariat of the Pacific Community through its Applied Geoscience & Technology Division (SPC/SOPAC), WB and ADB, with technical inputs from GNS Science, Geoscience Australia, and AIR Worldwide. PCRAFI produced detailed probabilistic hazard models for all 15 countries, such as tropical cyclones with winds, storm surge, rain earthquake with ground-shaking, and tsunami. PCRAFI assembled, processed, developed, and organized the largest collection of geo-referenced data for hazard modeling in the region: Satellite imagery Topographic maps Bathymetry maps Surface geology maps Surface soil maps Land cover/land use maps Geodetic and fault data Historical catalogs of tropical cyclones and earthquakes For example, PCRAFI offers a map layer of critical infrastructure on various Pacific islands, which is available for download and may be used by policymakers and ICT professionals to enhance e-resilience in the Pacific region.



InaSAFE Hazard Impact Scenario Software

- 📍 South-East Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Wildfires, and Extreme Weather
- 🔍 Know Your Risk, Network Planning, Preparedness, and Policy & Regulation
- ⚠️ Risk Reduction, Preparedness and Response, and Recovery
- 🏠 Government of Indonesia / Government of Australia / World Bank

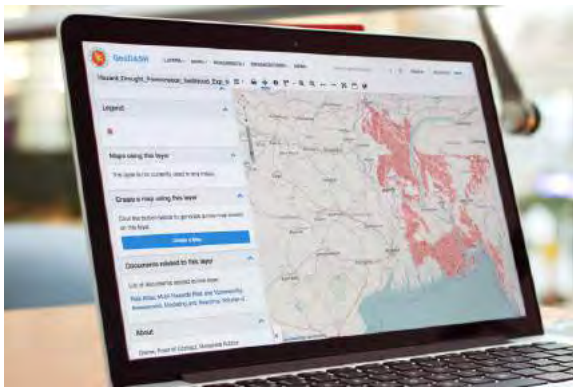
InaSAFE is free software that produces realistic natural hazard impact scenarios for better planning, preparedness and response activities. It provides a simple but rigorous way to combine data from scientists, local governments and communities to provide insights into the likely impacts of future disaster events. The software enables production of realistic natural hazard impact scenarios for better planning, preparedness and response training activities, by incorporating a range of natural hazard information, such as earthquake, volcanoes, tsunami or flood; and exposure data, such as the spatial distribution of population, roads or critical infrastructure. InaSAFE is designed to use and combine existing and new data from communities, local governments and science agencies. In the absence of available spatial data, external tools such as OpenStreetMap are available for communities and disaster managers. InaSAFE has been jointly developed by the Indonesian Government-BNPB, the Australian Government, the World Bank-GFDRR and independent contributors. The software is compatible with the free and open source Geographic Information System QGIS 2.0, and allows users to import spatial data from remote sources and create custom impact map templates.



Pakistan Disaster Info Portal

- 📍 South and South-West Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Landslides, Glacial Lake Outburst Floods, and Droughts
- 🔍 Know Your Risk, Network Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏠 National Disaster Management Authority, Pakistan

Pakistan Disaster Info is a nationally owned, open source data platform that aims to enable the mandated agencies to share their geospatial datasets and maps on hazards and exposure. In order to ensure that risk information is widely accessible to all decision makers, this platform will also host newly developed datasets, hazard and risk information. This project is being supported by Global Facility for Disaster Reduction and Recovery (GFDRR), World Bank and Department for International Development (DFID) under the Development of a National Platform for Risk Assessment and Catastrophe risk financing Programme in Pakistan which aims to implement risk identification and financing framework that will encourage data-driven analysis and lead to a reduction in disaster risk over the long term. The programme will test the use of evidence-based risk analysis in public policy making through a series of interventions to provide risk information, train users, and improve decision-making systems in disaster risk management. The Pakistan Disaster Info website contains a spectrum of hazard maps, including for drought, floods, landslides, glacial lake outburst floods, earthquakes and landslides.



GeoDASH Geospatial Data Platform Bangladesh

- 📍 South and South-West Asia
- ⚡ Earthquakes, Floods, Landslides, and Extreme Weather
- 📍 Know Your Risk, Network Planning, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🇬🇧 The Government of Bangladesh

GeoDASH is geo-spatial data storing and sharing initiative by Bangladesh Government. It is a web based platform for compiling, updating and sharing geospatial database which will allow facilitating the use, management, exchange and quality control of geospatial data sets in a collaborative manner. Some of the features that GeoDASH provides are listed below: Interoperability: GeoDASH is Open GeoSpatial Consortium (OGC) standards compliant to optimize interoperability between programs across the enterprise for managing, sharing, and analyzing geospatial and non-geospatial content. Map sharing: Users can share a map via e-mail, LinkedIn, Twitter, Facebook etc. to maximize data sharing and promotion of work. One can also publish and embed someone's map right away. Importing of own layers: Layers are the contents of a map. Users can add layers of the data format for Vector (Example: .shp, .shx, .dbf, .prj) or Raster (.tiff, .img). Data projection in WGS 84 or BTM should be ensured. GeoDASH also offers map layers for Bangladesh on fibre-optic connectivity and backbone paths, which may benefit relevant parties in enhancing e-resilience in the country.



Open Data for Resilience Initiative

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 📍 Know Your Risk, Network Planning, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🌐 Global Facility for Disaster Reduction and Recovery

As a part of global open data movement, Open Data for Resilience Initiative (OpenDRI) is designed to reduce vulnerability to natural hazard through data collection and data analysis. OpenDRI was launched by Global Facility for Disaster Reduction and Recovery (GFDRR) in 2011. Working with World Bank Regional Disaster Risk Management Teams, OpenDRI issues long-run opendata projects in countries like Indonesia, Madagascar and Mauritius. OpenDRI runs projects based on the need of the client country. For instance, the Indonesia mapping project uses OpenStreetMap to collect data and calculate likely damage in case of a physical disaster. This helps the government to develop actionable plans. Learn more about InaSAFE here. Similarly, taking into account that Bangladesh is highly vulnerable to natural hazards, including floods, cyclones and earthquakes, OpenDRI efforts in Bangladesh have led to the mapping of 8,500 buildings, of which 540 have historical significance, and 93 km of roads and drainage works through various efforts, including GeoDASH Bangladesh. Also, the Open Data for Resilience Initiative assisted in Typhoon Yolanda relief in the Philippines by establishing a repository of data on damage assessments.



Plus Voice Japan Portal

- 📍 East and North-East Asia
- ⚡ Earthquakes, and Tsunamis
- 🗺️ Know Your Risk, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🇯🇵 PLUSVoice Co., Japan

Plus Voice is an open access website, offering a free remote video service for people who have hearing problem positioned in areas in danger of earthquake and tsunami in Japan. People in need of help can obtain information in sign language through videophones right after the disasters occur. This is an example of good practice for helping vulnerable people in disaster-affected communities.



GEOSS Global Earth Observation Portal

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🗺️ Know Your Risk, Network Planning, Contingency Planning, and Preparedness
- ⚠️ Risk Prevention, and Risk Reduction
- 🇪🇺 Group on Earth Observations / European Space Agency

Global Earth Observation System of Systems (GEOSS) is a set of coordinated, independent Earth observation, information and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors. GEOSS is initiated to provide a global forum to monitor Earth system, which will strengthen disaster related data analysis and further help decision making. One of the main focuses for GEOSS is to provide access to diverse information using its Common Infrastructure (GCI), which is established through linking together existing and planned observing systems globally. Its shared environmental data and information are collected from observing systems contributed by countries and organizations within GEO. The design of GEOSS enables its users have a single Internet access point to seek data and other useful information that are imperative for decision making, planning and etc. The GEOSS Portal contains earth observatory data archives from all over the world and is operated by the European Space Agency. GEOSS also offers the GEONETCast network of telecommunication satellites for users with limited or no access to the Internet. GEONETCast is a global network of sustained and cost-effective satellite-based dissemination systems. It is based on collaboration between China (CMA), EUMETSAT and the US (NOAA). Its architecture is open and can accommodate other partners.



Help Kids Cope Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🗺️ Preparedness, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🇺🇸 Ozark Center & National Child Traumatic Stress Network

Help Kids Cope is a smartphone application designed to assist parents in talking to their children about different disasters they may experience or have already experienced. The application includes 10 different disaster types with sections in each on how to explain, prepare, respond, and heal from the event their family is concerned with. Each section gives guidance on talking to preschool, school-age, and adolescent children, as well as, includes ways parents can help themselves cope and support their children's reactions. Parent audio icons are located throughout the app—simply tap on these to hear a parent's personal story. The application is freely available in English language on Android and iOS operating systems and aims to assist parents in answering questions, including these: "How do I talk to my kids before, during, and after disasters?" "How can I help my child stay calm when we evacuate in a wildfire?" "What reactions from my child are common and when should I seek help?"



Post Disaster Needs Assessment Overview

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 📁 Contingency Planning, and Policy & Regulation
- ⚠️ Recovery
- 🏠 Global Facility for Disaster Reduction and Recovery

A Post-Disaster Needs Assessment (PDNA) is a government-led exercise; it provides a platform for the international community to assist the affected Government in recovery and reconstruction; it provides a coordinated and credible basis for recovery and reconstruction planning; it incorporates risk reduction measures and financing plans; and provides a systemic link into sustainable development. The Global Facility for Disaster Reduction and Recovery (GFDRR) provides an overview of previous PDNAs, labeled by country, year and disaster type on its website. The PDNAs conducted under the leadership of affected country governments are the most important tasks of the Standby Recovery Financing Facility (SRFF). The flagship products of SRFF are the reports that these assessments generate. These are reports of the respective governments prepared with the assistance of GFDRR and the international community at large. They are increasingly being used by governments and the international development community to base the recovery and reconstruction plans and programs upon. They are also as the base document for discussions to determine international development assistance in cases requiring external assistance including leveraging of targeted or additional assistance from the World Bank and other traditional donors. Photo: GFDRR



ThinkHazard! Hazard Data Portal

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, and Wildfires
- 📁 Know Your Risk, Network Planning, and Policy & Regulation
- ⚠️ Risk Prevention, and Risk Reduction
- 🏠 Global Facility for Disaster Reduction and Recovery

ThinkHazard! is a new web-based tool enabling non-specialists to consider the impacts of disasters on new development projects. Users of ThinkHazard! can quickly and robustly assess the level of river flood, earthquake, drought, cyclone, coastal flood, tsunami, volcano, and landslide hazard within their project area to assist with project planning and design. ThinkHazard! is a simple flagging system to highlight the hazards present in a project area. As such, a user is only required to enter their project location – national, provincial or district name. The results interface shows a user whether they require high, medium or low awareness of each hazard when planning their project.

ThinkHazard! also provides recommendations and guidance on how to reduce the risk from each hazard within the project area, and provides links to additional resources such as country risk assessments, best practice guidance, additional websites. ThinkHazard! also highlights how each hazard may change in the future as a result of climate change.



GAR Global Assessment Report on Disaster Risk Reduction

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔑 Know Your Risk, and Policy & Regulation
- ⚠️ Risk Prevention, and Risk Reduction
- 🏠 United Nations International Strategy for Disaster Reduction (UNISDR)

The Global Assessment Report on Disaster Risk Reduction (GAR) is a biennial global assessment of disaster risk reduction and comprehensive review and analysis of the natural hazards that are affecting humanity. The GAR contributed to achieving the aims of the Hyogo Framework for Action through monitoring risk patterns and trends and progress in disaster risk reduction while providing strategic policy guidance to countries and the international community. It will also be a powerful tool as the world works to implement the Sendai Framework for Disaster Risk Reduction through to 2030. The GAR aims to focus international attention on the issue of disaster risk and encourage political and economic support for disaster risk reduction. The GAR is produced in collaboration and consultation with a wide range of stakeholders, including various UN agencies, governments, academic and research institutions, donors and technical organizations and specialists. The GAR includes country profiles as well as a risk data platform that may benefit policymakers in the Asia-Pacific region in gaining a better understanding of national and regional risks and ensure e-resilience of critical ICT infrastructure.



ETC Emergency Telecommunications Cluster

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Wildfires, and Extreme Weather
- 🔑 Contingency Planning, Humanitarian Response, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🏠 The Emergency Telecommunications Cluster

The Emergency Telecommunications Cluster (ETC) is a global network of organizations that work together to provide shared communications services in humanitarian emergencies. The ETC is one of the 11 clusters designated by the Inter-Agency Standing Committee (IASC). The ETC website provides Emergency Telecommunications Cluster (ETC) project documentations, including meeting minutes, SitReps, maps, contact lists and updates. Timely, predictable, and effective information and communications technology (ICT) services provided by the ETC support improved: Response and coordination among humanitarian organizations; Operational security environment for staff and assets; Decision-making through timely access to critical information. Within 48 hours of a disaster, the ETC provides vital security communications services and voice and Internet connectivity to assist the response community in their life-saving operations. Within four weeks, ETC services are expanded for continued emergency relief. In the Asia-Pacific region, ETC has been activated in various disasters, including the aftermath of the 7.9 magnitude earthquake which struck Nepal in 2015 or a devastating typhoon in Indonesia in 2014. Through its ETC2020 strategy, the cluster is evolving from being primarily a service provider, to broker, facilitator and convenor of technology in emergency response. ETC2020 is the ETC's new strategy, to be achieved by 2020, to create a communications

environment for quick, effective and accountable humanitarian action. It seeks to enable an emergency response environment that provides humanitarians, citizens and governments with a seamless and resilient communications experience, grounded in humanitarian principles. Photo: ETC



Vanuatu Meteorological Services Portal

- 📍 Pacific
- ⚡ Typhoons / Cyclones, Tsunamis, and Extreme Weather
- 📍 Know Your Risk, Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 Vanuatu Meteorology and Geo-Hazards Department , Ministry of Infrastructure and Public Utilities, Vanuatu

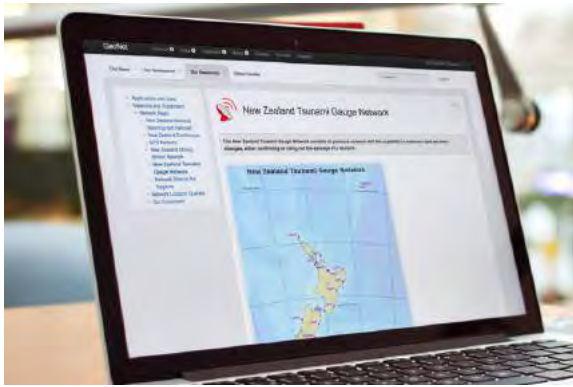
The Vanuatu Meteorology and Geo-Hazards Department (VMGD) through the Climate Division is actively involved in Awareness raising around the archipelago in an effort to get the general public to understand more about its services and other extreme climate phenomena's. The VMGD website provides latest warnings, as well as educational information and preparedness recommendations for tsunamis, tropical cyclones and extreme weather events. The main target groups are schools (both primary and secondary schools) and rural communities which make up 70% of the total population. Awareness topics include ENSO and its impacts, climate change and its impacts, tropical cyclones, clarification on warning systems and services; and on occasions try to raise the profile of Tsunamis. Climate Forecasting is currently the core service provided by the Climate Division through its bulletin 'The Vanuatu Climate Update'. These are Seasonal Rainfall Forecasting (6-monthly forecast), 3-monthly forecasts for the 2 main regions of Vanuatu, North Vanuatu which include TORBA, SANMA, PENAMA and MALAMPA Province (12°S – 16°S) and South Vanuatu which includes SHEFA and TAFEA Province (16° – 22°S). Specific forecasts for each province are also available. Tropical Cyclone Guidance are released before each cyclone season. The Climate Division also contributes to the preparation of the 'Island Climate Update' which is a seasonal forecast service produced by the National Institute for Water and Atmospheric Research (NIWA) for the Pacific Island Countries. The products are also distributed to various sectors in the country.



GeoNet New Zealand Earthquake Application

- 📍 Pacific
- ⚡ Earthquakes
- 📍 Know Your Risk, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏢 Ministry of Civil Defence and Emergency Management, New Zealand

GeoNet Quake is a smartphone application available on Android and iOS operating systems that provides information and alerts with regard to earthquake hazard in New Zealand. The application is free of charge and notifications can be set based on location and intensity, magnitude and depth. Provides a notification after a quake occurs. Option to set multiple notifications based on location and intensity, or magnitude and depth. Option to see recent earthquakes in a filterable list or map. Option to share quake info through social media (Facebook, Twitter, etc.) In addition to the application, GeoNet provides RSS feeds on felt earthquakes and volcanic alerts. GeoNet also offers information on tsunamis and monitors tsunami activity in New Zealand.



GeoNet New Zealand Tsunami Warning System

- 📍 Pacific
- ⚡ Earthquakes, Tsunamis, Landslides, and Volcanic Eruptions
- 🔍 Know Your Risk, Humanitarian Response, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇳🇵 Ministry of Civil Defence and Emergency Management, New Zealand

The Ministry of Civil Defence and Emergency Management of New Zealand (MCDEM) uses seismic sensors able to characterise potential tsunami-generating earthquakes occurring off the country's coast. It also operates or shares tsunami gauges across the greater New Zealand region to observe any tsunamis that may have been generated. The New Zealand seismograph network includes long-period seismic sensors which are able to detect potential tsunami-generating earthquakes occurring off the New Zealand coast. Analysis of the seismic waves can determine whether the event is likely to have disturbed the sea floor and caused a tsunami, allowing warnings to be issued by civil agencies. Such warnings will frequently come too late for people on the affected coast, but they will still be timely alerts for the initiation of any emergency response. MCDEM is responsible for the dissemination of national official tsunami notifications in New Zealand. With technical support from GNS Science, MCDEM assesses all messages received from the Pacific Tsunami Warning Center (PTWC, based in Honolulu, Hawaii) to determine the threat for New Zealand. Official tsunami notifications for New Zealand are disseminated by MCDEM via the National Warning System on a 24/7 basis. GeoNet also provides data on earthquakes, landslides and volcanoes on this page. A smartphone application for latest earthquake alerts is also offered.



eBayanihan Disaster Management System

- 📍 South-East Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Landslides, and Wildfires
- 🔍 Contingency Planning, Humanitarian Response, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇵🇭 Ateneo de Manila University

eBayanihan is a mobile and web based participatory disaster management system that allows citizens to participate in contributing and receiving disaster related information as part of disaster preparedness and mitigation. In fact, eBayanihan crowdsources information providing actionable response to make communities resilient to disaster. eBayanihan allows posting of citizen reports, shelter reports and flash reports for initial damage and needs assessment; connecting to friends and relevant social media sites; requesting skills, resources and volunteers; and visualize layers of information on a map. eBayanihan is available on mobile devices and operates an SMS service, but also offers a web-application containing reports and visualization modules. The data of the disaster management system is provided by citizens and local, regional and national agencies.



Early Warning eXplorer for Central Asia

- 📍 North and Central Asia
- ⚡ Floods, and Extreme Weather
- 🔍 Know Your Risk, and Preparedness
- ⚠️ Risk Prevention, and Preparedness and Response
- 🇺🇸 United States Geological Survey

The Early Warning eXplorer (EWX) software is an interactive web-based mapping tool that allows users to visualize continental-scale rainfall estimate (RFE), land surface temperature (LST) and total precipitable water (TPW) data and anomalies at varied time steps and review time series analyses. The United States Geological Survey (USGS) FEWS NET Data Portal provides access to geo-spatial data, satellite image products, and derived data products in support of FEWS NET drought monitoring efforts throughout the world. This portal is provided by the USGS FEWS NET Project, part of the Early Warning Focus Area at the USGS Earth Resources Observation and Science (EROS) Center.



Network of Environment Monitoring Stations

- 📍 North and Central Asia
- ⚡ Earthquakes
- 📍 Know Your Risk, and Humanitarian Response
- ⚠️ Preparedness and Response
- 🏢 Central-Asian Institute for Applied Geoscience

This Network of Environment Monitoring Stations monitors seismic activity and, depending on the location of the earthquake, may be used to give 10-15 second warnings before earthquakes reach certain locations. The database also provides a list of all important infrastructure, and together with real-time monitoring of seismic activity can aid in disaster response, assessment and coordination. The network is operated by the Central-Asian Institute for Applied Geoscience (CAIAG), a multidisciplinary institute comprising most of the geoscientific disciplines like geology, glaciology, hydrology, limnology, climatology, geophysics, geodesy and remote sensing. CAIAG operates dedicated monitoring networks for seismology and geodesy, a network of hydro-meteorological monitoring stations and high mountain glacier observatories.



Facebook Safety Check

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, and Wildfires
- 📍 Humanitarian Response, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🏢 Facebook

Safety Check is a feature of the social network Facebook that is meant to help Facebook users quickly alert friends and family that they are safe during times of crisis, like floods, earthquakes or tsunamis. Safety Check works by sending users a push notification asking them if they are safe whenever a natural disaster strikes the area they list as their current location. Users can then see a list of their Facebook friends in the area, and see which users have checked in as safe and which have not. The feature proved useful in the 2015 earthquake that struck Nepal. Within a few hours of the earthquake hitting, Facebook had activated Safety Check in the region. It identified users as possibly being in the affected area by their current city as listed on their profile, as well as the place from which they had most recently accessed Facebook. The desktop version of Safety Check also provided a brief synopsis of the event and emergency contact numbers. During the activation more than 7 million people in the affected area were marked safe, which generated notifications to over 150 million friends on the platform, Facebook announced.



Recommendations on Reducing Submarine Cable Cuts

- 📍 North and Central Asia
- ⚡ Tsunamis
- 📦 Network Planning
- ⚠️ Risk Prevention, and Risk Reduction
- 🇷🇺 Rostelecom, Russian Federation

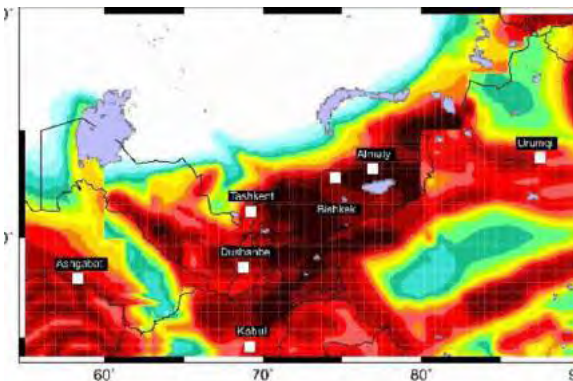
A large number of submarine cable (which are essential for international Internet connectivity) cuts are due to damage from anchors. A recent example from the Russian Federation's Rostelecom demonstrates how to reduce such risk by laying the cable close to shore through tunnels close to the beach rather than on the seafloor. In addition, warnings are posted on the beach showing that dropping anchors is prohibited. This can also mitigate the risk from powerful waves, such as from tsunamis. Photo: Refleader.ru



Get Ready Get Thru Information Portal

- 📍 Pacific
- ⚡ Earthquakes, Floods, Tsunamis, Landslides, Volcanic Eruptions, and Extreme Weather
- 📦 Know Your Risk, Contingency Planning, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇳🇿 Ministry of Civil Defence and Emergency Management, New Zealand

Get Ready Get Thru is an online multilingual guide for New Zealand to plan for and respond to disasters (offered in English, Chinese (both simplified and traditional), Hindi, Korean, Te Reo, Samoan, Tongan and Arabic). Due to its location and environment, New Zealand faces many potential disasters. In some cases, such as a weather related or volcanic disaster, there may be time for a warning. But an earthquake or a tsunami close to land could strike without warning. All disasters have the potential to cause disruption, damage property and take lives. Therefore, preparation is critical. The portal offers information material on different hazards, as well as guidance on establishing a household emergency plan and creating an emergency survival kit. In addition, information for people with disabilities is being offered and emergency contact details are provided.



Earthquake Model Central Asia

- 📍 North and Central Asia
- ⚡ Earthquakes
- 📦 Know Your Risk, and Network Planning
- ⚠️ Risk Prevention, and Risk Reduction
- 🇩🇪 GFZ German Research Centre for Geosciences

The Earthquake Model Central Asia (EMCA) is a Global Earthquake Model (GEM) regional program coordinated by the GFZ. The EMCA (Earthquake Model Central Asia) catalogue includes information for 33620 earthquakes that occurred in Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan). The catalogue provides for each event the estimated magnitude in terms of MLH (surface wave magnitude) scale, widely used in former USSR countries. MLH magnitudes range from 1.5 to 8.3. Activities are subdivided into "Seismic hazard assessment and Microzonation", "Seismic Vulnerability", and "Earthquake Risk". The catalogue includes the standard parametric information required for seismic hazard studies (i.e., time, location and magnitude values) and has been composed by

integrating different sources (using different magnitude scales) and harmonised in terms of MLH scale. The MLH magnitude is determined from the horizontal component of surface waves (Rautian and Khalturin, 1994) and is reported in most of the seismic bulletins issued by seismological observatories in Central Asia. For the instrumental period MLH magnitude was estimated, when not directly measured, either from body wave magnitude (Mb), the energy class (K) or Mpva (regional magnitude by body waves determined by P-wave recorded by short-period instruments) using empirical regression analyses. The dataset is freely available for scientific use.



J-SHIS Seismic Hazard Maps Japan

- 📍 East and North-East Asia
- ⚡ Earthquakes
- 🔍 Know Your Risk, Network Planning, Contingency Planning, and Policy & Regulation
- ⚠️ Risk Reduction, and Preparedness and Response
- 🇯🇵 Japan Headquarters for Earthquake Research Promotion (HERP)

J-SHIS was established to help prevent and prepare for earthquake disaster by providing a public portal for seismic hazard information across Japan. The offered maps contain a lot of information including the data required for mapping such as seismic activity models, seismic source fault models, subsurface structure models, and other models. The National Seismic Hazard Maps for Japan is prepared by a governmental organization, the Headquarters for Earthquake Research Promotion (HERP) to estimate strong motions caused by earthquakes that could occur in Japan in the future and show the estimated results on the maps. The National Seismic Hazard Maps for Japan consist of two types of maps different in nature: the Probabilistic Seismic Hazard Maps (PSHM) that combine long-term probabilistic evaluations of earthquake occurrence and strong motion evaluation, and the Seismic Hazard Maps for Specified Seismic Source Faults (also referred to as Scenario Earthquake Shaking Maps (SESM) in J-SHIS), which are based on strong motion evaluation for scenarios assumed for specific earthquakes.



Global Earthquake Model & OpenQuake Platform

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes
- 🔍 Know Your Risk, Network Planning, Preparedness, and Policy & Regulation
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🌐 Global Earthquake Model Foundation

The Global Earthquake Model (GEM) Foundation is a public-private partnership that drives a global collaborative effort in which science is applied to develop high-quality resources for transparent assessment of earthquake risk and to facilitate their application for risk management around the globe. The GEM Foundation works in 4 main areas: Development and maintenance of high-quality earthquake risk assessment tools; Collection and generation of earthquake risk information (datasets, models, methods and guidelines); Development and implementation of collaborative risk assessment projects at various scales; Technology transfer and capacity development. Through the OpenQuake Platform, GEM provides earthquake risk assessment tools, as well as risk assessments at local, national, regional and global level. In addition, earthquake risk information is provided, including hazard exposure vulnerability maps and datasets. Relevant to the Central Asia region: the Earthquake Model Central Asia (EMCA) is a regional programme focusing on crossborder assessment of seismic hazard and risk in Central Asia. The activities are subdivided into: Seismic Hazard Assessment and Microzonation, Seismic Vulnerability, and Earthquake Risk.



Sentinel Asia Web-GIS Technology

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Floods, Tsunamis, Glacial Lake Outburst Floods, Wildfires, and Extreme Weather
- 🛡️ Humanitarian Response, and Preparedness
- ⚠️ Preparedness and Response, and Recovery
- 🏠 Asia-Pacific Regional Space Agency Forum

The Sentinel Asia initiative is an international collaboration among space agencies, disaster management agencies, and international agencies for applying remote sensing and Web-GIS technologies to support disaster management in the Asia-Pacific region. Its aims include the following: Improve safety in society by Information and Communication Technology (ICT) and space technologies; Improve the speed and accuracy of disaster preparedness and early warning; Minimize the number of victims and social/economic losses. The main activities of Sentinel Asia are as follows: Emergency observation by Earth observation satellites upon request in cases of major disasters; Working group activities focusing on specific disasters such as wildfires, floods, glacial lake outburst floods (GLOF), and tsunamis; Capacity building and human resources development for effective disaster management.



ERDAS IMAGINE Geospatial Data Authoring System

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Landslides, Glacial Lake Outburst Floods, and Extreme Weather
- 🛡️ Know Your Risk, Contingency Planning, Humanitarian Response, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🏠 Hexagon Geospatial

ERDAS IMAGINE is a geospatial data authoring system, including tools for remote sensing, photogrammetry and GIS processing. The tool has been promoted, among others, in the North and Central Asia region. The software has various characteristics: Assess disaster situations in the field and collect information on the damage to assist in recovery operations. An extensive repository enables multiple agencies to rapidly access and interactively work from a single source of truth. View data related to disaster planning, response, and recovery in multiple contexts (e.g., desktop, web, mobile, 3D) for a fully coordinated interagency response. Proactively evaluate exposure by simulating the impact of storm events on critical facilities such as schools and hospitals before danger strikes. Plan evacuation and recovery response. Enhance existing planning efforts by combining late-breaking information to obtain a complete view of a changing situation. ERDAS IMAGINE promotes the development of a unified information source for better information sharing and coordination. It promotes preventing inefficiencies, errors, and risks that arise when departments work with islands of data, and simultaneously improve data distribution by easily organizing massive volumes of mission-critical data and quickly presenting it to first responders and relief agencies. The software allows to enlist the masses to help define and locate issues during disasters, such as road damage, tornado appearances, issues at shelter locations, water leaks, and more. Field personnel can view the latest information in real-time with mobile tablet devices and respond appropriately.



Space Applications for Environment (SAFE)

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Floods, Droughts, Dzuds, and Extreme Weather
- 🔍 Know Your Risk
- ⚠️ Risk Reduction
- 🏠 Asia-Pacific Regional Space Agency Forum

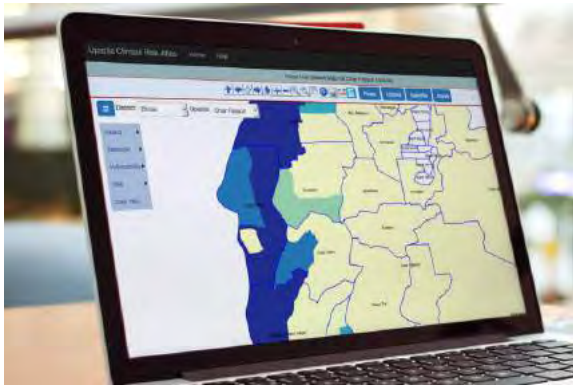
Space Applications for Environment (SAFE) is a voluntary initiative to encourage environmental monitoring in the long term to understand environmental changes. SAFE may be useful for risk reduction and adaptation programs associated with disasters and environmental risks. The Asia-Pacific region contains approximately two thirds of the world's population, and it faces a huge threat from disasters, including droughts and floods. Therefore, it is important to monitor climatic parameters as well as possible effects related to climate and environmental changes. Satellite remote sensing technology enables observation of the Earth from space and provides a basis for the measurement of some of the changing environmental parameters in various areas such as water resources, sea level, land cover, deforestation, agricultural production, and ecosystems. Continuous provision of such data could provide environmentally sensitive information with varying spectral and spatial resolutions for a better understanding of the status of the environment, its changes, and implications for its sustainable management. In the Asia-Pacific region, SAFE has carried out weather-related projects in, among others, Sri Lanka (development and implementation of an operational prototype for advanced flood forecasting, early warning, and data sharing), Viet Nam (utilization of satellite data in flood forecasting), Indonesia (drought monitoring), Cambodia (water cycle and agricultural activities) and Lao PDR (forest monitoring).



Central Asia Region Flash Flood Guidance System

- 📍 North and Central Asia
- ⚡ Floods, and Glacial Lake Outburst Floods
- 🔍 Know Your Risk, Contingency Planning, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🏠 World Meteorological Organization (WMO)

In the Central Asia region, flash floods account for a significant portion of the lives lost and property damages that result from natural disasters. Given that flash floods can occur at any time or place with disastrous results, there is an urgent need to prioritize efforts that aim to improve early warnings capabilities. Improvements help society cope with flash flood threats by enabling the mandated national authorities to undertake appropriate measures, thereby contributing to protecting the population at risk from the disastrous effects of flash floods. The purpose of this project is the development and implementation of regional flash flood guidance and early warning systems. The approach will entail development of regional technology, training, protocols and procedures to help mitigate the impacts from flash flooding. The application of such a system allows the National Meteorological and Hydrological Services (NMHSs) of the participating countries to provide timely nearly warnings of flash flooding. Specifically, the countries to be included in the Central Asia Region Flash Flood Guidance (CARFFG) System project are proposed to be the following: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The CARFFG System operational training took place at the HRC premises in Dan Diego, USA. Trainees from Kazakhstan, Uzbekistan, Tajikistan, and Kyrgyzstan as well as Lebanon, have successfully completed the training courses. Trainees have become familiar with technical and scientific aspects of the Central Asia Region Flash Flood Guidance System and to be able to interpret the CARFFG products for the issuance of flash flood warnings. Training also emphasized the importance of the local data for particularly bias correction of satellite precipitation estimation. Participants have also been introduced to QGIS, open source GIS and freely available, enabling trainees to further process CARFFG data and products. Additionally, participants were exposed numerous case studies, and hands-on exercises of the past flash flood events that had accrued in the region ("daily operations").



Bangladesh Upazila Climate Risk Atlas

- 📍 South and South-West Asia
- ⚡ Floods, Droughts, and Extreme Weather
- 🔍 Know Your Risk, Network Planning, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🇬🇧 Ministry of Disaster Management and Relief, Bangladesh

The Risk Atlas is basically a compendium risk maps for the area, population, agriculture and infrastructures at the Upazila level. The Atlas also includes information on different types of vulnerability and exposure to different hazards. The aim of the Risk Atlas is to provide the local government authority with easy, accessible and credible information and references for local level risk reduction and adaptation planning. The Comprehensive Disaster Management Programme (CDMP II) engaged the Center for Climate Change and Environmental Research (C3ER), BRAC University to prepare the Risk Atlas. A team of engineers, geographers, cartographers, environmental scientist and social scientists worked together to collect, analyze and use updated data and information on hazards, vulnerability and risks both from the national and other published sources. The team shared the draft Atlas with the planners and policy makers at local and national levels for validating data, information and assessing its usefulness. Reports in the Atlas are available in both English and Bangla and maps can be accessed and downloaded by region and upazila.



Firetide Wireless Mesh Network Flood Monitoring

- 📍 South-East Asia
- ⚡ Floods
- 🔍 Humanitarian Response, and Preparedness
- ⚠️ Preparedness and Response
- 🇹🇭 UNICOM

Firetide, Inc., a provider of high-performance wireless infrastructure mesh networks, installed the world's first mesh network capable of delivering live high-definition (HD) wireless video feeds of river water levels and telemetry data for real-time flood forecasting and historical data collection in Thailand. In addition to the live HD video feeds to the control room, live VGA resolution video feeds are provided to the public via the Internet. The Firetide network, which covers a geographical distance of 231 miles (372 km), is the world's longest fully redundant wireless mesh network. New expansion phases of the network are planned for deployment.



Monster Guard Kids Mobile Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Floods, Typhoons / Cyclones, and Extreme Weather
- 🔍 Preparedness, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🇺🇸 American Red Cross

Monster Guard is a mobile application created by the American Red Cross that is designed specifically for kids with the aim of preparing them for disasters. Follow Maya, Chad, Olivia and all the monsters as they teach kids (aged 7-11) about how to prepare for real-life emergencies-at home plus other environments-in a fun and engaging game. By training as a Monster Guard, children are able to learn how

to prepare for home fires, tornadoes, hurricanes, floods, severe winter weather and other types of emergencies. The smartphone application is available in English language for download on iOS and Android mobile and tablet devices. The educational game targets children from the ages 7 to 11 but children (or adults) of all ages can enjoy. However, it is important that parents are aware that there are many photographic images that sensitive or imaginative children will find disturbing: homes and roads underwater from floods, vehicles and property overturned and torn up by tornadoes, roads shredded by earthquakes, and more. Photo: WDAY



DUMBONET Multimedia Communication System

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Tsunamis, and Landslides
- 🔧 Network Planning, Contingency Planning, and Humanitarian Response
- ⚠️ Preparedness and Response
- 🏢 Asian Institute of Technology

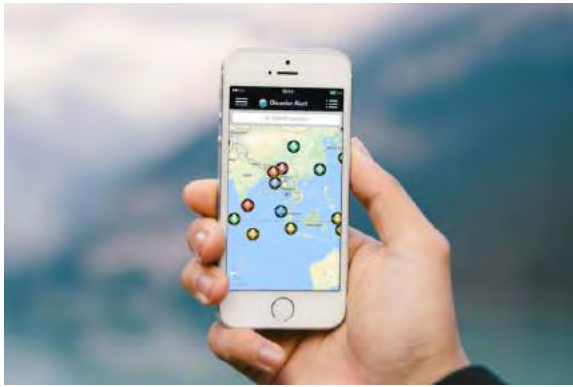
For many disasters prone countries, one issue in terms of post-disaster rescue mission is the lack of emergent communication system. To address this issue, DUMBONET, a multimedia communication system, has been developed by AIT interLab and its partners for collaborative emergency response operation. Its design includes mobile ad hoc networks (MANET) and a satellite IP network with conventional terrestrial Internet connectivity. In particular, DUMBONET is expected to send and receive multimedia information effectively for rescue missions and plan-making when disaster areas are relatively isolated. In an abstract model of DUMBONET, when traditional communication infrastructure is no longer available, people will use mobile devices create a self-organizing, self-resilient mobile ad-hoc network that permits multimedia communication among the devices. In addition, multimedia communication among different sites and with the command headquarter will also be provided. Different MENET devices also include WiFi, satellite and terrestrial connectivity. Digital Ubiquitous Mobile Broadband OLSR (DUMBO) has been applied in Nepal in the April 2015 earthquake. Read more about Nepal's experience on the AIT website.



Resilient Communications R&D Program

- 📍 East and North-East Asia
- ⚡ Earthquakes
- 🔧 Contingency Planning, Humanitarian Response, Policy & Regulation, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🏢 Ministry of Internal Affairs and Communication, Japan

Japan is highly vulnerable to earthquakes that cause loss of life and damage to property. When there is a disaster, problems like heavy traffic congestion, damage of the base station will restrain efficient communications through commercial operators. Therefore, an R&D program has been initiated by the Ministry of Internal Affairs and Communications of the Japanese Government to establish robust, resilient and dependable communications in the event of disasters. The goal of the R&D program is to create alternative communication routes through developing related technologies. The conceptual structure of the multilayered communications network includes (1) operator's cellular network, (2) public and private networks, (3) ITS, and (4) satellite systems. For example, when there is a disaster and the commercial operators' networks are damaged; under R&D program, a mobile phone will automatically connect to a surviving local network, such as private WiFi. However, a "policy server" will be installed to decide whether or not the network can be open to third users, as a security consideration.



PDC Disaster Alert Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Wildfires, and Extreme Weather
- 📍 Know Your Risk, Contingency Planning, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏠 Pacific Disaster Center

Disaster Alert is a free to download, global, multi-hazard monitoring and alerting application for both iOS and Android operating systems. Disaster Alert is accessible both on the web and through mobile app. Disaster Alert is an initiative of the Pacific Disaster Center (PDC), which monitors various types of disasters using data collected by satellites. When people open the app or website through personal computer or mobile phone, they could quickly view hazards around the globe on the map. The design of the application also enables individuals to locate hazards in a specific area. On a policy-making level, PDC could provide vulnerability assessments that help decision makers to identify the scope and the magnitude of the negative impacts of hazards. Using images from satellites, PDC helps disaster managers to visualize the hazard characteristics and potential impacts of a disaster.



Bangladesh Cyclone Preparedness Program

- 📍 South and South-West Asia
- ⚡ Typhoons / Cyclones
- 📍 Know Your Risk, Network Planning, Preparedness, Policy & Regulation, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏠 The Government of Bangladesh and Bangladesh Red Crescent Society, UN, International Red Cross

The Cyclone Preparedness Program (CPP) operates an extensive network of radio communications facilities in the coastal areas of Bangladesh. It consists of a combination of High Frequency and Very High Frequency radios that covers the high-risk cyclone zone areas. The CPP network utilizes over 42,000 volunteers along with a transceiver telecommunication network to ensure rapid delivery of warning. Warning information can be disseminated to the responding agencies and the public in less than 15 minutes from the time of warning issuance to the beginning of evacuation orders. The program has a significant emphasis on training and public awareness. These volunteers are trained through training program and they are equipped with warning equipment such as megaphones and sirens.



EWBS Emergency Warning Broadcast System

- 📍 South-East Asia
- ⚡ Earthquakes, and Tsunamis
- 📍 Know Your Risk, Preparedness, and Communication with Citizens
- ⚠️ Preparedness and Response
- 🏠 National Telecommunications Commission (NTC), Philippines

The Emergency Warning Broadcast System (EWBS) incorporates new technology into early warning systems alongside traditional methods of communication. EWBS is a remote activation system for Radio & TV that transmits alert/warning information to viewers and listener about a relevant disaster. EWBS is a feature of the Integrated Services Digital Broadcast-Terrestrial (ISDB-T) system, which is initially created

by Japan. The ISDB-T standard has been adopted by more than 15 countries in recent years. Find out more about EWBS in the Philippines through the link below:



Terai Cross-Border Flood Early Warning System

- 📍 South and South-West Asia
- ⚡ Floods
- 📁 Know Your Risk, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏠 Christian Aid

Terai is a low-lying region in Northwestern India and Southern Nepal. For years, the area has been affected by recurring floods, resulting in loss of lives. Christian Aid, with its local partner Poorvanchal Gramin Vikas Sansthan (PGVS), initiated a pilot flood early warning system in the Terai region. The system monitors the water level in the upstream at Chisapani in Nepal using information from the department of hydro meteorology, Government of Nepal. This information is also shared with Indian counterparts. Community groups in both countries are equipped with an electronic display machine, which reflects information in real time. The system is also equipped with an Alert Alarm System that will be activated based on the water level in Nepal.



Academy of ICT Essentials for Government Leaders

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 📁 Know Your Risk, Network Planning, Contingency Planning, Preparedness, and Policy & Regulation
- ⚠️ Risk Prevention, Risk Reduction, Preparedness and Response, and Recovery
- 🏠 Asian and Pacific Training Centre for ICT for Development (UN-APCICT)

APCICT Virtual Academy is the online distance learning programme of UN-APCICT "Academy of ICT Essentials for Government Leaders". The goal of the Academy is to equip policy makers and other government officials with the essential knowledge and skills they need to fully leverage information and communication technologies (ICTs) to achieve national development goals. Modules that are of particular relevance to e-resilience are: Module 9: ICT for Disaster Risk Management Module 10: ICT, Climate Change and Green Growth Module 11: Social Media for Development In addition to the other 8 ICT focused modules which are very useful to get a holistic understanding of the subject, these modules aim to inform teachers and learners on the risks associated with disasters, impacts of climate change and how green growth is a viable development option as well as social media for development and DRR/DRM. How ICT can support DRM and the threats to ICT from disasters are presented. Good case studies on how ICT is applied are also provided to make the teaching/learning experience more fruitful. Trainers can download and customize training materials, while learners can take each module as a self-paced online course. Launched in 2008, the Academy's comprehensive curriculum was developed in partnership with ICT experts from countries throughout the world. Currently, 11 Academy modules are available in various languages, with new training modules and more translations underway to meet the ICT capacity needs of ESCAP member and associate-member States. APCICT developed the Virtual Academy in multiple languages to bring Academy curriculum and training to a wider audience. As part of the online learning experience, online interactive Communities of Practice have been established to enable learners with common interests to share knowledge and best practices related to topics on ICT for development (ICTD). UN-APCICT was inaugurated on 16 June 2006 as a regional institute of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), and is located in Incheon, Republic of Korea. The Centre's

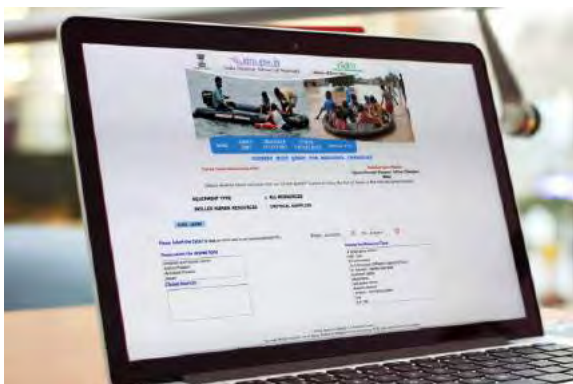
mission is to strengthen the efforts of the member countries of ESCAP to use ICT in their socio-economic development through human and institutional capacity building. To meet this objective, APCICT's work is focused on three inter-related pillars – Training, Research and Advisory Services. Together they form an integrated approach to ICT human capacity building.



Sahana Disaster Management Software

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, and Wildfires
- 🔦 Contingency Planning, Humanitarian Response, and Preparedness
- ⚠️ Risk Prevention, Risk Reduction, Preparedness and Response, and Recovery
- 🏠 Sahana Foundation

Sahana is a free, open-source codebase which provides a flexible, modular platform for rapidly deploying information management systems for disaster management and humanitarian use. Features of the Sahana EDEN software include over 20 modules which can support all phases of the emergency cycle: Organisation directory Human resources management Projects database Alerting and incidents planning Information on shelters Health facilities and disease tracking & patient tracking Assets, warehousing and requests management (logistics) Demographics, risks, outreach and assessments tools Collaboration tools including mapping, messaging and documents handling Sahana" means "relief" in Sinhalese, a language of Sri Lanka, where the first "Sahana" product was developed. It was developed in the immediate aftermath of the 2004 Indian Ocean earthquake and tsunami by the Lanka Software Foundation (LSF). In early 2009, at the request of the LSF, the software project spun off to become it's own US-based non-profit organization with a mission to develop open source software for humanitarian purposes. Since then, the SSF has developed a number of open source software products and implemented solutions used by some of the world's largest relief organizations, as well as a myriad of emergency services agencies in uniquely vulnerable nations such as the Philippines, Nepal and Bangladesh. The Sahana Software Foundation structure includes a Board of Directors, Foundation Members, Executive Committees and Project Management Committees who coordinate the voluntary efforts of its global community of contributors. The community has over 200 members, with volunteers from all over the world. The diverse team of contributors come from industry, academia, non-governmental humanitarian relief organizations and government agencies. The Sahana EDEN software modular approach as well as the Sahana Foundation organisational structure are examples of how effective and well planned ICT applications and efforts can thrive and continue to serve humanity for over 12 years. This tool/best practice improves preparedness and response efforts greatly by providing a 1 stop solution for crisis management. The data collected and the knowledge gained from Disaster events can be used to reduce risk and in prevention efforts. As part of the foundations on going efforts to reduce risk, it does field work such as working with communities and people where a low-literacy level increases their risk during disasters because they are unable to understand meteorological services text bulletins. They strive to understanding how pictographs maybe be more effective in these types of communities as disaster warnings.



IDRN India Disaster Resource Network

- 📍 South and South-West Asia
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Droughts, Wildfires, and Extreme Weather
- 🔦 Contingency Planning, Humanitarian Response, and Preparedness
- ⚠️ Risk Reduction, Preparedness and Response, and Recovery
- 🏠 National Institute of Disaster Management, India

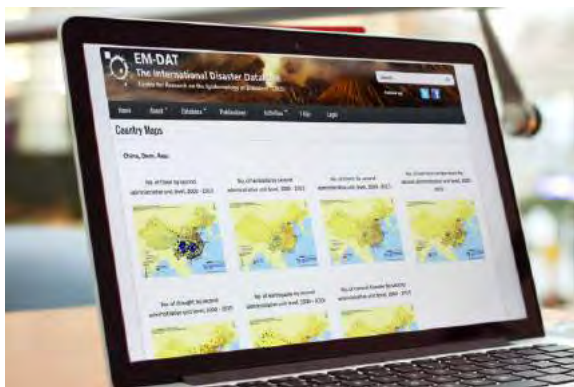
The India Disaster Resource Network (IDRN) is a web based platform for managing inventories of equipment, skilled human resources and critical supplies for emergency response. The primary focus of the IDRN portal is to enable the decision makers to better understand the availability of equipment and human resources required to deal with any emergency situation. The nation-wide electronic inventory of resources is comprised of data on equipment and human resources, collated from districts, states and national level line departments and agencies. The available information is readily accessible to anyone online. The user has to select a state and district as well as the resource type which range from 4 wheel drive vehicles, chlorine tablets, electric torch, ladders and so on, and must specify a date period to retrieve information. The online inventory of resources is hosted at the National Informatics Centre (NIC), New Delhi. Only the authorized Government officers have access to upload data onto the portal and to use the members only sections of the online portal. The district authorities facilitate data collection and updating. Data is monitored and maintained at the central level by National Institute of Disaster Management (NIDM), under the Ministry of Home Affairs. NIDM is also responsible for the overall administration of the portal. To keep it comprehensive and sustainable, the initiative has been institutionalized within the national government structure. District Collectors/Magistrates are authorized to collect the latest information on disaster management resources which are available at various line departments/agencies and upload onto the portal, with the assistance of District Informatics Officers. Training programs were carried out over various years up till 2015 on operating and maintaining the database. The database allows officials to better manage available resources improving response and recovery efforts. The database also enables assessment of levels of preparedness for specific disasters. These elements make this a good best practice on e-resilience, as well as a tool that can be scaled and implemented easily in other parts of the world.



PAGASA Weather Monitoring, Prediction & Alert System

- 📍 South-East Asia
- ⚡ Floods, Typhoons / Cyclones, Tsunamis, Droughts, Wildfires, and Extreme Weather
- 🔑 Know Your Risk, Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Prevention, Risk Reduction, Preparedness and Response, and Recovery
- 🇵🇭 Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

The National Meteorological and Hydrological Services agency of the Republic of the Philippines is mandated to provide protection against natural disasters through weather monitoring, forecasting and prediction modelling, and related alerts. The goal is to serve as the central agency for everyone to rely on during all phases of disasters. Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) provides information through various ICT including online, radio, TV, mobile alerts and even works with village level focal points to quickly spread alerts among citizens during emergency situations. The agency also monitors and reports on weather and climate in relation to aviation, marine activity, agriculture, and gives emphasis to tropical cyclones and floods as these hazards are prevalent locally. It plays a critical role in all the phases of disasters and is a major contributor to the e-resilience of the country. One of the products available is the Met-hydro Decision Support Infosys, which provides real time information presented as an online map that can be toggled by the user to show layers of information. Humidity, temperature, pressure, solar radiation, wind direction, wind speed, and rain related information is quickly accessible through this system. This information is directly fed from the weather stations. It also provides radar information from various locations around the country as well as satellite images from multiple sources. To enhance PAGASA's weather data gathering capabilities, automatic rain gauges (ARG) and automatic weather stations (AWS) were installed throughout the country. These ARGs and AWSs are automated version of the traditional weather station that enables measurements of parameters such as barometric pressure, atmospheric pressure, air temperature, relative humidity, wind speed and direction from remote areas using meteorological sensors attached to rechargeable batteries powered by solar panels. With the use of mobile technology, these stations report through the telecommunication networks. Further services offered through PAGASA: 4-hour rainfall forecast Weather forecasts from numerical prediction model Flood monitoring for metro Manila Risk maps Flood hazard maps In order to maintain sustainability, many of these products and services are delivered through strategic partnerships with various local and international agencies and donors. It has been granted ISO 9001:2008 certification.



EM-DAT International Disaster Database

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Droughts, Dzuds, Wildfires, and Extreme Weather
- 🔍 Know Your Risk, Network Planning, Contingency Planning, Policy & Regulation, and Communication with Citizens
- ⚠️ Risk Prevention, Risk Reduction, Preparedness and Response, and Recovery
- 🏠 Centre for Research on the Epidemiology of Disasters

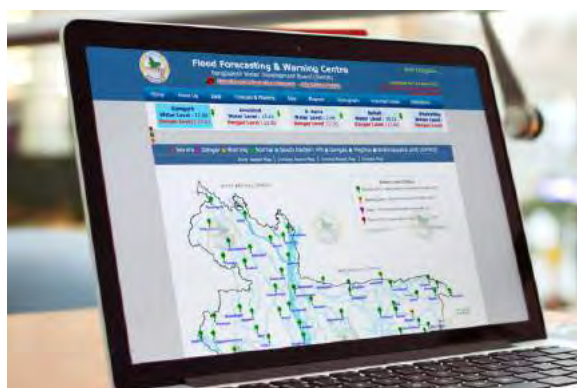
EM-DAT is an online database of historical disaster related information maintained by the Centre for Research on the Epidemiology of Disasters (CRED). It is a global database on natural and technological disasters, containing essential core data on the occurrence and effects of more than 21,000 disasters in the world, from 1900 to present. EM-DAT provides an objective basis for vulnerability assessment and rational decision-making in disaster situations. For example, it helps policymakers identify the disaster types that are most common in a given country and that have had significant historical impacts on human populations. In addition to providing information on the human impact of disasters - such as the number of people killed, injured or affected, EM-DAT provides disaster-related economic damage estimates and disaster-specific international aid contributions. Disasters data are available at a country-aggregated level. Development and relief agencies have long recognized the crucial role played by data and information in mitigating the impacts of disasters on vulnerable populations. Systematic collection and analysis of these data provides invaluable information to governments and agencies in charge of relief and recovery activities. They are also crucial in the integration of health components into development and poverty alleviation programmes. Yet there is still no international consensus regarding best practices for collecting these data. Together with the complexity of collecting reliable information, there remains huge variability in definitions, methodologies, tools and sourcing. EM-DAT is aimed at overcoming some of these issues. The database is made up of information from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies. Priority is given to data from UN agencies, governments, and the International Federation of Red Cross and Red Crescent Societies. This prioritization is not only a reflection of the quality or value of the data, it also reflects the fact that most reporting sources do not cover all disasters or have political limitations that could affect the figures. The entries are constantly reviewed for inconsistencies, redundancy, and incompleteness. CRED consolidates and updates data on a daily basis. A further check is made at monthly intervals, and revisions are made at the end of each calendar year. Disasters data are entered at a country-aggregated level. The search engine has been designed to allow users to directly browse EM-DAT's updated and validated disaster information. The search is composed of: Country profiles, given by natural and technological disasters. Disaster profiles, given by natural and technological and groups of disasters. Disasters list, accessible by selecting a data set (region or country, period or period in years, disaster group or disaster type). The Advanced Search, allowing users to generate datasheets based on the overall EM-DAT records. Three statistical options are available to generate tables and data sets: Frequency, cross tabulations and totals. Maps (based upon the EM-DAT database), providing geographical summaries of natural disasters events and impacts since 1974. A Trends Section, providing numerous pre-made graphs and other figures that display various trends and relationships within the EM-DAT. The database is used by many UN agencies including ESCAP and WHO, journals and news papers and others for research purposes in order to better understand and deal with disasters. CRED is located at the School of Public Health, Université catholique de Louvain in Brussels, Belgium. The database itself is accessible world wide through the internet.



Disaster Early Warning Phone Number

- 📍 South and South-West Asia
- ⚡ Floods, Typhoons / Cyclones, Tsunamis, Landslides, and Extreme Weather
- 🔍 Know Your Risk, Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction
- 🏠 Ministry of Disaster Management and Relief, Bangladesh

By dialing 10941 in Bangladesh, people can receive emergency alerts and early warning information related to weather, rainfall, cyclones, floods and landslides. The service is provided free of charge, irrespective of the mobile phone operator. The following warnings are disseminated: Inland River port warnings, four times daily, for safer river navigation. Sea bulletins, twice daily, to help protect the incoming and outgoing vessels traveling on the Bay of Bengal. 24 Hours Weather Forecast including rainfall and temperature for the general public. 5 Day Weather Forecasts including rainfall and temperature for farmers. Traditionally early warning and alerts in Bangladesh followed push protocols where alerts and warnings were broadcast on Television, Radio and published in Newspapers at the time of emergencies only. Officials working on disaster management and relief realized that these channels of information dissemination were inefficient and ineffective in terms of reaching the most at risk communities at the right time, hindering these communities from preparing well ahead of any potential disasters. The increase in mobile phone users opened up an avenue to introduce pull protocols where people can now receive alerts and warning whenever needed, allowing them to prepare themselves for potential disasters accordingly. When someone dials the number, an Interactive Voice Response (IVR) based system takes them through to the alert they are listening for. The system was first piloted in 2010 and then scaled-up to cover the entire country. The system is part of the efforts of the Ministry of Disaster Management and Relief to reduce risk and be better prepared for multi-hazards. This type of mobile phone leveraging tool contributes to the e-resilience of vulnerable communities and addresses critical gaps in information dissemination in preparation for and during disasters.



FFCW Flood Forecasting & Warning Centre

- 📍 South and South-West Asia
- ⚡ Floods
- 🔍 Know Your Risk, Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Prevention, Risk Reduction, and Preparedness and Response
- 🇬🇧 Bangladesh Water Development Board (BWDB)

The Flood Forecasting & Warning Centre (FFWC) provides rainfall and water level tables, forecasting and warnings through structure based forecasting, experimental 5 day deterministic forecasting, and satellite altimetry. It provides a real time water level map of Bangladesh showing normal, warning, flooding, and severe flooding (danger level). Physical water level readings are obtained through water level monitoring stations. FFWC through its Forecasting and Warning Services (FFWS) generates and provides flood forecasts and warning information to enhance the disaster management capacity of national agencies and communities using the best scientific principles, real time data, weather forecast information and mathematical models. The aim is to act as a centre of emergency response through FFWS to minimize or mitigate loss of life and property damage by enhancing capacity of agencies and communities. The center works with partners to continuously update and improve FFWS and the capacity of professionals. The Ministry of Water and Resources (MoWR) through the Bangladesh Water Development Board provide these services. Floods in Bangladesh are divided into monsoon river floods, flash floods, local rainfall floods and storm surge floods. Inflow through the Ganges, Brahmaputra and Meghna Rivers and rainfall causes the water level in the rivers to rise and fall during the monsoon season. To predict water level conditions in Bangladesh FFWC collects measurements of water level and rainfall, satellite pictures and simulates the water level conditions by use of a numerical model of the Bangladeshi river network. Every day during most of the monsoon season the model simulates the water level conditions during the previous 7 days (hind-cast simulations) and during the coming 3 days (forecast simulation). More precisely the forecasting starts during early monsoon when one of measuring stations shows a water level 60 cm below danger level. The model is named the "Super Model" and is based on measurements of the topography of Bangladesh and the general numerical hydrodynamic model system named MIKE 11 developed at DHI Water & Environment. This type of modelling tool, even though there are margins of error associated with it, is considered vital in flood prediction and risk reduction. E-resilience is enhanced through continuous improvements to modelling techniques, physical gauges and readings, and computing power.



AIDR Artificial Intelligence for Disaster Response

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, North and Central Asia, and Pacific
- ⚡ Earthquakes, Floods, Typhoons / Cyclones, Tsunamis, Landslides, Volcanic Eruptions, Glacial Lake Outburst Floods, Wildfires, and Extreme Weather
- 🛡️ Humanitarian Response
- ⚠️ Preparedness and Response
- 🏢 Qatar Computing Research Institute (QCRI)

AIDR (Artificial Intelligence for Disaster Response) is a free and open source software that automatically collects and classifies tweets that are posted during humanitarian crises. There is far too much data produced via social media during crisis situations for humans to manage on their own. In addition, the data are too rich and complex for machines to successfully process them. AIDR combines the best of both worlds by combining human and machine intelligence. In conjunction with Tweets and the Micromappers software, AIDR is able to learn from humans working on humanitarian situations and assists to make sense of the ton of text data, video, and images that are generated. For work related to humanitarian or crisis response where Twitter use needs to be more cohesive, AIDR can assist to gather and classify tweets about a particular situation. All that is needed to start is a list of keywords or hashtags, and/or a geographical region of interest. Once the collection commences and tweets begin to gather, different categories need to be defined to label the information communicated in the tweets, for example "Medical Needs" or "Sheltering." Custom categories can be created or examples are provided. AIDR is based on supervised machine learning. The first step is to collect tweets related to a disaster. The Collector helps to do this by filtering tweets using keywords and/or hashtags such as "hurricane" and "#Sandy," for example. This is just like a regular search on Twitter.com, which means many of the resulting tweets will contain selected keywords and/or hashtags, but will not be relevant to disaster response or to the specific information needs of humanitarian organizations. This is where the Tagger comes in. While the Collector is a word-filter, the Tagger is a topic-filter. The tagger classifies tweets by topics of interest, such as "Infrastructure Damage," and "Donations," for example. The classification is done automatically based on a set of human-tagged items which are provided through MicroMappers.org. More than one person (if desired) can contribute to classifying tweets. Once this is done, the "Tagger" automatically applies the classifier to incoming tweets collected in real-time using the Collector. All new tweets that relate to infrastructure damage (or other category) are automatically tagged and displayed on the Tagger, which you can use to power a live dashboard and/or crisis map. The AIDR team works closely with UNOCHA, ICRC and others to carry out deployments. The AIDR team fully endorses ICRC's Data Protection Protocols and UN's Guidelines on Cyber Security. This tool is relevant to e-resilience, as it helps to address information over-load in order to make crowd sourced data more cohesive and useful.



Artificial Intelligence Weather Chatbot

- 📍 South-East Asia
- ⚡ Floods, and Extreme Weather
- 🛡️ Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, Preparedness and Response, and Recovery
- 🏢 Robust Tech House, Singapore

This test version of a Artificial Intelligence Chatbot directly interacts with users through the Facebook Messenger app on mobile phones giving weather related information for all areas in Singapore. The user has to be specific in their questions as the AI bot is still very "young" as it calls itself and is still learning to comprehend and provide correct answers to questions. The AI Weather Chatbot is developed by a private company which is a Mobile App Development Company based in Singapore (iOS & Android), specialising in eCommerce, Mobile Commerce and FinTech web and apps development and chatbot development. This contribution to e-resilience from a private company is paving the way for future applications of AI and Chatbots. This company strives to be at the forefront of Chatbot Development in Singapore. With recent advances in Natural Language Processing, supported by Artificial Intelligence, Chatbots are now able to understand a much wider array of user inputs. Together with the greater availability of APIs, particularly with the support of the Singapore

Government, Chatbots now can automatically take actions pursuant to user inputs. The result is a whole new way for users to more conveniently communicate their intents and for systems to automatically recognize and act on these intents. Many use cases lend themselves naturally to such conversational interactions, beyond the limited use cases that “virtual assistants” used to provide. In finance, E-commerce and other industries, chatbots have become increasingly useful in helping the consumer to figure out what he or she needs and getting it promptly. Chatbots help to simulate the scenario of talking with a human being, while a machine is getting most of the work done. Big companies around the globe like Google and Facebook have already begun experimenting with chatbots, and this could have an effect in transforming the way that the Internet is seen and used especially for disaster response and preparedness in terms of providing services such as weather information that could be more effectively handled by a machine. A challenge that needs to be overcome is to make the interaction between the human and the machine (Chatbot) easy for the human to grasp in order for it to be useful. The potential of this tool is what lends itself to e-resilience - application of AI through simple messaging services to provide weather related information which can potentially save lives and reduce damages to property.



MOWRAM Weather Monitoring & Online Alerts

- 📍 South-East Asia
- ⚡ Floods, Typhoons / Cyclones, Tsunamis, Landslides, and Extreme Weather
- 🔍 Know Your Risk, Contingency Planning, Humanitarian Response, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, Preparedness and Response, and Recovery
- 🏢 Ministry of Water Resources and Meteorology, Cambodia

The Ministry of Water Resources and Meteorology through its web site and other channels provides weather related maps and information to keep the public up-to-date both in the local language and in English. It provides current weather information and warnings as well as forecasts that are important for railways, fisheries and tourism. The website is part of the strategy for providing weather related information and is linked to a network of real time sensors and ground personal. A radar station also supports the efforts. The Ministry of Water Resources and Meteorology (MOWRAM) was created in 1999 during the second term of the Royal Government of Cambodia. The mandates of the Department of Meteorology includes: To prepare short, medium and long term plans for rehabilitation and development of meteorology abilities throughout the country. To establish and manage the Cambodian meteorological stations. To provide weather forecast in short and long term range for all concerned sectors. To predict abnormal meteorological phenomenon and send out alerts to enable people and agencies to be better prepared in response. To raise knowledge and communicate with national and international actors on meteorology technologies. To strengthen and broaden Cambodian cooperation on meteorology with meteorological organizations, United Nations agencies and World Meteorological Organization. To prepare annual reports on the situation of meteorology in the Kingdom of Cambodia. MOWRAM serves as the central agency to provide critical information which improves e-resilience. Users can view City weather forecasts, Radar animations, Satellite animations, Automatic Weather Station readings, Severe Weather Safety and Awareness alerts, and Forecasts on the website. Given its strong commitment to providing more accurate information, the Ministry and its ICT-based approach is a good example for other least developed countries who do not already have such an online presence and approach.



DHMS Weather Monitoring & Early Warning

- 📍 South and South-West Asia
- ⚡ Floods, Glacial Lake Outburst Floods, Droughts, and Extreme Weather
- 🔍 Know Your Risk, Contingency Planning, Humanitarian Response, Preparedness, and Communication with Citizens
- ⚠️ Risk Reduction, and Preparedness and Response
- 🏢 Department of Hydro Met Services, Bhutan

The Department of Hydro Met Services (DHMS) website provides hazard related information. It provides current information on meteorology, hydrology, snow and glaciers and early warnings. Each hazard monitoring system is linked to real time sensors (and ground personnel) which are in turn linked to sirens to warn people living in high risk areas. Overall, the website provides weather forecasts, real time water level readings, and news. DHMS provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. Its specific objectives are: To develop effective hydro-meteorological and flood warning services networks and databases to provide appropriate and timely services and products. To strengthen institutional and capacity development. To Strengthen cooperation with national, regional and international organization to carry out research and development study related to hydro-meteorology and water resources. The department aims to provide reliable and timely hydro-meteorological information needed by various agencies for: Natural resources policy formulation and planning for effective management of water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses; Hydropower planning, development and operation as well as for other water related infrastructures; Planning for Agricultural, Construction, Tourism and Health Sector and other Environmental Sectors; Provide information and services for disaster risk reduction; Weather and climate forecasting, flood forecasting and warning services to minimize the loss of life and property as a result of hydro-meteorological related hazards, such as floods, droughts, wind storms, snow avalanches, GLOF etc.; To establish institutional linkages and coordinate with international organizations such as WMO, UNESCO, SAARC/BIMSTEC, ICIMOD etc. To maintain national, bi-lateral, regional, and international cooperation related to hydro-meteorology as well as exchange of data; To enable the development of resource pool of qualified professionals/specialist/experts in the field of hydrology and meteorology; Planning, coordinate and conduct research related to hydrology, meteorology, climatology, water resources, snow, glaciers, climate change etc. The department works with international partners to implement projects to enhance its capacity and effectiveness and to be a part of regional efforts to combat cross-boarder disasters. The online weather information and the services of the department are an integral part of disaster risk reduction, preparedness and response contributing to e-resilience of the country.

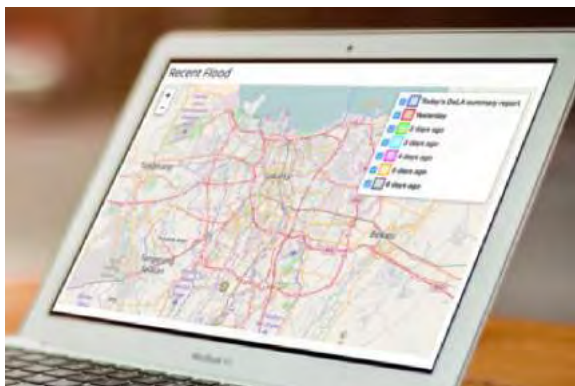


DesInventar Disaster Information Management System

- 📍 South and South-West Asia
- ⚡ Floods, Landslides, Droughts, and Wildfires
- 🔍 Know Your Risk, Contingency Planning, Preparedness, and Communication with Citizens
- ⚠️ Risk Prevention, and Risk Reduction
- 🏢 Disaster Management Centre (DMC), Sri Lanka

The Disaster Information Management System is a tool that helps to analyze disaster related trends and their impacts in a systematic manner. With increased understanding of the disaster trends and their impacts, better prevention, mitigation and preparedness measures can be planned to reduce the impact of disasters on the communities. The Disaster Information Management System functions through a sustainable arrangement within an institution for the systematic collection, documentation and analysis of data about losses caused by natural and man made disasters. The Disaster Management Centre (DMC) of Sri Lanka in partnership with UNDP maintains this comprehensive disaster information database which is kept up-to-date through collaboration with many government organisations and newspaper reports. The database holds information pertaining to disasters since year 1974. Analysis of historical data of each type of hazard and its impact is also available online. The Disaster Information Management System (DesInventar methodology) includes a software product with two main components: The DesInventar module is a relational and structural database through which the data is fed by filling in predefined fields (space and temporal data, types of events and causes, sources) and by both direct and indirect effects (deaths, houses, infrastructure, economic sectors). The DesConsultar module allows access to the database through queries that may include relations among the diverse variables of effects, types of events, causes, sites, dates, etc. This module permits at the same time to represent those queries using tables, graphics and thematic maps. Sources for obtaining information include print media, government and non-governmental organisations and other research organisations. Due to a serious lack of historical data that is collected using standard methods by government organizations, print media was used as a starting point. Then based on information and data collected from the print media, it is easier to obtain further detailed information through government organisations. Links have been initiated with the following organisations to collect data at the national level: Epidemiology Unit of the Ministry of Health Department of Social Services Department of Wildlife Conservation Department of Fire Services of the Colombo Municipal Council National Building Research Organization Department of Meteorology Disaster Relief Service Centre Department of Agriculture Department of Census and Statistics Links have been initiated with the following organisations to collect data at the district level. District Secretariats Divisional Secretariats

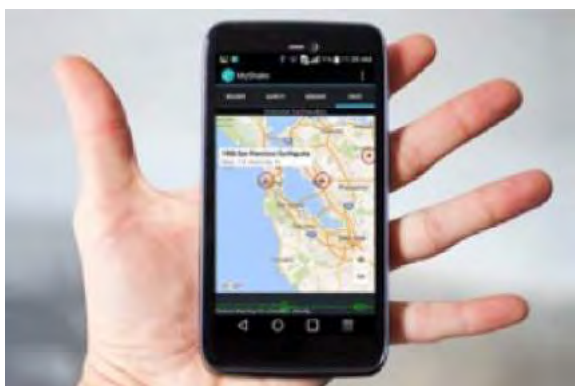
Provincial Councils / Local Authorities Police Stations MOH office Though the initial data collection, validation and database system set-up was completed in 2006, national level data entry still continues. Including this database in Sri Lanka, UNISDR and UNDP in partnership with others have implemented Desinventar systems in various countries around the world. The information from these databases can be requested by international agencies and others for research purposes to better understand disasters and to reduce risks. This tool improves preparedness by enabling contingency planning and assists in improving e-resilience by empowering policy makers and citizens to make more informed decisions which reduce vulnerability towards hazards and disasters.



JakSAFE Flood Web Portal

- 📍 South-East Asia
- ⚡ Floods
- 🔧 Network Planning, and Preparedness
- ⚠️ Risk Prevention, and Recovery
- 🇮🇩 BPBD Indonesia

JakSAFE is a system designed to estimate the damage and loss (including infrastructure) due to flood events in Jakarta, based on information sourced from BPBD, external reports, social media and field observations. The web-based software has been running since 2015 to estimate the damages and losses due to flood events in the Jakarta area. The main activities of this project are software development and exposure data collection. Damage and loss calculation is a complex process that involving several aspects. Therefore, it needs at least exposure data, hazard data, and other assumptions as the input, for the calculation to begin. The exposure database was collected from local government, while the hazard data is gathered from command center of Badan Penanggulangan Bencana Daerah (BPBD) DKI Jakarta, in the form of flooded area with RW (Rukun Warga) Boundary as the unit analysis. After the database has been completed, the exposure overlaid with hazard data and will generate information about assets impacted by the flood, which later will be calculated with several assumption and produce damage and loss value in Rupiahs (Indonesian currency). Flood is one of the most common and frequent disasters in Indonesia. Among all areas in Indonesia, Jakarta is one of the regions which has a high risk of flooding. Losses caused by flooding in early February 2007 reached 5.16 trillion rupiahs, according to JakSAFE's website.



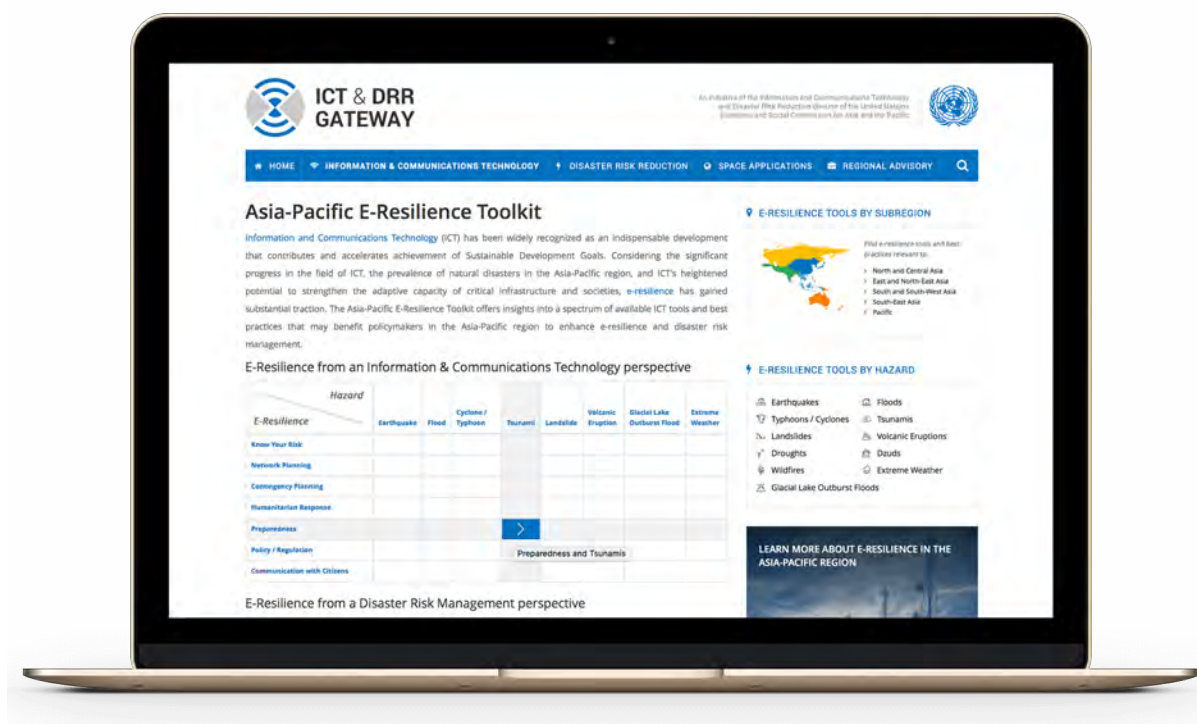
MyShake Earthquake Application

- 📍 East and North-East Asia, South-East Asia, South and South-West Asia, and North and Central Asia
- ⚡ Earthquakes
- 🔧 Know Your Risk, and Preparedness
- ⚠️ Risk Reduction
- 🇺🇸 Berkeley Seismology Lab

MyShake is a free app for Android smartphones that has the ability to recognize earthquake shaking using the sensors (such as the accelerometer) in every smartphone. The app runs 'silently' in the background of a phone using very little power. The application is able to distinguish earthquakes from normal human activities and uses advanced neural networks, as well as the power of a global network. The application's goal is to build a worldwide seismic network and use the data to reduce the effects of earthquakes on individuals, and our society as a whole. MyShake also provides users with information about recent earthquakes around the world and significant global historical earthquakes.

III. Web-Version of the Toolkit

The web-version of the Asia-Pacific E-Resilience Toolkit currently contains 80 tools and best practices that may benefit policymakers in the Asia-Pacific region to enhance e-resilience and disaster risk management. In the web-version of the Toolkit, tools and best practices are filterable by various parameters, including e-resilience phase (e.g., Know Your Risk, Network Planning), DRM phase (e.g., Risk Reduction, Risk Prevention), hazard type (e.g., tsunamis, floods) and ESCAP sub-region (e.g., North and Central Asia).



The web-version of the Toolkit will become a part of the Asia-Pacific ICT & DRR Gateway, a web-based portal that aims to provide policymakers and relevant stakeholders with an accessible gateway containing a spectrum of resources with regard to Information and Communications Technology and Disaster Risk Reduction. The Asia-Pacific ICT & DRR Gateway is reachable through **drrgateway.net** and offers news, publications, maps and other tools, including soon the E-Resilience Toolkit. The E-Resilience Toolkit is developed to be accessible from **drrgateway.net/e-resilience** upon approval of the content and technical migration to the Gateway.

The subsequent section contains an overview of the distribution of tools and best practices with regard to the various parameters listed previously.

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