

# Global Disaster Alert and Coordination System

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## Introduction

The Global Disaster Alert and Coordination System (GDACS), established in 2004, is a cooperation framework under the United Nations umbrella with the aim to consolidate and strengthen the network of providers and users of disaster information worldwide in order to provide reliable and accurate alerts and impact estimations after sudden-onset disasters and to improve the cooperation of international responders in the immediate aftermath of major natural, technological and environmental disasters.

For the first five years (2004-2009), GDACS was funded by the European Commission. This resulted in the development of an integrated web-based service that combines critical disaster information systems under one umbrella. During this period, GDACS introduced its services to international disaster responders in meetings, workshops, seminars and disaster response exercises. The main information service providers in GDACS are

- the European Commission Joint Research Centre (JRC) in Ispra, Italy,
- the United Nations Office for Coordination of Humanitarian Affairs (OCHA), with the Virtual OSOCC – or Virtual On Site Operations Coordination Center – and ReliefWeb and
- the United Nations Operational Satellite Applications Programme (UNOSAT).

### GDACS comprises three elements:

1. Web-based automatic alert notifications and impact estimations (JRC) for earthquakes, tropical cyclones, floods and volcanoes.
2. A community of emergency managers and emergency operation centres in responding and disaster-prone countries and disaster response organisations worldwide.
3. Automatic information exchange between web-based disaster information systems (presently: JRC, Virtual OSOCC, ReliefWeb and UNOSAT).

Today, many governments and disaster response organisations rely on GDACS alerts and impact estimations and utilise the Virtual OSOCC for information exchange and cooperation with other actors in the first phase of major disasters.

GDACS has around 10000 subscribers, most of which represent governmental or non-governmental disaster response organisations. Several countries have included the use of GDACS services, in particular JRC's automatic alert and impact estimations and the Virtual OSOCC, in their national disaster response plans.

An on-line survey that was carried out in 2008 among GDACS users shows that most organisations rely heavily on its services both with regard to automatic alerts and impact estimations as well as its network of disaster managers and coordination platform.

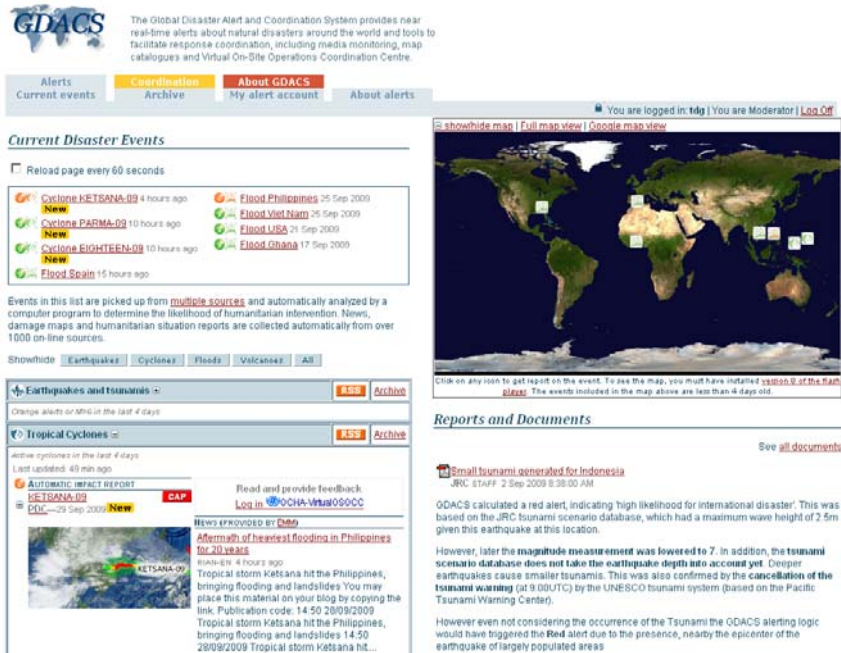


Figure 1. The GDACS website (<http://www.gdacs.org>) shows near real-time information for earthquake, cyclone, flood and volcano disasters.

## Three ingredients for success

### *Multi-hazard approach*

GDACS was born out of a need to reduce the need to monitor several web sites for several disaster types. The European Commission Office for Humanitarian Aid (ECHO), one of the largest donors of humanitarian aid, expressed the wish for a single portal to access information on any natural disaster. This has driven the early development of GDACS, or global disaster alert system. Only later, the system was integrated with an information system for “coordination” response, which proved successful and will be described later.

GDACS provides global multi-hazard disaster monitoring and alerting for earthquakes, tsunamis, floods, volcanoes and tropical cyclones. These hazards have very different physics and are studied in disconnected scientific communities. Through partnerships with scientific organisations and other hazard monitoring institutions, GDACS collects near real-time hazard information, which is combined in GIS models with demographic and socio-economic data. GDACS performs a consequence analysis with a risk formula combining the magnitude of a hazard with an element at risk (such as the amount of people in the affected area) and a vulnerability factor accounting for physical and socio-economic resilience of the affected area. For tsunamis, GDACS uses a novel tsunami system developed at the Joint Research Centre, which, through 135000 pre-calculated scenarios, can provide an immediate assessment of tsunami risk.

### Current scientific partners

- Earthquakes: US, Italian, European, German, Chinese and Russian seismological institutes
- Tropical cyclones: Pacific Disaster Centre
- Floods: Dartmouth Flood Observatory, NASA, Ithaca
- Volcanic eruptions: Smithsonian Global Volcanism Program
- Tsunamis: NOAA, UNESCO

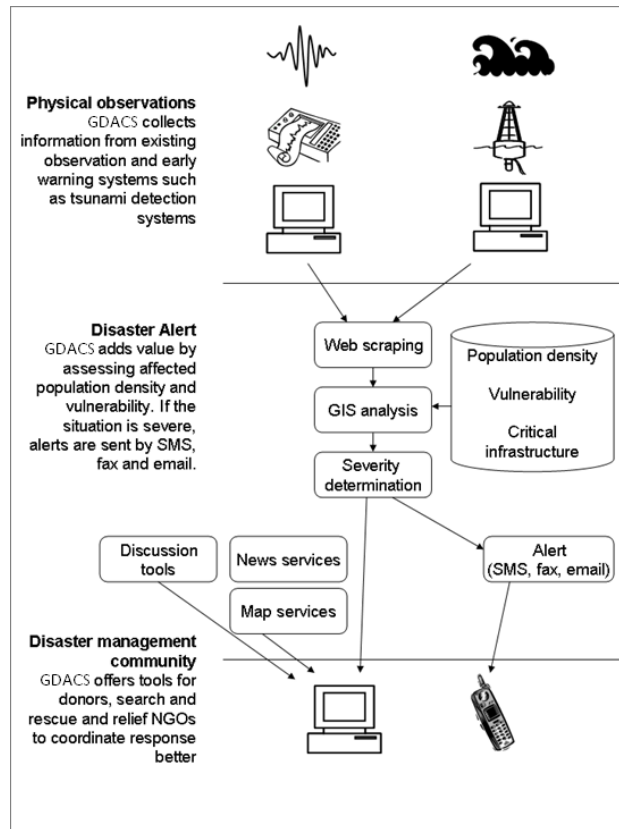


Figure 2. Principle of GDACS system

### ***A system of systems based on open standards***

As research in early warning and alert systems is developing rapidly, existing data and models will be outdated soon. In order to provide a robust framework for cooperation, GDACS was designed from the beginning as a system of systems. Individual components can be exchanged with newer, better components that provide more added value for emergency responders.

As a means to achieve interoperability of models and systems, GDACS has promoted the use of standards for information and communication. The two most important standards in the GDACS framework are RSS (a communication standard) and the GLIDE number (a content standard).

The first, Really Simple Syndication or RSS, is a well-established XML format for exchange of messages. Because it is so simple and widely used, almost any organisation has the ability to produce RSS feeds, making it a very useful standard. Over the past years, JRC has assisted several organisations to start producing RSS feeds, making their information interoperable with GDACS.

The second, the GLocal IDentifier for disasters or GLIDE<sup>1</sup>, is a unique identifier for a disaster, pioneered by the Asian Disaster Reduction Center. It's purpose is to allow many organisations to link their databases on disasters. This is not a trivial problem, because a disaster is a loosely defined concept used in different ways in different research and

<sup>1</sup> <http://www.glidenumber.net/>

practitioner communities. The components of a GLIDE number consist of two letters to identify the disaster type (e.g. EQ - earthquake); the year of the disaster; a six-digit, sequential disaster number; and the three-letter ISO code for country of occurrence.

GDACS also supports more complex standards (such as Open Geospatial Consortium standards) or emerging standards (KML was adopted soon after it emerged). Supporting (and syndicating) different standards is an essential characteristic for a system of systems.

### ***A community built on trust***

During major disasters, information exchange between international responders and the affected country is critical. In the immediate aftermath of a disaster, international responders seek to have an overview of the situation in order to provide quick but measured response. The affected country, on the other hand, is burdened by managing the disaster internally and handling the international responders. The challenge in this environment is to make sure information is not misused. Quick release of uncertain information can have adverse effects. For instance, if picked up by media and distributed, inaccurate information can cause panic in the affected population.

The main purpose of the GDACS Virtual OSOCC is to facilitate decision-making for international response to major disasters through real-time information exchange by all actors of the international disaster response community. The GDACS Virtual OSOCC is a platform for informal information exchange for a well-defined, private, professional community of disaster managers. Virtual OSOCC members include:

- Emergency management authorities of affected countries;
- International responders (including search and rescue teams, relief teams, governmental and non-governmental actors);
- OCHA response communities, including the United Nations Disaster Assessment and Coordination (UNDAC): a stand-by team of disaster management professionals.

The community excludes press, media and non-professionals. This, and the fact that community members meet occasionally at OCHA training courses, makes for a level of trust among members which is essential to freely share informal information during major disasters. Informal information, as opposed to official information, is information that is inaccurate, incomplete, partially true or of restricted nature, is very valuable among professionals who understand the value and the risks of it. Not least because it is timelier than official information. For instance, the community exchanges data on potential assistance before it is officially approved in their governments. This can avoid duplication and overlap in response. However, when initial offers of assistance are withdrawn, this could be negatively perceived by the general public.

In addition, through the Virtual OSOCC the United Nations Assessment and Coordination Team (UNDAC) can be mobilised effectively through on-line workflow procedures including SMS and e-mail.

During crises, all Virtual OSOCC users have the opportunity to create e-mail and SMS messages that are sent automatically to subscribers to inform about critical situation updates during disaster response operations.

In between crises, the Virtual OSOCC facilitates management of UNDAC, INSARAG and UN-CMCoord training, meetings and workshops through e-mail notification, on-line participant

registration and discussion of background material. It also provides its users with a discussion forum for any area of interest, including information exchange on best practice and lessons-learned after disaster response operations.

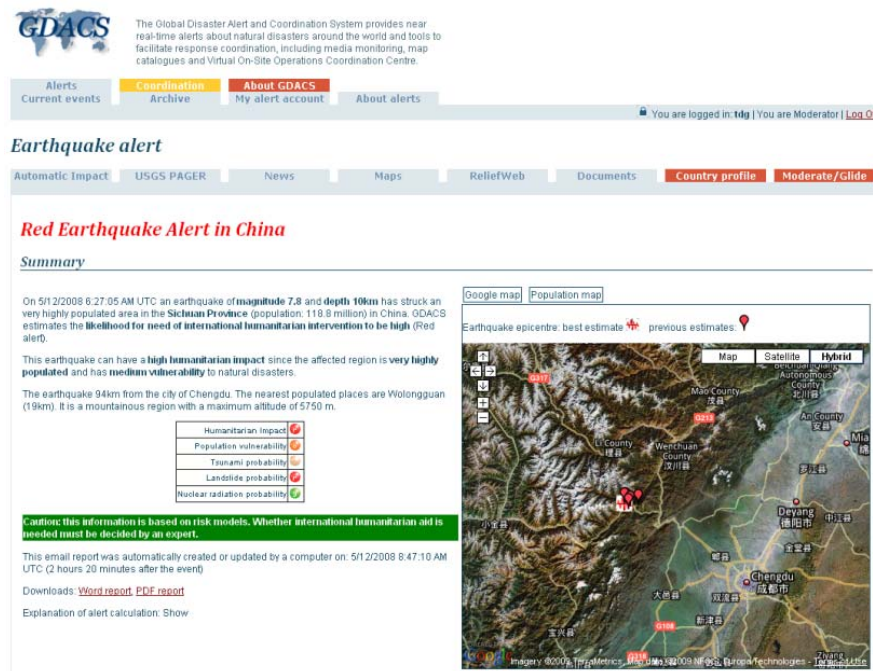


Figure 3. Example - 2008 Wenchuan earthquake.

## Example – 2008 Wenchuan earthquake

On 12 May 2008, a major earthquake struck the Sichuan province in China, a very large populated region with more than 100 million inhabitants. The first event, of magnitude 7.8 Richter scale, occurred at 6:28 UTC and was followed by 8 large aftershocks. The location of the epicentre was 94km from the city of Chengdu.

GDACS received the first event information from USGS (NEIC) at 6:41 UTC (13 min. after the event) and, after calculating the impact, evaluated it as a Red Alert (high humanitarian impact). GDACS automatically sent out 4500 email, 2700 SMS and 100 fax alert messages 14 minutes after the event.

Until about 14:00 UTC 12th May, there was no evidence of the size of the disaster in the international media. Only after about 9h, the first reports of more than 1000 casualties were published. The first information message about the earthquake was posted on the Virtual OSOCC by one of its users on 12 May at 07.07 UTC, which was 39 minutes after the earthquake event. More information updates were provided by disaster managers from 23 countries and disaster response organisations until 22 May. From 10.49 UTC, which was 4h21 after the event, the China Earthquake Administration provided regular situation

### GDACS system (times relative to event)

- 13min: Detection of earthquake through USGS
- 14min: GDACS Red Alert
- 14min: GDACS report published
- 14min: **Email** alert to 4500 users
- 19min: **SMS** alert to 2700 users
- 39min: GDACS Virtual OSOCC topic created
- 1h20: UNDAC Alert Message
- 9h: Media reports >1000 killed
- 1<sup>st</sup> day: 1<sup>st</sup> IFRC Situation Report
- 2<sup>nd</sup> day: First OCHA Situation Report
- 18 May: First satellite based damage map

updates on the Virtual OSOCC. Furthermore, some 79 countries and organisations informed about teams or assets that they had mobilized or deployed, together with details about their capacity and contact information of focal points. Twelve countries/organisations provided detailed information about a total of 26 pledges or dispatches of relief items. UNOSAT provided 10 satellite-based maps of the disaster, which were linked automatically to the disaster discussion through the GLIDE number. GLIDE was also used to integrate related reports from ReliefWeb within the China earthquake discussion on the Virtual OSOCC.

## **Way forward**

### ***Global monitoring, satellite data and crowd-sourcing***

Analysts in emergency situation rooms have the difficult task of making sense of a very dynamic stream of information from multiple sources with various degrees of reliability, such as early warning systems, media reports, crowd sourcing data, social networking, email, expert reports, sensor data and satellite imagery.

Since not all information is of equal value, the challenge for global multi-hazard disaster alert systems is to establish standards for quality of information ruling the inclusion of certain information sources in a system of systems. GDACS is the principle cooperation platform of information providers where such standards are continuously evaluated and revised.

Scientific and operational information providers in regional networks, member countries and response organisations are encouraged to participate in GDACS meetings, workshops and simulations to explore possibilities for integration of new monitoring systems in the GDACS system of systems. The JRC and UNOSAT are facilitating this process respectively for disaster alert/impact systems and satellite based maps.

### ***Towards a global network of emergency management entities***

The GDACS community is growing rapidly, which brings its own challenges. With many new members entering the community, information exchange still lacks predictability, quality and standardised formats. In addition, many organisations make information available only after the internal analysis and decision making process has been completed, often by disseminating situation reports or through entries on the Virtual OSOCC.

GDACS is working towards building a global network of emergency management entities or disaster operation centres, cooperating using standards for the exchange of operational information. Emergency management and disaster operation centres in regional networks, member countries and response organisations are encouraged to participate in GDACS meetings, workshops and simulations to explore possibilities for better cooperation and to agree on procedures for information exchange and coordination in major disasters. The GDACS Secretariat in the ERCC, OCHA-Geneva is facilitating this process.