



Disaster Risk Management Using ICT

Submission to Mint

Digital Empowerment Foundation

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According to the Emergency Events Database (EM-DAT)([D. Guha-Sapir, R. Below, Ph. Hoyois - EM-DAT: International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.](http://www.emdat.be)), the floods, storms and earthquakes comprise the most frequent natural disasters. Table 1 and Chart 1 represent the Top 10 natural disasters by frequency

| Rank | Events | Frequency |
|------|----------------------|-----------|
| 1 | Floods | 1466 |
| 2 | Storms | 1167 |
| 3 | Earthquakes | 481 |
| 4 | Mass Movements - Wet | 289 |
| 5 | Extreme Temperatures | 130 |
| 6 | Droughts | 111 |
| 7 | Wildfires | 71 |
| 8 | Volcanic Eruptions | 70 |
| 9 | Mass Movements - Dry | 18 |
| 10 | Insect Infestations | 10 |

Table 1: Top 10 Natural Disasters by Frequency

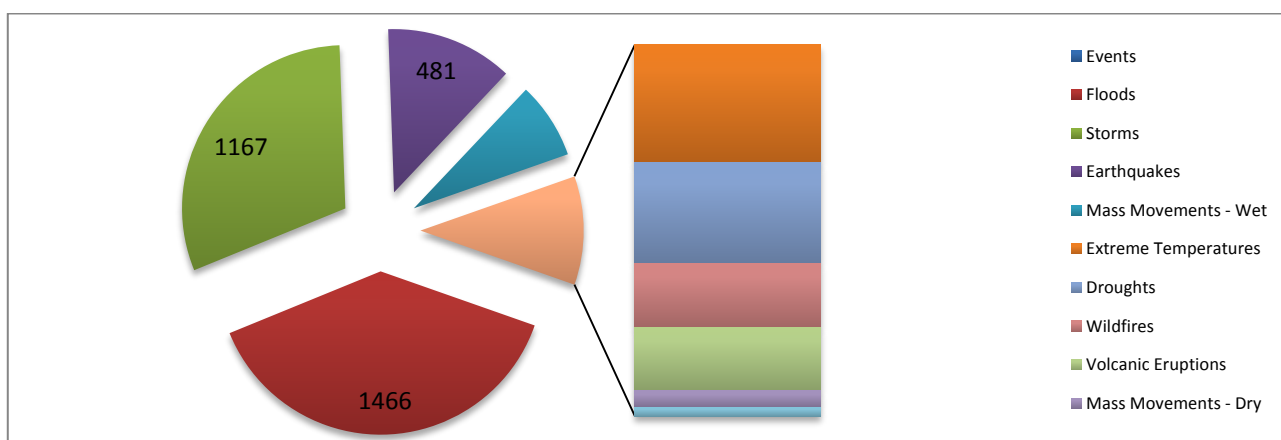


Figure 1: Top 10 Natural Disasters by Frequency

There are 2.2 times more floods than earthquakes. However, when we look at the damage caused by the same natural disasters, a very different picture emerges. Table 2 and Chart 2 represent this stark difference.

| Rank | Events | Deaths (Thousands) |
|------|----------------------|--------------------|
| 1 | Earthquakes | 573.45 |
| 2 | Storms | 381.71 |
| 3 | Floods | 126.52 |
| 4 | Extreme Temperatures | 17.96 |
| 5 | Mass Movements - Wet | 16.59 |
| 6 | Droughts | 5.09 |
| 7 | Mass Movements - Dry | 1.26 |
| 8 | Volcanic Eruptions | 1.25 |
| 9 | Wildfires | 0.97 |
| 10 | Insect Infestations | 0 |

Table 2: Top 10 Natural Disasters by Deaths

Earthquakes account for a far higher number of deaths than the other 9 natural disasters combined (573.45 Vs. 551.35 (figures in thousands)).

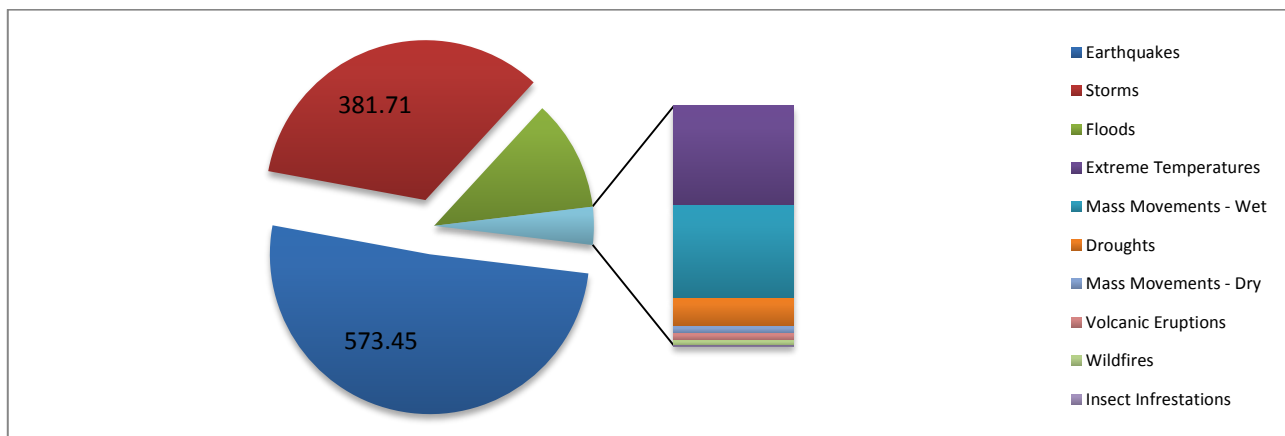


Figure 2: Top 10 Natural Disasters by Deaths

Another demonstrator of the sheer destructive power of earthquakes can be seen in the millions of dollars' worth of damage that they cause. The damage caused from earthquakes is higher than the combined damage caused by Floods and Storms (549024 Million \$ Vs. 548571 Million\$). Table 3 and Figure 3 demonstrate this.

| Rank | Events | Damage (Millions USD) |
|------|----------------------|-----------------------|
| 1 | Earthquakes | 549024 |
| 2 | Floods | 362191 |
| 3 | Storms | 186380 |
| 4 | Droughts | 37804 |
| 5 | Extreme Temperatures | 24007 |
| 6 | Wildfires | 14013 |
| 7 | Mass Movements - Wet | 2717 |
| 8 | Volcanic Eruptions | 345 |
| 9 | Insect Infrestations | 120 |
| 10 | Mass Movements - Dry | 1 |

Table 3: Top 10 Natural Disasters by Damage Caused (USD Millions)

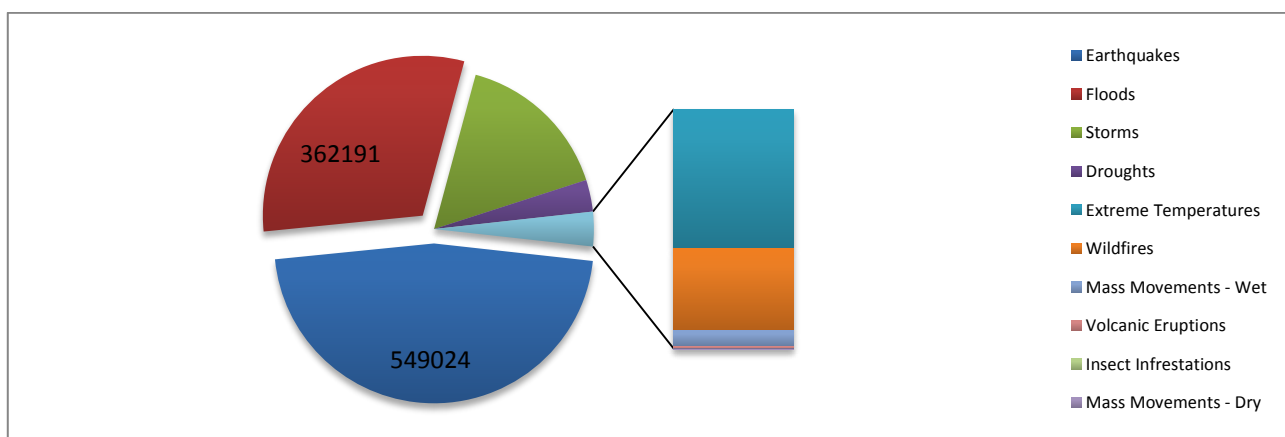


Figure 3: Top 10 Natural Disasters by Damage Caused (USD Millions)

As shown above, earthquakes are a major contributor to deaths in the world due to natural disasters. Table 4 maps the deaths caused by earthquakes in the world. Table 5 and Graph 4 map the same in specific for India.

| Year | Occurrence | Total deaths | Total affected | Total damage(000's USD) |
|------|------------|--------------|----------------|-------------------------|
| 1990 | 48 | 43002 | 2615976 | 9205450 |
| 1991 | 42 | 3223 | 2170979 | 2158500 |
| 1992 | 35 | 4357 | 1118156 | 2666750 |
| 1993 | 31 | 10528 | 401742 | 1770988 |
| 1994 | 31 | 1343 | 1024369 | 30532676 |
| 1995 | 31 | 7739 | 1966431 | 101286522 |
| 1996 | 18 | 580 | 5496753 | 588900 |
| 1997 | 27 | 3212 | 1304203 | 4966343 |
| 1998 | 34 | 9573 | 3685671 | 1220100 |
| 1999 | 38 | 21869 | 6890398 | 41712293 |
| 2000 | 37 | 228 | 2605185 | 777117 |
| 2001 | 31 | 21348 | 9821774 | 7379705 |
| 2002 | 45 | 1899 | 1128053 | 2076714 |
| 2003 | 42 | 29617 | 4219467 | 8252851 |
| 2004 | 48 | 227336 | 3200091 | 38770000 |
| 2005 | 33 | 76244 | 6528464 | 6705100 |
| 2006 | 37 | 6708 | 4237455 | 3581453 |
| 2007 | 27 | 791 | 1433347 | 14972000 |
| 2008 | 33 | 88054 | 47620977 | 85796000 |
| 2009 | 25 | 1924 | 3271653 | 6058690 |
| 2010 | 31 | 227058 | 7107684 | 47300660 |
| 2011 | 36 | 20949 | 1796424 | 230403850 |
| 2012 | 31 | 727 | 2870258 | 18536314 |
| 2013 | 33 | 1166 | 7137310 | 9082859 |
| 2014 | 32 | 880 | 3934306 | 8267000 |

Table 4: Deaths casued by earthquakes around the world (1990-2014)

| Year | Occurrence | Total deaths | Total affected | Total damage (Thousands USD) |
|------|------------|--------------|----------------|------------------------------|
| 1991 | 1 | 1500 | 54383 | 60000 |
| 1993 | 2 | 9748 | 30525 | 280000 |
| 1997 | 1 | 43 | 156500 | 37000 |
| 1999 | 1 | 100 | 477894 | 2000 |
| 2001 | 1 | 20005 | 6321812 | 2623000 |
| 2002 | 1 | 2 | 200 | 0 |
| 2004 | 1 | 16389 | 654512 | 1022800 |
| 2005 | 1 | 1309 | 156622 | 1000000 |
| 2011 | 1 | 112 | 575200 | 0 |
| 2012 | 1 | 16 | 0 | 0 |
| 2013 | 1 | 3 | 59350 | 120000 |

Table 5: Deaths and Damage caused by earthquakes in India (1990 - 2014)

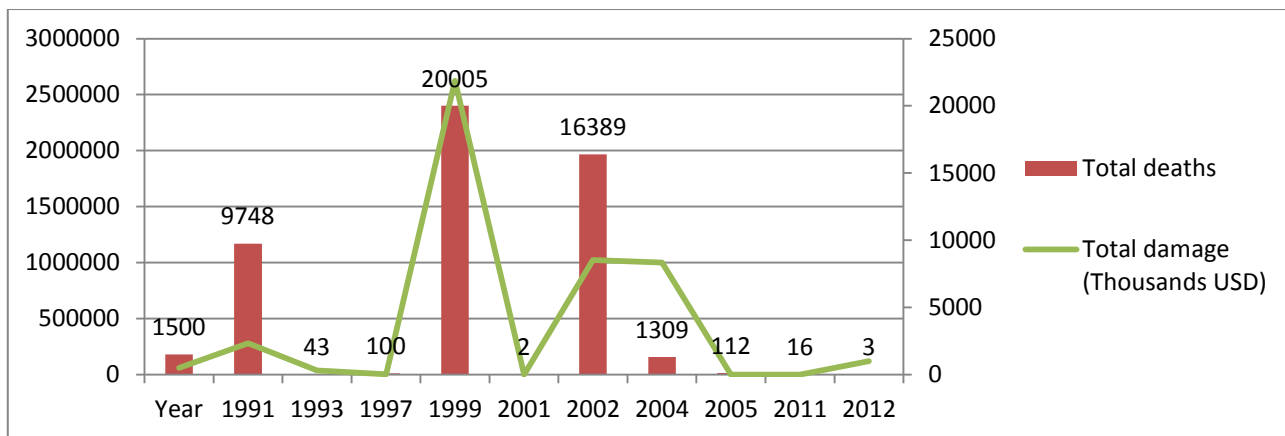


Figure 4: Deaths and Damage caused by earthquakes in India (1990 - 2014)

After the recent earthquake in Nepal, the United States Geological Survey has stated publicly that predicting the time and magnitude of earthquakes is next to impossible. Thus, with regards to earthquakes and some other geophysical phenomena, the focus shifts to response after the fact.

Information Communication Technologies present an important set of tools that aid responders in effectively deploying aid and resources to people in need.

In India, the Disaster Management Act (2005) lays the institutional framework and legal arrangements for organisations working on disaster management in India.

- The National Disaster Management Authority (NDMA) – the apex body for disaster management in India. Headed by the Prime Minister and has the responsibility for laying down policies, plans and guidelines for DM (and coordinating their enforcement and implementation for ensuring timely and effective response to disasters). It also has oversight and control on the National Disaster Response Force (NDRF), which is a specialised force created for the purpose of a specialised response to a threatening disaster situation or disasters/emergencies both natural and man-made such as those of Chemical, Biological, Radiological and Nuclear origin.
 - The National Executive Committee (NEC) - comprises the Union Home Secretary as the Chairperson, and the Secretaries to the GOI in the Ministries/Departments of Agriculture, Atomic Energy, Defence, Drinking Water Supply, Environment and Forests, Finance (Expenditure), Health, Power, Rural Development, Science and Technology, Space, Telecommunications, Urban Development, Water Resources and the Chief of the Integrated Defence Staff of the Chiefs of Staff Committee as members. Secretaries in the Ministry of External Affairs, Earth Sciences, Human Resource Development, Mines, Shipping, Road Transport & Highways and Secretary, NDMA will be special invitees to the meetings of the NEC.
- State Disaster Management Authority (SDMA) – Headed by the Chief Minister of each state and is responsible for the creating policies for disaster management in the state.
 - State Executive Committee (SEC) – Headed by the Chief Secretary to the State Government and coordinate and monitor the implementation of the National Policy, the National Plan and the State Plan
- District Disaster Management Authority (DDMA) - headed by the District Collector, Deputy Commissioner or District Magistrate as applicable, with the elected representative of the local authority as the Co-Chairperson. Creates plans for disaster management at the district level.
- Local Institutions include Panchayati Raj Institutions (PRI), Municipalities, District and Cantonment Boards and Town Planning Authorities which control and manage civic services.

ICT for Disaster Response

According to the National Policy on Disaster Management ([Source](#)), the role that ICT tools play in the support of disaster response can be explained as the following:

- Decision makers and disaster managers at all levels.
- Real time dissemination of advance warnings and information to the concerned authorities at various levels and threatened community. For dissemination of advance warning and information through broadcasting mediums such as

television and radio shall be used significantly as it has higher geographical reach. For coastal and hilly regions, network of meteorological department may be used.

- Last mile connectivity at the disaster site for control and conduct of rescue and relief operations.

The Indian Government has created the India Disaster Resource Network ([source](#)). IDRN is a nation-wide electronic inventory of resources that enlists equipment and human resources, collated from districts, states and national level line departments and agencies.

The figure below shows the growth of updated data records on the IDRN in successive years.

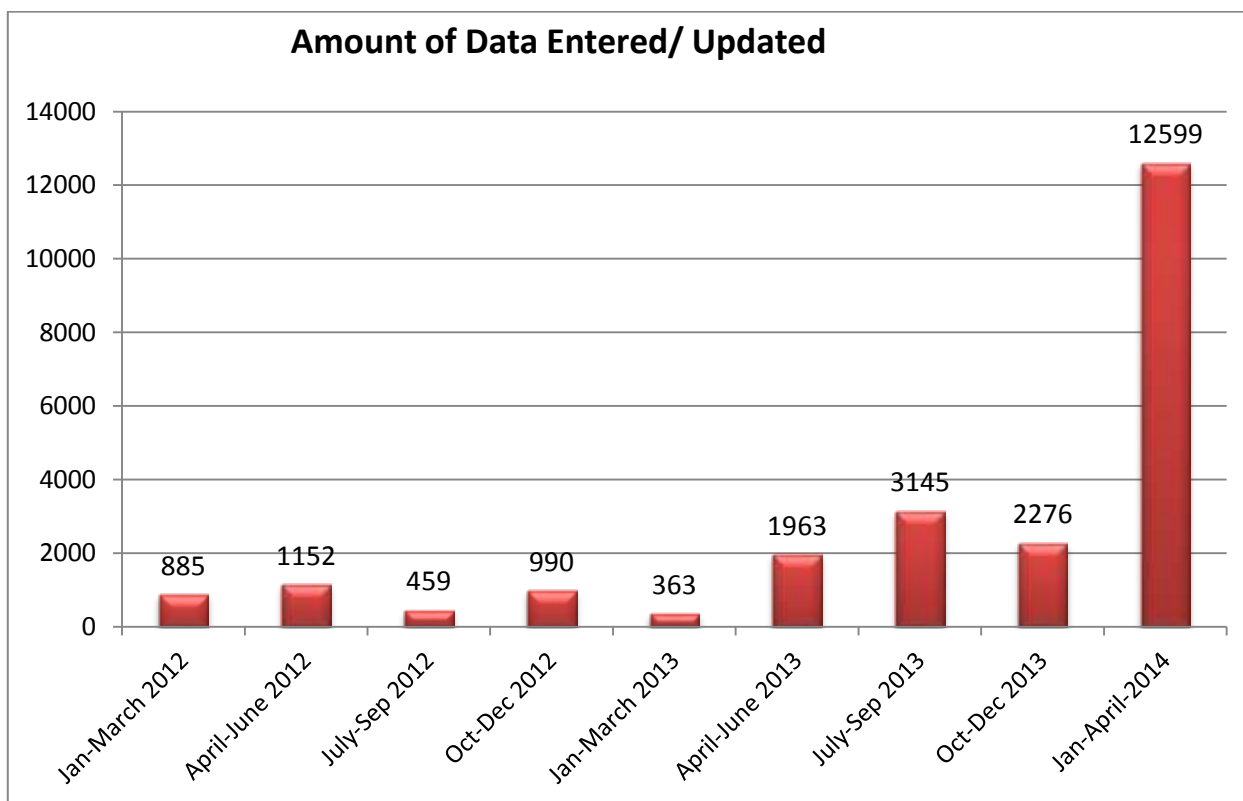


Figure 5: Growth of IDRN data records (2012 - 2014)

The government has been planning augmenting the role of the IDRN using ICT namely in adding GIS features, creating a new MIS system and most importantly, developing an Android based application for field officials or line department officers.

The major challenges to the success of the IDRN are:

- Districts are not yet updating data regularly which limits the usability.
- Data not received timely from line departments and no dedicated person for data entry as reported by districts.
- Lack of proper coordination between district administration and NIC officials.
- Applicability during major disasters limited due to internet and power failures.

Emergency Telecommunications play a critical role in the immediate aftermath of disasters by ensuring timely flow of vital information which is much needed by government agencies, and other humanitarian actors that are involved in rescue operations and providing medical assistance to the injured. The International Telecommunications Union's Communication Development Sector wing (ITU-D) considers emergency telecommunications an integral part of its projects integrating telecommunications/information and communication technology in disaster predication, detection, and alerting.

Its primary vision with regards to the importance of ICT tools in disaster management and response are summed up in the table below.

Table 6: Services and Tasks of Emergency Telecommunications

| Services | Tasks |
|---|--|
| <ul style="list-style-type: none"> • Meteorological services (Meteorological aids and Meteorological-satellite service) • Earth Exploration-satellite service | <ul style="list-style-type: none"> • Weather and climate prediction. Detection and tracking of earthquakes, tsunamis, hurricanes, typhoons, forest fires, oil leaks etc. • Providing warning information |
| <ul style="list-style-type: none"> • Amateur Services • Broadcasting services – terrestrial and satellite (radio, television etc.) • Fixed services terrestrial and satellite • Mobile services (land, satellite, maritime services etc.) | <ul style="list-style-type: none"> • Receiving and distributing alert messages • Disseminating alert messages and advice to large sections of the public • Delivering alert messages and instruction to telecommunication centres for further dissemination to the public • Distributing alter messages and advice to individuals |
| <ul style="list-style-type: none"> • Amateur Services • Broadcasting services – terrestrial and satellite (radio, television etc.) • Fixed services terrestrial and satellite • Mobile services (land, satellite, maritime services etc.) | <ul style="list-style-type: none"> • Assisting in organizing relief operations in areas (especially when other services are still not operational) • Coordination of relief activities by disseminating information from relief planning teams to population • Assessment of damage and providing information for planning relief activities • Exchange of information between different teams/groups for planning and coordination relief activities • Exchange of information between individuals and/or groups of people involved in relief activities |