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the Epidemiology of  
Disasters - CRED



**UCL**  
Université  
catholique  
de Louvain

# Annual Disaster Statistical Review 2010

## The numbers and trends

Debby Guha-Sapir, Femke Vos, Regina Below  
with Sylvain Ponserre



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**Debby Guha-Sapir  
Femke Vos  
Regina Below**

**with  
Sylvain Ponserre (UNISDR)**

Centre for Research on the Epidemiology of Disasters (CRED)  
Université catholique de Louvain – Brussels, Belgium

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## About CRED

The Centre for Research on the Epidemiology of Disasters (CRED) has been active for more than 35 years in the fields of international disaster and conflict health studies, with research and training activities linking relief, rehabilitation and development. It was established in Brussels in 1973 at the School of Public Health of the Catholic University of Louvain (UCL) as a non-profit institution with international status under Belgian law. In 1980, CRED became a World Health Organization (WHO) collaborating centre as part of WHO's Global Program for Emergency Preparedness and Response. Since then, CRED has increased its international network substantially and collaborates closely with numerous UN agencies, inter-governmental and governmental institutions, non-governmental organizations, research institutes and universities.

## Objective

The Centre promotes research and provides an evidence base to the international community on the burden of disease and related health issues due to disasters and conflicts, in order to improve preparedness and responses to these humanitarian emergencies. CRED trains field managers, students, relief personnel and health professionals in the management of short and long-term humanitarian emergencies.

## CRED's focus

CRED's research focuses on all humanitarian and emergency situations with a major impact on human health. These include all types of natural and human-made disasters, such as earthquakes, floods and storms; longer-term disasters such as famines and droughts; and situations creating mass displacement of people such as civil strife and conflicts.

The Centre focuses on health aspects and the burden of disease arising from disasters and complex emergencies. CRED also promotes research on broader aspects of humanitarian crises, such as human rights and humanitarian law, socio-economic and environmental issues, early warning systems, the special needs of women and children, and mental health care.

The Centre is actively involved in stimulating debate on the effectiveness of various humanitarian interventions. It encourages scientific and policy discussions on existing and potential interventions and their impacts on acute and chronic malnutrition, human survival, morbidity, infectious diseases and mental health.

The CRED team works in four main areas:

- Natural disasters and their impacts
- Civil strife and conflict epidemiology
- Database and information support
- Capacity building and training

## The CRED team

The Centre is composed of a multinational and multidisciplinary team that includes experts in medicine and public health, informatics and database management, psychology, nutritional sciences, sociology, economics and geography. The working languages are English and French.



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## Executive Summary

After the relatively moderate year of 2009, the extent of the impact of natural disasters<sup>1</sup> took a turn for the worse in 2010. A total of 385 natural disasters killed more than 297 000 people worldwide, affected over 217.0 million others and caused US\$ 123.9 billion of economic damages.

Haiti suffered 222 570 fatalities<sup>2</sup> and had over 39.1% of its population – or a total of 3.9 million victims – affected by the January 12<sup>th</sup>, 2010 earthquake. Besides Haiti, many deaths were reported in Russia<sup>3</sup>, which was affected by extreme temperatures, floods and wildfires, adding up to a total of 55 800 deaths. Most fatalities were due to the heat wave that occurred from June to August. These two mega-disasters made 2010 the deadliest year in at least two decades.

In 2010, the number of reported disasters approximated the annual average disaster occurrence during 2000 to 2009 (387). The number of victims increased from 198.7 million in 2009 to 217.3 million in 2010, but remained below the annual average number of victims of 227.5 million during 2000 to 2009 (see Figure 1). Economic damages from natural disasters in 2010 were over 2.5 times higher than in 2009 (US\$ 47.6 billion), and increased by 25.3% compared to the annual average for the period 2000-2009 (US\$ 98.9 billion). When looking at the decade, damages in 2010 ranked fourth, only surpassed in 2004 (mainly due to the Niigata-ken earthquake in Japan), in 2005 (hurricanes 'Katrina', 'Rita' and 'Wilma' in Northern and Central America and the Caribbean) and in 2008 (Sichuan earthquake in China).

The Chilean earthquake of February 27<sup>th</sup>, 2010 ranked highest in terms of economic damages caused by natural disasters, with US\$ 30.0 billion damages – or a share of 24.2% of the global reported damages in 2010. Ranked second, the floods and landslides in China from May to August cost US\$ 18.0 billion. The Haiti earthquake was especially destructive in view of the country's already impoverished economy. The costs of this earthquake (US\$ 8.0 billion) surpassed Haiti's GDP.

Globally, more hydrological disasters were reported in 2010. However, as meteorological disaster occurrence was lower, it evened out an increase in disaster occurrence in 2010. Similar to the average over the last decade, hydrological disasters were by far the most abundant disasters in 2010. These disasters represented 56.1% of the total disaster occurrence in 2010, and together with meteorological disasters - the second-most frequent disasters - accounted for 79.0% of total occurrence.

The regional distribution of disaster occurrence in 2010 resembled the annual average distribution of the last decade. Asia accounted for more than a third of the number of all reported disasters (34.8%). The Americas had a 25.2% share of global disaster occurrence, Europe and Africa both took nearly a fifth of disaster occurrence (18.2% and 17.9% respectively) and Oceania 3.9%. Europe saw the biggest increase in disaster occurrence, whereas Asia had the largest decrease. Although Asia counted fewer disasters, victims and damages compared to the last decade's annual averages, the continent still took the largest share of disaster occurrence and victims in 2010.

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<sup>1</sup> Biological disasters are not included in this publication.

<sup>2</sup> On January 12<sup>th</sup> 2011, the Prime Minister of Haiti updated the mortality figures and added 93 430 people to the death toll, making a total of 316 000 deaths. At present, this figure still needs to be validated by CRED and is therefore not included.

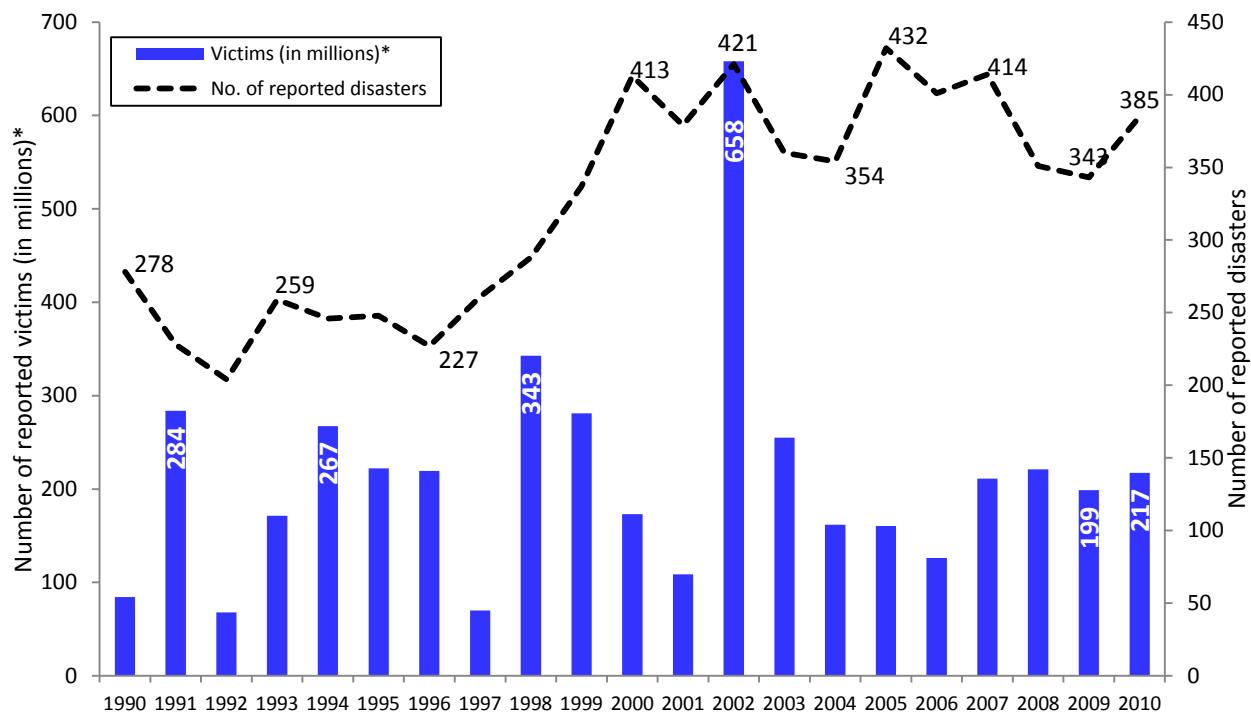
<sup>3</sup> Excess mortality.

The number of victims in the Americas and Oceania increased in 2010 compared to the previous decade. Nevertheless, as much as 89.2% of global disaster victims in 2010 were from Asia, compared to 5.6% from the Americas. China alone, affected by 25 natural disasters, counted 145.7 million victims, which represented 67.0% of worldwide reported victims. Disaster victims from Africa accounted for 4.5% of global victims in 2010, whereas Europe took a 0.4% share and Oceania 0.3%. The number of victims caused by hydrological disasters in 2010 was the highest in a decade, and increased by 98.9% compared to the yearly average of the last decade. These disasters caused 87.0% of the global reported number of victims in 2010, followed by climatological disasters which caused 5.6% of total victims. Hydrological disasters were responsible for 92.9% of disaster victims in the Asian continent in 2010, the highest share since the 1980s. Extensive floods and landslides following heavy monsoonal rains in Southern China caused 134.0 million victims; floods and flash floods in Pakistan another 20.4 million. A drop in the number of victims from climatological disasters was apparent, due to the absence of extensive droughts and extreme temperatures that have affected Asia and Africa in the last decade. Meteorological disaster occurrence dropped, especially in Asia, and caused fewer victims and damages in the continent. The Americas also had fewer damages from storms in 2010, compared to the annual average of the last decade.

Damages from natural disasters in 2010 show a different regional distribution than that seen for disaster occurrence and victims. The Americas had the major share of global damages (45.9%). Most damages were caused by the earthquakes in Chile and Haiti. Damages from geophysical disasters in the Americas have not been this high since 1994, when the January 17<sup>th</sup> Northridge earthquake struck the United States. Whereas Asia experienced the most disasters in 2010 and was home of most victims from natural disasters, its share of damages ranked second. Damages from natural disasters increased mainly in the Americas and Oceania, compared to the decade's averages. Damages in Oceania, mostly caused by the September 4<sup>th</sup>, 2010 earthquake in New Zealand and floods in Australia, have not been as high since the early 1980s when droughts affected large parts of Australia. Asia had less damage costs in 2010, and its share of global damages (28.1%) was below the 2000-2009 share of 39.8%. Globally, more than one third of the damages were caused by hydrological disasters (37.9%). However, geophysical disasters, which accounted only for 8.1% of global disaster occurrence and 3.4% of all victims in 2010, caused 37.3% of total damages. Damages from geophysical disasters in 2010 increased by 147.4% compared to the average damages from 2000 to 2009, mainly due to the earthquakes in Chile, Haiti and New Zealand. Likewise, damages from hydrological disasters increased by 145.1% as a result of the severe floods in China, Pakistan and Australia. In contrast, both meteorological and climatological disasters caused fewer damages in 2010, compared to the 2000-2009 annual average.

Major fluctuations in numbers of fatalities, victims or damages caused by natural disasters can be seen from year to year. Sudden high-impact events or disasters that are extensive in time and space can bring about changes in disaster impact trends and patterns. Disaster epidemiology brings these tendencies to light and provides information on the temporal and spatial distributions of disasters and their human impact around the world.

**Figure 1 – Trends in occurrence and victims**



\* Victims: sum of killed and total affected



# Chapter 1

## About EM-DAT: The International Disaster Database

- **What is EM-DAT?**
- **Database definitions, criteria and content**
- **Methodology**
- **Disaster classification**



# 1. About EM-DAT: the International Disaster Database

## 1.1 What is EM-DAT?

Since 1988, with the sponsorship of the United States Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA), CRED has maintained EM-DAT, a worldwide database on disasters. It contains essential core data on the occurrence and impacts of more than 19 000 disasters in the world dating from 1900 to the present. The data are compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies. Priority is given to data from UN agencies, followed by OFDA, 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, but it also reflects the fact that most reporting sources do not cover all disasters or have political limitations that can affect the figures. The entries are constantly reviewed for redundancy, inconsistencies and incompleteness. The database's main objectives are to assist humanitarian action at both national and international levels; to rationalize decision-making for disaster preparedness; and to provide an objective basis for vulnerability assessment and priority setting.

## 1.2 Database definitions, criteria and content

CRED defines a disaster as "a situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering". Table 1 shows the definitions of natural disaster subgroups and their main types. More disaster definitions can be found in Annex 1. For a disaster to be entered into the database, at least one of the following criteria must be fulfilled:

- 10 or more people reported killed;
- 100 or more people reported affected;
- declaration of a state of emergency;
- call for international assistance.

**Table 1 – Disaster subgroup definition and classification**

Disaster Subgroup	Definition	Disaster Main Types
<b>Geophysical</b>	Events originating from solid earth	Earthquake, Volcano, Mass Movement (dry)
<b>Meteorological</b>	Events caused by short-lived/small to meso scale atmospheric processes (in the spectrum from minutes to days)	Storm
<b>Hydrological</b>	Events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up	Flood, Mass Movement (wet)
<b>Climatological</b>	Events caused by long-lived/meso to macro scale processes (in the spectrum from intra-seasonal to multi-decadal climate variability)	Extreme Temperature, Drought, Wildfire
<b>Biological<sup>4</sup></b>	Disaster caused by the exposure of living organisms to germs and toxic substances	Epidemic, Insect Infestation, Animal Stampede

<sup>4</sup>Biological disasters are not included in this publication.

EM-DAT includes the following fields:

<b>DISNO:</b>	Unique disaster number for each disaster event (8 digits: 4 digits for the year and 4 digits for the disaster number – for example, 19950324).
<b>Country:</b>	Country (ies) in which the disaster occurred.
<b>Disaster generic group:</b>	Two groups are distinguished in EM-DAT – natural and technological disasters.
<b>Disaster sub-group:</b>	Five sub-groups of natural disasters have been defined: geophysical, meteorological, hydrological, climatological and biological.
<b>Disaster main type and sub-type:</b>	Description of the disaster according to a pre-defined classification (for example, type: flood; sub-type: flash flood).
<b>Date (start and end):</b>	Date when the disaster occurred and ended (month/day/year).
<b>Killed:</b>	Number of people confirmed dead and number missing and presumed dead.
<b>Injured:</b>	Number of people suffering from physical injuries, trauma or an illness requiring immediate medical treatment as a direct result of a disaster.
<b>Homeless:</b>	Number of people needing immediate assistance for shelter.
<b>Affected:</b>	Number of people requiring immediate assistance during a period of emergency; this may include displaced or evacuated people.
<b>Total affected:</b>	Sum of injured, homeless and affected.
<b>Victims:</b>	Sum of killed and total affected.
<b>Estimated damage:</b>	Global figure of the economic impact of a disaster; it is given in US dollars.
<b>Additional fields:</b>	Other geographical information (such as latitude and longitude, location), value and scale of the events (such as the Richter scale value for an earthquake), the international status (OFDA response, request for international assistance, disaster/emergency declaration), the aid contribution (in US dollars), and the different sectors affected.

## 1.3 Methodology

In EM-DAT and in this report, data are considered at the country level. This is for two reasons: first, it is at this level that they are usually reported; and second, it allows the aggregation and disaggregation of data. Annex 2 shows the list of countries per continent. In order to facilitate the comparison over time for the analyses of this report, the event start date has been used as the disaster reference date.

In EM-DAT, the number of people killed includes those confirmed dead and those missing and presumed dead. People affected are those requiring immediate assistance during a period of emergency (e.g. requiring basic survival assistance such as food, water, shelter, sanitation and immediate medical help). People reported injured or homeless are aggregated with those affected to produce the total number of people affected. In this report, the number of victims is used as a measure of the human impact of a disaster. The number of victims is equal to the sum of persons reported killed and the total number of persons reported affected.

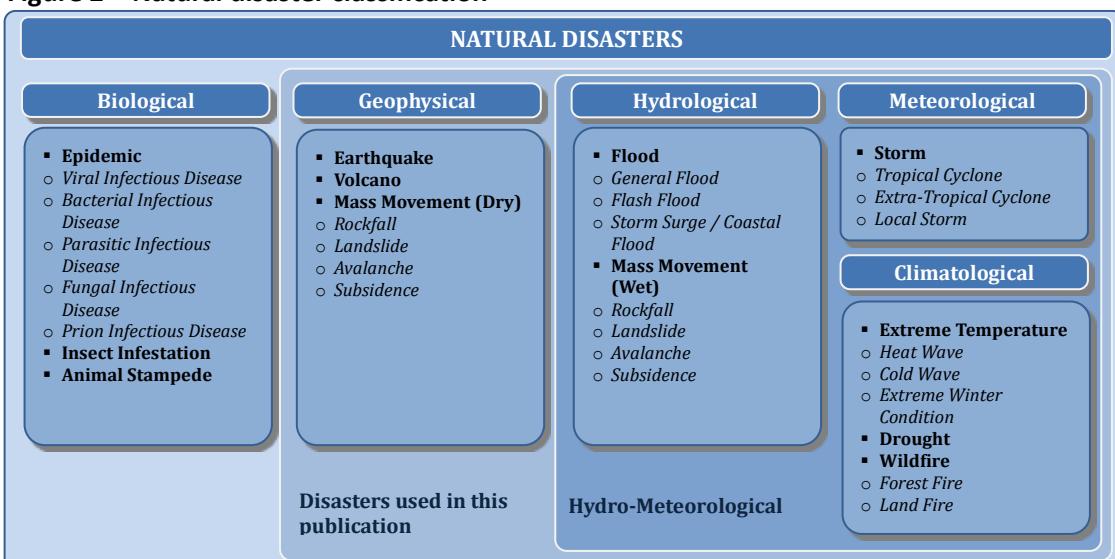
The economic impact of a disaster usually consists of direct consequences on the local economy (e.g. damage to infrastructure, crops, housing) and indirect consequences (e.g. loss of revenues, unemployment, market destabilization). In EM-DAT, the registered figure corresponds to the value of the immediate damage at the time of the event and usually only to the direct damage, expressed in US dollars. Economic damages in this report are converted into 2010 dollar values.

The CRED/EM-DAT team continuously strives to improve its data reporting methodologies and the EM-DAT database as a whole.

## 1.4 Disaster classification

EM-DAT distinguishes two generic categories for disasters (natural and technological), the natural disaster category is divided into 5 sub-groups, which in turn cover 12 disaster types and more than 30 sub-types (Figure 2). See <http://www.emdat.be/classification> for the complete classification and definitions.

Figure 2 – Natural disaster classification





# Chapter 2

## What did 2010 bring?

- Thematic Frame: Earthquake impacts in 2009 and 2010

## 2. What did 2010 bring?

In 2010, 385 natural disasters<sup>5</sup> killed more than 297 000 people worldwide, affected over 217.0 million others and caused US\$ 123.9 billion of damages. A total of 131 countries were hit by these natural disasters, though only 10 countries accounted for 120 of the 385 disasters (31.2%). Similar to previous years, China, India, Philippines, United States and Indonesia were the countries most often hit by natural disasters (see Figure 3).

Nineteen countries, representing 98.6%, 95.0% and 89.0% of the total reported number of deaths, victims and damages, respectively, made up the top 10 rankings of 2010 (see Figures 4, 5 and 6). Six out of these nineteen countries are located in Asia, representing 87.7% of the global reported victims from natural disasters. Six other countries are located in the Americas. These countries accounted for 75.4% of the deaths caused by natural disasters worldwide, mainly due to the January 12<sup>th</sup> 2010 earthquake in Haiti, for which 222 570 deaths were reported<sup>6</sup>.

Haiti had over 39.1% of its population – or a total of 3.9 million victims – affected by the January 12<sup>th</sup> earthquake. Besides Haiti, many deaths were reported in Russia<sup>7</sup>, which was affected by extreme temperatures, floods and wildfires, causing over 55 800 deaths. Most deaths were due to the heat wave that occurred from June to August. These two mega-disasters made 2010 the deadliest year in at least two decades.

In China, a total of 7 186 deaths and 145.7 million victims from natural disasters were reported. Most victims were caused by floods and associated landslides from May to August. This country alone represents 2.4% of global reported deaths and 67.0% of worldwide reported victims. Pakistan also suffered greatly from the impact of natural disasters, as it was struck by floods and flash floods in July and August that caused 20.4 million victims (9.4% of global reported victims). Thailand was affected by floods (North, Centre, East and South) causing 9.0 million victims, as well as droughts (North, Northeast and Centre) causing 6.5 million victims, together affecting 22.8% of Thailand's population. Droughts in Somalia affected 2.4 million people, or 26.5% of its population.

The Chilean earthquake on February 27<sup>th</sup> caused 2.7 million victims, which represents 15.7% of the country's population. The earthquake ranked highest in terms of economic damages caused by natural disasters in 2010, with a total of US\$ 30.0 billion of reported damages (24.2% of the global reported damages). Ranked second, the floods and landslides in China from May to August are estimated to have cost US\$ 18.0 billion. Pakistan suffered economic damages up to US\$ 9.5 billion from flash floods in July and August, representing 5.9% of the countries' GDP.

However, the Haiti earthquake was especially destructive in view of the already impoverished economy. The costs of this earthquake surpassed Haiti's GDP; the estimated US\$ 8.0 billion damages equalled nearly 123.5% of the countries' GDP.

In the American continent, Saint Vincent and the Grenadines, Guatemala, Guyana and Jamaica appear high in the top ranking when the economic damages are compared to the countries' GDP.

<sup>5</sup> Biological disasters are not included in this publication.

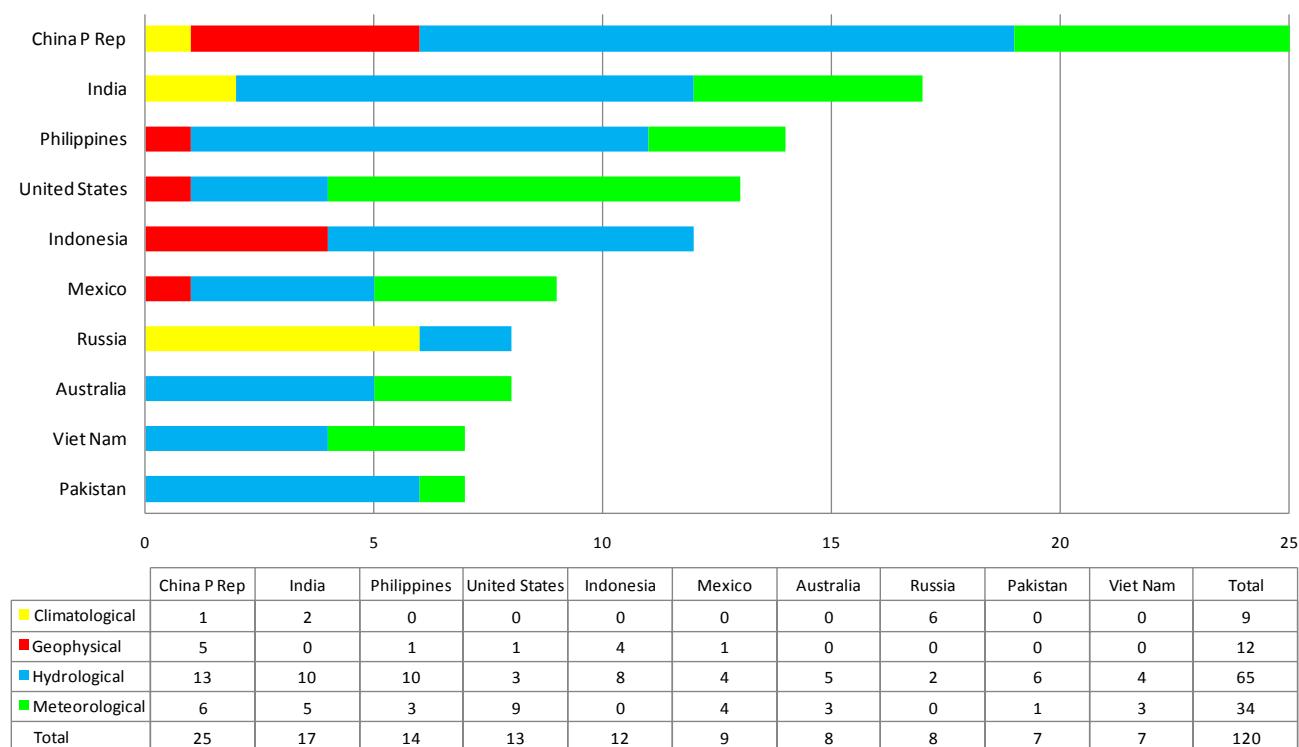
<sup>6</sup> On January 12<sup>th</sup> 2011, the Prime Minister of Haiti updated the mortality figures and added 93 430 people to the death toll, making a total of 316 000 deaths. At present, this figure still needs to be validated by CRED and is therefore not included.

<sup>7</sup> Excess mortality.

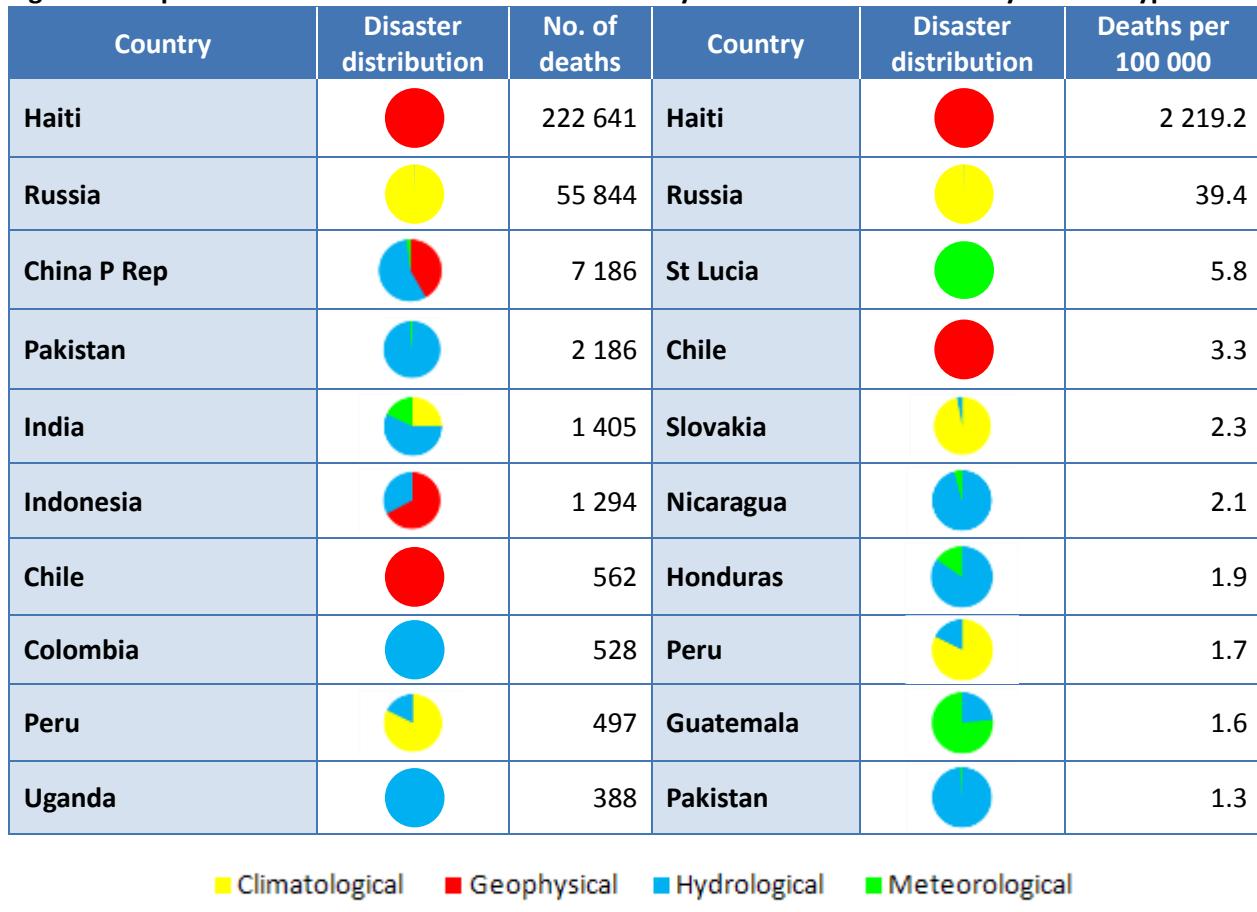
Damages equalled 4.3%, 4.0%, 1.3% and 1.2% of their GDP respectively. Damages in the United States totalled US\$ 9.2 billion, mostly caused by multiple storms in the first half of 2010. In Asia, Tajikistan also suffered extensive damages from natural disasters, mainly due to the floods and landslides that occurred in May. Disaster damages represented 4.1% of Tajikistans GDP. In Europe, winter storm 'Xynthia' and associated storm surges in February and March caused US\$ 6.1 billion damages, mostly in France (US\$ 4.2 billion) and Germany (US\$ 1.0 billion).

In summary, the ten most important disasters worldwide accounted for 97.0%, 87.6% and 75.4% of total mortality, victims and economic damages from natural disasters, respectively (see Tables 2, 3 and 4). In 2010, for the first time the Americas headed the list of the worst affected continents, with 74.8% of total deaths being caused by one single event: the Haiti earthquake.

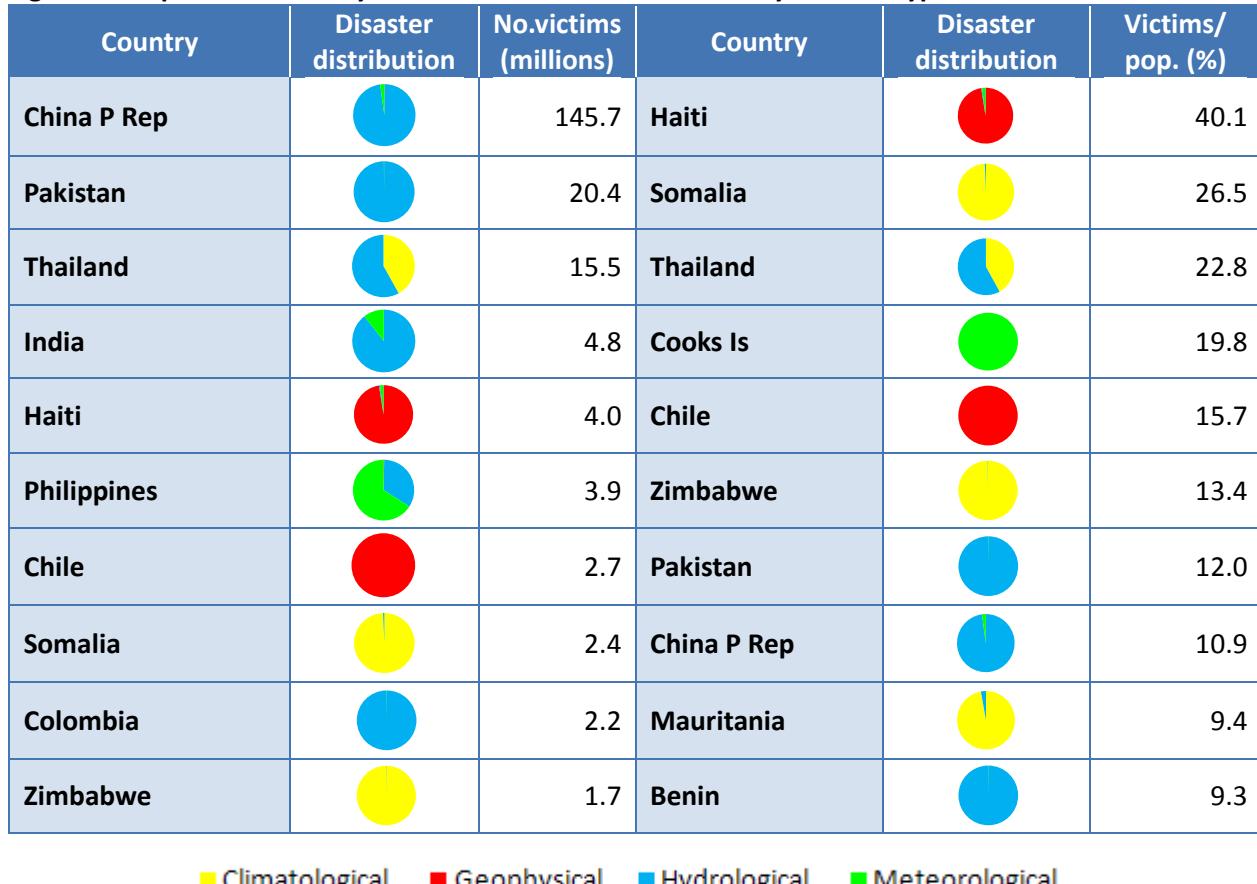
**Figure 3 – Top 10 countries by number of reported events in 2010**



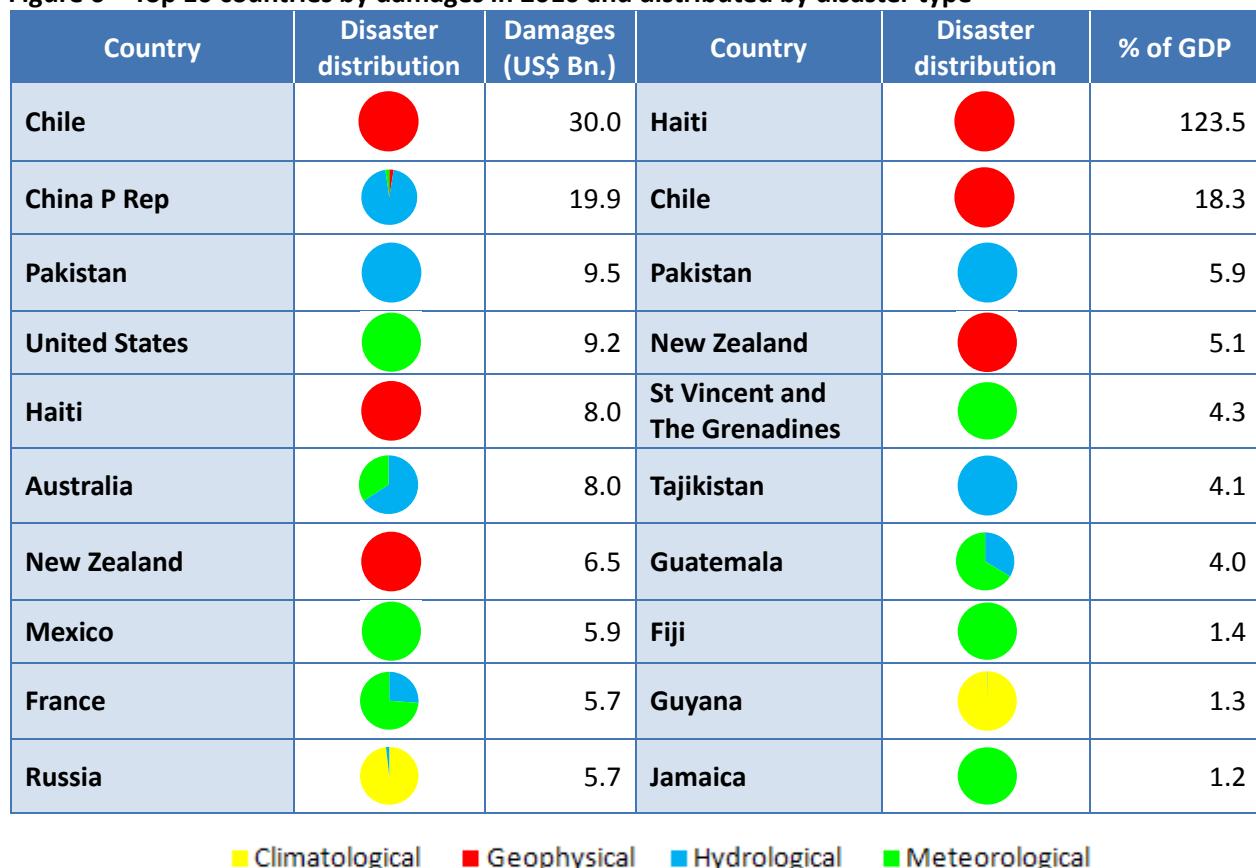
**Figure 4 – Top 10 countries in terms of disaster mortality in 2010 and distributed by disaster type**



**Figure 5 – Top 10 countries by victims in 2010 and distributed by disaster type**



**Figure 6 – Top 10 countries by damages in 2010 and distributed by disaster type**



**Table 2 – Top 10 most important disasters by number of persons killed**

Events	Country	Persons killed
Earthquake, January	Haiti*	222 570
Heat wave, June-August	Russia	55 736
Earthquake, April	China P Rep	2 968
Flash flood, July-August	Pakistan	1 985
Mass Movement Wet, August	China P Rep	1 765
Flood, May-August	China P Rep	1 691
Earthquake, February	Chile	562
Tsunami, October	Indonesia	530
Cold wave, July-December	Peru	409
Mass Movement Wet, Feb-March	Uganda	388
	Total	288 604

\*On January 12th 2011, the Prime Minister of Haiti updated the mortality figures and added 93 430 people to the death toll, making a total of 316 000 deaths. At present, this figure still needs to be validated by CRED and is therefore not included.

**Table 3 – Top 10 most important disasters by number of victims**

Events	Country	Victims (in millions)
Flood, May-August	China P Rep	134.0
Flash Flood, July-August	Pakistan	20.4
Flood, October-December	Thailand, Cambodia*	9.0
Drought, March-August	Thailand	6.5
Flood, June-August	China P Rep	6.0
Earthquake, January	Haiti	3.9
Flood, September	India	3.3
Earthquake, February	Chile	2.7
Drought, February-December	Somalia	2.4
Flood, April-December	Colombia	2.2
	<b>Total</b>	<b>190.3</b>

\*Thailand (8 970 911 victims), Cambodia (8 victims)

**Table 4 – Top 10 most important disasters by economic damages**

Events	Country	Damages (in 2010 US\$ bn)
Earthquake, February	Chile	30.0
Flood, May-August	China P Rep	18.0
Flash Flood, July-August	Pakistan	9.5
Earthquake, January	Haiti	8.0
Earthquake, September	New Zealand	6.5
Winter storm 'Xynthia', February-March	France, Germany, Spain, Portugal, Belgium, Luxembourg, Netherlands, Switzerland, United Kingdom*	6.1
Flood, December	Australia	5.1
Hurricane 'Karl', September	Mexico	3.9
Flood, May	Poland, Hungary, Czech Rep, Croatia, Serbia, Slovakia**	3.6
Storm, May	United States	2.7
	<b>Total</b>	<b>93.4</b>

\*France (4.23), Germany (1.00), Spain (0.34), Portugal (0.27), Belgium (0.16), Luxembourg (0.03), Netherlands (0.03), Switzerland (0.01), United Kingdom (0.001)

\*\*Poland (3.20), Hungary (0.36), Czech Rep (0.06), Croatia (0), Serbia (0), Slovakia (0)

## Thematic Frame: Earthquake impacts in 2009 and 2010



**Photo credit:** UN Photo/Marco Dormino on Flickr

**Both 2009 and 2010 were marked again by powerful earthquakes.**

The United States Geological Survey (USGS) estimates that several million earthquakes occur in the world each year. Many go undetected because they hit remote areas or have very small magnitudes.

Are earthquakes really on the rise, however?

"A partial explanation may lie in the fact that in the last twenty years, we have definitely had an increase in the number of earthquakes we have been able to locate each

year. This is because of the tremendous increase in the number of seismograph stations in the world and the many improvements in global communications", says USGS.

In 2009, 22 earthquakes killed 1,888 persons, made 3.2 million victims and caused US\$ 6.2 billion of damages, according to EM-DAT - the OFDA/CRED International Disaster Database. In 2010, 25 earthquakes caused 226,735 fatalities, 7.2 million victims and US\$ 46.2 billion of damages. The historical database from USGS counts 74 earthquakes stronger than magnitude 8.0 between the China (Shensi) earthquake of January 1556 and the Great East Japan Earthquake of March 2011 - including the Lisbon quake of November 1755.

In 1756, Voltaire wrote to Rousseau regarding the Lisbon earthquake and tsunami disaster, where an estimated 10,000 people were killed. "Ce n'est pas le tremblement de terre qui fit mourir les gens à Lisbonne, c'est le fait qu'ils habitaient à Lisbonne" [ED. translation: "It is not the earthquake that killed the people of Lisbon, but the fact that they lived in Lisbon."]. More than 250 years later, as Voltaire's letters suggested, when earthquake strikes, unsafe buildings in urban sprawl remain a primary killer.

For several centuries, cities have been growing as people move away from the countryside in search of better jobs and living conditions. Now, for the first time in human history, the majority of the world's population is living in urban areas. Each day, almost 180,000 people move to cities – with 60 million per year moving from developing countries alone. While city populations grow faster than city infrastructure can adapt, migrants often encounter a lack of infrastructure, services, housing and property rights. These urban newcomers are forced to live in unsafe places.



### 2010: Two major earthquakes – two different outcomes

On January 12, a magnitude 7.0 earthquake struck Haiti. Just over a month later, on February 27, a magnitude 8.8 earthquake struck Chile. Given the difference in magnitude, why were fewer people killed in Chile than in Haiti?

The earthquake in Haiti, which struck closer to the surface than in Chile, was no match for the homes and buildings of that city. Around 70 per cent of them collapsed, killing over 200,000 people.

**Photo credit:** UN Photo/Marco Dormino on Flickr

Strict building codes in Chile implemented after the devastating magnitude 9.5 earthquake in 1960, however,

helped protect the Chilean people even though the tremor was 500 times stronger than the magnitude 8.8 earthquake in Haiti. In Chile, buildings were better built and people better prepared.

For Haiti, no lesson had been learned from the past. During two centuries, earthquake had not shaken Port-au-Prince, although the capital had been completely destroyed in 1751 and 1757. In September 2008, geologist Patrick Charles predicted the "disaster" that was to come. In September 2008, minor quakes alerted him. "They announce an earthquake with a bigger intensity", said Patrick Charles. Unfortunately, history shows that he was correct.

What could have happened in Haiti if people had known the safest places to go when the earthquake struck as they had known in Chile?

Haiti is one of the poorest countries in the world. The illiteracy rate stands at 45%, and some 60% of people, primarily in rural areas, lack access to basic health-care services. Moreover, years of conflict, political instability and recurrent disasters such as cyclones, floods and mudslides have weakened Haiti's already low capacity to invest in the long-term safety of its citizens.

"In earthquake zones, three factors affect our degree of risk: changes to our natural environment, the quality of the built environment around us, and whether awareness and knowledge is widespread enough for us to modify our behavior in response to these factors," said Margareta Wahlström, the United Nations Special Representative of the Secretary-General for Disaster Risk Reduction. "The key to surviving high magnitude quakes is to live and work in seismically safe buildings, while being aware of how nature around us can also change."

The entire international community, including the UN, is doing their utmost to assist the Haitian Government and the millions of people who have been affected by the tragedy, and is helping to push forward the relief and recovery process, and calls for long-term measures to rebuild a safer Haiti.

Cities and local governments need to get ready, reduce the risks and become resilient to disasters. For the next two years and beyond, the United Nations International Strategy for Disaster Reduction (UNISDR) will campaign together with its partners for this to happen. In May 2010, Port-au-Prince was one of the cities that signed up to the "Making Cities Resilient" world disaster reduction campaign.

#### **2010 Volcano: the Eyjafjallajökull eruption**

Another geophysical event, quite different from earthquake, was ash from Iceland's Eyjafjallajökull volcano eruption in April, that grounded flights and paralyzed intercontinental travel for almost a week. There was hardly any direct damage, but it demonstrated the vulnerability of the networked global economy.

"While the Eyjafjallajökull eruption was not a relatively big one compared with others in the past, it has caused chaos on a massive scale. Other volcanoes in Europe, such as Italy's Vesuvius and Iceland's much bigger Katla, would create far more disruption if they were to erupt today", according to Henri Gaudru, President of the European Volcanologist Society. The volcanic eruption is an example of a rare but largely disruptive event that exposes our key infrastructure vulnerability.

When prepared, living with risk doesn't have to be a disaster. Disaster risk reduction can reduce the damage caused by natural hazards like earthquake and volcano, through an ethic of prevention. There is no such thing as a 'natural' disaster, only natural hazards.

***Contributed by UNISDR***

# Chapter 3

## How different was 2010?

- Thematic Frame: Disaster losses in a changing climate

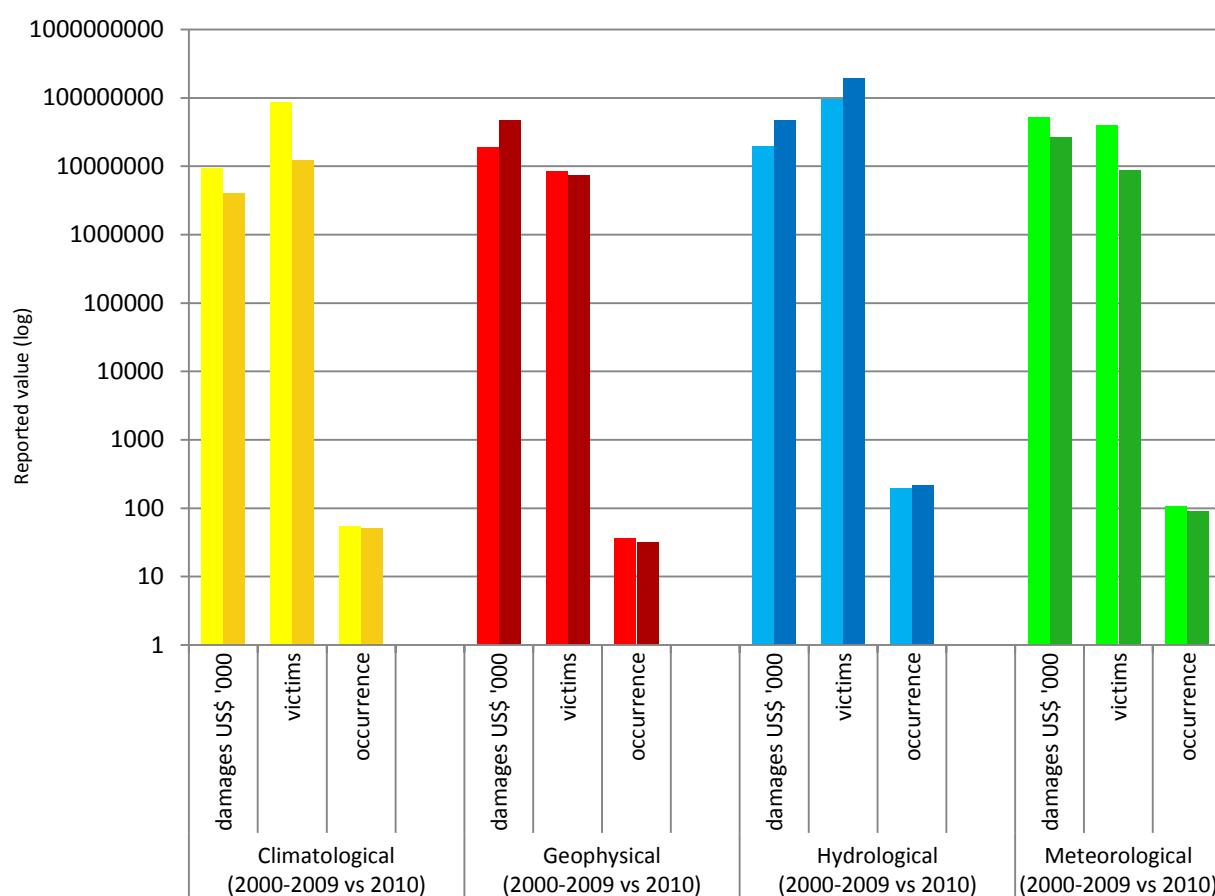


### 3. How different was 2010?

Once again, the year 2010 showed the world the devastating impact that natural disasters can have on human lives and livelihoods. After the relatively moderate year of 2009, natural disaster impact took a turn for the worse in 2010 with more than 297 000 fatalities. One must note that trends and patterns in disaster statistics are often greatly altered by single extreme events causing excessive human or economic losses. This was the case for example with cyclone 'Nargis' in Southeast Asia in 2008 or with the recent March 11th, 2011 'Tohoku' earthquake and tsunami in Japan. Over the last four decades, the mortality figures of 2010 were only surpassed in 1970, when a tropical cyclone killed 300 000 people in Bangladesh, and in '83/'84, when droughts and associated famines affected the African continent and caused 450 000 deaths.

In 2010, 42 more disasters were reported than in 2009. The number of reported disasters (385) approximated the average yearly disaster occurrence from 2000 to 2009 (387). Although the total number of reported disasters in 2010 approached the 2000-2009 annual average of disaster occurrence, a slight change was seen in the distribution between disaster subgroups. Mostly, hydrological disaster occurrence increased whereas meteorological disaster occurrence decreased, hereby enlarging the share of hydrological disasters in 2010.

**Figure 7 – Natural disaster impacts by disaster sub-group: 2010 versus 2000-2009 annual average**



The number of victims increased from 198.7 million in 2009 to 217.3 million in 2010 but remained below the annual average number of victims of 227.5 million for the period 2000 to 2009. The number of victims from hydrological disasters increased by 98.9% compared to the yearly average of the last decade. In contrast, climatological, meteorological and to a lesser extent geophysical

disasters caused fewer victims, leading to an overall decrease in the number of victims in 2010 compared to the decade's annual average.

Economic damages from natural disasters in 2010 (US\$ 123.9 billion) increased by 160.4% compared to 2009, and were above the annual average damages for the period 2000-2009 (US\$ 98.9 billion). Damages from geophysical and hydrological disasters increased by 147.4% and 145.1% respectively in 2010 compared to the annual average damages from 2000 to 2009. In contrast, damages from meteorological and -to a lesser extent- climatological disasters decreased. This led not only to an overall increase of damages in 2010 compared to the yearly average of the decade, but also a different distribution of disaster damages.

By far, hydrological disasters were the most prominent disasters in 2010, as was the case on average during the last decade. These disasters represented 56.1% of the total disaster occurrence in 2010. Meteorological disasters were the second-most occurring disasters, showing a ratio of one to 2.5 (meteorological:hydrological disasters) when comparing to hydrological disaster occurrence. Together, hydrological and meteorological disasters accounted for 79.0% of total occurrence. Hydrological disasters caused 87.0% of the global reported number of victims in 2010, only followed by climatological disasters with 5.6%. More than one third of the damages were caused by hydrological disasters (37.9%). Geophysical disasters, which accounted only for 8.1% of the disaster occurrence in 2010, caused however 37.3% of total damages. The number of victims caused by hydrological disasters in 2010 was the highest in a decade. A total of 216 hydrological disasters (85.2% floods and 14.8% wet mass movements) caused 189.0 million victims. This figure was only surpassed in 1998, when extended floods in China affected over 239.0 million people. Hydrological disaster occurrence increased by 20% compared to 2009 and remained above the annual average for the period 2000-2009 (192) (see Figure 7). The reported number of victims in 2010 was more than tripled compared to 2009 and nearly twice as many victims from hydrological disasters were reported compared to the annual average number for the year 2000 to 2009. Damages in 2010 caused by hydrological disasters (US\$ 46.9 billion) were also the highest since 1998 (US\$ 60.0 billion, mostly due to China floods), and 2.5 times higher than the annual average of US\$ 19.1 billion for the period 2000-2009.

The impact of meteorological disasters in 2010 in terms of occurrence (88), damages (US\$ 26.8 billion) and especially victims (8.7 million) was particularly low compared to the decade. Whereas meteorological disasters between 2000 and 2009 accounted for 17.5% of total reported victims, in 2010 they took only a 4.0% share. In 2009, meteorological disasters still took the largest share of total damages (55.8%), mainly due to winter storm 'Klaus' in France, Spain and Italy, multiple tornadoes in the United States, and typhoon 'Morakot' (Kiko) which hit China, Taiwan and the Philippines. In contrast, in 2010 meteorological disasters took only one-fifth of total damages.

The number of climatological disasters in 2010 (50) approximated the annual average occurrence during 2000-2009 (54). These disasters, representing 13.0% of total disaster occurrence in 2010, accounted for only 5.6% of the total number of victims and for as little as 3.2% of total damages. In particular, climatological disasters caused much fewer victims (12.2 million) compared to both 2009 (87.2 million) as well as to the yearly average number of victims during the last decade (84.3 million). Damage costs (US\$ 4.0 billion) also remained below the annual average of the last decade (US\$ 9.3 billion). Although droughts in Thailand, Somalia and Zimbabwe affected many people, their overall impact remained smaller compared to previous years. Nevertheless, extreme temperatures in Russia (heat wave) caused high excess mortality in 2010.

In 2010, geophysical disasters had a major human and economic impact. The January 12th Haiti earthquake, followed by the February 27th Chile earthquake and tsunami, the April 14th China earthquake and the October 25th Indonesia earthquake and tsunami are only examples of the geophysical disasters that shocked the world in 2010. Mortality figures from geophysical disasters were the third highest ever recorded, only surpassed in 2004 (Indian Ocean tsunami) and 1976 (July 27th Tangshan earthquake in China). Although 31 geophysical disasters were registered in 2010, more than in 2009 (25) but less than the annual average occurrence from 2000 to 2009 (36), economic damages (US\$ 46.2 billion) were 2.5 times higher than the annual average in the 2000-2009 decade (US\$ 18.7 billion). In 2010, damages from geophysical disasters were the second-highest in a decade, only exceeded in 2008 due to the Sichuan earthquake in China. The number of reported victims from geophysical disasters in 2010 (7.3 million or 3.4% of total number of victims) remained somewhat below the annual average number of victims from 2000 to 2009 (8.5 million).

## **Thematic Frame: Disaster losses in a changing climate**

Several major disasters in 2010 resulted in substantial losses and exceptionally high numbers of fatalities. The numbers of hydro-meteorological disaster including extreme temperature, from a large scale to a small scale country level, continue to provide indicators of a changing climate.

The impacts of catastrophic floods in Pakistan in July 2010 show once again how disaster risk and poverty are closely interlinked. Meanwhile, wildfires and extreme temperatures in the Russian Federation in the summer of 2010 and floods in Australia in December 2010 are stark reminders that developed countries are also very exposed and vulnerable. Both disasters have been attributed to the La Niña phenomenon.

In 2010, the La Niña phenomenon was classified as moderate to strong. The phenomenon is a result of El Niño-southern oscillation:

A complex interaction of the tropical Pacific Ocean and the global atmosphere that results in irregularly occurring episodes of changed ocean and weather patterns in many parts of the world, often with significant impacts over many months, such as altered marine habitats, rainfall changes, floods, droughts, and changes in storm patterns. (UNISDR Terminology)

In the summer of 2010, one-fifth of Pakistan was under water. Over 20 million people were affected by flooding that ran the length of the country, along the Indus River. The flooded area was similar in size to Italy and destroyed more than 1.6 million acres of crops, making millions homeless. This calamity has surpassed the humanitarian aid scope of the 2004 Indian Ocean tsunami.



**Photo credit: UN Photo/Evan Schneider on Flickr**

Later in the year, La Niña's impact was felt again in Australia. "Floods in Australia underline the needs for all countries - both developed and developing - to plan ahead or face increasing economic losses in the face of a 'new normal' marked by unpredictable and extreme weather patterns," said UNISDR.

Many experts believe that climate change fueled the weather systems that led to the unprecedented rain and flooding.

Meteorologists have noted that the heavy rains in Pakistan have coincided with unusually high temperatures. A heat wave unseen in 130 years that fueled disastrous wildfires in Russia killed nearly 56,000 as result of heat and increased air pollution, destroying one third of the country's wheat crop.

"Unfortunately, what is happening now in [Russian] central regions is evidence of this global climate change, because we have never in our history faced such weather conditions in the past," said Russian Federation President Dmitry Medvedev.

However, scientists have cautioned against branding these events as directly caused by climate change, as extreme weather events have periodically happened throughout history. At the same time, the IPCC has confirmed that the geographic distribution, frequency and intensity of these hazards are already being altered significantly by climate change. Changes are already occurring in the amount, intensity, frequency and type of precipitation. This is associated with increases in the extent of the areas affected by drought, in the number of heavy daily precipitations events that lead to flooding and increases in the intensity and duration of certain kinds of tropical storms<sup>1</sup>.

Nevertheless, the mortality risk associated with major weather-related hazards is now declining globally, including Asia, where most of the risk is concentrated. In most of the world, the risk of being killed by a tropical cyclone or a major river flood is lower today than it was in 1990. "This trend is particularly encouraging when compared to the rapid increase in population exposure to such hazards.

Since 1970, the frequency of tropical cyclones has not increased, but 'at risk' populations have grown rapidly with global physical exposure to tropical cyclones almost tripling." concluded the Global Assessment Report on Disaster Risk Reduction 2011 (GAR11).

The GAR11 also highlights the climate-related 'hidden risk': drought. "Thanks to improved early warning, preparedness and response, the massive mortality from sub-Saharan African droughts in the 1970s has not been repeated. Globally drought is still a hidden risk and locally its social and economic impacts are disproportionately concentrated on poor rural households". Less visible internationally, hundreds of smaller disasters associated with climate variability have caused enormous damages in many countries<sup>2</sup>.

"It's critical for local governments, city leaders and their partners to incorporate climate change adaptation in urban planning," said Margareta Wahlström, the United Nations Special Representative of the Secretary-General for Disaster Risk Reduction, stressing that disaster risk reduction was no longer optional. "What we call 'disaster risk reduction' – and what some are calling 'risk mitigation' or 'risk management' – is a strategic and technical tool for helping national and local governments to fulfill their responsibilities to citizens."

Applying disaster risk reduction measures can significantly reduce losses – even in a changing climate.

<sup>1</sup>2009 Global Assessment Report on Disaster Risk Reduction: Risk and poverty in a changing climate (UNISDR)

<sup>2</sup>2011 Global Assessment Report on Disaster Risk Reduction: Revealing Risk, Redefining Development (UNISDR)

**Contributed by UNISDR**



# Chapter 4

## Regional analysis

- Africa
- Americas
- Asia
- Europe
- Oceania



## 4. Regional analysis

The regional distribution of disaster occurrence in 2010 resembled the annual average distribution over the last decade, which showed the highest concentration of disasters in Asia, followed by the Americas (see Table 5). Europe saw in 2010 the biggest increase in disaster occurrence (18.2%) whereas Asia experienced the largest decrease (13.8%), compared to the decade's averages. The number of victims in Africa, Europe and Asia decreased compared to the 2000-2009 yearly averages. However, the number of victims in the Americas and Oceania increased, resulting in a slightly larger share of disaster victims in these continents. Damages from natural disasters increased mainly in the Americas and Oceania, compared to the decade's averages. They contributed most to the overall increase in damages from natural disasters in 2010. Asia's share of global damages (28.1%) was below the 2000-2009 share of 39.8%.

**Table 5 – Natural disaster occurrence and impacts: regional figures**

No. of Natural Disasters	Africa	Americas	Asia	Europe	Oceania	Global
<b>Climatological 2010</b>	6	16	6	22	0	<b>50</b>
	9	13	13	18	1	<b>54</b>
<b>Geophysical 2010</b>	1	6	20	2	2	<b>31</b>
	3	7	21	3	2	<b>31</b>
<b>Hydrological 2010</b>	57	40	81	32	6	<b>216</b>
	43	39	80	25	5	<b>192</b>
<b>Meteorological 2010</b>	5	35	27	14	7	<b>88</b>
	9	33	42	14	6	<b>105</b>
<b>Total 2010</b>	<b>69</b>	<b>97</b>	<b>134</b>	<b>70</b>	<b>15</b>	<b>385</b>
<b>Avg. 2000-09</b>	<b>64</b>	<b>92</b>	<b>156</b>	<b>59</b>	<b>15</b>	<b>387</b>

No. of victims (millions)	Africa	Americas	Asia	Europe	Oceania	Global
<b>Climatological 2010</b>	5.44	0.18	6.52	0.06	0.00	<b>12.21</b>
	12.21	1.21	70.57	0.26	0.00	<b>84.25</b>
<b>Geophysical 2010</b>	0.00	6.62	0.38	0.03	0.30	<b>7.33</b>
	0.08	0.37	7.98	0.01	0.01	<b>8.45</b>
<b>Hydrological 2010</b>	4.23	4.18	180.10	0.28	0.23	<b>189.03</b>
	2.34	2.90	89.42	0.34	0.02	<b>95.01</b>
<b>Meteorological 2010</b>	0.20	1.11	6.88	0.50	0.05	<b>8.73</b>
	0.45	2.62	36.31	0.32	0.04	<b>39.74</b>
<b>Total 2010</b>	<b>9.87</b>	<b>12.10</b>	<b>193.89</b>	<b>0.87</b>	<b>0.57</b>	<b>217.30</b>
<b>Avg. 2000-09</b>	<b>15.07</b>	<b>7.09</b>	<b>204.29</b>	<b>0.94</b>	<b>0.06</b>	<b>227.46</b>

Damages (2009 US\$ bn)	Africa	Americas	Asia	Europe	Oceania	Global
<b>Climatological 2010</b>	0.00	0.11	0.27	3.60	0.00	<b>3.98</b>
	0.04	2.29	3.56	2.90	0.47	<b>9.26</b>
<b>Geophysical 2010</b>	0.00	38.01	1.51	0.13	6.50	<b>46.15</b>
	0.67	0.69	16.73	0.54	0.02	<b>18.65</b>
<b>Hydrological 2010</b>	0.06	2.49	32.08	7.02	5.24	<b>46.89</b>
	0.35	2.89	8.86	6.53	0.50	<b>19.13</b>
<b>Meteorological 2010</b>	0.00	16.22	0.90	6.95	2.77	<b>26.84</b>
	0.08	37.82	10.21	3.44	0.29	<b>51.83</b>
<b>Total 2010</b>	<b>0.06</b>	<b>56.84</b>	<b>34.76</b>	<b>17.70</b>	<b>14.51</b>	<b>123.86</b>
<b>Avg. 2000-09</b>	<b>1.15</b>	<b>43.69</b>	<b>39.36</b>	<b>13.41</b>	<b>1.27</b>	<b>98.87</b>

Asia accounted in 2010, despite a decline in disaster occurrence, for more than one-third of the number of reported global disasters (34.8%), whereas one quarter of the disasters happened in the

Americas (25.2%). Europe and Africa both took nearly one-fifth of global disaster occurrence (18.2% and 17.9% respectively) and Oceania 3.9%.

Although the Americas were gravely affected by natural disasters in 2010, especially in terms of fatalities, the number of disaster victims remained by far the highest in Asia. As much as 89.2% of global disaster victims in 2010 were from Asia, compared to 5.6% from the Americas. In spite of the non-negligible disaster occurrence in Europe, only 0.4% of disaster victims came from this continent. Disaster victims from Africa accounted for 4.5% of global victims in 2010 and 0.3% for Oceania. The unequal distribution of the global human impact of natural disasters was repeatedly present throughout the last decades. Going back in time, it was only in 1983 that both the Americas and Africa had similar shares of disaster victims compared to Asia, mainly due to the widespread African droughts and food shortages and droughts and floods in the Americas. In later years, it has without exception been Asia that has represented the major share of global disaster victims.

The damages from natural disasters in 2010 show a different regional distribution than those seen for disaster occurrence and victims. The Americas took the biggest share of global damages (45.9%), mostly caused by the earthquakes in Chile and Haiti and storms in Mexico and the United States. Whereas Asia experienced the most disasters in 2010 and was home of most victims from natural disasters, its share of damages ranked second. Damages in Europe accounted for 14.3% of the global reported damages in 2010, whereas Oceania's share of damages was 11.7%. Africa accounted for only 0.05% of global economic damages from natural disasters, even less than the 2000-2009 share of 1.2%.

## **Africa**

In 2010, Africa experienced slightly more disasters (69) compared to the annual average disaster occurrence during the last decade (64). This was mostly due to an increase in the number of hydrological disasters. Other disasters occurred less frequently than observed on average over the last decade. Consequently, hydrological disasters took an 82.6% share in 2010, while from 2000 to 2009 they represented 66.5% of all disasters in Africa. However, climatological disasters caused most victims in Africa (55.1%), followed by hydrological disasters with 42.9%. These figures diverge from the annual average number of victims from 2000 to 2009, when 81.0% and 15.5% of the victims were caused by climatological and hydrological disasters, respectively. Overall, Africa counted fewer victims from natural disasters in 2010 (9.9 million) compared to the 2000-2009 annual average (15.1 million), mainly due to the absence of extensive droughts and famines that added to the number of victims in earlier years. On average per year during 2000 to 2009, geophysical disasters were the costliest disasters, taking a share of 58.3% of total damages in the continent. However, in 2010, all reported damages from natural disasters were caused by hydrological disasters (US\$ 59.2 million). This figure, as well as the yearly average over the decade (US\$ 1.2 billion), can only be considered as a low approximation of the real costs that are repeatedly caused by natural disasters in Africa. In general, economic damages from natural disasters in Africa are infrequently and incompletely reported, leading to an underestimation of damage figures.

## **Americas**

Overall, more disasters, more victims and higher damages were observed in the Americas in 2010 compared to the 2000-2009 annual averages. Hydrological disasters occurred most often in the Americas (41.2%), followed by meteorological disasters (36.1%). Geophysical disasters represented a 6.2% share of disaster occurrence in the continent. This pattern resembles the disaster distribution seen from 2000 to 2009. Yet, many more victims from geophysical disasters were reported in 2010, increasing the share of 5.2% during the last decade to a share of 54.7% in 2010.

Two main disasters had a major influence on these figures: the Haiti earthquake and the Chile earthquake. The number of victims from hydrological disasters was also higher in 2010 compared to the annual average of the last decade. These disasters accounted for 34.6% of disaster victims in the Americas in 2010. The human impact of both meteorological and climatological disasters was smaller in 2010 compared to the 2000-2009 yearly average of the number of victims of these disasters. Damages from geophysical disasters topped in 2010, increasing from a share of 1.6% of total damages in the continent over the last decade to 66.9% in 2010. Damages from geophysical disasters as high as those reported in 2010 were only observed in 1994 after the January 17th Northridge earthquake in the United States. On the other hand, damages from meteorological disasters decreased in 2010. They took a share of 28.5% of damages, while these disasters were responsible for the majority of damages in the Americas during the last decade (86.6%). Hydrological disasters, although highest in occurrence, took only 4.4% of total disaster damages in the Americas in 2010, slightly below the 2000-2009 share of 6.6%.

## **Asia**

The decrease in disaster occurrence in Asia in 2010 was mostly due to a drop in the number of meteorological disasters, though the number of climatological disasters dropped as well. The percent share of hydrological disasters increased from 51.2% for the period 2000-2009 to 60.4% in 2010, and these disasters remained the most frequent disasters in the continent in 2010. Overall, fewer victims were reported in Asia in 2010 compared to the yearly average for 2000-2009. The Asian population was less struck by extensive droughts, destructive storms and extreme temperatures, and also earthquakes caused fewer victims. Although the hydrological disaster frequency remained the same, the number of victims from hydrological disasters increased from 89.4 million on average per year throughout the last decade to 180.1 million in 2010. Since the number of victims caused by climatological, meteorological and geophysical disasters in Asia in 2010 decreased compared to the 2000-2009 yearly average, the relative share of victims from hydrological disasters was even larger in 2010. Whereas hydrological disasters were responsible for 43.8% of victims from 2000 to 2009, in 2010 they took a share of 92.9% of disaster victims in the continent. Likewise, damages from geophysical, meteorological and climatological disasters decreased in 2010 compared to the annual average damages from 2000 to 2009, whereas damages brought by hydrological disasters increased. Hydrological disasters represented 92.3% of damages in Asia in 2010, compared to 22.5% for the 2000-2009 decade. In contrast, geophysical disasters, which were the costliest disasters on average during 2000 to 2009 with a share of 42.5% of disaster damages, only represented 4.3% of damages in the continent in 2010. Overall, damages in 2010 were slightly less than the average damages per year during the last decade.

## **Europe**

The number of natural disasters in Europe rose from 59 disasters on average per year during 2000 to 2009 to 70 disasters in 2010. This increase was mostly due to a rise in the number of hydrological and climatological disasters, respectively the most frequent and second-most frequent disaster subgroups in Europe in the last decade. In 2010, 45.7% of all disasters were hydrological disasters, slightly above the 2000-2009 share of 42.1%, and 31.4% were climatological disasters, also above the decade's share of 29.6%. In contrast, meteorological disasters caused the most victims in Europe in 2010; more than half (57.4%) of all natural disasters victims were due to storms, especially winter storm 'Xynthia' and associated storm surges which made many victims in France. The number of meteorological disaster victims increased by 54.1% compared to the average number of victims per year during 2000 to 2009. Whereas hydrological disasters took the largest share of disaster victims in Europe over the last decade (36.3%), they accounted for 32.2% of total disaster victims in Europe in 2010, behind meteorological disasters. Overall, the number of victims

in Europe in 2010 remained somewhat below the annual average during 2000 to 2009, mainly due to a decrease in the number of victims from climatological disasters. In terms of mortality, climatological disasters, however, had a major impact in 2010. The number of people killed by climatological disasters in Europe was the second-highest in a decade, only surpassed in 2003 when a heat wave in Western Europe caused over 72 000 deaths. In 2010, over 55 730 people were killed<sup>8</sup> by the Russian heat wave that occurred from June to August, adding to a total of over 56 200 deaths from climatological disasters in Europe. Hydrological disasters were the costliest disasters in 2010, but damages from meteorological disasters increased the most in 2010 compared to the annual average damages from 2000 to 2009, adding up to an overall increase of 31.9% in disaster damages in Europe in 2010. Again, winter storm 'Xynthia' that affected Europe in February and March 2010 strongly contributed to this increase in damages.

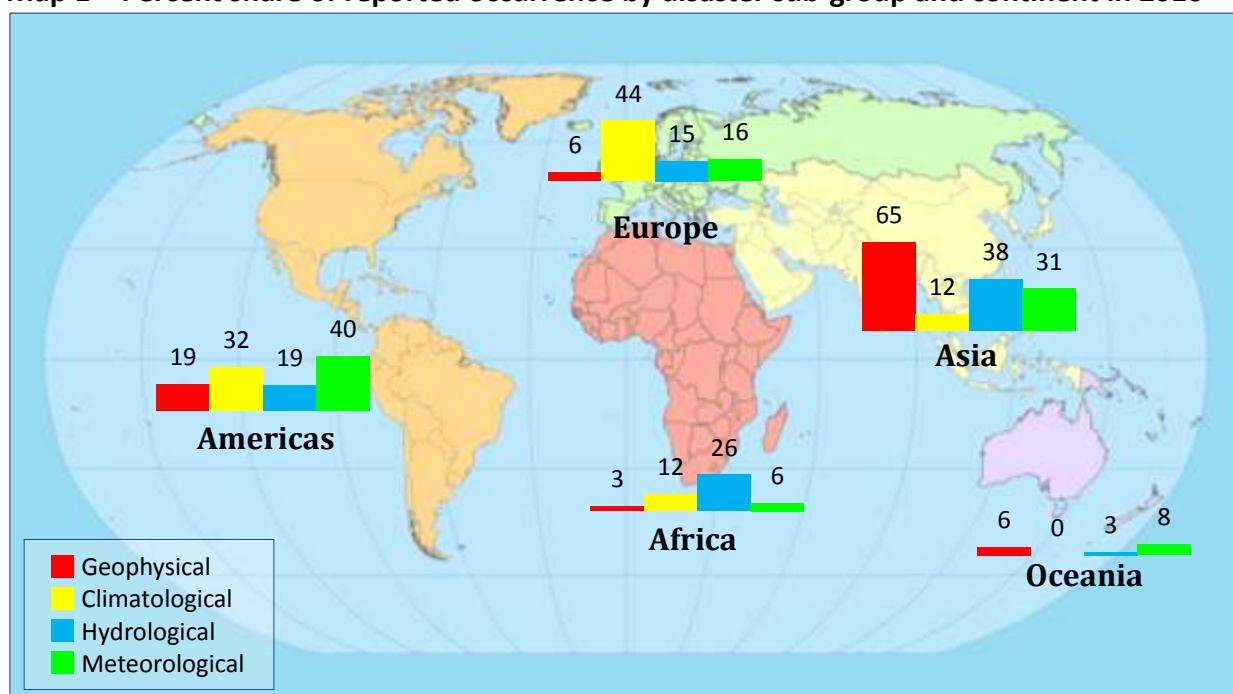
## Oceania

The disaster frequency distribution in Oceania in 2010 was comparable to that of 2000-2009. Meteorological disasters struck most often (46.7%), followed by hydrological (40.0%) and geophysical disasters (13.3%). Whereas during 2000-2009 climatological disasters accounted for 9.1% of disaster occurrence in the continent, there were no climatological disasters reported in 2010. While meteorological and hydrological disasters happened most frequently, most victims in 2010 were caused by geophysical disasters, mainly due to the earthquake that struck New Zealand on September 4th. Geophysical disasters accounted for 52.5% of victims in Oceania in 2010, compared to 12.8% during 2000 to 2009. Meteorological disasters, which caused the largest share of disaster victims in the last decade (56.7%), represented only 7.9% of victims in 2010. Although major storms affected the continent in 2010, the number of victims remained relatively low compared to when, for example, tropical cyclone Guba hit Papua New Guinea in 2007 and affected over 160 000 persons. Hydrological disasters caused more victims in 2010 in comparison with the annual average number of victims from 2000 to 2009, and together with geophysical disasters, contributed to an increase in disaster victims in Oceania in 2010. Damages from natural disasters in Oceania greatly increased in 2010 (US\$ 14.5 billion) compared to the decade's annual average (US\$ 1.3 billion), and were the highest since 1981 when droughts affected Australia. Oceania's share of global damages increased from 1.3% to 11.7% in 2010. This was mostly due to the damages caused by the earthquake in New Zealand and by the floods in Australia, but also storms in Australia contributed to elevated damages. Whereas on average per year during 2000 to 2009, hydrological disasters accounted for the most damages in Oceania (39.1%), followed by climatological disasters (36.9%), it were geophysical disasters that took the biggest share in 2010 (44.8%), followed by hydrological disasters (36.1%).

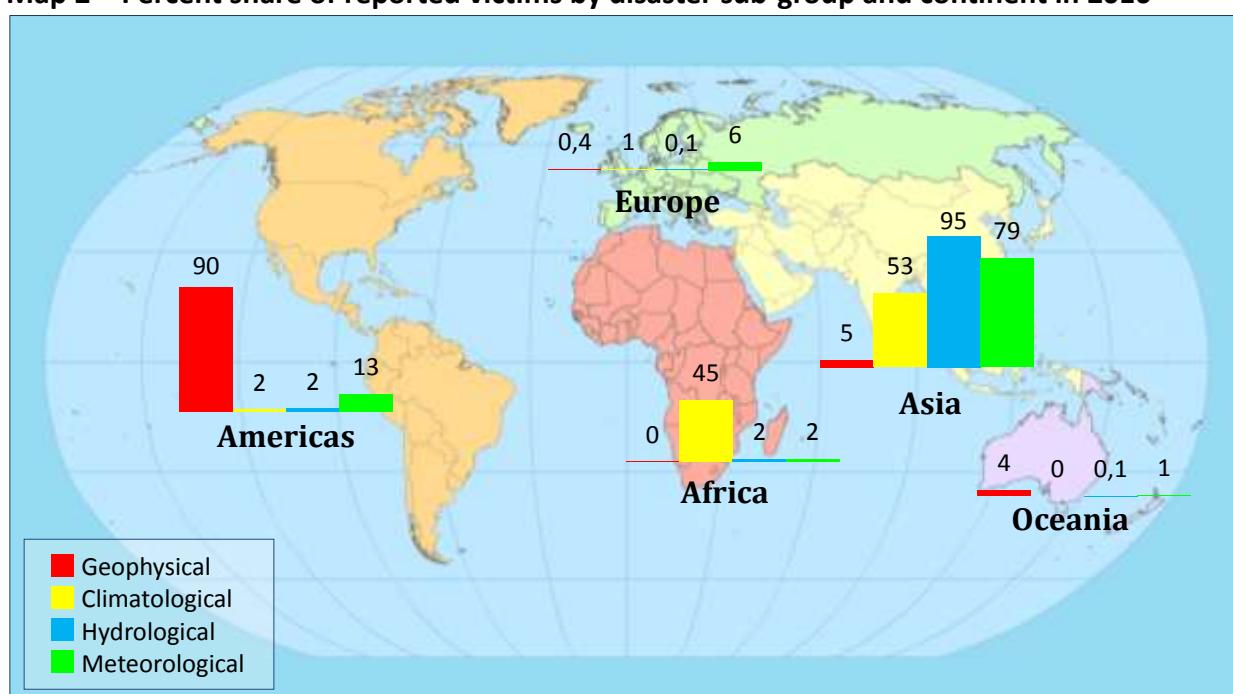
When comparing the occurrence of the disaster subgroups in 2010 between continents, we see that geophysical and hydrological disasters occurred most often in Asia (64.5% and 37.5% respectively). Meteorological disasters were most frequent in the Americas (39.8%), whereas climatological disasters were most concentrated in Europe (44.0%). In terms of human impact, geophysical disasters caused the highest number of victims in the Americas (90.3%) whereas most victims from hydrological, meteorological as well as climatological disasters were in Asia (resp. 95.3%, 78.8% and 53.4%). Similar to the number of victims they led to, hydrological disasters caused the most damages in Asia (68.4%). Climatological disasters, on the other hand, brought the most damages in Europe (90.3%) and meteorological disasters brought the most damages in the Americas (60.4%). Furthermore, the economic impact from geophysical disasters was mostly concentrated in the Americas (82.4%) (see Maps 1, 2 and 3).

<sup>8</sup> Excess mortality.

**Map 1 – Percent share of reported occurrence by disaster sub-group and continent in 2010**

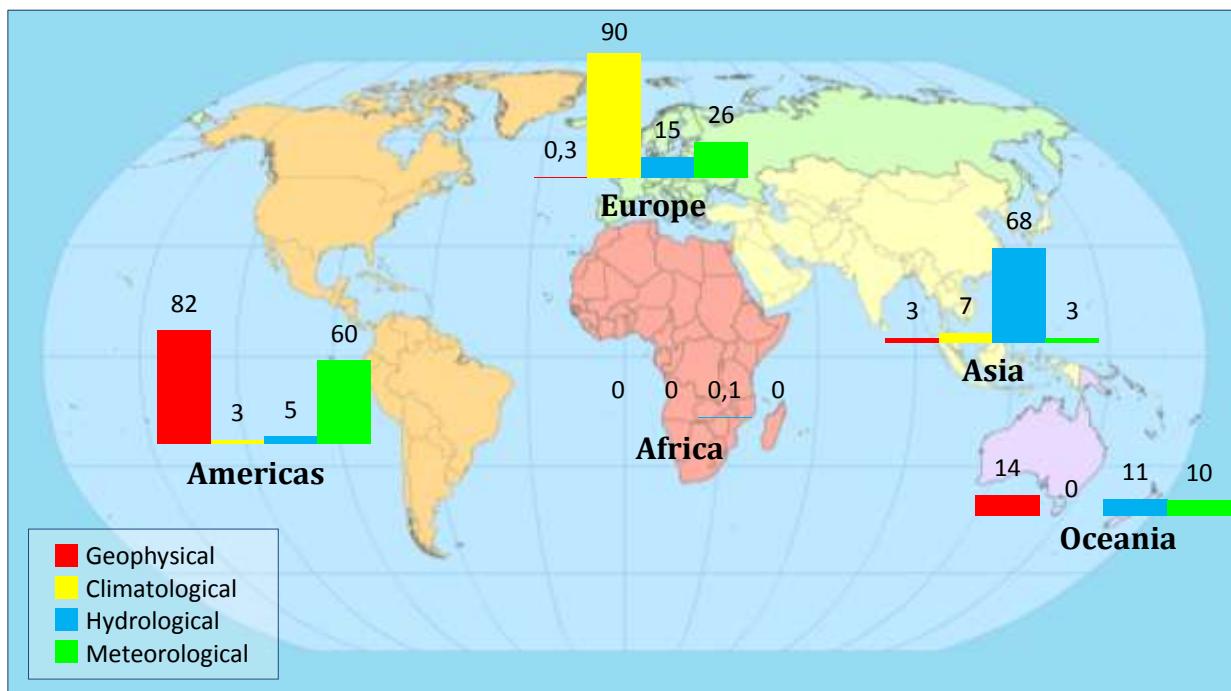


**Map 2 – Percent share of reported victims by disaster sub-group and continent in 2010\***



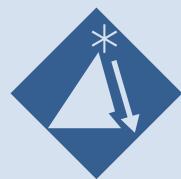
\*Percentages ≤ 0,05 are displayed as zeros

**Map 3 – Percent share of reported economic damages by disaster sub-group and continent in 2010\***



\*Percentages  $\leq 0.05$  are displayed as zeros

## ANNEX 1: Definitions<sup>9</sup>



**Avalanche:** Avalanche describes a quantity of snow or ice that slides down a mountainside under the force of gravity. It occurs if the load on the upper snow layers exceeds the bonding forces of the entire mass of snow. It often gathers material that is underneath the snowpack like soil, rock etc. (debris avalanche). Any kind of rapid snow/ice movement.



**Biological Disasters:** Disasters caused by the exposure of living organisms to germs and toxic substances.



**Climatological Disasters:** Events caused by long-lived/meso to macro scale processes (in the spectrum from intraseasonal to multidecadal climate variability).



**Cold wave:** A cold wave can be both a prolonged period of excessively cold weather and the sudden invasion of very cold air over a large area. Along with frost it can cause damage to agriculture, infrastructure, and property. Damage caused by low temperatures.



**Drought:** Long-lasting event triggered by a lack of precipitation. A drought is an extended period of time characterized by a deficiency in a region's water supply that is the result of constantly below average precipitation. A drought can lead to losses in agriculture, affect inland navigation and hydropower plants, and cause a lack of drinking water and famine.



**Earthquake:** Shaking and displacement of ground due to seismic waves. This is the earthquake itself without secondary effects. An earthquake is the result of a sudden release of stored energy in the Earth's crust that creates seismic waves. They can be of tectonic or volcanic origin. At the Earth's surface they are felt as a shaking or displacement of the ground. The energy released in the hypocenter can be measured in different frequency ranges. Therefore there are different scales for measuring the magnitude of a quake according to a certain frequency range. These are: a) surface wave magnitude (Ms); b) body wave magnitude (Mb); c) local magnitude (ML); d) moment magnitude (Mw).



**Epidemic:** Either an unusual increase in the number of cases of an infectious disease that already exists in the region or population concerned, or the appearance of an infection disease previously absent from a region.

<sup>9</sup> These definitions have been established by MunichRe/Geo Risks Research Department and CRED. More information on definitions can be found on the EM-DAT website in the “Glossary” section.



**Extreme winter condition:** Damage caused by snow and ice. Winter damage refers to damage to buildings, infrastructure, traffic (especially navigation) inflicted by snow and ice in the form of snow pressure, freezing rain, frozen waterways, etc.



**Flash flood:** Rapid inland floods due to intense rainfall. A flash flood describes sudden flooding with short duration. In sloped terrains the water flows rapidly with a high destruction potential. In flat terrains the rainwater cannot infiltrate into the ground or run off (due to small slope) as quickly as it falls. Flash floods typically are associated with thunderstorms. A flash flood can occur at virtually any place.



**Flood:** Significant rise of water level in a stream, lake, reservoir or coastal region.



**Forest fire:** Fires in forests that cover extensive damage. They may start by natural causes such as volcanic eruptions or lightning, or they may be caused by arsonists or careless smokers, by those burning wood, or by clearing a forest area.



**General flood:** Gradually rising inland floods (rivers, lakes, groundwater) due to high total depth of rainfall or snowmelt. A general flood is caused when a body of water (river, lake) overflows its normal confines due to rising water levels. The term general flood additionally comprises the accumulation of water on the surface due to long-lasting rainfall (water logging) and the rise of the groundwater table above surface. Furthermore, inundation by melting snow and ice, backwater effects, and special causes such as the outburst of a glacial lake or the breaching of a dam are subsumed under the term general flood. General floods can be expected at certain locations (e.g. along rivers) with a significantly higher probability than at others.



**Geophysical disasters:** Events originating from solid earth.



**Heat wave:** A heat wave is a prolonged period of excessively hot and sometimes also humid weather relative to normal climate patterns of a certain region.



**Hydrological Disasters:** Events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind set-up.



**Insect infestation:** Pervasive influx and development of insects or parasites affecting humans, animals, crops and materials.



**Landslide:** Any kind of moderate to rapid soil movement including lahar, mudslide and debris flow. A landslide is the movement of soil or rock controlled by gravity and the speed of the movement usually ranges between slow and rapid. It can be superficial or deep, but the materials have to make up a mass that is a portion of the slope or the slope itself. The movement has to be downward and outward with a free face.



**Local Windstorm (orographic storm):** Local windstorm refers to strong winds caused by regional atmospheric phenomena which are typical for a certain area. These can be katabatic winds, foehn winds, Mistral, Bora etc.



**Meteorological disasters:** Events caused by short-lived/small to meso scale atmospheric processes (in the spectrum from minutes to days).



**Rockfall:** Quantities of rock or stone falling freely from a cliff face. It is caused by undercutting, weathering or permafrost degradation.



**Storm surge:** Coastal flood on coasts and lake shores induced by wind. A storm surge is the rise of the water level in the sea, an estuary or lake as result of strong wind driving the seawater towards the coast. This so-called wind setup is superimposed on the normal astronomical tide. The mean high water level can be exceeded by five and more metres. The areas threatened by storm surges are coastal lowlands.



**Subsidence:** Downward motion of the Earth's surface relative to a datum (e.g. the sea level). Dry subsidence can be the result of geological faulting, isostatic rebound, human impact (e.g. mining, extraction of natural gas). Wet subsidence can be the result of karst, changes in soil water saturation, permafrost degradation (thermokarst), etc.



**Tropical cyclone:** A tropical cyclone is a non-frontal storm system that is characterized by a low pressure centre, spiral rain bands and strong winds. Usually it originates over tropical or sub-tropical waters and rotates clockwise in the southern hemisphere and counter-clockwise in the northern hemisphere. The system is fuelled by heat released when moist air rises and the water vapour it contains condenses ("warm core" storm system). Therefore the water temperature must be  $>27^{\circ}\text{C}$ . Depending on their location and strength, tropical cyclones are referred to as hurricane (western Atlantic/eastern Pacific), typhoon (western Pacific), cyclone (southern Pacific/Indian Ocean), tropical storm, and tropical depression (defined by wind speed; see Saffir-Simpson-Scale). Cyclones

in tropical areas are called hurricanes, typhoons and tropical depressions (names depending on location).

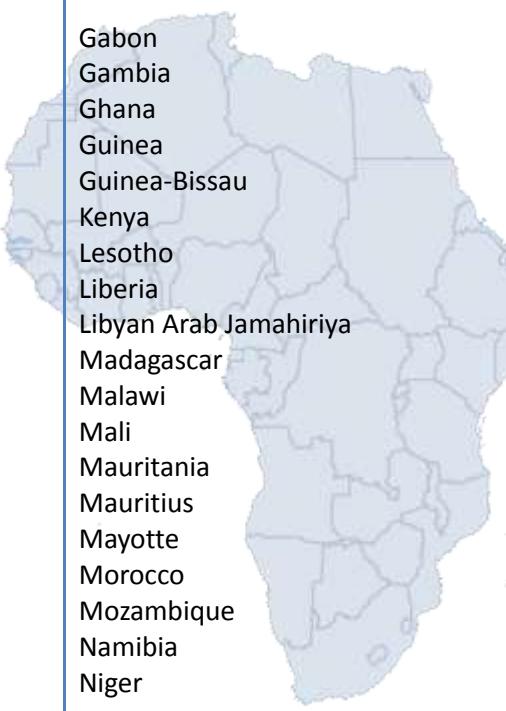


**Volcanic eruption:** All volcanic activity like rock fall, ash fall, lava streams, gases etc. Volcanic activity describes both the transport of magma and/or gases to the Earth's surface, which can be accompanied by tremors and eruptions, and the interaction of magma and water (e.g. groundwater, crater lakes) underneath the Earth's surface, which can result in phreatic eruptions. Depending on the composition of the magma, eruptions can be explosive and effusive and result in variations of rock fall, ash fall, lava streams, pyroclastic flows, emission of gases etc.



**Wildfire:** Wildfire describes an uncontrolled burning fire, usually in wild lands, which can cause damage to forestry, agriculture, infrastructure and buildings.

## ANNEX 2: List of countries per continent

AFRICA		
Algeria Angola Benin Botswana Burkina Faso Burundi Cameroon Cape Verde Central African Republic Chad Comoros Congo Cote d'Ivoire Democratic Republic of Congo Djibouti Egypt Equatorial Guinea Eritrea Ethiopia	 Gabon Gambia Ghana Guinea Guinea-Bissau Kenya Lesotho Liberia Libyan Arab Jamahiriya Madagascar Malawi Mali Mauritania Mauritius Mayotte Morocco Mozambique Namibia Niger	Nigeria Reunion Rwanda Sao Tome and Principe Senegal Seychelles Sierra Leone Somalia South Africa St. Helena Sudan Swaziland Togo Tunisia Uganda United Republic of Tanzania Western Sahara Zambia Zimbabwe

AMERICAS		
Anguilla Antigua and Barbuda Argentina Aruba Bahamas Barbados Belize Bermuda Bolivia Brazil British Virgin Islands Canada Cayman Islands Chile Colombia Costa Rica Cuba Dominica	 Dominican Republic Ecuador El Salvador Falkland Islands (Malvinas) French Guiana Greenland Grenada Guadeloupe Guatemala Guyana Haiti Honduras Jamaica Martinique Mexico Montserrat Netherlands Antilles Nicaragua	Panama Paraguay Peru Puerto Rico St. Barthélemy St. Kitts and Nevis St. Lucia St. Martin (French part) St. Pierre and Miquelon St. Vincent and the Grenadines Suriname Trinidad and Tobago Turks and Caicos Islands Uruguay Venezuela United States of America United States Virgin Islands

## ASIA

Afghanistan  
Armenia  
Azerbaijan  
Bahrain  
Bangladesh  
Bhutan  
Brunei Darussalam  
Cambodia  
China  
Cyprus  
Georgia  
Hong Kong (China)  
India  
Indonesia  
Iran  
Iraq  
Israel  
Japan

Jordan  
Kazakhstan  
Korea (Dem Rep)  
Korea (Rep)  
Kuwait  
Kyrgyzstan  
Laos  
Lebanon  
Macau (China)  
Malaysia  
Maldives  
Mongolia  
Myanmar  
Nepal  
Palestine (West Bank)  
Oman  
Pakistan  
Philippines

Qatar  
Saudi Arabia  
Singapore  
Sri Lanka  
Syrian Arab Republic  
Taiwan (China)  
Tajikistan  
Thailand  
Timor-Leste  
Turkey  
Turkmenistan  
United Arab Emirates  
Uzbekistan  
Viet Nam  
Yemen

## EUROPE

Aland Islands  
Albania  
Andorra  
Austria  
Belarus  
Belgium  
Bosnia and Herzegovina  
Bulgaria  
Channel Islands  
Croatia  
Czech Republic  
Denmark  
Estonia  
Faroe Islands  
Finland  
France  
Germany  
Gibraltar

Greece  
Guernsey  
Holy See  
Hungary  
Iceland  
Ireland  
Italy  
Jersey  
Latvia  
Liechtenstein  
Lithuania  
Luxembourg  
Macedonia, FYR  
Malta  
Man, Isle of  
Moldova  
Monaco  
Montenegro

Netherlands  
Norway  
Poland  
Portugal  
Romania  
Russian Federation  
San Marino  
Serbia  
Slovakia  
Slovenia  
Spain  
Svalbard & Jan Mayen Islands  
Sweden  
Switzerland  
Ukraine  
United Kingdom

## OCEANIA

American Samoa  
Australia  
Cook Islands  
Federated States of Micronesia  
Fiji  
French Polynesia  
Guam  
Kiribati  
Marshall Islands

Nauru  
New Caledonia  
New Zealand  
Niue  
Norfolk Island  
Northern Mariana Islands  
Palau  
Papua New Guinea  
Pitcairn

Samoa  
Solomon Islands  
Tokelau  
Tonga  
Tuvalu  
Vanuatu  
Wallis and Futuna





**Centre for Research on the Epidemiology of Disasters**  
**Université catholique de Louvain**  
**30.94 Clos Chapelle-aux-Champs**  
**1200 Brussels -Belgium**  
**Phone: +32 (0)2.764.33.27 Fax: +32 (0)2.764.34.41**  
**E-mail: contact@cred.be URL: www.cred.be**

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