Human cost of disasters

An overview of the last 20 years

2000-2019

Centre for Research on the Epidemiology of Disasters
CRED

UNDRR
UN Office for Disaster Risk Reduction

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Foreword

We are twenty years into this new century, and disaster risk is taking on new shapes and sizes with every passing year.

Disasters have never waited their turn, and increasingly risk is interconnected. Risk drivers and consequences are multiplying and cascading, colliding in unanticipated ways. We must have a commensurate systemic response with national and local strategies for disaster risk reduction fit for purpose. Political commitment, strategies and scenario planning have never been more important for disaster risk management.

While this report focuses primarily on the staggering rise in climate-related disasters over the last twenty years, it is also a commentary on the need to strengthen disaster risk governance for the entire range of natural hazards and man-made hazards including related environmental, technological and biological hazards and risks.

In the short-term, disaster management agencies have succeeded in saving many lives through improved preparedness and the dedication of staff and volunteers. But the odds continue to be stacked against them in particular by industrial nations that are failing miserably on reducing greenhouse gas emissions to levels commensurate with the desired goal of keeping global warming at 1.5˚C as set out in the Paris Agreement.

At the same time, almost all nations failed to prepare appropriately to prevent the wave of death and illness unleashed across the globe by the COVID-19 pandemic despite many urgings to do so from a plethora of experts including WHO, UNDRR and others.

It is baffling that we willingly and knowingly continue to sow the seeds of our own destruction, despite the science and evidence that we are turning our only home into an uninhabitable hell for millions of people.

It really is all about governance if we want to deliver this planet from the scourge of poverty, further loss of species and biodiversity, the explosion of urban risk and the worst consequences of global warming.

This year's International Day for Disaster Risk Reduction on October 13 is all about risk governance, and is given added significance by the words of the UN Secretary-General, "If we do not change course by 2020, we risk missing the point where we can avoid runaway climate change, with disastrous consequences for people and all the natural systems that sustain us."

A change must come. We hope this report will add weight to the argument for action on climate and the overall strengthening of disaster risk governance.

Mami Mizutori

Special Representative of the Secretary-General for Disaster Risk Reduction and Head of the UN Office for Disaster Risk Reduction

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Who Are We

Centre for Research on the Epidemiology of Disasters CRED

CRED

The Centre for Research on the Epidemiology of Disasters (CRED) is one of the leading agencies for the study of public health during mass emergencies, including the structural and socio-economic impacts of natural-hazard-related, technological disasters and human conflicts. CRED was founded in 1973 at the School of Public Health of UCLouvain, Belgium. Since then, CRED has been working closely with United Nations agencies, inter-governmental and governmental institutions, non-governmental organizations (NGOs), research institutes and other universities. Disaster preparedness, mitigation and prevention, and protecting vulnerable populations, have also gained a higher profile within CRED's activities in recent years. More info on: **www.cred.be**.

EM-DAT

CRED's Emergency Events Database (EM-DAT) contains the world's most comprehensive data on the occurrence and effects of more than 24,000 technological and natural hazard-related disasters from 1900 to the present day. Originally created with the support of the WHO and the Belgian government, the main objective of EM-DAT is to inform humanitarian action at the national and international levels in order to improve decision-making in disaster preparedness, provide objective data for assessing communities' vulnerability to disasters and to help policy-makers set priorities. It has received funding from USAID since 1999. Since 2014, EM-DAT also geo-references disasters, adding geographical values to numeric data which is essential for deeper analysis. Details on EMDAT's methodology & partner organizations can be found on our website **www.emdat.be**. For the purposes of this report, the term "disaster" is reserved for natural hazard-related disasters, excluding biological disasters.

UNDRR
UN Office for Disaster Risk Reduction

UNDRR

The UN Office for Disaster Risk Reduction was established in 1999 and serves as the focal point in the United Nations System for the coordination of disaster risk reduction. It supports the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030, which maps out a broad people-centered approach towards achieving a substantial reduction in disaster losses from natural and man-made hazards and a shift in emphasis from disaster management to disaster risk management. UNDRR and partners produce the biennial Global Assessment Report on Disaster Risk Reduction which provides evidence for the integration of disaster risk reduction into private investment decision-making and public policy in urban, environmental, social and economic sectors. UNDRR also coordinates the Making Cities Resilient Campaign, ARISE private sector network and supports governments in the implementation and monitoring of the Sendai Framework. More info on: **www.undrr.org**.

Introduction

Disaster Risk Reduction in the 21st Century

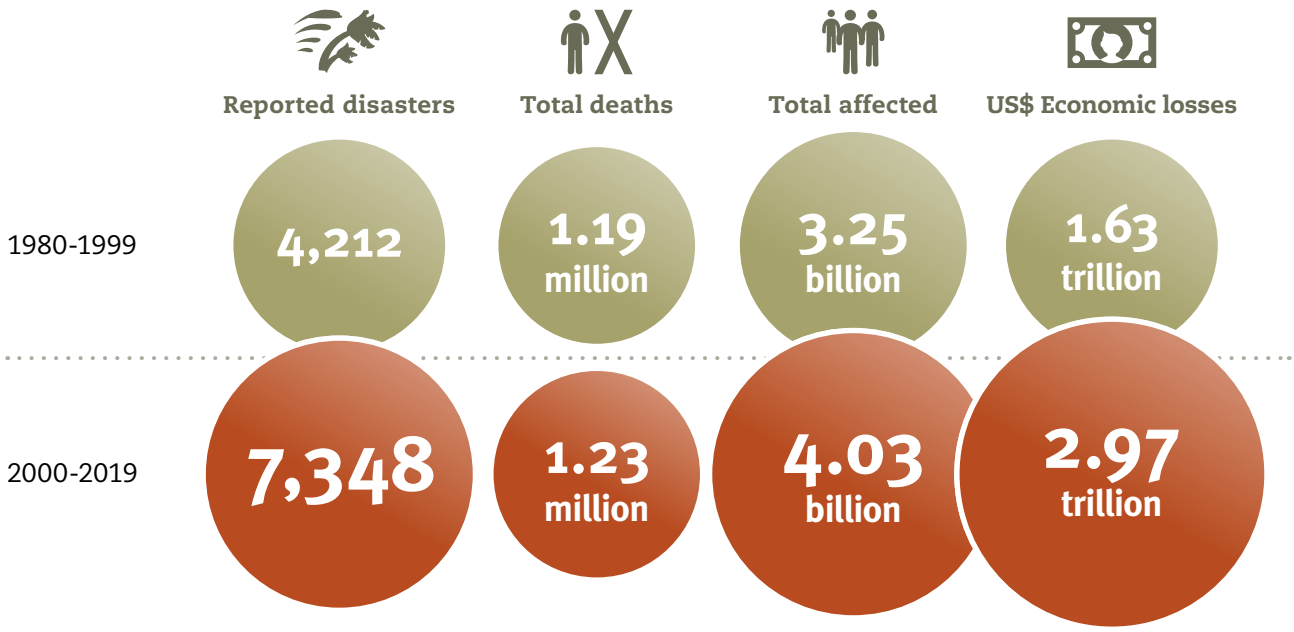
Over the last twenty years, 7,348 disaster events[1] were recorded worldwide by EM-DAT, one of the foremost international databases of such events. In total, as seen in Figure 1, disasters claimed approximately 1.23 million lives, an average of 60,000 per annum, and affected a total of over 4 billion people (many on more than one occasion). Additionally, disasters led to approximately US$ 2.97 trillion[2] in economic losses worldwide.

These numbers represent a sharp increase of the number of recorded disaster events by comparison with the previous twenty years. Between 1980 and 1999, EM-DAT recorded 4,212 disasters linked to natural hazards worldwide, which claimed approximately 1.19 million lives and affected over 3 billion people (Figure 1). Economic losses totaled US$ 1.63 trillion.

While better recording and reporting may partly explain some of the increase in events, much of it is due to a significant rise in the number of climate-related disasters.[3] Between 2000 and 2019, there were 510,837 deaths and 3.9 billion people affected by 6,681 climate-related disasters. This compares with 3,656 climate-related events which accounted for 995,330 deaths (47% due to drought/famine) and 3.2 billion affected in the period 1980-1999. The number of people affected by disasters, including injuries and disruption of livelihoods, especially in agriculture, and the associated economic damage are growing in contrast to the decrease in mortality.

Figure 1

Disaster Impacts: 1980-1999 vs. 2000-2019



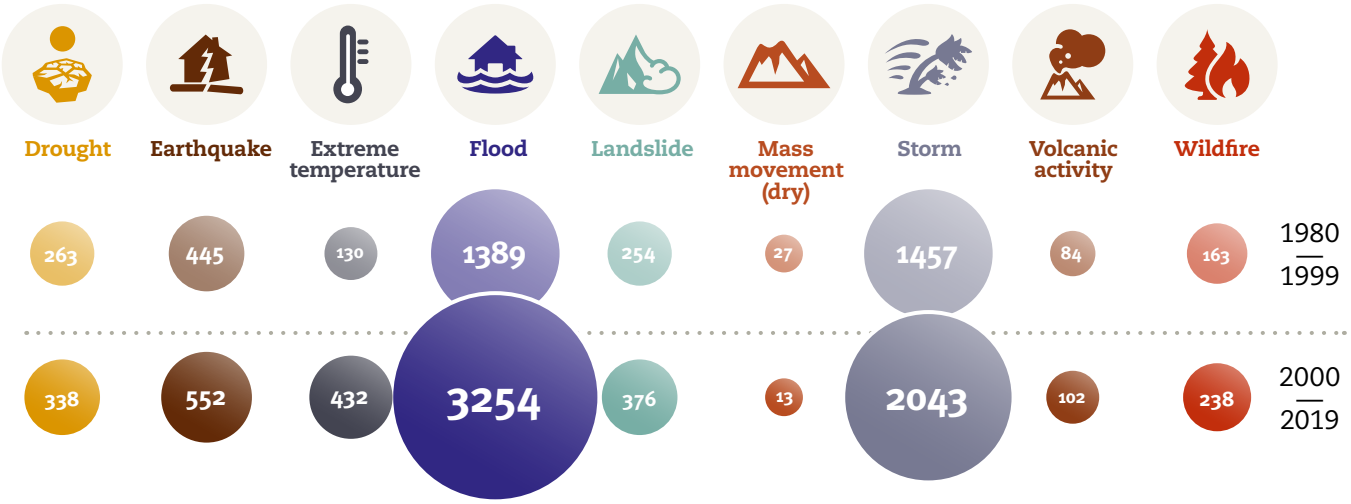
1 For the purposes of this report, the term "disaster" will only be reserved for natural hazard-related disasters, excluding biological and technological disasters.

2 All economic figures are adjusted to inflation for US$ 2019.

3 Climate-related disasters include disasters categorized as meteorological, climatological, or hydrological.

Figure 2

Total disaster events by type: 1980-1999 vs. 2000-2019



This is clear evidence that in a world where the global average temperature in 2019 was 1.1˚C above the pre-industrial period, the impacts are being felt in the increased frequency of extreme weather events including heatwaves, droughts, flooding, winter storms, hurricanes and wildfires.

While improvements have been made in terms of early warnings, disaster preparedness and response, which have led to a reduction in loss of life in single-hazard scenarios, it is also clear that the increasingly systemic nature of disaster risk, i.e. the overlap of events and the interplay between risk drivers such as poverty, climate change, air pollution, population growth in hazard-exposed areas, uncontrolled urbanization and the loss of bio-diversity, requires greater strengthening of disaster risk governance. Political commitment is essential if the SDGs are to be achieved and if progress is to be made on reducing the numbers of people affected by disasters and reducing the economic losses and damage to critical infrastructure that come with them.

UNDRR's 2019 Global Assessment Report for Disaster Risk Reduction highlights that failure to understand and manage systemic risk is a challenge for reducing disaster losses as set out in the global blueprint: the Sendai Framework for Disaster Risk Reduction (2015-2030) adopted by UN member States. While this current report only examines direct losses from single events for ease of analysis of trends over time, it also recognizes that current risk management institutions and approaches are appropriate for handling individual hazards but are not fit for handling systemic risk on the scale indicated by the steep rise in climate-related disaster events.

Nothing has revealed more clearly the need for an all-of-society focus on disaster risk reduction than the current COVID-19 pandemic which has laid bare many shortcomings in disaster risk management, not least in governance failures in response to repeated warnings.

This report is a further reminder of the urgency of action on global heating in a world currently on course for a temperature increase of 3.2˚C or more unless the industrial nations deliver reductions in greenhouse gas emissions of at least 7.2% annually over the next ten years in order to achieve the 1.5˚C goal of the Paris Agreement.

Key points and recommendations:

- A temperature increase of 3°C of the global climate is estimated to increase the frequency of potentially high impact natural hazard events across the world. This could render current national and local strategies for disaster risk reduction and climate change adaptation obsolete in many countries;
- Shifting rainfall patterns and greater variability in precipitation poses a risk to the 70% of global agriculture that is rain-fed and the 1.3 billion people dependent on degrading agricultural land;
- The concentrated impact due to a single disaster type in some countries provides an opportunity for a more focused approach on disaster risk reduction. However, COVID-19 demonstrates the need for a systemic, multi-hazard approach in an increasingly globalized and interconnected world;
- There is a requirement for strengthening disaster risk governance to manage disaster risk with clear vision, competence, plans, guidelines, funding and coordination across sectors and in a manner which takes account of the increasingly systemic nature of disaster risk;
- Public and private investment in disaster risk prevention and reduction through structural and non-structural measures needs to be stepped up to create disaster resilient societies.

BOX 1

Disasters

In order to be recorded as a disaster in EM-DAT, an event must meet at least one of the following criteria:

- Ten or more people reported killed
- 100 or more people reported affected
- Declaration of a state of emergency
- Call for international assistance.

While EM-DAT is one of the most comprehensive disaster databases available worldwide, and every effort is made to collect and validate information from our sources, we are aware that certain regions, including Africa, lack capacity and resources to fully report events. This report does not include technological and biological disasters.

For details about the definitions used in this report, please see: www.emdat.be/explanatory-notes

BOX 2

Hazards vs. Disasters

In this report, the term hazard refers to a severe or extreme event such as a flood, storm, cold spell or heatwave etc. which occurs naturally anywhere in the world.

Hazards only become disasters when human lives are lost, and livelihoods damaged or destroyed. Increases in the global population, particularly in areas of high hazard risk raises the level of the risk of disasters as more people are exposed to the potential harms of hazards.

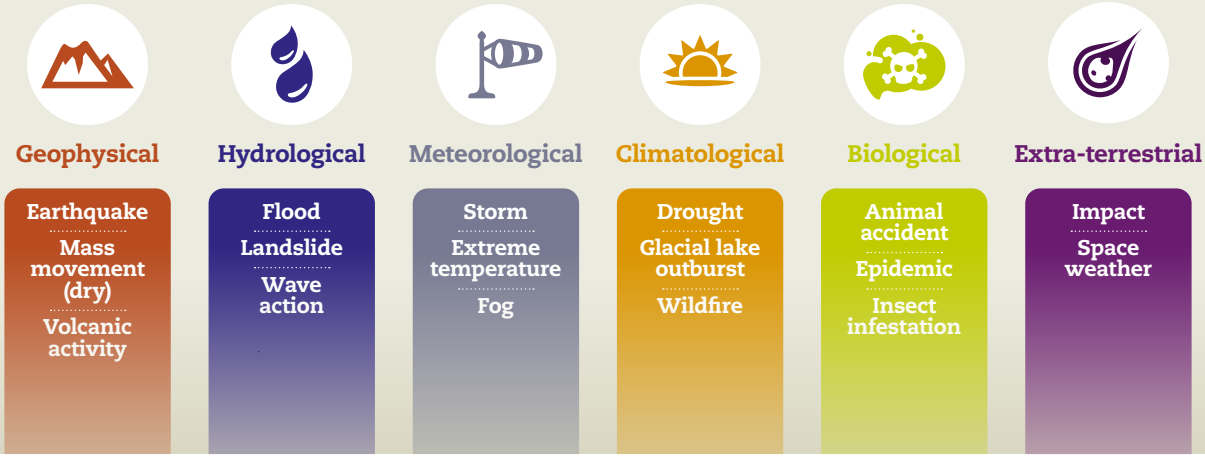
This underlines the need for national and local disaster risk reduction strategies aligned with the Sendai Framework for Disaster Risk Reduction.

BOX 3

Classifying natural hazards by disaster type

EM-DAT classifies disasters according to the type of hazard that provokes them. In addition, EM-DAT collects data on technological disasters, such as industrial, miscellaneous and transport accidents. This report focuses on geophysical, hydrological, meteorological and climatological disasters.

For information on the classification, see www.emdat.be/new-classification



Chapter 1

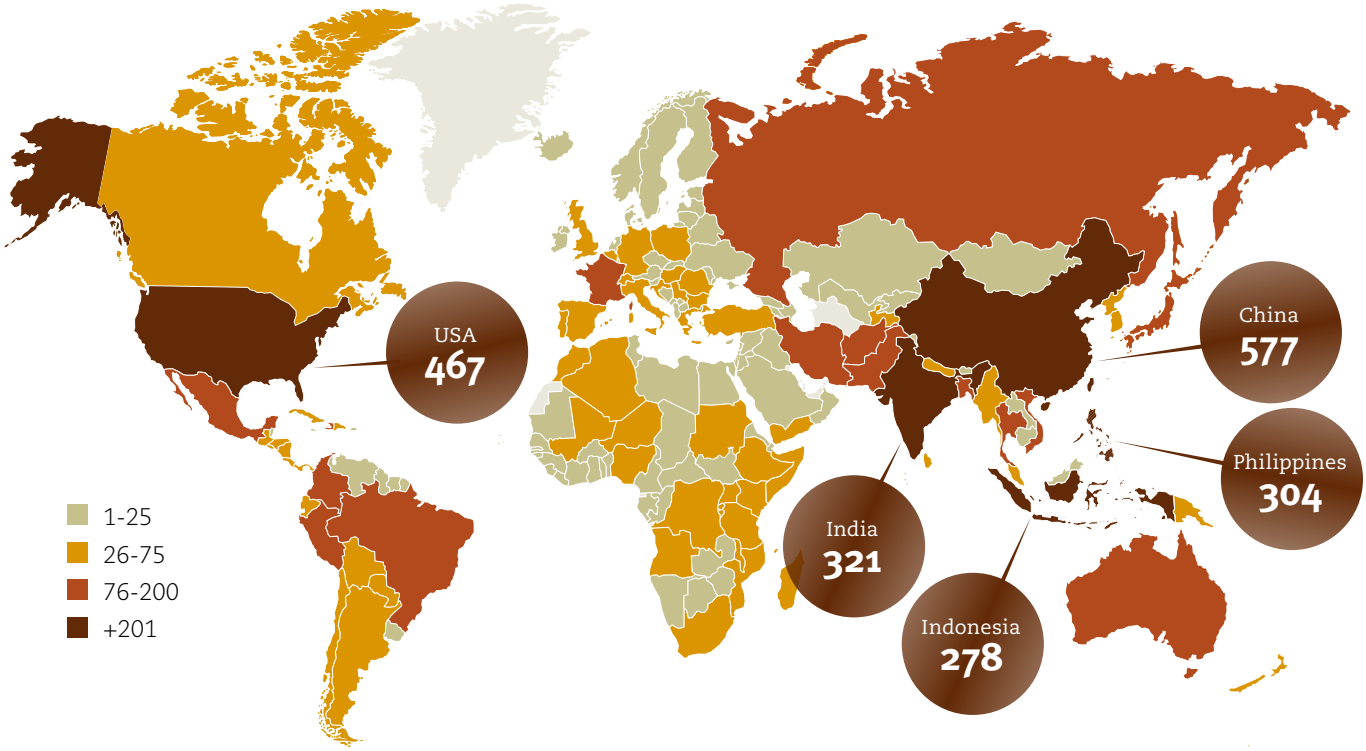
Disasters 2000-2019

In the 20-year period between 2000 and 2019, EM-DAT recorded 7,348 disasters events, which claimed a total of approximately 1.2 million lives and affected more than 4.03 billion people. On average, there were 367 disaster events each year, the majority of which were floods and storms (44% and 28% respectively) (Figure 4).

Asia suffered the highest number of disaster events, as can be seen in Figure 3. In total, between 2000 and 2019, there were 3,068 disaster events in Asia, followed by the 1,756 events in the Americas and 1,192 events in Africa. The high frequency and impact of disasters in Asia is largely due to the size of the continent and landscapes that represent a high risk of natural hazards, such as river basins, flood plains, and seismic fault lines. Additionally, there are high population densities in many disaster-prone areas of the continent. In terms of affected countries globally, China (577 events) and the United States of America (U.S.) (467 events) reported the highest number of disaster events, followed by India (321 events), Philippines (304 events), and Indonesia (278 events) (Figure 3). These countries all have large and heterogenous landmasses and relatively high population densities in at-risk areas.

Figure 3

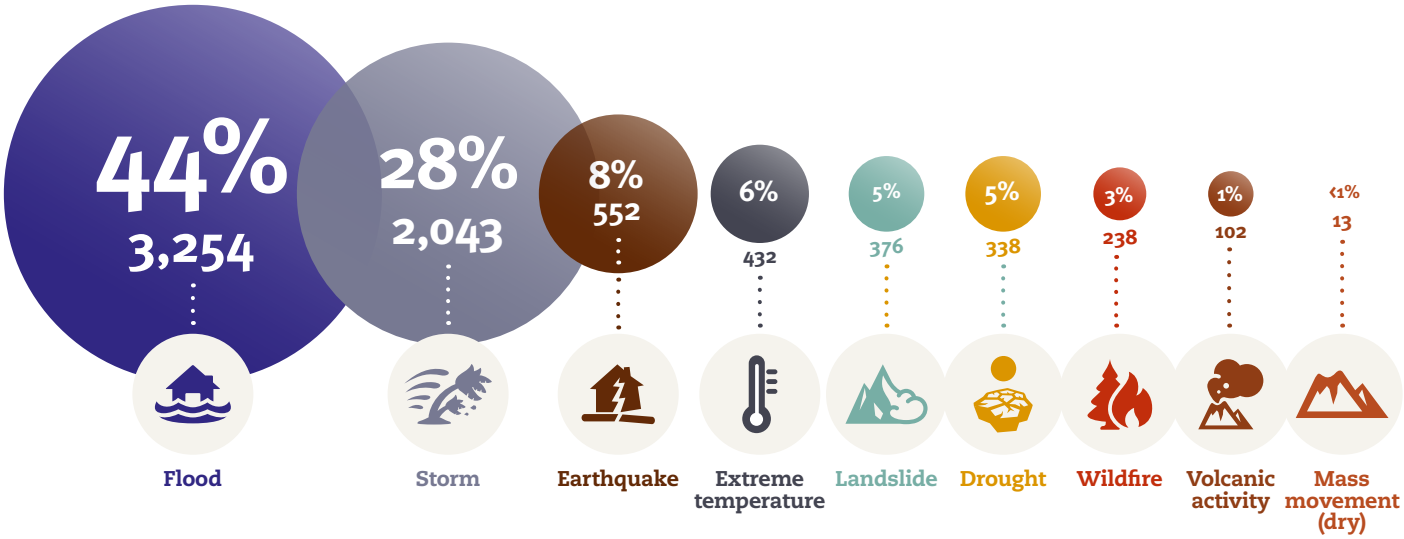
Number of disasters reported per country / territory (2000-2019)



Worldwide, floods are the most common type of disaster, accounting for 44% of total events considered in this report (Figure 4). Floods are hydrological events, a disaster sub-group that also includes landslides which are responsible for 5% of total events (Figure 4). Storms are the second most common type of disaster event, accounting for 28% of events worldwide. Storms most frequently affect coastal communities near the world's oceans and are considered part of the meteorological disaster sub-group, along with extreme temperatures (6% of events). Climatological events are a less prevalent disaster sub-group that include droughts and wildfires, which account for 5% and 3% of total events respectively. Finally, geophysical events, such as earthquakes and volcanic activity, make up a total of 9% of all events, the majority of which are earthquakes (including tsunamis). Overall, the number of disaster events per year and the distribution of disaster sub-groups has remained relatively stable between the year 2000 and 2019, with an average of 367 recorded events per year (Figure 5).

Figure 4

Percentage of occurrences of disasters by disaster type (2000-2019)



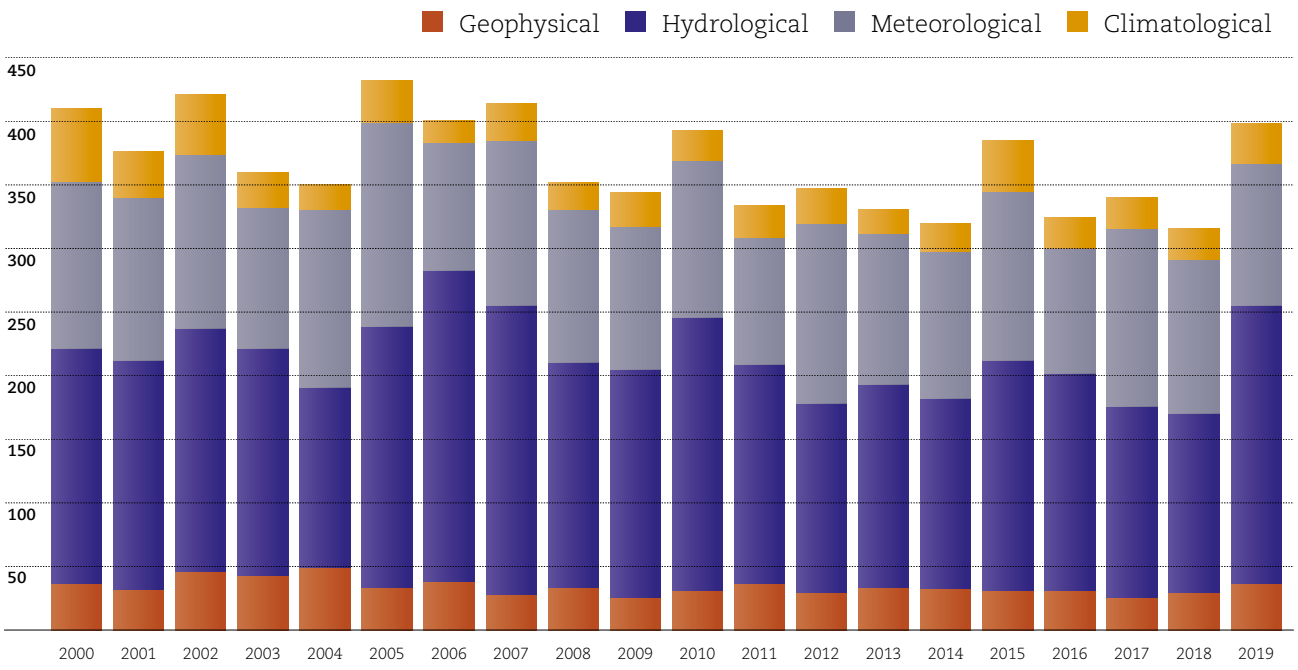
Action Point

1

Focused studies on disaster risk communication would help understand how residents interpret warnings, which would aid in steering communication strategies in the most effective forms in various contexts.

Figure 5

The number of disasters by disaster sub-groups per year (2000-2019)



BOX 4

Sendai Framework for Disaster Risk Reduction 2015-2030

Adopted at the Third UN World Conference on Disaster Risk Reduction, the Sendai Framework for Disaster Risk Reduction, clearly recognizes that disaster risk management needs to be about managing the risk inherent in social and economic activity, rather than simply mainstreaming disaster risk management to protect against external threats like natural hazards. UNDRR recognizes that the inability to understand and manage systemic risk is a challenge for the achievement of the Sendai Framework and the SDGs.

The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognizes that the State has the primary role to reduce disaster risk, but that responsibility should be shared with other stakeholders including local governments, the private sector, the scientific community and NGOs. It aims for a substantial reduction in disaster losses resulting from both man-made and natural hazards. It lists priority areas for action such as understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

The Sendai Framework's seven Targets focus on substantial reductions in (a) disaster mortality, (b) number of affected people, (c) direct economic losses and (d) reducing damage to critical infrastructure and disruption of basic services. The Sendai Framework also seeks a substantial increase in (e) national and local disaster risk reduction strategies by 2020, (f) enhanced cooperation to developing countries, and (g) a substantial increase in multi-hazard early warning systems, disaster risk information and assessments.

Strong accountability is one of the corner stones of the Sendai Framework for Disaster Risk Reduction. A set of 38 indicators, recommended by an Open-ended Intergovernmental Expert Working Group, is being used to track progress in implementing the seven targets of the Sendai Framework as well as its related dimensions reflected in three Sustainable Development Goals: 1, Poverty Eradication; 11, Sustainable Cities; and 13, Climate Action. The Sendai Framework Monitor functions as a management tool to help countries develop disaster risk reduction strategies, make risk-informed policy decisions and allocate resources to prevent new disaster risks. The achievement of Target (e) of the Sendai Framework –the development of national and local strategies for disaster risk reduction– is of particular importance as it constitutes the foundation for the implementation of the goal and priorities for action.

2

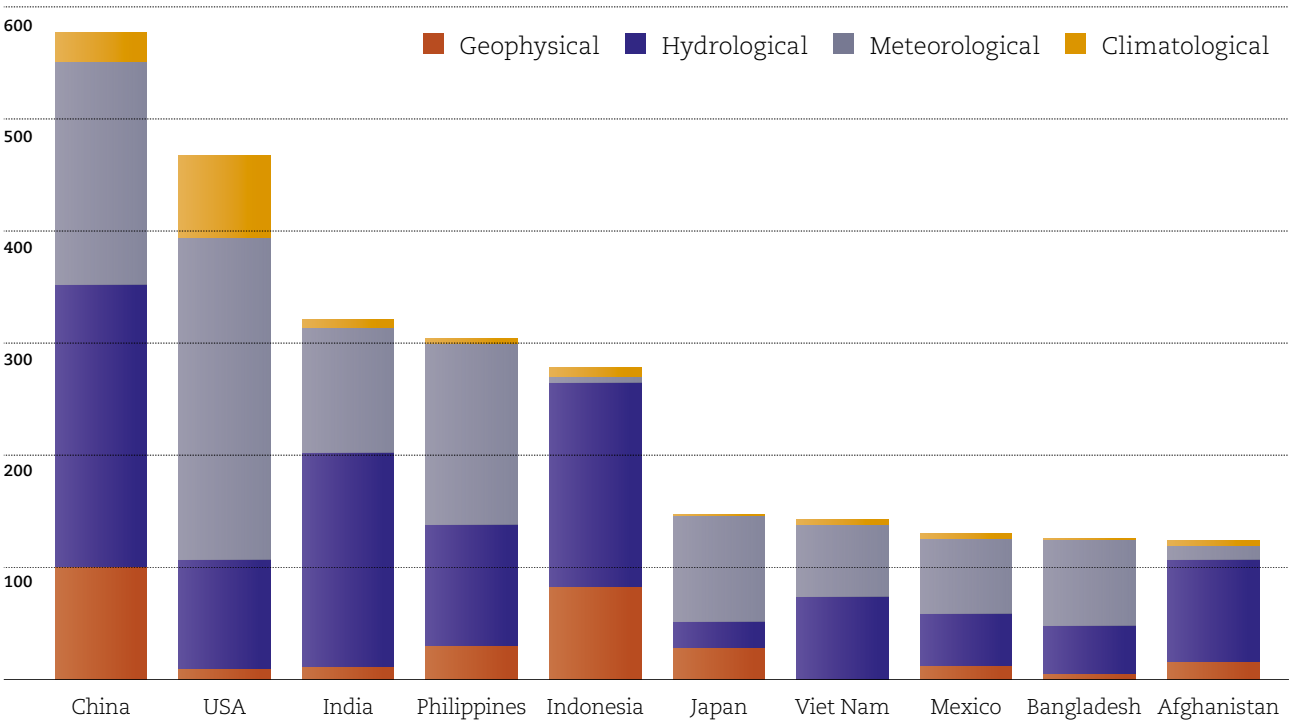
Action Point

Better flood control is one "low-hanging fruit" in DRR policy terms since affordable and effective technologies already exist, including dams, dykes, mobile dykes and improved early warning systems.

China experienced a wide variety of over 500 disaster events including geophysical, hydrological, and meteorological events (Figure 6). The U.S. is the 2nd most affected country, experiencing 467 disaster events in total. However, compared to China, the U.S. has fewer geophysical and hydrological events, and more meteorological and climatological events, such as storms and wildfires. Overall, eight of the top 10 countries by disaster events are in Asia. There are notable differences between the types of events in these countries. For example, 30% of disasters in Indonesia are geophysical events and 65% are hydrological events. These two disaster sub-groups make up 95% of the total events in Indonesia. In contrast, in Vietnam, 52% of events are hydrological and 45% are meteorological, accounting for a total of 97% of the country's overall events.

Figure 6

Top 10 countries by occurrence of disaster sub-groups (2000-2019)



Chapter 2

Human Cost of Disasters

The human cost of disasters depends on multiple factors, including the type of hazard, its location, duration and the size and vulnerability of the population in harm's way. Given the intensification of many environmental hazards and their complex interactions, risk reduction strategies and risk informed decision-making cannot afford to ignore their integrated, multiscale, multiplier effects.

In this report, three types of human costs are discussed; total number of people affected, deaths, and economic losses.

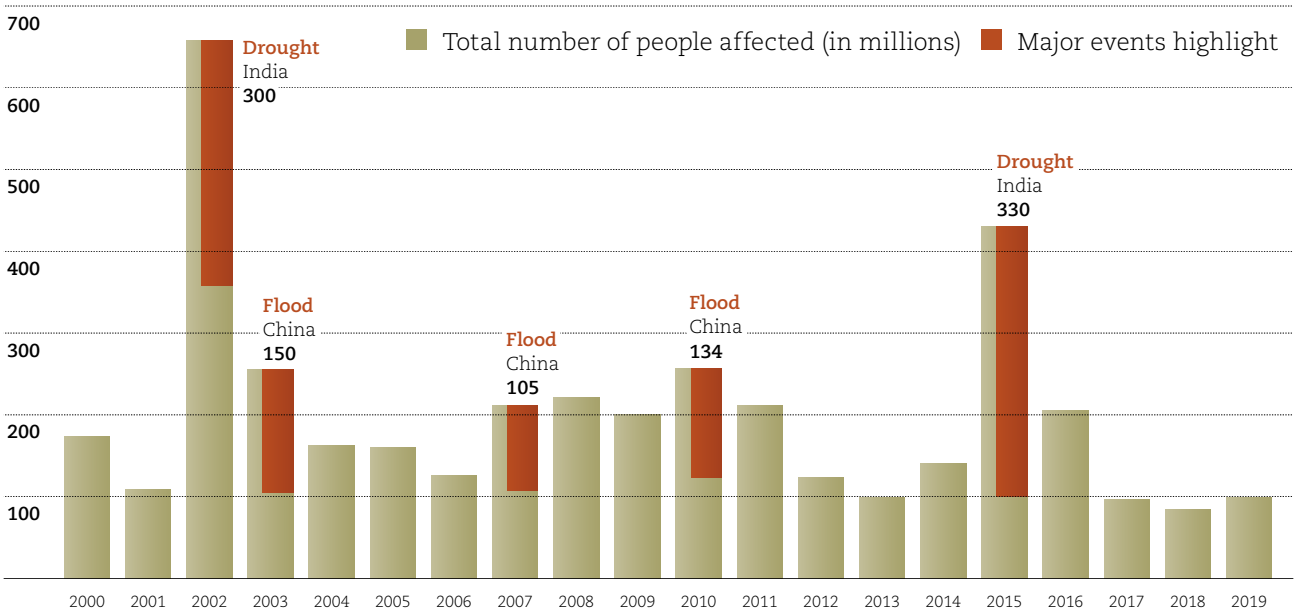
Between 2000 and 2019, over 4 billion people worldwide were affected by disasters and over 1.2 million people lost their lives. These significant numbers not only demonstrate the large-scale impact disasters have across the world, but also the importance of promoting a greater understanding of disaster risk so that appropriate measures can be taken to protect lives and livelihoods.

Figure 7 indicates the total number of people affected worldwide by disasters in the past 20 years by year. The most impactful years were 2002, with 658 million people affected, and 2015, with 430 million people affected. Both of those years were partly shaped by widespread droughts in India, which affected over 300 million people each year. Other major events include three significant years of flooding in China, which affected over 100 million people each year. **Overall, in the past two decades, the average number of people affected worldwide by disasters was approximately 200 million per year.**

Figure 8 indicates the total number of people killed per year by disasters in the past 20 years. **From the two decades, the years 2004, 2008, and 2010 stand out most, having had over 200,000 deaths each.** The largest single event by death toll was the 2004 Indian Ocean Tsunami, which was triggered by a 9.1 Richter earthquake, and resulted in the deaths of 226,400 people in twelve Asian and African countries. The largest death tolls were in Indonesia where 165,708 people died, followed by Sri Lanka with 35,399 deaths. The second largest event occurred in 2010, when a 7.0 Richter earthquake struck Haiti in the middle of the night, killing approximately 222,000 people and leaving millions homeless. Additionally, in 2008, Cyclone Nargis killed over 138,000 people in Myanmar. **The average number of deaths worldwide from 2000 to 2019 was approximately 60,000 deaths per year. Since 2010 there have been no mega-disasters and no single year with over 35,000 deaths.**

Figure 7

Total number of people affected per year (in millions) with major events highlighted (2000-2019)



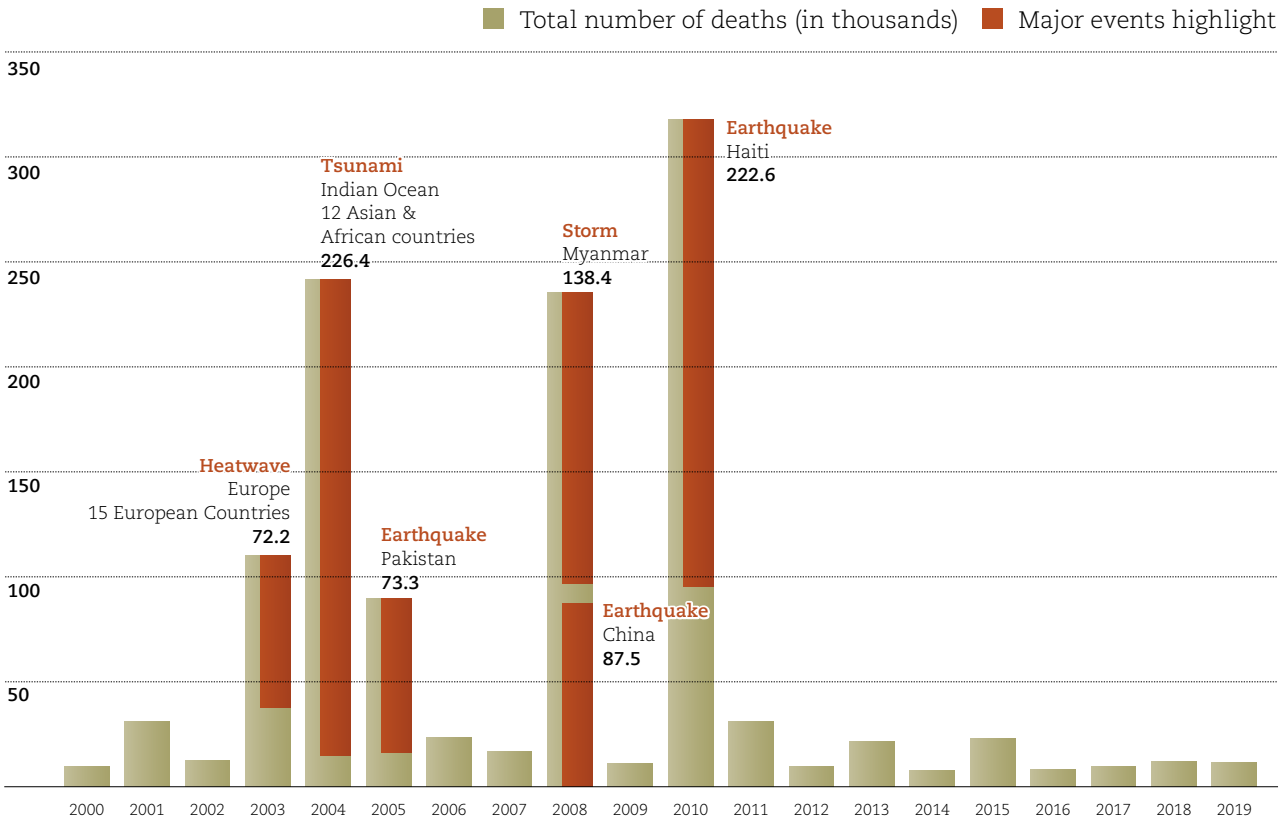
Action Point

3

Considering the serious health and socio-economic impacts of flooding, CRED and UNDRR believe that flood control should be regarded as a development issue in addition to a humanitarian concern. Priority should be given to cost-effective measures in poor regions at high risk of recurrent flooding, together with malnutrition prevention programmes.

Figure 8

Total number of deaths per year with major events highlighted (in thousands) (2000-2019)



BOX 5

The Impact of Mega-disasters

A mega-disaster is an event that kills more than 100,000 people. Mega-disasters have a significant impact on EM-DAT total figures and therefore must be considered when interpreting the data. **Three mega disasters occurred in the period 2000-2019: the 2004 Indian Ocean Tsunami, the 2008 Cyclone Nargis in Myanmar, and the 2010 Haiti earthquake.** Other mass casualty events include the 2003 heatwaves in Europe which killed 72,200 across 15 European countries, the 2005 earthquake in Pakistan which killed 73,300 people, and the 2008 earthquake in China which killed 87,500 people.

The top 10 disasters by death toll, which include the 3 mega-disasters and 7 other mass casualty events, have a combined death toll of 943,085. In comparison, floods, the most common type of disaster, killed 104,614 people in total across the two decades. Furthermore, in comparison to all other disaster events, the top 10 disasters by death toll account for 76% of all deaths, while the other 7,338 events account for 24%, or approximately 290,000 deaths. As seen in Figure 7 and 8, it is these major events that shape the total figures in a year and a decade, making it a challenge to perceive exact mortality trends over such a relatively short time span.

Ten Deadliest Disasters (2000-2019)

Earthquake & Tsunami	Indian Ocean	2004	**226,408**
Earthquake	Haiti	2010	**222,570**
Storm	Myanmar	2008	**138,366**
Earthquake	China	2008	**87,476**
Earthquake	Pakistan	2005	**73,338**
Heatwave	Europe	2003	**72,210**
Heatwave	Russia	2010	**55,736**
Earthquake	Iran	2003	**26,716**
Earthquake	India	2001	**20,005**
Drought	Somalia	2010	**20,000**

4

Action Point

There are numerous proven life-saving measures for storm impacts, such as cyclone shelters, wind-resistant buildings and preservation of protective eco-systems such as mangrove forests and coral reefs. In addition, effective deployment of early warning systems supported by increasingly accurate weather forecasts, have the potential to protect vulnerable populations worldwide and save thousands of lives.

Figure 9

Total number of people affected by disaster type (2000-2019)

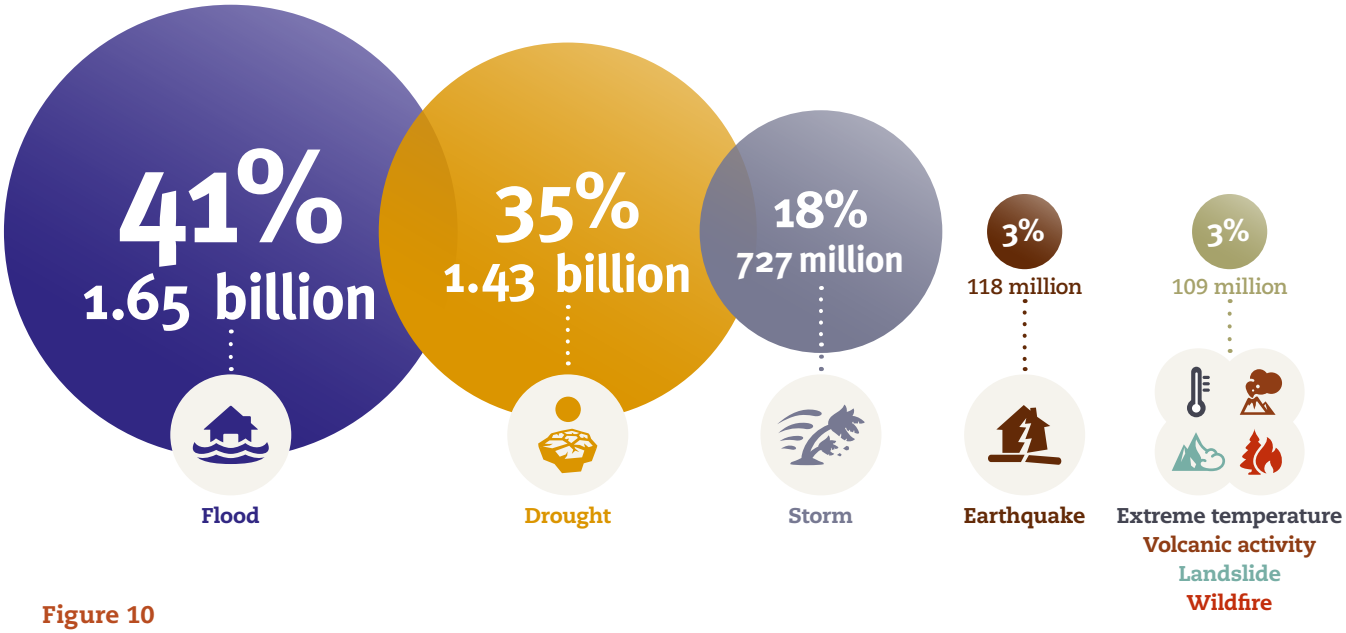
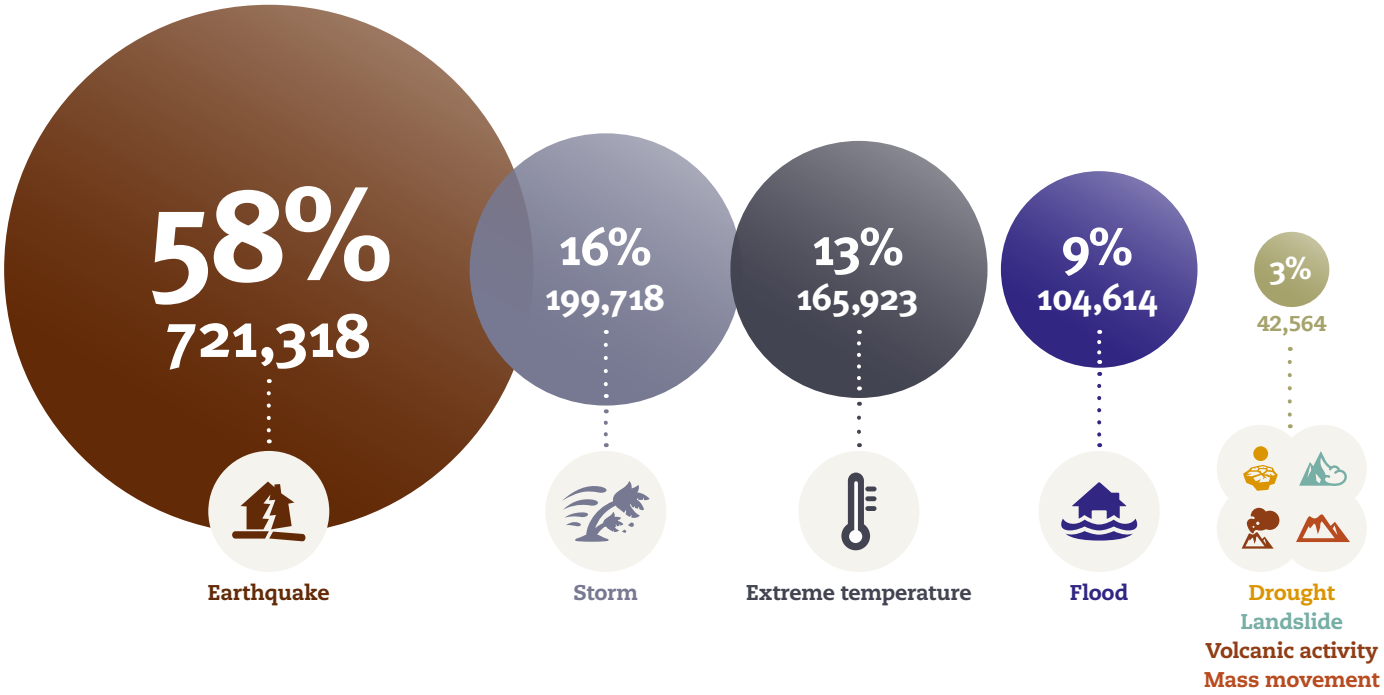


Figure 10

Total number of deaths by disaster type (2000-2019)



2.1 Floods

Floods have accounted for 44% of all disaster events from 2000 to 2019, affecting 1.6 billion people worldwide, the highest figure for any disaster type (Figure 9). Furthermore, floods are the most common type of event with an average of 163 events per year.

The most affected country by flooding in the past two decades was China, which experienced an average of 20 floods per year. Flooding in China affected a total of 900 million people over the two decades, accounting for approximately 55% of people affected by flooding worldwide. India is the 2nd most affected country by floods: it experienced an average of 17 flood events per year and had a total of approximately 345 million people affected. The deadliest flooding events from 2000 to 2019 were the June 2013 floods in India (6,054 deaths), May 2004 floods in Haiti (2,665 deaths), and the July 2010 floods in Pakistan (1,985 deaths).

Floods have the highest impacts in Asia, as the continent experienced 41% of all flooding events and with a total of 1.5 billion people affected, accounted for 93% of people affected by floods worldwide. Africa (763 flood events) and the Americas (680 flood events) experience significant flooding impacts as well. Many of these impacts are preventable since flooding, unlike most types of disasters, has affordable mechanisms of primary prevention, such as dams, dykes and drainage systems.

2.2 Storms

Storms, including hurricanes, cyclones and storm surges, killed nearly 200,000 people between 2000 and 2019 (Figure 10), making storms the 2nd deadliest type of disaster worldwide, and the deadliest type of weather-related disaster in the past 20 years. The 2,043 storms recorded by EM-DAT during this period also make these events the second most frequent disaster type after flooding.

While storms typically cut through wide swathes of densely populated regions, island states are particularly vulnerable as many are in storm paths. In 2017, Hurricane Maria hammered the U.S. territory of Puerto Rico, directly resulting in 64 deaths and leading to approximately 3,000 excess deaths.[4]

In 2019, Hurricane Dorian hit the Bahamas resulting in at least 370 deaths/missing, a high figure for a country of under 400,000 people. Despite the relatively small landmass and total population, the Caribbean has experienced 163 storm events affecting a total of 25.8 million people and resulting in over 5,000 deaths in the past two decades. Additionally, storm events in the Caribbean have caused US$ 121 billion in direct economic losses, a relatively devastating impact for a small region.

Like distribution for flood impacts, Asia is the most affected continent by storms. Asia accounted for 79% of people affected by storms, with the highest affected region being East Asia. The continent also accounted for 90% of storm deaths, with South East Asia having the highest death tolls. Critically, the highest share of storm deaths belongs to a single event, Cyclone Nargis in Myanmar. In 2008, Cyclone Nargis struck southern Myanmar and resulted in approximately 138,000 deaths, making it the deadliest storm worldwide since the early 1990's. Furthermore, the Americas experienced 72% of the world's total economic impacts due to storms, most of which occurred in the U.S.

Scientific evidence suggests that, as a result of climate change, certain areas of the world will experience an increase in flooding and storm events.[5] Concurrently, the population in need of protection from such hazards is expected to increase as the total worldwide population in disaster-prone regions increases. Storm drainage systems must be adapted to accommodate increasing rainfall intensity resulting from climate change. Risk-informed policies, backed by political leadership, sustained funding and based on accurate, timely, relevant, interoperable and accessible data, are the key to ensure that the most vulnerable are not left behind.

Encouragingly, there are advances in resilience that have already resulted in reduced human impacts. Weather forecasting has made extraordinary progress in recent years, as has access to mobile phones, now with highly reliable storm forecasts. Thus, authorities can issue alerts and organize evacuations resulting in thousands of lives saved. However, it is important to note that this year there is an added layer of complexity to large-scale evacuations due to protective measures necessary against COVID-19 in cyclone shelters and other places of refuge.

4 Kishore N, Marqués D, Mahmud A, Kiang M V., Rodriguez I, Fuller A, et al. Mortality in Puerto Rico after Hurricane Maria. N Engl J Med. 2018;379(2):162–70.

5 IPCC Chapter 3: Chapter 3: Impacts of 1.5o C global warming on natural and human systems. http://report.ipcc.ch/sr15/pdf/sr15_chapter3.pdf

2.3 Earthquakes

In the past two decades, earthquakes and tsunamis were the deadliest form of disasters accounting for 58% of total deaths (Figure 10). However, unlike some other types of disasters, impacts from earthquakes are relatively uneven. As seen in the EM-DAT data, in the past two decades, there were some years in which earthquakes were responsible for less than 1,000 deaths worldwide, while in other years, earthquakes killed over 100,000 people. In the past five years (2014-2019), there have been no earthquake events that have killed over 10,000 people. However, the 2015 earthquakes in Nepal (8,969 deaths) and 2018 earthquake in Palu, Indonesia (4,340 deaths) reminded the world of the dangerous potential of earthquakes. Additionally, earthquakes can cause massive damage to infrastructure, as was seen in the 2011 earthquake and tsunami in Japan which resulted in US$ 239 billion in economic losses, the highest figure in any disaster event on record. Such events underline the importance of good land use and appropriate building codes in seismic zones.

2.4 Droughts

Drought affects Africa more than any other continent. EM-DAT recorded 134 events on the continent between 2000 and 2019 (some 40% of the global total), including 70 droughts in East Africa alone. Droughts take a high human toll in terms of hunger, poverty and the perpetuation of under-development.[6] They are associated with widespread agricultural failures, loss of livestock, water shortages and outbreaks of epidemic diseases. Some droughts last for years, causing extensive and long-term economic impacts, as well as displacing large sections of the population.

Consecutive failures of seasonal rains in Eastern Africa in 2005 affected 10 countries and 16.7 million people. In 2016 and 2017, conditions due to the El Niño event caused another drought in East Africa, affecting over 20 million people, 10.2 million of whom were in Ethiopia. In total, EM-DAT recorded 1.4 billion people affected by droughts in the period 2000-2019; making droughts the 2nd most impactful type of disaster by that measure (Figure 9), even though drought accounted for only 5% of all disaster events.

While EM-DAT data also show that just 2% of disaster deaths were due to drought, this figure underestimates the impacts as it often excludes indirect deaths from malnutrition, disease, and displacement, which are the primary outcome of droughts. Such indirect deaths largely occur after the emergency phase and are often poorly documented or not counted at all. Both the disproportionate numbers of people affected by drought and the scarcity of data about deaths are particularly disturbing at a time when effective early warning systems for drought have long been in place.

Climate change is expected to increase the risk of droughts in many vulnerable regions of the world, particularly those with concurrent population growth, vulnerable populations, and challenges with food security.[7]

2.5 Extreme Temperatures, Wildfires, and Volcanic Activity

Between 2000 and 2019, extreme temperatures caused 13% of all disaster deaths worldwide, with the majority (91%) being the result of heatwaves. Almost all extreme temperature deaths were recorded in the global north, with Europe accounting for the lion's share at 88% of all deaths. In 2003, a major European heatwave across 15 European countries killed over 72,000 people, with the biggest impacts in Italy and France (20,089 and 19,490 deaths respectively). In 2010, a summer heatwave led to more than 55,000 deaths in Russia, and more recently, two heatwaves in the summer of 2019 resulted in over 1,400 deaths in France. Outside of Europe, recorded heatwave impacts have been less high over the period 2000-2019. The most notable were the May and June heatwaves of 2015 in India and Pakistan which resulted in 2,248 and 1,229 deaths respectively.

Overall, it is believed that the high proportion of heatwave deaths recorded in Europe is a result of better reporting systems. Heatwaves frequently occur throughout the world in areas with vulnerable populations and poor infrastructure, however, it is likely that the challenges in identifying heatwave-related deaths lead to undercounting. Heatwaves are forecasted to increase dramatically throughout much of the world due to climate change[5]. Longer and more intensive heatwaves in coming decades will result in increased pressure on productivity and electrical grids, and unless properly managed, could lead to conditions that further exacerbate impacts.

Wildfires and volcanic activity are less frequent and impactful disaster types as compared to others. However, in the past three years, several large events have brought them more attention. In the past two decades 26% of wildfire events and 69% of economic losses due to wildfires have occurred in the U.S., particularly in the state of California. In addition to the direct impacts from the fire, wildfires release pollutants over long distances, creating health hazards for sensitive individuals. Large-scale wildfires in remote areas have been attributed to increased mortality in distant areas as a result of smoke exposure.[8] Volcanic activity is also relatively rare, accounting for only 1% of total disaster events. However, in 2018, two volcanic eruptions resulted in more deaths from volcanic activity than had occurred in all previous 18 years combined. In June, an eruption in Guatemala killed 425 people and affected 1.7 million people. Then in December a volcanic eruption in Indonesia triggered tsunami waves that killed 453 people in coastal settlements.

6 Below, R., Grover-Kopec, E. & Dilley, M. (2007). Documenting Drought-Related Disasters: A Global Reassessment. The Journal of Environment Development, 16 (3): 328-344.doi: 10.1177/1070496507306222

7 IPCC Chapter 3: Chapter 3: Impacts of 1.5o C global warming on natural and human systems. http://report.ipcc.ch/sr15/pdf/sr15_chapter3.pdf

8 Centre for Research on the Epidemiology of Disasters. Volcanic activity & Wildfires: CRED Crunch 55. 2019.

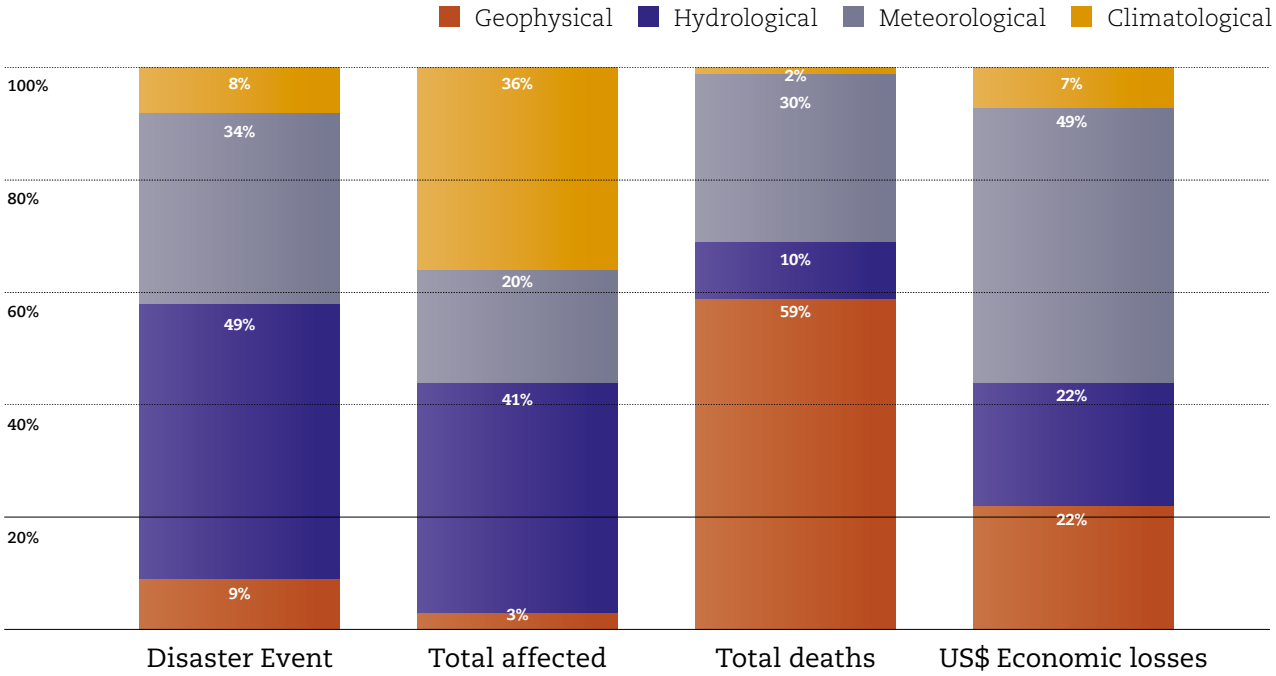
Action Point

5

Strengthening the resilience of drought-vulnerable populations should be a global priority over the next decade; better accounting systems for indirect deaths from drought are also required; these should be linked to early warning systems and response mechanisms in order to monitor the impacts of drought more comprehensively.

Figure 11

Proportion of various types of impacts by disaster sub-group (2000-2019)



Action Point

6

Standardized methodologies are needed to collect comprehensive national data on deaths from all natural hazards. Following the adoption of the Sendai Framework, work is underway to promote a more comprehensive approach to data collection on disaster losses by UN member States using the Sendai Framework Monitor.

Figure 11 demonstrates the variability in impacts by disaster types. Although hydrological disasters make up the bulk of total events (49%) and people affected (41%), they are only responsible for 10% of total deaths. In contrast, geophysical events account for only 9% of total disaster events, but 59% of all disaster-related deaths, making them by far the deadliest type of disaster. Additionally, meteorological disasters stand out as the costliest type of disaster, accounting for 49% of overall economic damage.

Chapter 3

Impacts of Disaster Events by Country

China and India typically dominate the list of countries by impacts in absolute numbers, largely due to their massive populations. Together, the two nations account for over 2.8 billion disaster-affected people between 2000-2019, approximately 70% of the global total. The top 10 list of countries by absolute number of people affected by disaster is dominated by Asia (7 countries), with only two from the Americas (U.S. and Brazil), and one from Africa (Ethiopia). When the data is standardized to provide the number of people affected per 100,000 population averaged across the years, the list is quite different, with only the Philippines present in both.

Standardized to population size, the top 10 list of countries with the highest share of affected populations is dominated by African countries, which make up 6 out of the 10 countries on the list. In the past two decades, Eswatini (formerly Swaziland) and Mauritania have faced relatively large and frequent droughts, while the island nations of Cuba, Philippines, and Dominica were hit by storms.

Figure 12

Top ten countries by total population affected by disasters (2000-2019) compared with the top ten countries most affected per 100,000 inhabitants

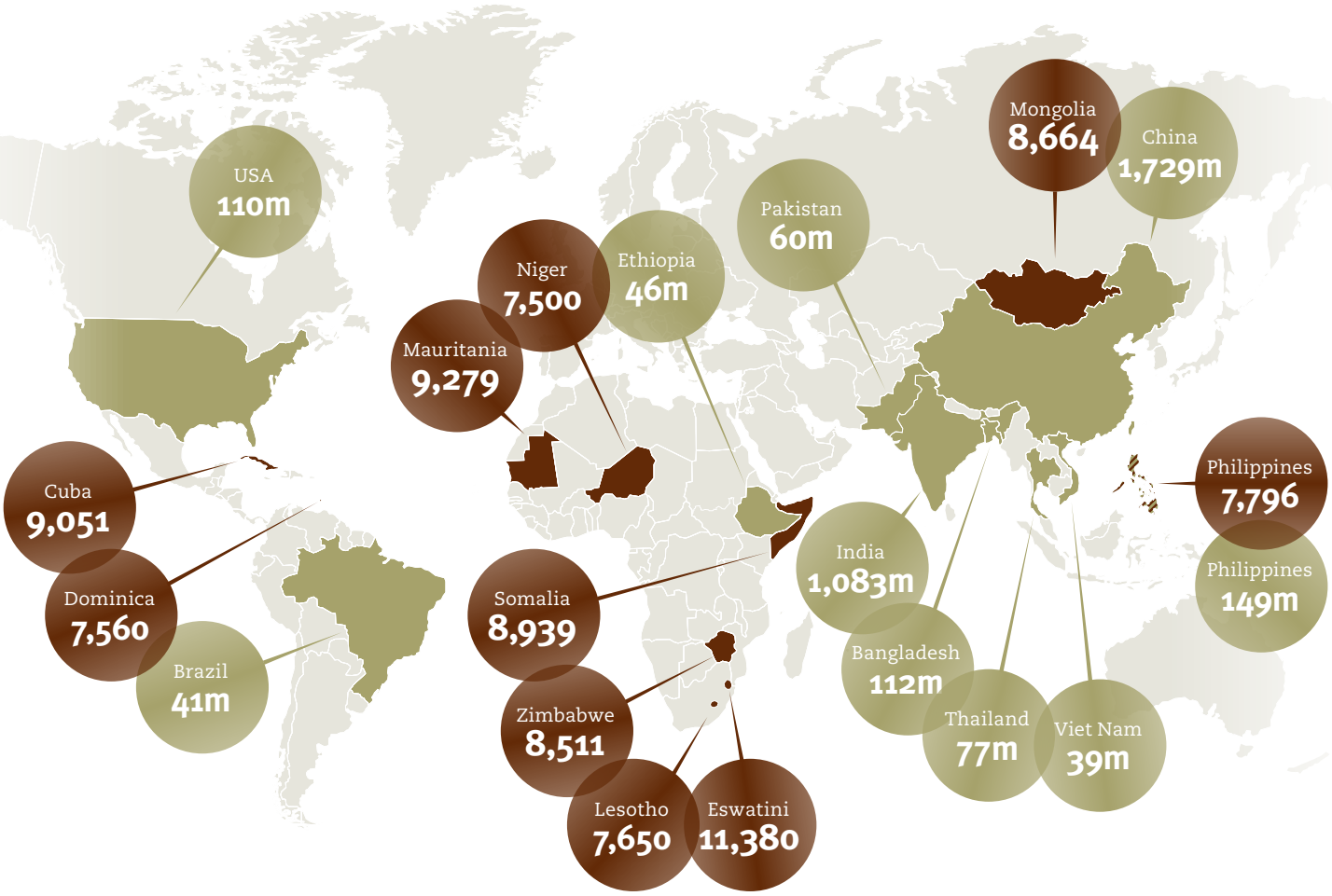
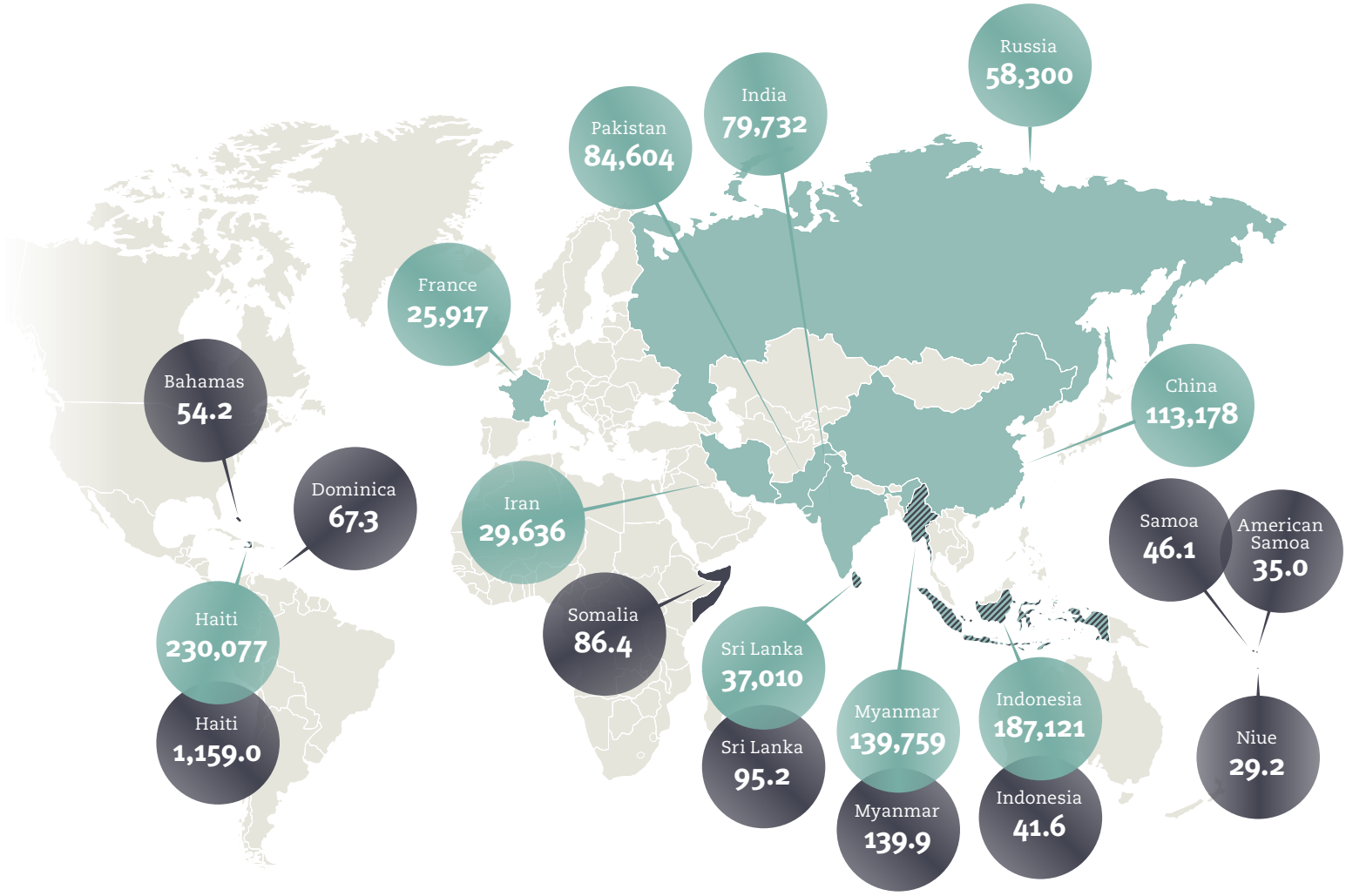


Figure 13

Top ten countries by total deaths (2000-2019) compared with the top ten countries/territories by total deaths per million inhabitants (2000-2019)



Total deaths ■ Total deaths per million inhabitants

The top 10 list of countries/territories by absolute death tolls is reflective of the mega-disasters of the past two decades, with Haiti, Indonesia, and Myanmar taking the top 3 spots. Similarly, for people affected, once the data for deaths are standardized, the list changes drastically, yet Haiti remains in the top spot. This is largely due to the 2010 earthquake which killed approximately 2% of the country's population in a single event.

In the list for absolute number of deaths, seven of the top 10 countries are in Asia, with the exceptions being Haiti, Russia, and France.

However, in the figures standardized for population size, the top 10 list is made up largely of island nations in Asia, the Americas, and Oceania. Frequent storms and relatively small populations place nations like Dominica, the Bahamas, and Samoa, high up on the list. **The difference in the two measures in Figure 13 demonstrates that absolute death tolls are not the best measures to understand the relative impact of an event on an area.**

Chapter 4

Disasters & National Income

EM-DAT data shows that when nations are grouped together by income levels, there are notable differences in disaster impacts across income groups. It can be noted that compared to population distribution by income group (Figure 14), the distribution of disaster events is quite evenly distributed (Figure 15). However, the distribution of deaths, total people affected, and economic damage differs across income groups (Figure 15). High-income countries tend to have lower numbers of people affected and killed by disaster events, but suffer significantly larger economic losses, while low-income countries report limited economic losses and relatively high death tolls per disaster event. Lower-middle and upper-middle income countries make up most disaster events, deaths, and total people affected; however, they also account for most of the world's population (Figure 14).

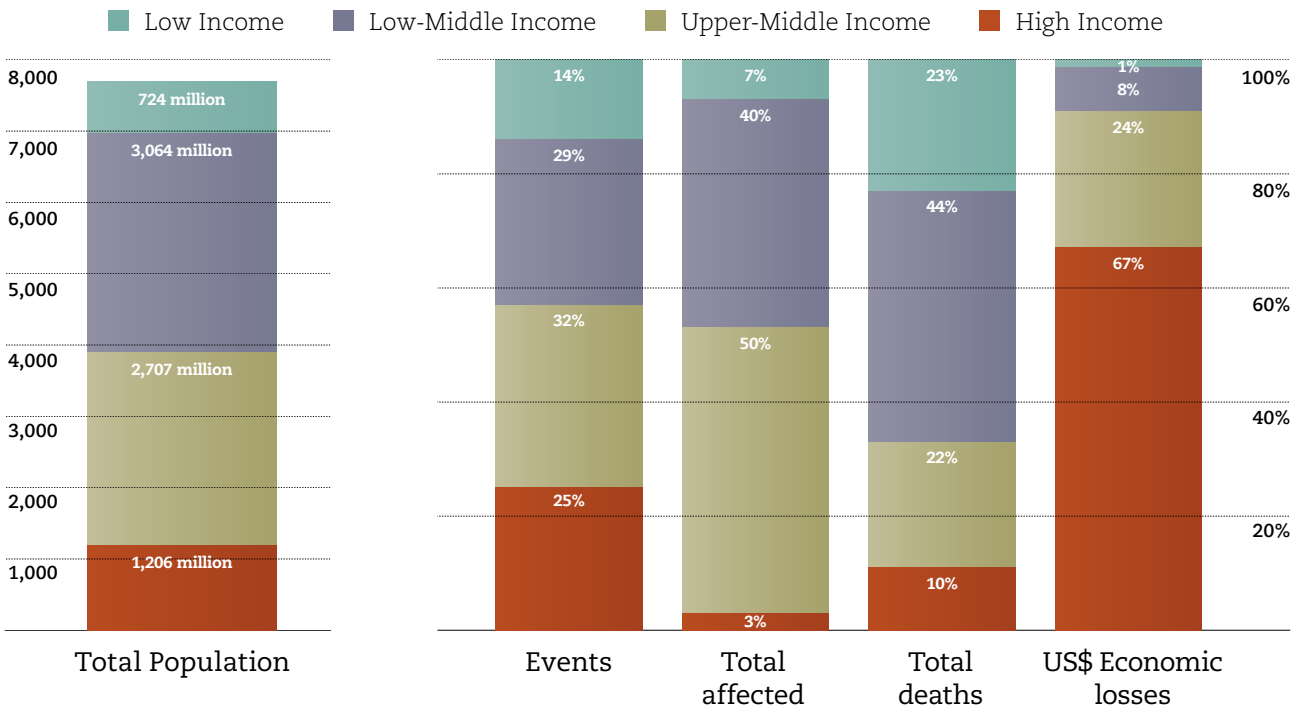
High income countries accounted for most total economic losses (67%), with a total of US$ 1.99 trillion between 2000 and 2019 (Figure 15). In comparison, countries in other income groups reported significantly lower total economic losses. **Low-income countries account for 23% of total disaster deaths despite accounting for less than 10% of the world's population.** In fact, low-income countries had the highest average number of deaths per disaster event (284 deaths per event), followed by low-middle income countries (255 deaths per event) (Figure 16). The relatively better risk governance, infrastructure, surveillance systems, and reduced exposure to natural hazards is likely responsible for the improved protection in countries as income levels increase.

Figure 14

Global population distribution by income group (millions)

Figure 15

Proportion of various types of impacts on countries/territories by income group (2000-2019)



BOX 6

Under-Reported Disaster Impacts

The data provided by the 7,000+ disaster events recorded in EM-DAT from 2000 to 2019 provide valuable insight into the impact of disasters worldwide. However, there remain gaps in disaster reporting, which hinders our understanding of the global picture. This is especially critical for certain regions (such as those in Sub-Saharan Africa) and certain disaster types (such as extreme temperatures), which remain a challenge for data collection and disaster reporting. For example, from 2000 to 2019, only 34% of extreme temperature events reported the total number of people affected. In the meantime, an additional unknown number of extreme temperature events were completely unrecorded.

Risk assessment and modeling is tuned to the largest and most historically obvious and tractable risks but often misses the risks of smaller, often recurrent and in sum equally damaging events. The significant data gaps in critically under-reported disasters, such as heatwaves, result in our poor understanding of the impacts of such disasters. Additionally, some disasters, such as droughts, are notoriously hard to measure. In order to provide a strong evidence-base for local and national strategies for disaster risk reduction, it is critical that the field of disaster epidemiology improves on these weaknesses, particularly in the context of the growing impact of global warming and the climate emergency.

Action Point

7

Better data collection would improve our understanding of disaster impacts and improve analyses. More in-depth data, such as disaster damage to buildings, dis-aggregated demographic data, and impacts on local economies, would help decision-makers prioritize and target new measures more effectively. This underlines the importance of national disaster loss databases which are vital to the development of national and local DRR strategies aligned with the Sendai Framework.

Figure 16

Total numbers of deaths compared to the average number of deaths per disaster by income group (2000-2019)

Chapter 5

Counting the Economic Cost

EM-DAT recorded losses totaling US$ 2.97 trillion from recorded disasters between 2000 and 2019, however, this figure is an underestimation given under-reporting of losses worldwide. With this caveat, **EM-DAT data show that storms cost more than any other disaster type in terms of recorded economic damage (1.39 trillion US$), followed by floods (651 billion US$).**

At the regional level, economic losses in the Americas accounted for 45% of the total losses, followed by Asia at 43% (Figure 18). However, most of these losses are attributable to three countries. In the Americas, the U.S. accounts for 78% of the continents' total losses with US$ 1.03 trillion in economic losses (Figure 18). In Asia, China and Japan account for 38% and 35% of the region's total losses respectively (Figure 18).

Economic losses compared to Gross Domestic Product (GDP) results in a stark difference between income groups. **Despite accounting for most the world's economic losses, high-income countries have the lowest level of losses as a percentage of GDP** (Figure 19). Contrastingly, **low-income countries had the highest level of losses compared to GDP** (0.61%), 3x higher than high-income countries. These figures demonstrate the inequality of impacts between rich and poor nations, especially considering the higher level of under-reporting in low-income countries.

Figure 17

Breakdown of recorded economic losses (US$) per disaster type (2000-2019)

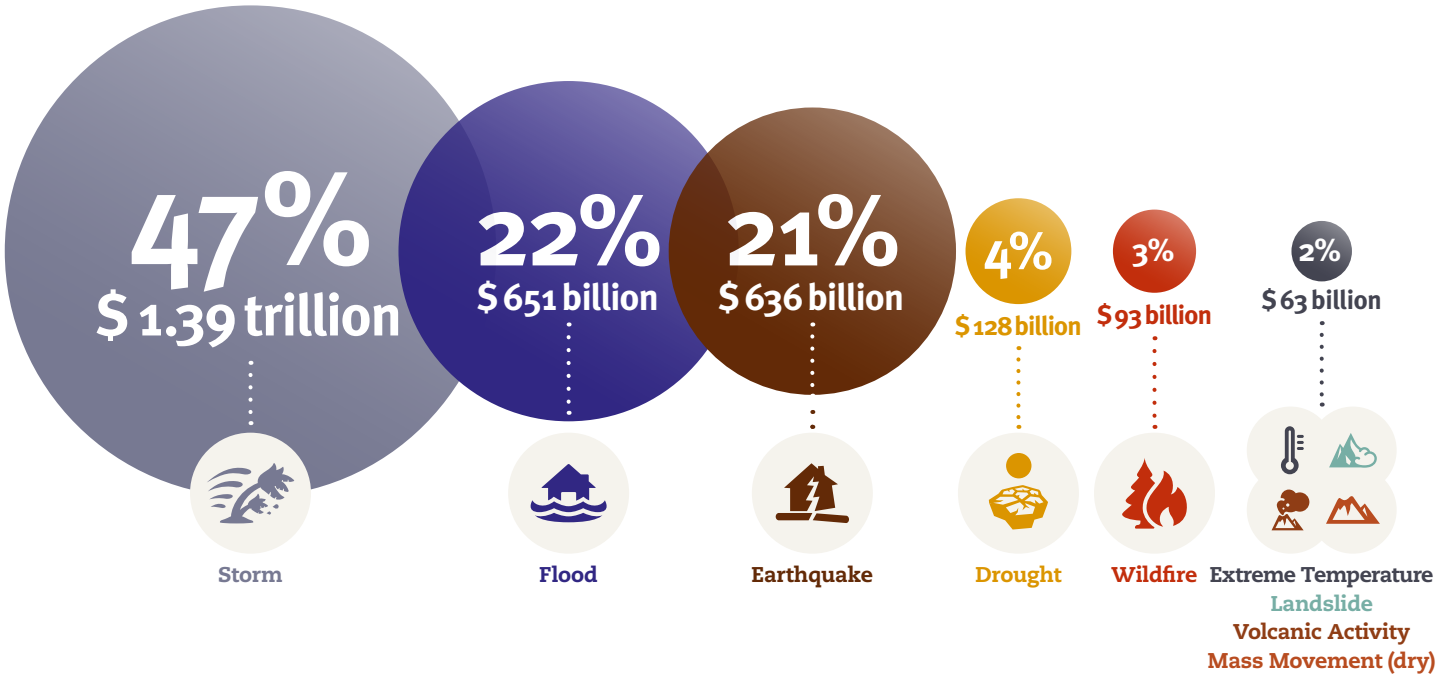
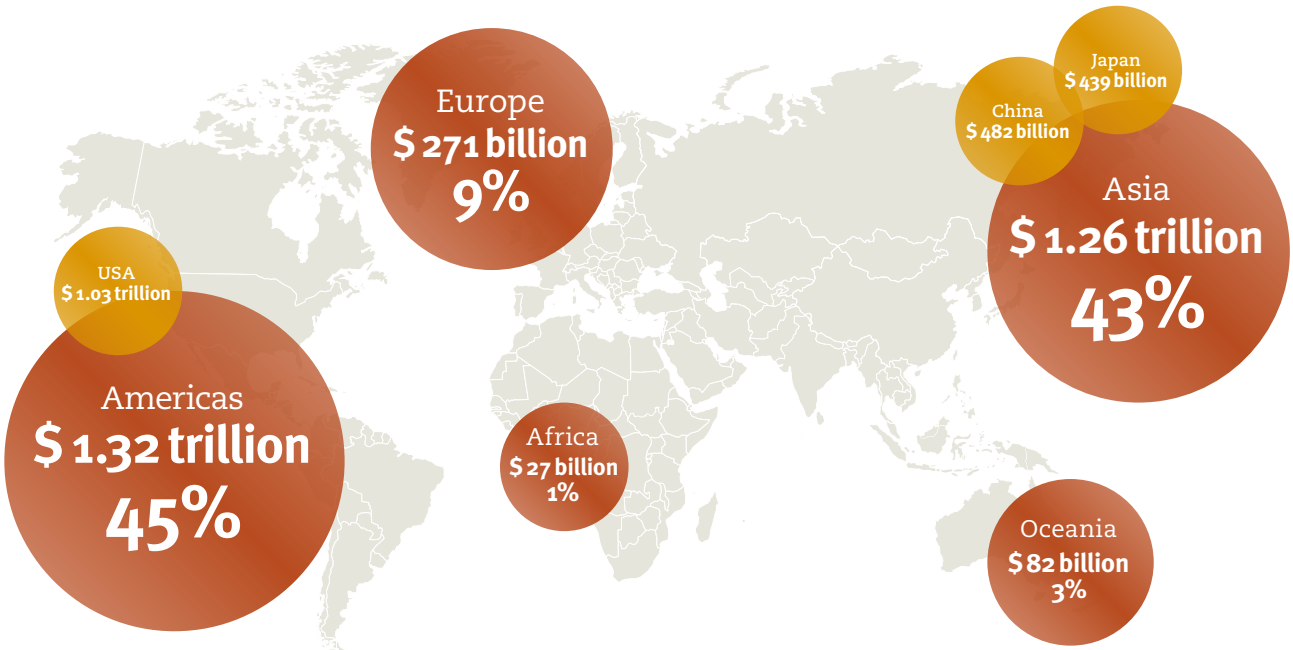


Figure 18

Breakdown of recorded economic losses (US$) by continent (2000-2019)



BOX 7

Under-Reported Economic Losses

There remains a gap in data on economic losses from disasters worldwide. From 2000 to 2019, only 35% of all disaster events reported any figures for economic losses. Records are particularly incomplete from Africa and South Asia, as only 13% of all disaster events in Africa reported any economic losses and only 23% of all events in South Asia reported losses.

Concerning data gaps by disaster type, storms had the highest percentage of events with reported losses (53%). In contrast only 28% of droughts, 12% of landslides, and 9% of extreme temperature events recorded any losses.

These gaps are of concern since economic data is often used to establish policy priorities. Considering Figure 19, and the evidence that despite substantial amounts of missing data, low-income and low-middle income countries still report higher relative economic impacts. It is clear that these countries bear the largest brunt of relative economic losses due to disasters.

8

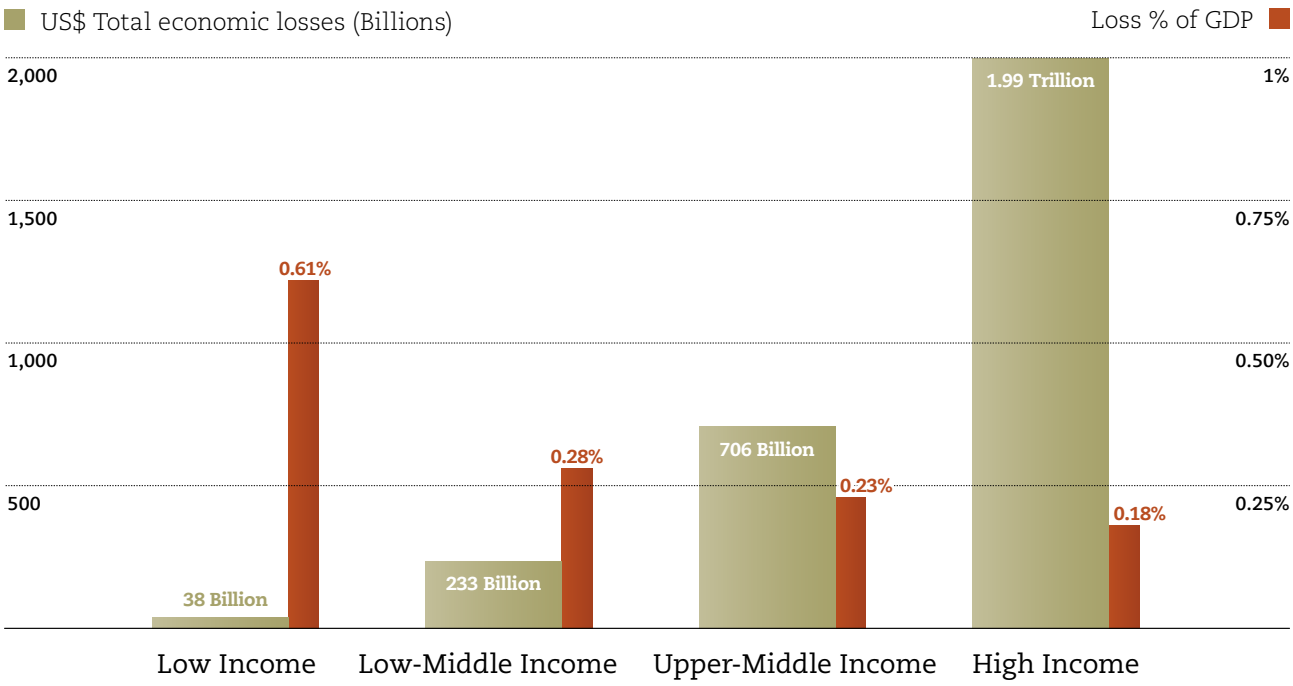
Action Point

Reporting of economic losses should be improved, particularly for lower-income countries. Priority should also be given to a review of existing methodologies to estimate losses and the development of realistic, standard operational methods.

Figure 20 demonstrates the relatively high impact disasters have on smaller economies, particularly as a result of storms on small islands. Of the top 10 countries/territories by economic losses as a percentage of GDP, eight of the countries/territories are island nations, seven of those being in the Caribbean region.

Figure 19

Economic losses in absolute value (US$) compared to losses as % of GDP by income group



BOX 8

The Impact of Single Disaster Types or Single Events

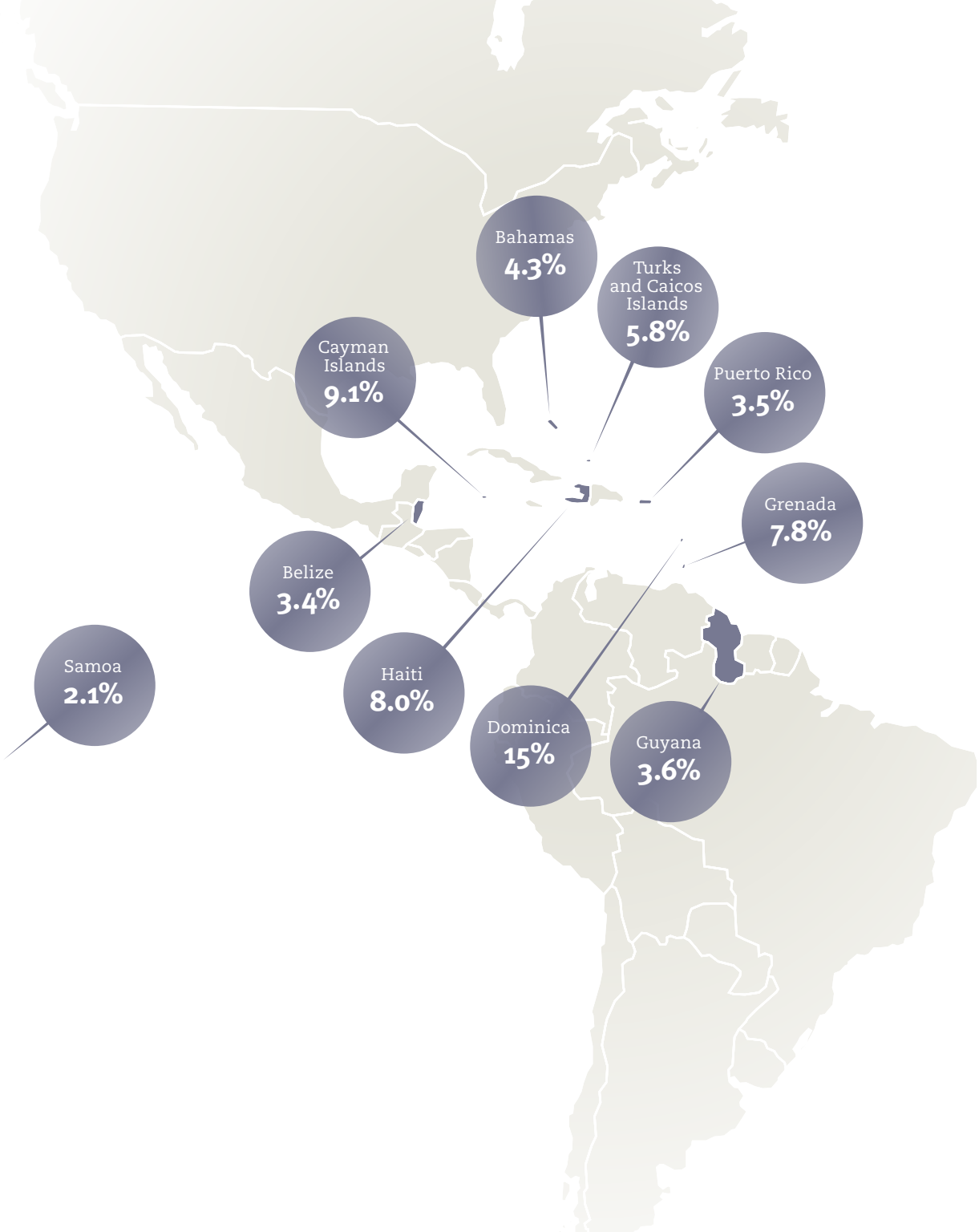
For many of the most disaster-affected nations, much of the impact in the past two decades came from only one disaster type or, in some cases, a single disaster event. For example, in Eswatini and Mauritania, the two highest ranked countries by total people affected relative to population, 88% and 97% of those affected were impacted by droughts.

For Dominica, a country that featured on all the top 10 lists for relative disaster impacts, over 99% of those affected or killed by disasters were from storms only. In the Cayman Islands, 98% of all economic losses were due to a single event; Hurricane Ivan's destructive impact on the island nation.

This relatively high burden due to single disaster types or single disaster events suggests that in some locations the best course of action is to focus on mitigation on the most at-risk type of disaster.

Figure 20

Top ten countries/territories by economic losses as % of GDP (2000-2019)[9]



9 Note: Countries/territories without reliable economic figures (GDP) from the sources mentioned in Appendix 2 were not included in this analysis. Some of the countries/territories excluded reported significant economic losses, such as St. Martin and British Virgin Islands, which reported US$ 4.1 billion and US$ 3 billion respectively in losses during the 2017 hurricane season. These losses represent significant impacts relative to the local economies, however, without reliable figures available, comparison with other nations is not appropriate.

Appendix

1. List of countries/territories by income group

The list of countries/territories per income group was adopted using the World Bank revised classification of the world's economies based on estimates of GNI per capita from the calendar year 2018.

https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

- **Low income:** $1,025 or less
- **Low-middle income:** $1,026 — 3,995
- **Upper-middle income:** $3,996 — 12,375
- **High income:** $12,375 or more

2. Calculation of economic losses related to GDP

The values for GDP were provided by World Bank or International Monetary Fund.

The percentage calculated is equal to the sum of economic losses for a year compared to the GDP figure for the same year. The final percentage for the country for the period 2000-2019 is the average of the calculated values for each year.

3. Calculation of population affected, and number of deaths related to the population

The values for population were sourced from *United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition.*

The percentage calculated is equal to the sum of number of people affected/deaths for a year compared to the population figure for that year. For number of people affected, this figure was provided per 100,000 people in the population, and for number of deaths, this figure was provided per million in the population. The final rate for the country for the period 2000-2019 is the average of the calculated figure for each year.

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