Photo: Melis

1
A REGION AT RISK

A REGION AT RISK

Asia and the Pacific is the region most affected by natural disasters. The greatest losses of life and economic impacts are in the most populous countries, but proportionately the economic impacts are greatest in the least developed countries and small island developing States.

For the last several decades, the Asia-Pacific region has experienced the greatest human and economic impacts reported from natural disasters. This partly corresponds to its size – Asia and the Pacific has 60 per cent of the world's people and 40 per cent of the landmass, as well as 36 per cent of global GDP.[1] But even taking the region's size into account, a person living in Asia and the Pacific is much more likely to be affected by natural disasters.[2]

By historical standards, 2016 witnessed relatively lower disaster impacts, but disasters still took their toll – killing 4,987 people, affecting 34.5 million people and causing estimated damage of about $77 billion (Table 1-1). The greatest loss of life was through flooding, which caused 3,250 deaths – in Bangladesh, China, Democratic People's Republic of Korea, India, Nepal, Pakistan, and Sri Lanka. But droughts also affected 13.4 million people, primarily in China and Cambodia, including many people who suffered from El Niño-induced droughts in Indonesia, Mongolia, Timor-Leste, Viet Nam, and in Papua New Guinea, other Pacific island countries.

Major disasters in 2016 and 2017 included:

Afghanistan – In February 2017, avalanches, snowfall and rain-related disasters caused significant damage to homes and livelihoods in 22 out of 34 provinces.[3]

China – In August 2017, typhoon Hato battered Hong Kong, China; Macao, China; and southern China, severely damaging houses and farmland.

Fiji – Tropical cyclone Winston, a category 5 cyclone, struck Fiji in February 2016. Approximately, 540,400 people were impacted – 62 per cent of the population.[4]

Mongolia – In 2016-17, a dzud (summer drought followed by severe winter) affected more than 157,000 people across 17 of 21 provinces.[5]

Philippines – In February 2017, a 6.7 magnitude earthquake affected over 53,000 people.[6]

Sri Lanka – In September–October 2016, around 1.2 million people were affected by drought in 17 of 25 districts.[7]

Viet Nam – The country had the worst drought for 90 years; here, as elsewhere, induced or exacerbated by the recent El Niño phenomena.[8]

South Asia – In June 2017, torrential monsoon rains led to floods and landslides in Bangladesh, India and Nepal, killing over 900 people and affecting almost 41 million people (Box 1-1).[9]

The events in 2016 fit into a broader historical sequence over the past half century. The most

Table 1-1

Disaster impacts in Asia and the Pacific, 2016

	Lives lost	People affected	Estimated damage (million $, current)
Floods	3,250	13,785,307	35,846
Storms	880	6,345,793	11,409
Droughts	-	13,381,000	3,000
Extreme temperature	336	158,100	1,727
Earthquakes	198	613,022	24,407
Others	323	240,480	835
Total	4,987	34,523,702	77,223

Source: EM-DAT: The OFDA/CRED International Disaster Database. (Accessed on 4 July 2017)

Box 1-1

Floods and landslides in South Asia, June 2017

In South Asia, many of the region's vulnerable people live in the vast agrarian belts along the Indus, Ganges, Brahmaputra-Meghna basins which are subject to periods of widespread and seasonal flooding. Monsoon variabilities, El Niño and La Niña, and other extreme weather events often result in large-scale flooding, which has significant impacts, especially on the poor and vulnerable populations who depend on subsistence agriculture.

In June 2017, torrential monsoon rains triggered floods and landslides in Bangladesh, India and Nepal. This killed more than 900 people, and affected 41 million people. Many areas became inaccessible due to damage to roads, bridges, railways and airports.

	Bangladesh	India	Nepal
Deaths	114	Over 600	143
People affected	6.9 million	32.1 million	461,000
Areas affected	31 out of 64 districts	4 states (Bihar, West Bengal, Uttar Pradesh, Assam)	35 out of 75 districts

Source: Relief Web (2017).

significant, in terms of fatalities and economic impacts, are summarized in Figure 1-1. Disasters that affected the region over this period included:

Cyclones – In 1970, cyclone Bhola devastated Bangladesh, with more than 300,000 fatalities. In 2008, cyclone Nargis hit Myanmar, and in 2013 typhoon Haiyan struck the Philippines.

Earthquakes and tsunamis – In 1976, the Tangshan earthquake hit China, killing 242,000 people. In 2004, the Indian Ocean

Figure 1-1

Selected major disasters in Asia and the Pacific, 1970-2016

Source: Based on data from EM-DAT. (Accessed on 4 July 2017)

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

tsunami devastated many countries in Asia and Africa. Indonesia alone reported about 165,000 fatalities. In 2011, the Japan earthquake and tsunami caused the largest disaster-related economic loss in human history.[10] Major earthquakes were also reported in the Islamic Republic of Iran (Manjil-Rudbar in 1990), Turkey (Izmit in 1999), India (Gujarat in 2001), Pakistan (Kashmir in 2005), China (Sichuan in 2008), and Nepal (Ghorka in 2015).

Floods – In 1995, Democratic People's Republic of Korea witnessed devastating floods from torrential rain, which left over 100,000 families homeless.[11] In 2011, floods widely affected Thailand, with huge economic losses not only for Thailand but also for its economic partners in the region and around the world.

The human and economic cost

Since 1970, natural disasters in Asia and the Pacific have killed two million people – contributing 57 per cent of the global death toll. On average, the number of people killed annually was 43,000, though the number fluctuated considerably from year to year. As indicated in Figure 1-2, the principal causes of natural disaster deaths were earthquakes and storms, followed by floods. In the rest of the world the pattern was different: the death toll was lower and the principal killer was drought, followed by earthquakes. Epidemics were also more significant, as a result of cholera, malaria, and meningococcal meningitis as well as the Ebola outbreak in 2014.

In addition to the large number of people who have lost their lives, millions more have been

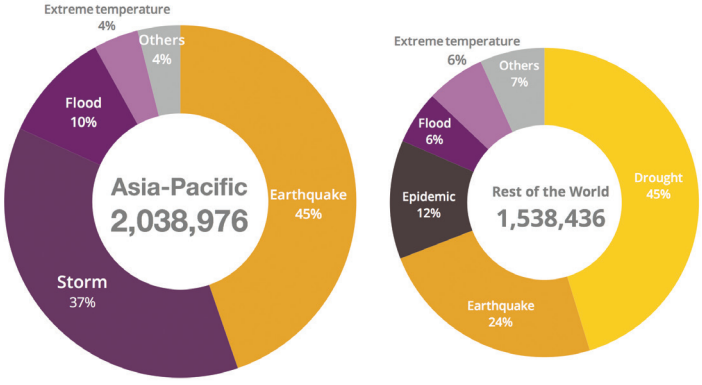
affected. Affected refers to "people requiring immediate assistance during a period of emergency, i.e. requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance".[12] Asia and the Pacific, though having around 60 per cent of the global population had 88 per cent of the people affected (Figure 1-3).

Indeed, since 1970 a person living in the Asia-Pacific region has been approximately five times more likely to be affected by natural disasters than a person living outside the region.

This imbalance is largely a consequence of the region's floods, droughts and storms. These affected around 6.3 billion people in Asia and the Pacific since 1970, while the rest of the world reported less than 0.9 billion people affected by these hazards. In particular, droughts affected almost 2 billion people in the Asia-Pacific region, but this did not lead to huge loss of life. In comparison, the rest of the world witnessed around half a billion people affected by droughts, which also resulted in a huge number of fatalities, especially in African countries where many people suffered from food insecurity.[13]

Figure 1-2

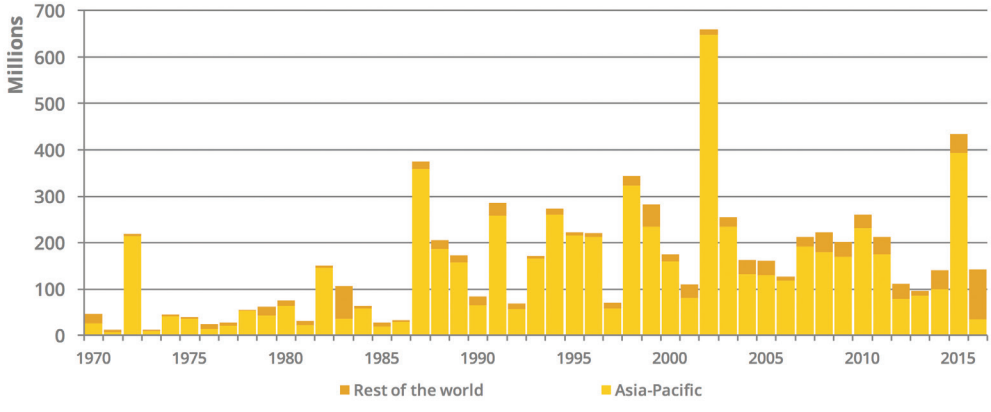
Fatalities from natural disasters, 1970–2016



Note: From 1990, includes data from countries of the former Soviet Union.
Source: Based on data from EM-DAT. (Accessed on 4 July 2017)

Figure 1-3

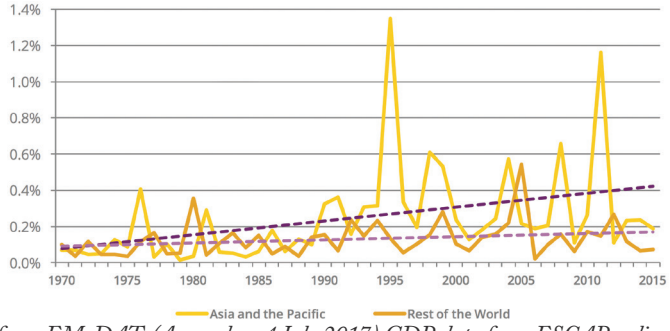
People affected by natural disasters, millions, 1970–2016



Source: Based on data from EM-DAT. (Accessed on 4 July 2017)

Figure 1- 4

Estimated damage, Asia and the Pacific and the rest of the world, percentage of GDP, 1970-2016



Source: Based on damage data from EM-DAT. (Accessed on 4 July 2017) GDP data from ESCAP online statistical database.

Disasters also cause large-scale damage. Between 1970 and 2016, the region lost $1.3 trillion.[14] Almost all of this was the result of floods, storms, droughts and earthquakes including tsunamis. Such damage has been rising. This is partly because as GDP increases there are more physical assets at risk. However, disaster impacts have been outpacing the region's economic growth – rising as a proportion of GDP, from around 0.1 per cent in the 1970s to about 0.4 per cent in recent decades (Figure 1-4). The estimated damage fluctuates from year to year according to the nature and impact of disasters, but the trend is clear: disasters cause more damage in Asia and the Pacific than in the rest of the world, and this gap has been widening. The region's rapid economic growth has increased the exposure of people and assets to natural hazards, thereby increasing disaster risks.

Disruption to livelihoods of the vulnerable

Disasters can have complex and deeply disruptive effects on livelihoods – further disadvantaging those who are already in a vulnerable situation. Some of these are explored further in later chapters of this report.

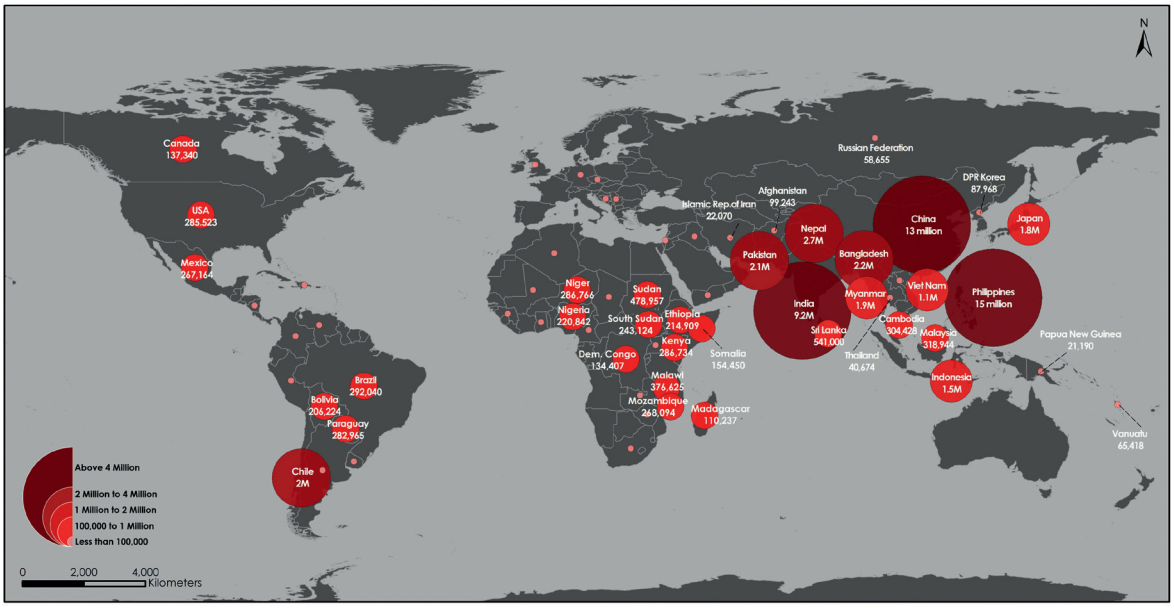
Disasters displace many people, increasing socio-economic vulnerabilities. Between 2013 and 2015, for example, globally natural disasters displaced 60.4 million people, of whom 52.7 million were in Asia and the Pacific. The largest numbers were in Philippines (15 million), China (13.1 million), and India (9.2 million), followed by Nepal, Bangladesh, Pakistan and Myanmar (Figure 1-5).

In many disasters, a high proportion of the victims are women and girls – who face disadvantages, institutional and socio-economic, with regard to disaster risk reduction policies and initiatives. As UN Women has explained, this imbalance in Asia and the Pacific is linked to gender roles.[15] Women and girls often have limited access to information, financial services, land and property rights, health and education – structural disadvantages that reduce their resilience to disasters. In the 2004 tsunami in Aceh Indonesia, for example, 77 per cent of the deaths were of women. During earthquakes and tsunamis, women and girls are more likely to be at home in poorly constructed houses, while men are working in open spaces, or in stronger buildings such as offices. Women are also less likely to learn to swim or climb trees, or to receive disaster early warning information.

Typically, the greatest impacts are the poorest countries which have less capacity to prepare for, or respond to, their high disaster risks. These include the least developed countries (LDCs), the landlocked developing countries (LLDCs)

Figure 1-5

New displacements associated with natural disasters, 2013-2015



Data source: IDMC. 2017

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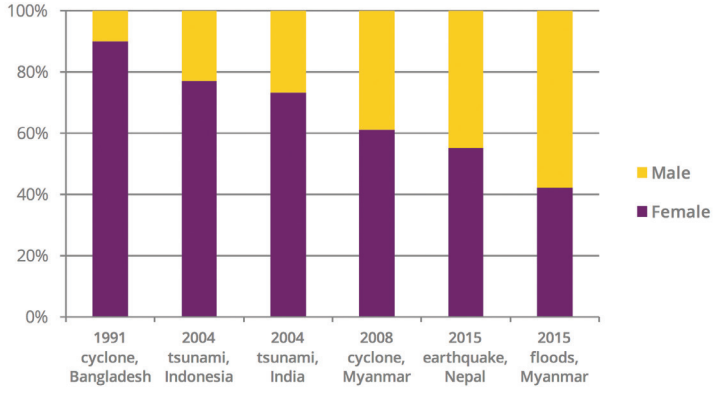
Figure 1-6

Mortality distribution, by sex, selected disasters



Source: UNWomen, 2016.

and the small island developing States (SIDS). As a group, these are classified as countries with special needs (CSNs). Most exposed have been the SIDS which since 2000 have suffered damage from disasters of over 1 per cent of GDP, compared with 0.4 per cent for non-CSN countries (Figure 1-7).

These are countries with small populations and economies, and their vulnerability frequently goes unrecognized. In future, however, the global agenda for sustainable development, which is based on the principle of leaving no one behind, will now be focusing on these countries and aiming to boost their resilience. Furthermore, many countries at high risk still lack capacities to absorb and manage disaster risks. According to the World Risk Report 2016, eight of the 10 countries at greatest disaster risk in Asia and the Pacific, had low coping capacity

(Table 1-2). The two exceptions were Japan and Brunei Darussalam. Even when countries have capacities to forecast and warn citizens of potential disasters, their capabilities can be overwhelmed by the scale and intensity of the event.

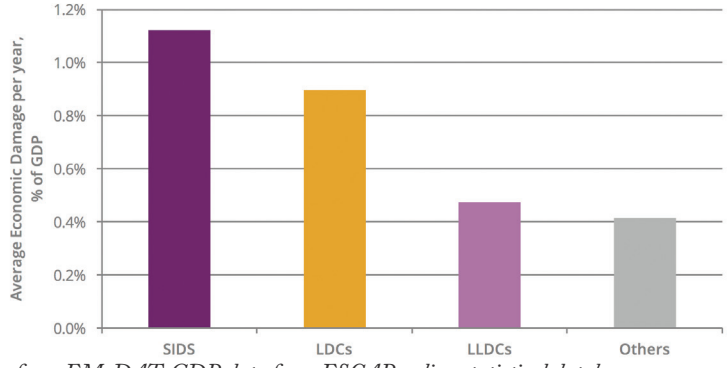
This was the case in Nepal for the Gorkha earthquake, in the Philippines for typhoon Haiyan (known locally as Yolanda), and even to some extent in Japan for the 2011 earthquake and tsunami. A common refrain after those events was that 'we were prepared, but not for something like this'.

Subregional disaster risks

The Asia-Pacific region encompasses a vast geographical area – from the Russian Federation in the North, Australia and New Zealand in the South, Turkey in the West, to Japan and the Pacific SIDS in the East. Each subregion has its own vulnerabilities and hazards. As indicated in the estimates in Figure 1-8, over the period 2000–2016, most of the damage was in East and North-East Asia, while a high proportion of the fatalities were in South-East Asia.

Figure 1-7

Average estimated damage in countries with special needs, 2000-2016 (percentage of GDP)



Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database.

Table 1-2

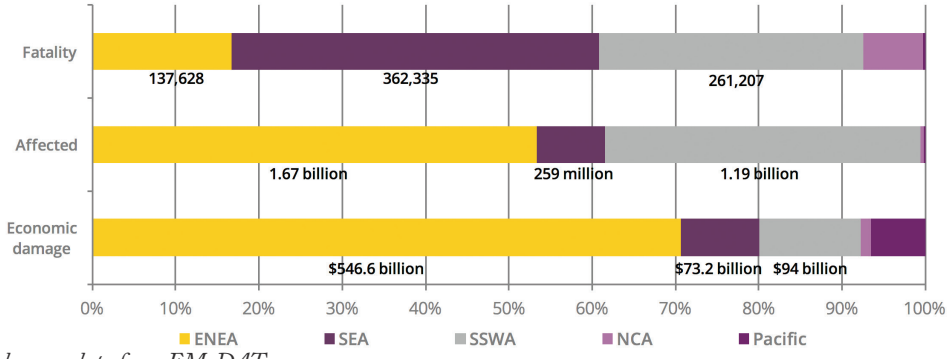
Exposure and coping capacity, Asia-Pacific countries at greatest risk

Country	Exposure (%)		Coping Capacities
Vanuatu	64	Very High	Low
Tonga	55	Very High	Low
Philippines	53	Very High	Low
Japan	46	Very High	Very High
Brunei Darussalam	41	Very High	High
Bangladesh	32	Very High	Very Low
Solomon Islands	30	Very High	Very Low
Fiji	28	Very High	Low
Cambodia	28	Very High	Very Low
Timor-Leste	26	Very High	Low

Note: Exposure refers to entities (population, conditions of built-up areas, infrastructure component, environmental area) being exposed to the impacts of one or more natural hazards.
Source: Based on Alliance Development Works & UNU-EHS (2016) World Risk Report 2016, p64.

Figure 1-8

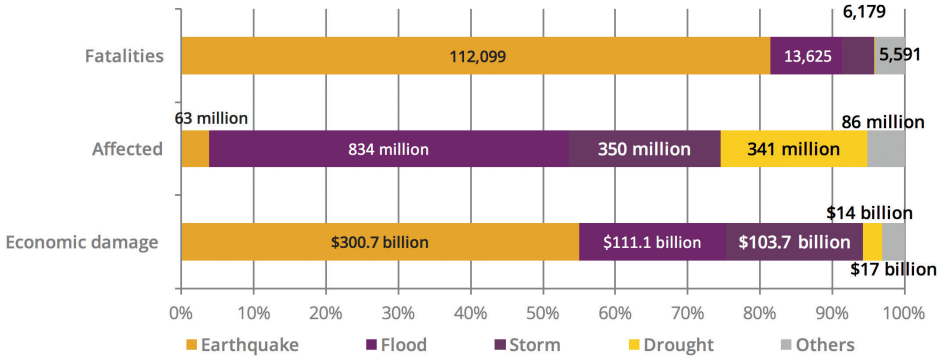
Disaster impacts by subregion, 2000–2016



Source: Based on damage data from EM-DAT.

Figure 1-9

Disaster impacts in East and North-East Asia, 2000–2016



Source: Based on damage data from EM-DAT.

East and North-East Asia

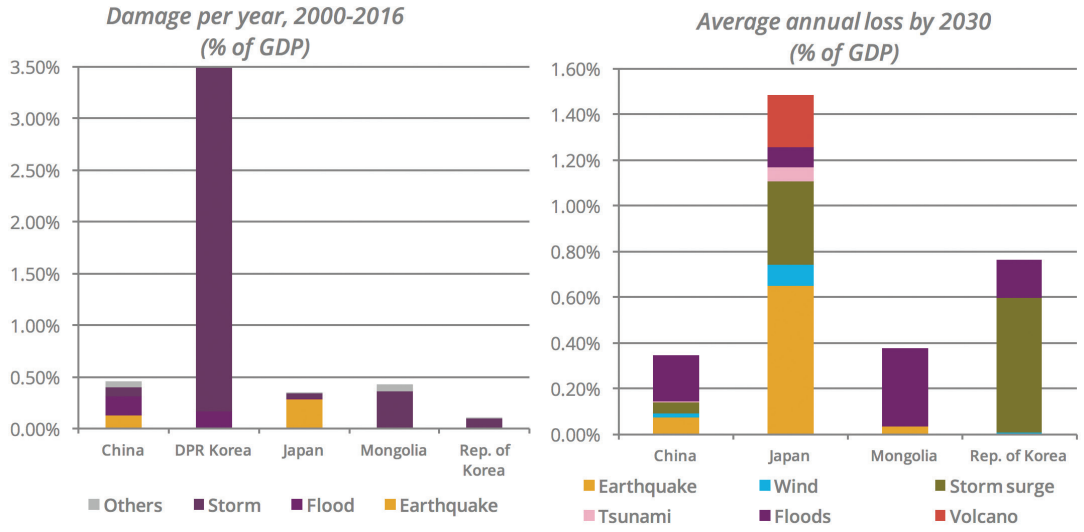
Since 2000, the subregion has lost over 130,000 lives, mainly from earthquakes and tsunamis including the 2008 Sichuan earthquake and the 2011 earthquake and tsunami in Japan (Figure 1-9). During this period, 1.67 billion people were affected by natural disasters, around half from floods. Storms and droughts each affected around 350 million people. In 2016, East and North-East Asia reported 1,900 fatalities, 14 million people were affected and damage reached $65 billion (in 2016 US dollars) – from earthquakes, floods, storms, droughts, extreme temperatures and landslides.[16]

Over the period 2000–2016, this subregion accounted for more than 70 per cent of the total Asia-Pacific estimated damage – $547 billion. This was mainly due to the exposure of assets in large economies, in particular those of China, Japan and the Republic of Korea – on average they lost 0.35 per cent of GDP. More than half of total estimated damage was from earthquakes.

Since 2000, Democratic People's Republic of Korea has had the highest estimated damage, with annual damage of close to 3.5 per cent of GDP (Figure 1-10). This was largely a consequence of typhoon Prapiroon in 2000 which cost about $6.5 billion.[17] China and Japan reported damage of less than 0.5 per cent of GDP.

Figure 1-10

Damage and future estimates in East and North-East Asia



Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database. Average annual loss data from UNISDR (2015)

These countries also face significant future risks. By 2030, Japan is expected to lose around 1.5 per cent of its GDP annually, mainly from earthquakes and tropical cyclones. The Republic of Korea is likely to lose around 0.8 per cent of GDP, mostly from tropical cyclones. All four countries will face losses from floods, though there are no estimates available for the Democratic People's Republic of Korea.

Mongolia also faces the risk of a dzud, a severe winter, which in 2009-2010, for example, killed 9.7 million animals and affected large numbers of people.[18] Many were also affected during the 2016-2017 winter season (Box 1-2). In 2005, the World Bank launched an index-based livestock insurance scheme. However, as of 2016, only around 12 per cent of herding households were insured, probably due to the high costs and the vaccination requirements.[19]

South-East Asia

Since 2000, the subregion has had 362,000 deaths and 259 million people affected, largely from earthquakes, storms and floods (Figure 1-11). Estimated damage over this period was also mainly from these disasters. In 2016, countries in South-East Asia lost more than 700 lives from natural disasters. Nearly 12 million people were affected, principally by floods, tropical cyclones and droughts, with $2.1 billion (in 2016 US dollars) in damage. South-East Asia has been the most disaster-prone subregion in terms of fatalities.

The Philippines has around 20 tropical cyclones per year – with serious implications for development.[20] The areas affected by typhoon Haiyan in 2013, for example, have not yet fully recovered. Tropical cyclones are less frequent in Myanmar, but can be devastating, as with cyclone Nargis in 2008, which over the period 2000–2016 accounted for most of the estimated damage of over 1.2 per cent of GDP.

Flood risks are widespread in the Mekong river basin, affecting the riparian countries of Cambodia, Thailand and Viet Nam which reported large economic losses. Lao People's Democratic Republic is also expected to have large losses from floods.

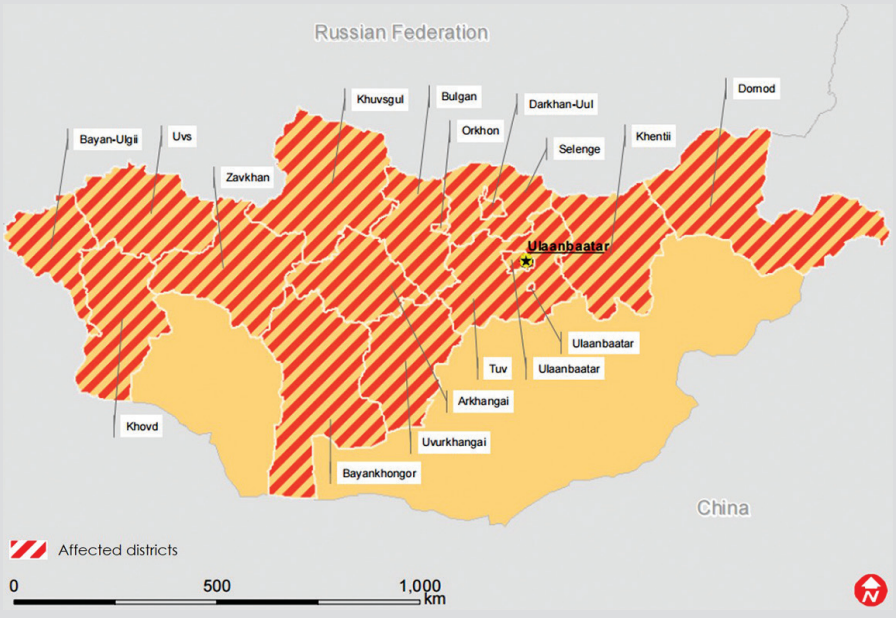
Box 1-2

The 2016-2017 dzud in Mongolia

In Mongolia, a severe winter is called a dzud. The 2016–2017 temperatures were lower than normal and there was a thick layer of snow over the grassland used for open grazing. In the affected regions, 6 per cent of livestock died and 157,000 people were affected, including 2,500 pregnant women, 26,000 children under five and 13,000 elderly people who had less access to basic services.[29]

Herders attempted to sell off their livestock, leading to a 50 per cent drop in meat prices. At the same time prices of essential food items increased by 10 per cent. Accordingly, Mongolia requested $6.6 million of rapid humanitarian assistance.[30]

Dzud affected areas



Source: International Federation of Red Cross and Red Crescent Societies, Mongolia: Severe Winter, 26 December 2016.

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Slow onset disasters like droughts are not well reported (and not included in calculating annual average losses) but they can have considerable impact. In addition, erratic monsoons and El Niño-induced droughts affected most countries in South-East Asia over the period 2015–2017 (Box 1-3). Viet Nam had its worst drought in 90 years, affecting 52 out of 63 provinces with a state of emergency declared in 18, affecting over 2 million people.[21]

South and South-West Asia

This is the least urbanized subregion, with only around a third of its population living in towns or cities. But it is now experiencing rapid urban population growth – around 2.5 per cent per year over the past decade.[22] Rapid urbanization needs to be well managed if it is not to increase disaster risks.

Over the period 2000–2016, the subregion reported more than 260,000 disaster deaths, 70 per cent from earthquakes (Figure 1-13). Estimated damage was $94 billion, which was mainly from floods. During this period, 1.19 billion people in the subregion were affected.

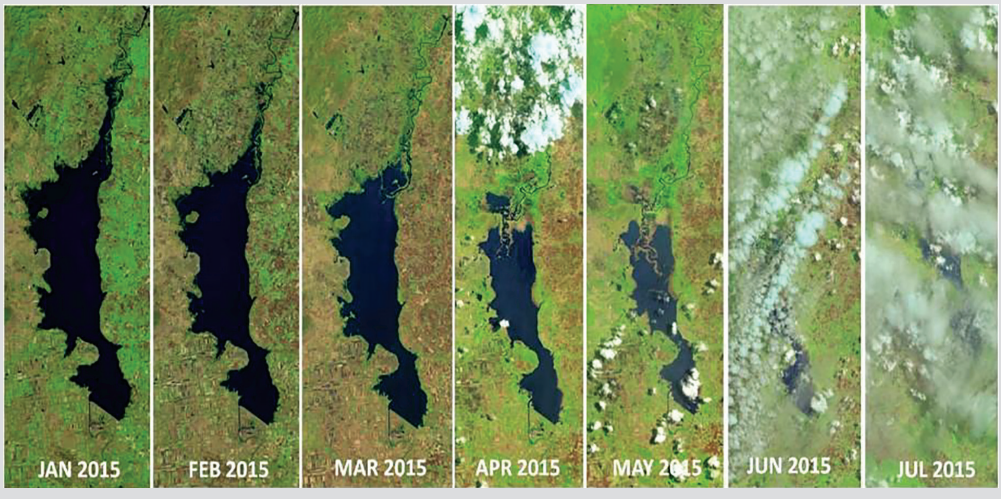
Box 1-3

Impacts of El Niño in South-East Asia and the Pacific

El Niño has had huge socio-economic impacts, leading to severe drought conditions in many parts of the region. In 2014, for example, the Philippines lost around 800,000 tons of rice.[31] During the El Niño years, 17 of Thailand's reservoirs only had between 1 and 20 per cent of usable storage.[32]

The El Niño also provoked outbreaks of disease. In August 2016 in Viet Nam, an increase in dengue fever was reported, particularly in the Central Highlands and in South-Central Viet Nam, requiring $17 million in emergency assistance.[33] The El Niño also increased the risk of forest fires. In Indonesia in 2015, the toxic haze affected more than 40 million people and caused illness to more than 500,000 people.[34]

Diminishing water levels in Pasak Chonlasit Dam, Lopburi Province, Thailand, 2015.



El Niño-induced droughts also caused considerable damage in the Pacific. In February 2016, this led to severe food shortages for 4,700 people in Marshall Islands.[35] There were also critical water shortages in Micronesia (Federated States of), Palau, and Papua New Guinea. Warmer Pacific water also intensified tropical cyclones. Vanuatu and Fiji were devastated by cyclone Pam in 2015 and cyclone Winston in 2016. In Fiji, subsequent floods washed away up to 80 per cent of replanted crops.[36]

Source: GISTDA 2015 cited in ESCAP (2016)

Droughts affected 692 million, and floods 428 million. Extreme temperatures resulted in more than 14,000 fatalities. The largest numbers were in Pakistan with 84,000 and India with 75,000. However, there were also many fatalities in Sri Lanka, Nepal and Afghanistan. In 2016 alone, countries in the subregion lost 2,300 lives from 42 natural disasters, with $4.85 billion (in 2016 US dollars) in damage.

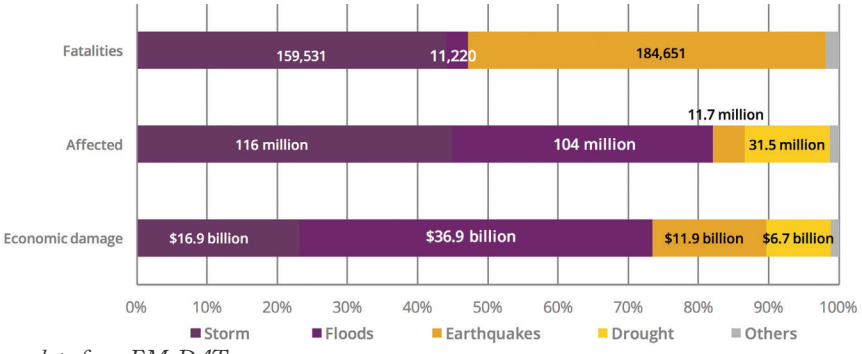
In Maldives, Nepal and Sri Lanka, most of the estimated damage was from earthquakes and tsunamis (Figure 1-14). However, by 2030 there are also likely to be high impacts from floods – and high overall disaster losses as a proportion of GDP for the subregion's smaller countries.

North and Central Asia

Over the period 2000–2016, in North and Central Asia disasters caused close to 60,000 deaths, almost all from extreme temperature, particularly in the Russian Federation (Box 1- 5). More than 13 million people were affected, and there was $9.8 billion in estimated damage, mostly from floods and droughts (Figure 1-15). There was also damage from extreme temperature and earthquakes.

Figure 1-11

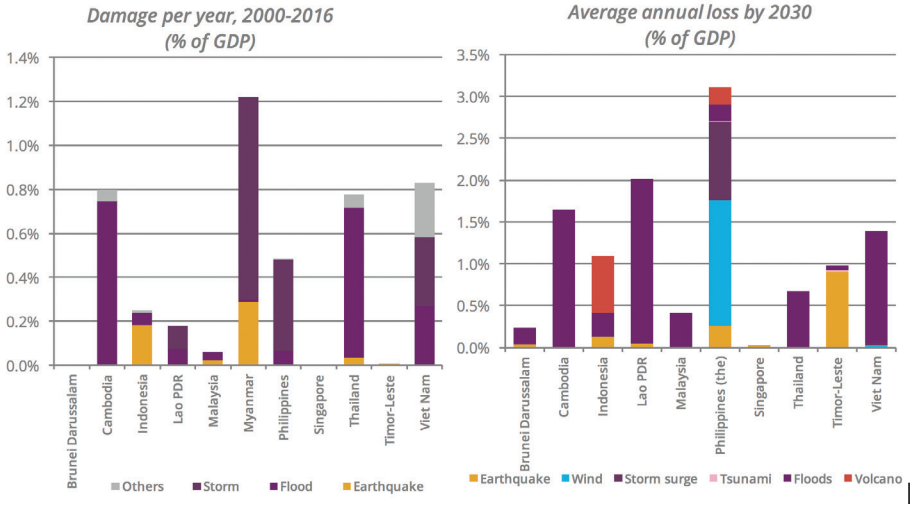
Disaster impacts in South-East Asia, 2000-2016



Source: Based on damage data from EM-DAT.

Figure 1-12

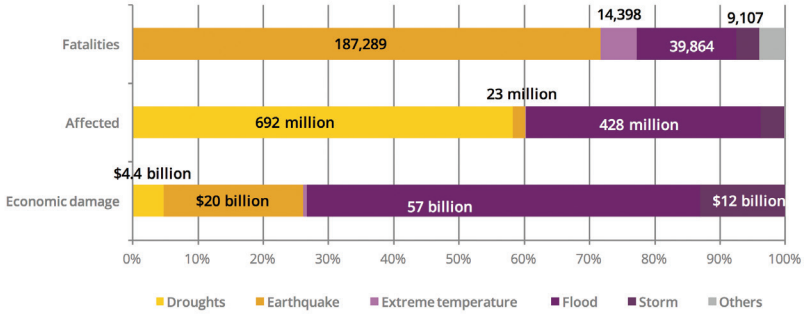
Damage and future estimates in South-East Asia



Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database. Average annual loss data from UNISDR (2015)

Figure 1-13

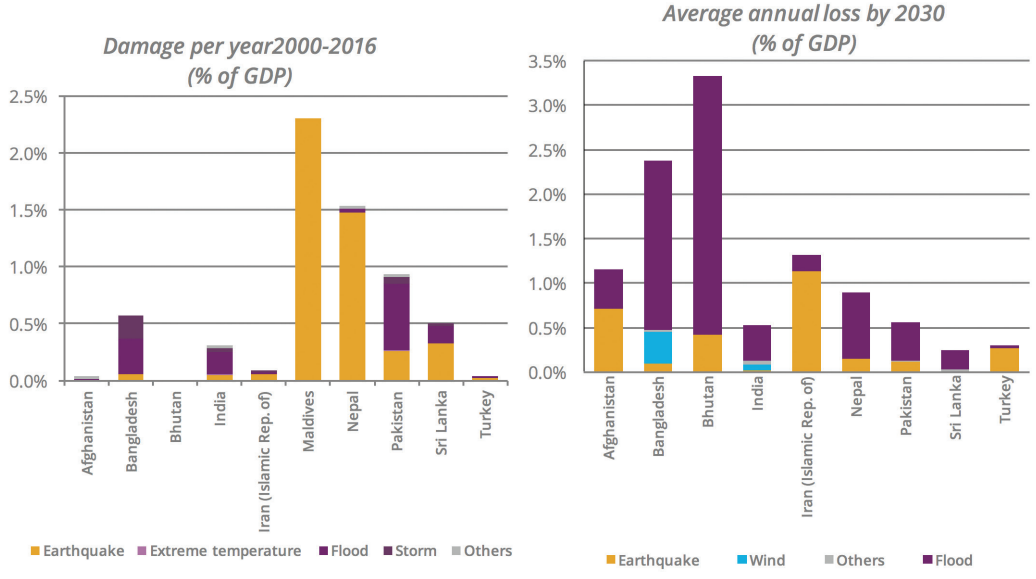
Disaster impacts in South and South-West Asia, 2000–2016



Source: Based on damage data from EM-DAT.

Figure 1-14

Damage and future estimates in South and South-West Asian countries



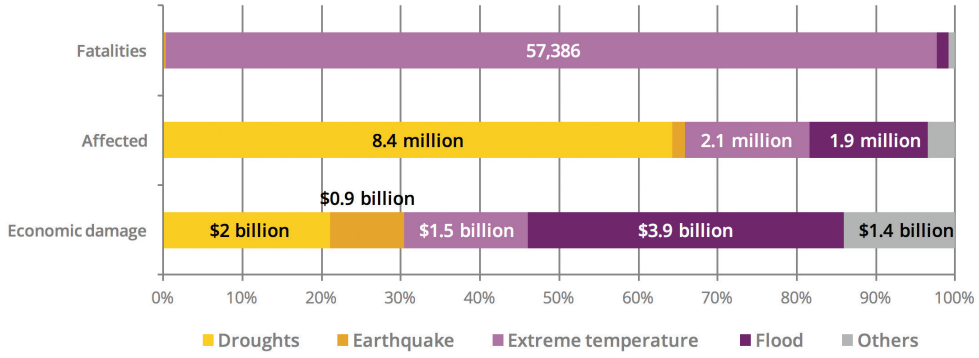
Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database. Average annual loss data from UNISDR (2015)

As a percentage of GDP, the highest estimated damage was in Tajikistan, followed by Georgia (Figure 1-16). Armenia, Azerbaijan, Georgia and Tajikistan had widespread droughts.

By 2030, all countries in this subregion are expected to have considerable asset losses from earthquakes and floods: estimated annual losses average more than 1.3 per cent of GDP in Georgia, Kyrgyzstan, and Tajikistan. However, this does not include droughts so the overall impact is likely to be significantly higher.

Figure 1-15

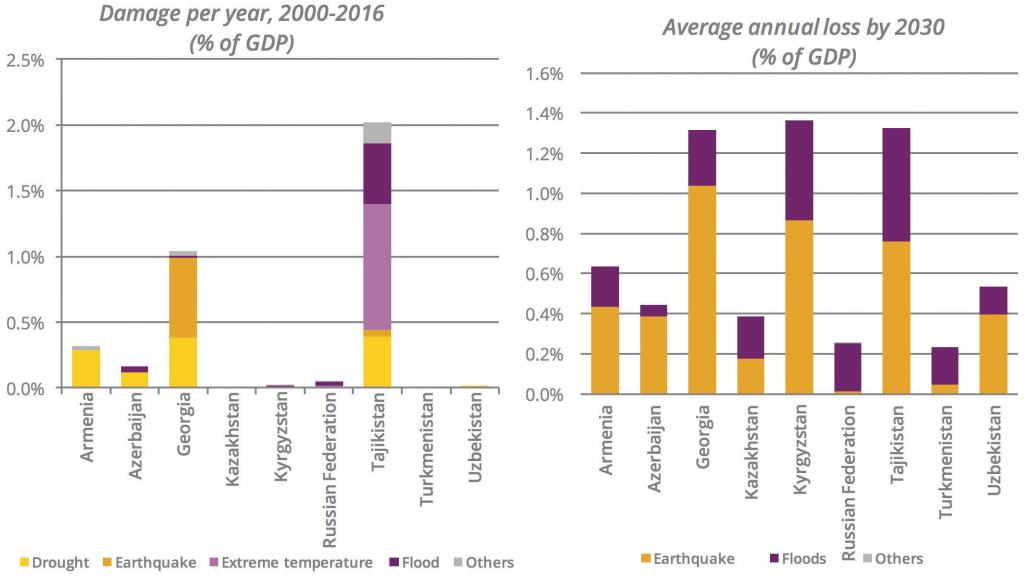
Disaster impacts in North and Central Asia, 2000–2016



Source: Based on damage data from EM-DAT. (Accessed on 4 July 2017)

Figure 1-16

Damage and future estimates in North and Central Asia



Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database. Average annual loss data from UNISDR (2015)

Box 1-4

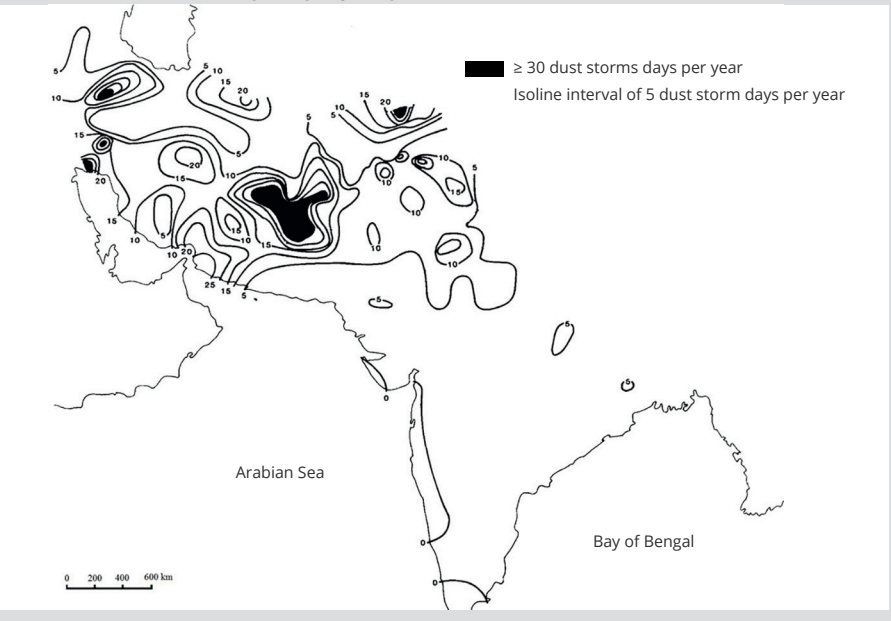
Sand and dust storms

Sand and dust storms (SDS) arise when the speed of wind is high enough to carry soil particles. Recent studies demonstrate that sand and dust storms are changing and expanding, creating new areas and pockets of risk. Many countries in Asia and the Pacific are experiencing severe and, in some cases accelerating, desertification.[37, 38]

Sand and dust storms have significant impacts on human health, the environment, and economy; inhaling fine particles can cause or aggravate diseases such as asthma, bronchitis, emphysema, and silicosis. Such storms may damage buildings, as well as paralyze airports, communication networks, and power and water supply systems.[39] The dust further affects the climate system, possibly changing the earth's radiative balance and modifying tropical cyclones, which intensify droughts. Major effects of sand and dust storms include crop damage, livestock mortality, soil erosion, reduced soil quality, and soil pollution through deposition of pollutants.[40]

Sand and dust storms are widespread across the Asia-Pacific region, particularly in South and South-West Asia. Hotspots include the Sistan Basin in south-eastern Islamic Republic of Iran, south-western Afghanistan and north-western Baluchistan in Pakistan. Sand and dust storms originate within the subregion but some also come from West Asia and North Africa. The impacts are not fully reflected in disaster inventories but they appear to be increasing.

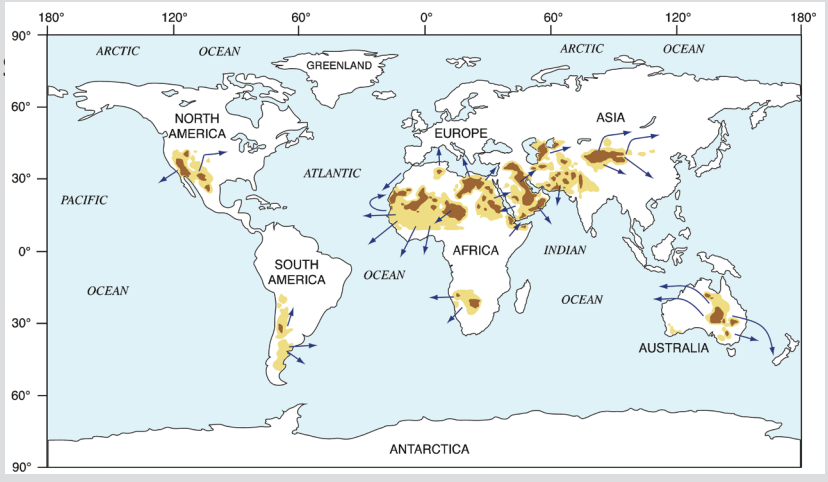
Number of dusty days per year in South and South-West Asia



Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Box 1-4 cont'd

Sand and dust storms



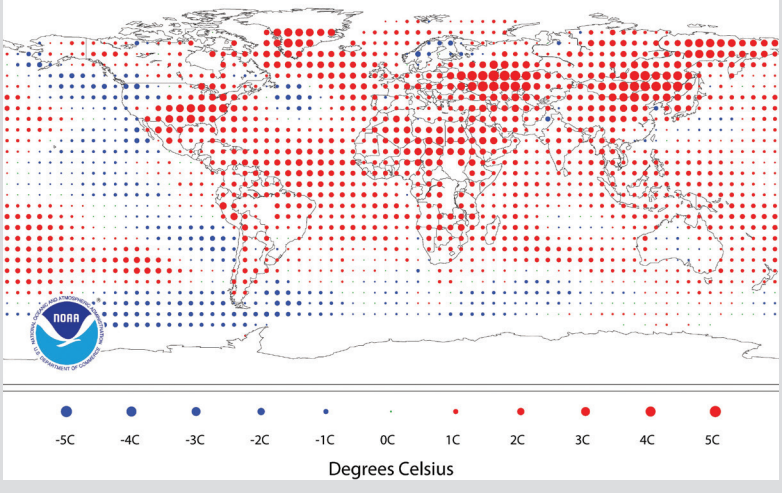
Source: Muhs, D. R., Prospero, J. M., Baddock, M. C., & Gill, T. E. (2014). Identifying Sources of Aeolian Mineral Dust: Present and Past. In J. Stuut, & P. Knippertz (Eds.), Mineral Dust- A Key Player in The Earth System (pp. 51-74). Springer.

Box 1-5

Wildfires and extreme temperatures in the Russian Federation

The summer of 2010 was the hottest recorded. The extreme temperature promoted the outbreak of wildfires that started in late July and lasted until early September, costing around $630 million (19 billion roubles) in damage. The smoke contributed to heavy smog in large urban areas. This, together with the long heat wave and extreme dryness, put pressure on the healthcare system. MunichRe estimated that 56,000 people lost their lives as result of the smog and the heat wave.[41] There were also extreme temperatures and associated wildfires in 2012 and in 2015.

Global temperature anomalies in June 2010 (with respect to 1971-2000 base)



Source: National Climatic Data Center, National Oceanic and Atmospheric Administration. Available at http://www.noaanews.noaa.gov/stories2010/images/map-blended-mntp-201006.gif. (Accessed on 4 August 2017)

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Pacific

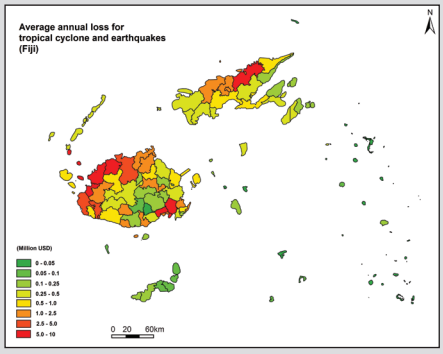
Over the period 2000–2016, the Pacific subregion reported over 2,300 fatalities from various hazards, including tropical cyclones, earthquakes, floods, and extreme temperatures (Figure 1-17). Among the most damaging were tropical cyclones which affected over 1.2 million people with over $10 billion estimated damage. Earthquakes and floods had considerable impacts. The year 2016 proved perilous: around 490,000 people suffered from tropical cyclones, droughts and earthquakes, with estimated damage of $5.1 billion (in 2016 US dollars), largely due to the earthquake in New Zealand which caused damage of $3.9 billion.[23]

Except for Australia, countries in the Pacific subregion recorded significantly higher average damage per year between 2000 and 2016 as a percentage of GDP than countries in other subregions. Vanuatu recorded more than 3.5 per cent of GDP of average damage per year from tropical cyclones, while Samoa and Tonga also recorded over 2 per cent of average damage per year from tropical cyclones and earthquakes (Figure 1-18). Future estimates for average annual loss by 2030 indicate similar outcomes.

Box 1-6
Disaster losses in Fiji

Located in a tropical cyclone belt, Fiji experiences frequent disasters but the impacts vary across the country. This is indicated in the estimated average annual loss. These are greater in the coastal cities, including the capital, Suva, and the north-western cities of the main island, including Nadi and Lautoka, and areas near Labasa.

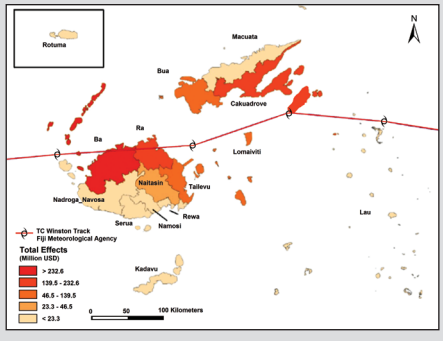
Estimated average annual loss



Source: ESCAP based on Pacific Catastrophe Risk and Financing Initiative – Country Risk Profile Fiji.

Cyclone Winston, which struck Fiji in 2016, caused higher losses in cities in the north-western part of the main island. Around one-third of damage and of losses were in Ba district – $311 million.[28] This time, Suva and Labasa were not in the cyclone track, but sub-national annual average loss predictions suggest that government policies on disaster management should also target these areas.

Losses from cyclone Winston, 2016

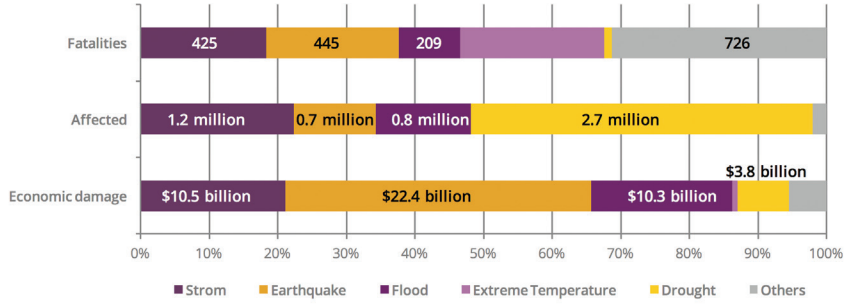


Source: ESCAP based on Government of Fiji (2016).

Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Figure 1-17

Disaster impacts in the Pacific, 2000–2016



Source: Data from EM-DAT.

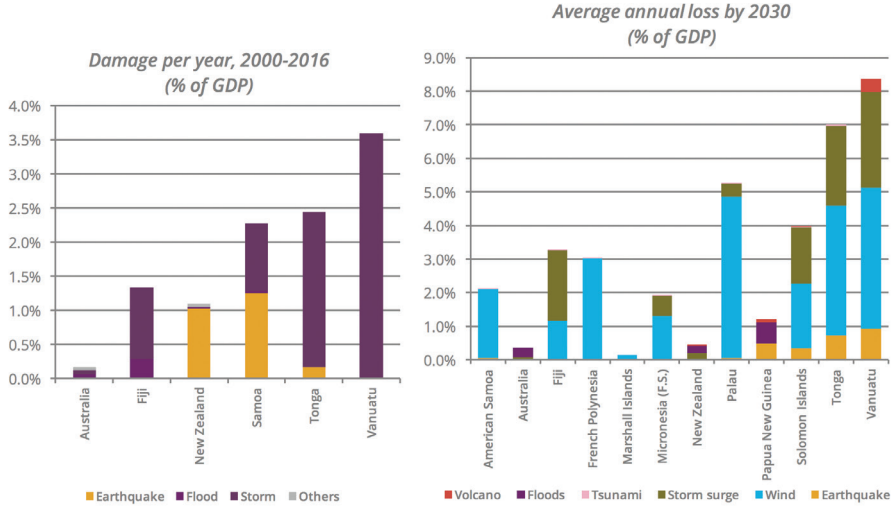
Vanuatu, Tonga and Palau are expected to have average annual loss more than 5 per cent of GDP, mainly from tropical cyclones. Countries in the Pacific are also particularly at risk from the impacts of climate change, including sea-level rise.

Understanding future disaster risks

Governments can anticipate future risks based partly on the historical record. Such analysis however faces a number of constraints. One is that disaster reporting lacks consistent international standards. Another is that the most catastrophic disasters are infrequent – and thus likely to fall outside regular reporting periods. This was demonstrated by the 2015 earthquake in Nepal. The *World Risk Report 2014*, which provides a risk index for 171 countries, considered Nepal relatively safe and had ranked the country at number 108.[24] In 2015 however, the Gorkha earthquake killed close to 9,000 people and affected 8 million others, around one-third of the entire population, with economic losses of around $7 billion, one-third of GDP (in 2015 US dollars).[25] Disaster risks also change over time, for example, in response to climate change.

Figure 1-18

Damage and future loss estimates for Pacific countries



Source: Based on damage data from EM-DAT. GDP data from ESCAP online statistical database. Average annual loss data from UNISDR (2015)

Table 1-3

Mortality rate and affected population rate, 2005-2015 and estimate for 2020–2030

Rank	Mortality rate (per million people per year)				Affected population (per million people per year)			
	Country	2005-2015	2020-2030	Change	Country	2005-2015	2020-2030	Change
1	Philippines	3.652	3.575	-0.077	Bangladesh	5,430	5,329	-101
2	Bangladesh	2.194	2.195	0.001	Philippines	6,079	5,043	-1036
3	Viet Nam	1.455	1.451	-0.004	Viet Nam	3,615	3,237	-378
4	Lao PDR	1.184	1.163	-0.021	Lao PDR	3,034	2,702	-332
5	Japan	1.244	1.162	-0.082	Bhutan	2,929	2,679	-250
6	Myanmar	1.084	1.081	-0.003	Myanmar	2,452	2,058	-394
7	Rep. of Korea	1.018	1.013	-0.005	Nepal	1,933	1,885	-48
8	Bhutan	1.078	0.982	-0.096	India	1,907	1,794	-113
9	India	0.671	0.664	-0.007	Cambodia	1,732	1,581	-151
10	China	0.659	0.660	0.001	DPR Korea	1,456	1,250	-206

Source: Shi, P. et al (2016)

One study has estimated future impacts for the period 2020 to 2030 – based on annual multi-hazard intensity and other indicators of vulnerability and exposure. This suggests that most of the Asia-Pacific countries at higher risk will make limited progress – in terms of reducing either fatalities or the affected populations (Table 1-3). Among the 43 countries studied, those listed as most seriously affected were the Philippines, Bangladesh, Viet Nam and Lao People's Democratic Republic; all were expected to see only small decreases, either in fatalities or in the number of people affected.

Estimating economic losses

Beyond measuring the human cost, there have been efforts to predict future economic costs. UNISDR has calculated the average annual loss (AAL) over the long term for each country.[26] This indicates a global average annual loss of $415 billion. Of this, 40 per cent will be in Asia and the Pacific, with the largest losses in the largest economies – Japan and China, followed by the Republic of Korea and India. However, when considered as a proportion of GDP, the burden of losses is greatest in countries with special needs, and in particular in the SIDs, led by New Caledonia and Vanuatu (Figure 1-19).

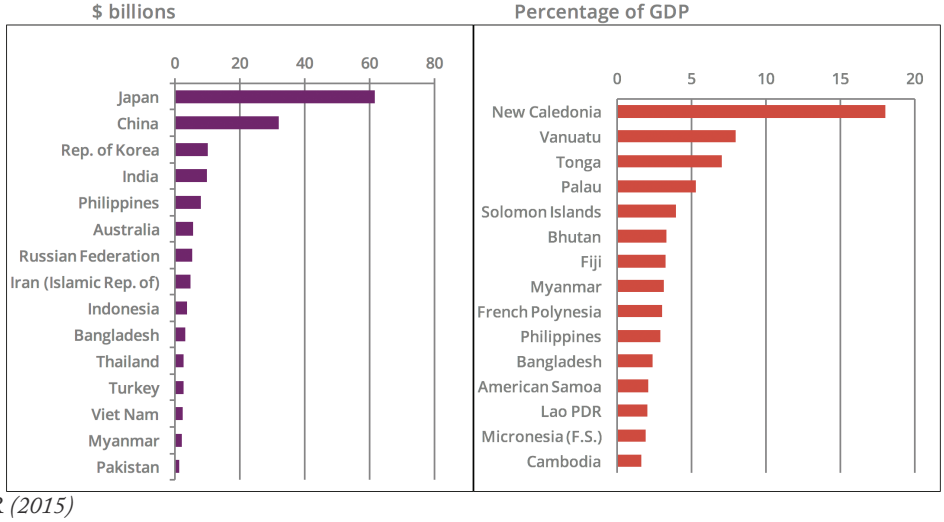
The SIDS as a whole are expected to have AALs close to 4 per cent of their GDP, equivalent to around 16.5 per cent of gross fixed capital formation. The LDCs are expected to have AAL of around 2.5 per cent of GDP equivalent to around 10.2 per cent of gross fixed capital formation (Figure 1-20).

Losses from natural disasters vary considerably within countries, with different areas having differing degrees of exposure and vulnerability to natural hazards: some areas may be well-equipped while others struggle to cope. National policies thus need to take these differences in exposure, vulnerability and coping capacities into account.

The concept of average annual loss also fails to register the scale of devastation from single catastrophic episodes. This can be assessed instead as the 'probable maximum loss' (PML) that could be expected in each period. The SIDS, for example, are very exposed to tropical cyclones which can be considered to happen once every 100 years. For Palau, for example, the PML from a cyclone has been estimated at 54 per cent of GDP (Table 1-4). Other SIDS at risk from tropical cyclones include Tonga, New Caledonia, American Samoa, Solomon

Figure 1-19

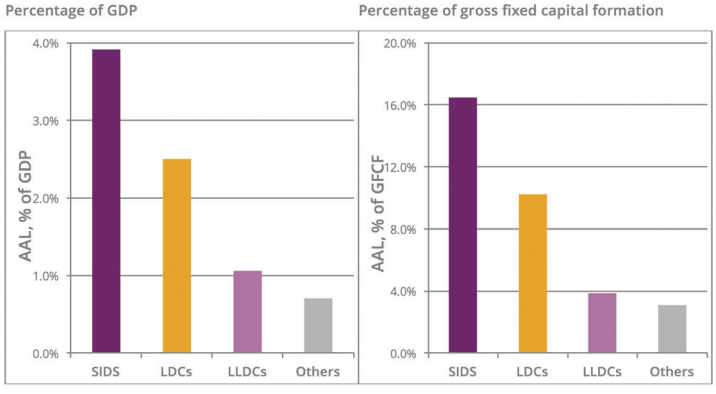
Estimated annual average future losses



Source: UNISDR (2015)

Figure 1-20

Average annual loss in countries with special needs, by 2030



Source: UNISDR (2015)

Table 1-4

Probable maximum loss over a 100-year period, by disaster, selected countries, percentage of GDP

	PML-wind	PML-storm surge	PML-earth-quake	Government expenditure	Total government revenue
Palau	54.18	4.31	0.17		43.5
Tonga	31.29	5.00	3.91	26.6	
New Caledonia	26.28	7.67	0.21		
American Samoa	25.73	0.00	0.37		
Solomon Islands	20.08	6.93	1.32	41.8	38.4
Vanuatu	19.39	3.37	3.37	20.6	24.6
French Polynesia	12.34	0.00	0.00		
Fiji	8.31	7.85	0.22	32.3	27
Micronesia (F.S.)	6.53	5.05	0.06	55.4	37
Philippines	3.86	0.68	1.35	16.6	15.4
Bangladesh	3.55	0.08	0.68	13.6	11.6

Source: Based on PML data from UNISDR (2015). Government expenditure and total government revenue data from ESCAP Online Statistical Database.

Islands and Vanuatu. Tonga and Vanuatu are also exposed to earthquakes. Governments can try to deal with disasters partly from their own revenues but these will be insufficient for this purpose – often a much smaller proportion of GDP.

Rethinking disaster resilience

Analysis of historical disaster records and future disaster risks provide only a partial understanding of the complexities of disasters and their impacts on societies, economies and the environment. A better understanding of disaster risks requires a more integrated approach that includes socio-economic, structural and conceptual considerations. For example, estimates for disaster impacts can be incomplete, since they consider losses in assets and not in people's socio-economic well-being – in their health, education and livelihoods. A World Bank report estimates, for example, that, compared with high-income countries, a $1 asset loss causes a greater loss in well-being in LDCs – twice as great in Cambodia, for example, and over 1.5 times in Bangladesh and Nepal. This is because poorer people with fewer assets who live close to subsistence cannot use savings to smooth the impacts, putting their health and education at greater risk, and they may need more time to recover and reconstruct. The report uses the concept of 'socio-economic resilience' which is the ratio of asset losses to well-being losses. This tends to be greater in richer countries. The highest resilience is in Denmark at 82 per cent, but the global average is 62 per cent. Estimates for Asia-Pacific LDCs and LLDCs are in Table 1-5.

As well as being exposed to natural hazards, countries are also at risk from man-made disasters through wars and violent conflicts. These broader risks have been incorporated into the INFORM index which includes the risks from both natural and man-made disasters (Box 1-7). The results by Asia-Pacific subregion are indicated in Figure 1-21. On this basis, the greatest risks are in South and South-West Asia and South-East Asia, largely because of natural hazards, for which the rating is higher than for man-made disasters. However, countries such as Afghanistan, have a higher rating for conflict (Figure 1-22).

In his vision statement on prevention, the Secretary-General of the United Nations pointed out the importance of reducing inequalities and building resilience and preventing the fraying of social fabrics that increases the risk of conflict. This will mean investing in inclusive and sustainable development, including concerted climate action.[27]

Historical experience has demonstrated that even the richest countries suffer devastating blows from natural disasters – and future climate change is likely to increase the risks. Countries cannot tame the forces of nature, but they can anticipate the blows and aim to protect people, and make their property and infrastructure as well as livelihoods more resilient. In particular, it is necessary to protect the poorest citizens, who are the subject of the next chapter.

Table 1-5

Socio-economic resilience

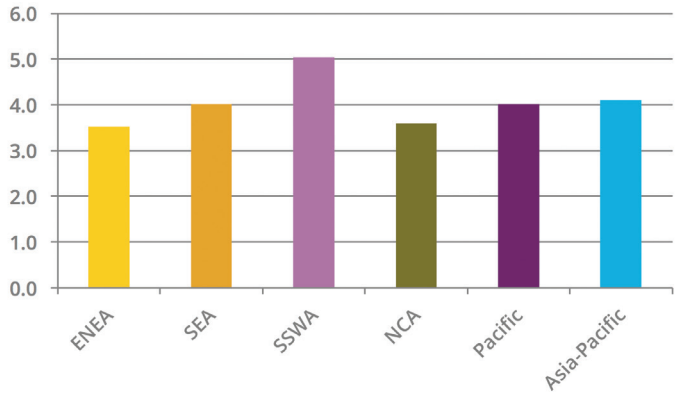
	Country	Socio-economic resilience (%)
LDCs	Bangladesh	66
	Cambodia	53
	Lao PDR*	73
	Nepal*	63
LLDCs	Kazakhstan	62
	Kyrgyzstan	55
	Mongolia	57
	Tajikistan	56
	Uzbekistan	44

Notes *1. 'socio-economic resilience' is the ratio of asset losses to well-being losses.*
2. Lao People's Democratic Republic and Nepal are both LDCs and LLDCs.

Source: Hallegatte et al. (2017)

Figure 1-21

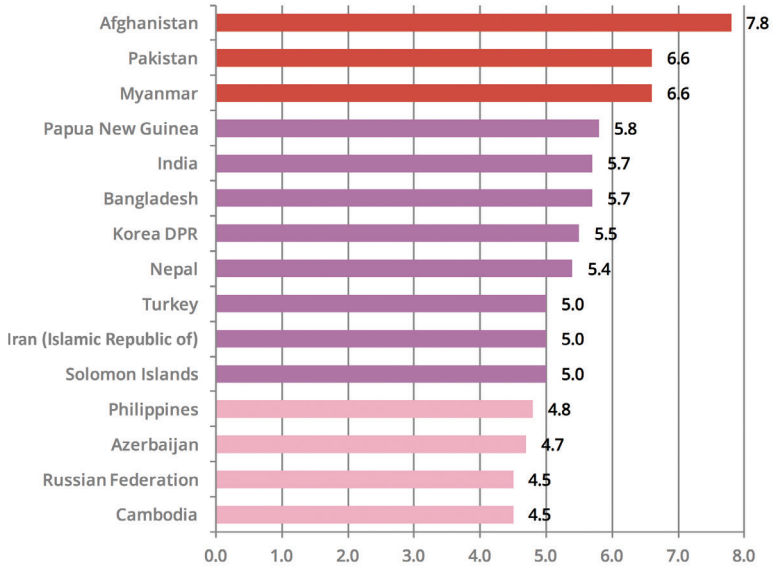
Risk from natural and man-made disasters, INFORM index, by subregion



Note: Every country has an overall risk rating between 0 and 10.
Source: INFORM index (2017)

Figure 1-22

Risk from natural and man-made disasters, INFORM index, by countries

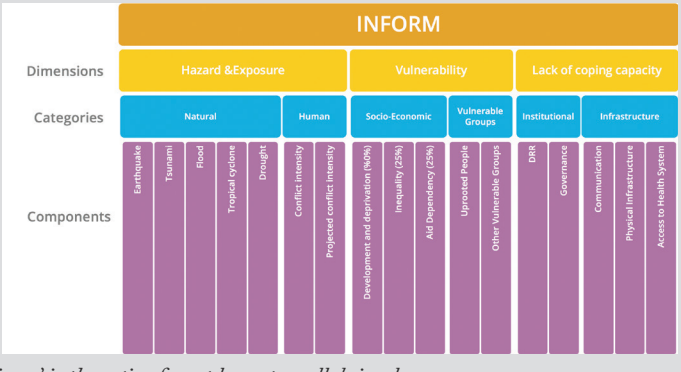


Note: Every country has an overall risk rating between 0 and 10.
Source: INFORM index (2017)

Box 1-7

INFORM – index for risk management

INFORM is a global, open-source risk assessment index for humanitarian crises and disasters. INFORM is a collaboration of the Inter-Agency Standing Committee Task Team for Preparedness and Resilience and the European Commission. It is the first global, objective and transparent tool that includes the risk of humanitarian crises – simplifying crisis risk information so that it can be easily used for decision-making. The INFORM model envisages three dimensions of risk: hazards and exposure, vulnerability and lack of coping capacity dimensions.



Notes: 1. 'socio-economic resilience' is the ratio of asset losses to well-being losses.
2. Lao People's Democratic Republic and Nepal are both LDCs and LLDCs.
Source: Hallegatte et al. (2017)

ENDNOTES

1 Population and GDP data from ESCAP, 2017a, and land area data from the World Bank, 2017.
2 Unless noted otherwise, disasters in this report includes drought, earthquakes (including tsunamis), epidemic, extreme temperature, flood, landslide, mass movement (dry), storm, volcanic activity and wildfire. "Fatalities (or deaths)" refers to persons confirmed as dead and persons missing and presumed dead as defined by EM-DAT. "Damage" refers to damage to property, crops, and livestock; "Losses" refers to negative impacts in business activities, income generation and increased costs of production caused indirectly as a consequence of damage. Unless noted otherwise, damage in this chapter is in 2005 constant US dollars.
3 Relief Web, 2017a.
4 Government of Fiji, 2016.
5 Relief Web, 2017c.
6 Relief Web, 2017d.
7 Relief Web, 2016c.
8 Relief Web, 2016b.
9 Relief Web, 2017e.
10 International Tsunami Information Center, n.d.
11 Koppel, 1995.
12 Guha-Sapir et al.
13 Ibid.
14 Ibid.
15 Dankelman, 2017.
16 Guha-Sapir et al.
17 Ibid.
18 Win, 2017.
19 Ibid.
20 ADRC, 2017.
21 ReliefWeb, 2017f.
22 ESCAP, 2017a.
23 Guha-Sapir et al.
24 Alliance Development Works and UNU-EHS, 2014.
25 Government of Nepal, NPC, 2015a.
26 Average annual loss (AAL) refers to the estimated average loss annualized over a long time period considering the full range of loss scenarios relating to different return periods. Unless noted otherwise, AAL in this chapter is in 2012 constant US dollars from UNISDR, 2015b.
27 United Nations Secretary General Vision Statement on Prevention. 2017.
28 Government of Fiji, 2016.
29 Relief Web, 2017b.
30 Ibid.
31 ESCAP & RIMES, 2015.
32 ESCAP, UNDP & RIMES, 2016.
33 Relief Web, 2016d.
34 Farr, 2015.
35 ReliefWeb, 2016a.
36 Ibid.
37 Indoitu et al., 2015
38 ESCAP, n.d.
39 Jung, 2016.
40 UNEP, WMO & UNCCD, 2016
41 Munich Re, 2010.