BRIEFING PAPER

GLOBAL CLIMATE RISK INDEX 2021

Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2019 and 2000-2019

David Eckstein, Vera Künzel, Laura Schäfer

GERMANWATCH

Brief Summary

The Global Climate Risk Index 2021 analyses and ranks to what extent countries and regions have been affected by impacts of climate related extreme weather events (storms, floods, heatwaves etc.). The most recent data available for 2019 and from 2000 to 2019 was taken into account.

The countries most affected in 2019 were Mozambique, Zimbabwe as well as the Bahamas. For the period from 2000 to 2019 Puerto Rico, Myanmar and Haiti rank highest.

This year's 16th edition of the Climate Risk Index clearly shows: Signs of escalating climate change can no longer be ignored – on any continent or in any region. Impacts from extreme-weather events hit the poorest countries hardest as these are particularly vulnerable to the damaging effects of a hazard, have a lower coping capacity and may need more time to rebuild and recover. The Global Climate Risk Index indicates a level of exposure and vulnerability to extreme weather events, which countries should understand as warnings in order to be prepared for more frequent and/or more severe events in the future. The storms in Japan show: Also high-income countries are feeling climate impacts more clearly than ever before. Effective climate change mitigation and adaptation to prevent or minimize potential damage is therefore in the self-interest of all countries worldwide.

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Authors: David Eckstein, Vera Künzel, Laura Schäfer

Contributors: Emma Opfer and Rixa Schwarz

Editing: Joanne Chapman-Rose, Janina Longwitz

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Publisher:
Germanwatch e.V.

Office Bonn
Dr. Werner-Schuster-Haus
Kaiserstr. 201
D-53113 Bonn
Phone +49 (0)228 / 60 492-0, Fax -19

Office Berlin
Stresemannstr. 72
D-10963 Berlin
Phone +49 (0)30 / 28 88 356-0, Fax -1

Internet: www.germanwatch.org
Email: info@germanwatch.org

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Comments welcome. For correspondence with the authors, please contact: kri@germanwatch.org

Content

How to Interpret the Global Climate Risk Index

The Germanwatch Global Climate Risk Index is an analysis based on one of the most reliable data sets available on the impacts of extreme weather events and associated socio-economic data, the MunichRe NatCatSERVICE. The Global Climate Risk Index 2021 is the 16th edition of this annual analysis. Its aim is to contextualise ongoing climate policy debates – especially the international climate negotiations – looking at real-world impacts over the last year and the last 20 years.

However, the index must not be mistaken for a comprehensive climate vulnerability[1] scoring. It represents one important piece in the overall puzzle of climate-related impacts and the associated vulnerabilities. The index focuses on extreme weather events such as storms, floods and heatwaves but does not take into account important slow-onset processes such as rising sea levels, glacier melting or ocean warming and acidification. It is based on past data and should not be used as a basis for a linear projection of future climate impacts. More specifically, not too far-reaching conclusions should be drawn for the purpose of political discussions regarding which country or region is the most vulnerable to climate change. Also, it is important to note that the occurrence of a single extreme event cannot be easily attributed to anthropogenic climate change. Nevertheless, climate change is an increasingly important factor for changing the likelihood of the occurrence and the intensity of these events. There is a growing body of research that is looking into the attribution of the risk[2] of extreme events to the influences of climate change[3] (see chapter 2).

The Climate Risk Index (CRI) indicates a level of exposure and vulnerability to extreme events, which countries should understand as warnings in order to be prepared for more frequent and/or more severe events in the future. In the CRI 2021, data from 180 countries were analysed. However, not being mentioned in the CRI does not mean there are no impacts occurring in these countries. Due to the limitations of the available data[4], particularly long-term comparative data, including socio-economic data, some very small countries, such as certain small island states, are not included in this analysis. Moreover, the data only reflects the direct impacts (direct losses and fatalities) of extreme weather events, whereas, indirect impacts (e.g. as a result of droughts and food scarcity) are not captured. The results

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[1] According to IPCC (2014b) we define vulnerability as "the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt".

[2] According to IPCC (2012) we define disaster risk as "the likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.

[3] See, for instance: American Meteorological Society 2018, Herring et al. (2018), Trenberth et al. (2018), Zhang et al. (2016); Hansen et al. (2016); Haustein et al. (2016) & Committee on Extreme Weather Events and Climate Change Attribution et al. (2016); Stott et al. (2015)

[4] See also the Methodological Remarks in Chapter 5.

of this index must be viewed against the background of data availability and quality as well as the underlying methodology for their collection. Data quality and coverage may vary from country to country as well as within countries. This has led to an underrepresentation of, for example, African countries when it comes to heatwaves. Finally, the index does not include the total number of affected people (in addition to the fatalities), since the comparability of such data is very limited.

Key Messages

- Mozambique, Zimbabwe and the Bahamas were the countries most affected by the impacts of extreme weather events in 2019.
- Between 2000 and 2019, Puerto Rico, Myanmar and Haiti were the countries most affected by the impacts of extreme weather events.
- Altogether, between 2000 and 2019 over 475 000 people lost their lives as a direct result of more than 11 000 extreme weather events globally and losses amounted to around US$ 2.56 trillion (in purchasing power parities).
- Storms and their direct implications – precipitation, floods and landslides – were one major cause of losses and damages in 2019. Of the ten most affected countries in 2019, six were hit by tropical cyclones. Recent science suggests that the number of severe tropical cyclones will increase with every tenth of a degree in global average temperature rise.
- In many cases, single exceptionally intense extreme weather events have such a strong impact that the countries and territories concerned also have a high ranking in the long-term index. Over the last few years, another category of countries has been gaining relevance: Countries like Haiti, the Philippines and Pakistan that are recurrently affected by catastrophes continuously rank among the most affected countries both in the long-term index and in the index for the respective year.
- Developing countries are particularly affected by the impacts of climate change. They are hit hardest because they are more vulnerable to the damaging effects of a hazard but have lower coping capacity. Eight out of the ten countries most affected by the quantified impacts of extreme weather events in 2019 belong to the low- to lower-middle income category. Half of them are Least Developed Countries.
- The global COVID-19 pandemic has reiterated the fact that both risks and vulnerability are systemic and interconnected. It is therefore important to strengthen the resilience of the most vulnerable against different types of risk (climatic, geophysical, economic or health-related).
- After the international climate policy process stalled in 2020 due to the Covid-19 pandemic expectations regarding progress on the long-term finance goal and adequate support for adaptation and L&D lie in 2021 and 2022. The process needs to deliver: a) a decision on how the need for support for vulnerable countries concerning future loss and damage is to be determined on an ongoing basis; b) the necessary steps to generate and make available financial resources to meet these needs; and c) strengthening the implementation of measures for adapting to climate change.

1 Key Results of the Global Climate Risk Index 2021

People all over the world are facing the reality of climate change – in many parts of the world this is manifesting in an increased volatility of extreme weather events. Between 2000 and 2019, over 475 000 people lost their lives worldwide and losses of US$ 2.56 trillion[5] (in PPP) were incurred as a direct result of more than 11 000 extreme weather events. Slow-onset processes are already adding an additional burden and will increasingly do so in the future. According to the UNEP Adaptation Gap Report 2016, increasing impacts will result in increases in global adaptation costs: By 2030 it is estimated that these costs will amount to between US$ 140 billion and US$ 300 billion annually and by 2050 to between US$ 280 billion and US$ 500 billion.[6] Costs resulting from residual risks or unavoidable loss and damage are not covered in these numbers. Current estimates of climate finance needs for residual loss and damage in developing countries range between US$ 290 billion to US$ 580 billion in 2030.[7] Similarly, the Intergovernmental Panel on Climate Change (IPCC) estimates in its Special Report “Global Warming of 1.5°C” that the "mean net present value of the costs of damage from warming in 2100 for 1.5°C and 2°C (including costs associated with climate change induced market and non-market impacts, impacts due to sea level rise, and impacts associated with large scale discontinuities) are US$ 54 trillion and US$ 69 trillion, respectively, relative to 1961–1990".[8] This indicates that the gap between the necessary financing to deal with climate-induced risks and impacts is even greater than earlier projected. On the other hand, the report highlights the importance of enhanced mitigation action towards limiting a global temperature increase to well below 2°C or even to 1.5°C, which could avoid substantive costs and hardships.[9]

The **Global Climate Risk Index (CRI)** developed by Germanwatch analyses quantified impacts of extreme weather events[10] – both in terms of the fatalities as well as the economic losses that occurred. The index is based on data from the Munich Re NatCatSERVICE[11], which is considered worldwide as one of the most reliable and complete databases on this matter. The CRI examines both absolute and relative

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[5] Note: Contrary to previous years, the underlying database for the calculation of the CRI 2021 does NOT include data for the United States of America. This results in a significantly lower number for the overall losses in PPP for the 20-year period, compared to, for instance, the number presented in the CRI 2020 (overall losses of US$ 3.54 trillion). As a comparison: Excluding the United States of America, the overall losses in the CRI 2020 amounted to US$ 2.51 trillion.

[6] UNEP 2016, p. 40ff

[7] Markandya/González-Eguino 2018 - Their figures depend on the climate scenario, the discount rate, the assumed parameters of the climate model and the socioeconomic model. The analysis is based on the case where equilibrium temperatures increase by 2.5–3.4 °C, implying some mitigation, but less than is required under the Paris accord. They note that the uncertainties regarding these sources are very large and meaningful projections of residual damage in the medium to long-term are not possible

[8] IPCC 2018a, p 153

[9] Ibid. 2018a

[10] Meteorological events such as tropical storms, winter storms, severe weather, hail, tornados, local storms; hydrological events such as storm surges, river floods, flash floods, mass movement (landslide); climatological events such as freezing, wildfires, droughts.

[11] For further information visit https://www.munichre.com/en/solutions/reinsurance-property-casualty/natcatservice.html

impacts to create an average ranking of countries in four indicative categories, with a stronger emphasis on the relative indicators (see chapter 4 “Methodological Remarks” for further details on the calculation). The countries ranking highest (figuring in the “Bottom 10”[12]) are the ones most impacted by extreme weather events and should consider the CRI as a warning sign that they are at risk of either frequent events or rare but extraordinary catastrophes.

The CRI does not provide an all-encompassing analysis of the risks of anthropogenic climate change, but should be seen as one analysis, which contributes to explaining countries' exposure and vulnerability to climate-related risks based on the most reliable quantified data available – alongside other analyses.[13] It is based on data reflecting the current and past climate variability and also on climate change – to the extent that it has already left its footprint on climate variability over the last 20 years.

Countries Most Affected in 2019

Mozambique, **Zimbabwe** and the **Bahamas** were the most affected countries in 2019 followed by **Japan**, **Malawi** and the **Islamic Republic of Afghanistan**. Table 1 shows the ten most affected countries (Bottom 10) in 2019, with their average weighted ranking (CRI score) and the specific results relating to the four indicators analysed.

[12] The term "Bottom 10" refers to the 10 most affected countries in the respective time period.
[13] See e.g. analyses of Columbia University; Maplecroft's Climate Change Vulnerability Index

Table 1: The 10 most affected countries in 2019

Ranking 2019 (2018)	**Country**	**CRI score**	Fatalities	Fatalities per 100 000 inhabitants	Absolute losses (in million US$ PPP)	Losses per unit GDP in %	Human Development Index 2020 Ranking[14]
1 (54)	Mozambique	2.67	700	2.25	4 930.08	12.16	181
2 (132)	Zimbabwe	6.17	347	2.33	1 836.82	4.26	150
3 (135)	The Bahamas	6.50	56	14.70	4 758.21	31.59	58
4 (1)	Japan	14.50	290	0.23	28 899.79	0.53	19
5 (93)	Malawi	15.17	95	0.47	452.14	2.22	174
6 (24)	Islamic Republic of Afghanistan	16.00	191	0.51	548.73	0.67	169
7 (5)	India	16.67	2 267	0.17	68 812.35	0.72	131
8 (133)	South Sudan	17.33	185	1.38	85.86	0.74	185
9 (27)	Niger	18.17	117	0.50	219.58	0.74	189
10 (59)	Bolivia	19.67	33	0.29	798.91	0.76	107

PPP = Purchasing Power Parities. GDP = Gross Domestic Product.

In March 2019, the intense tropical Cyclone Idai hit **Mozambique** (1), **Zimbabwe** (2) and **Malawi** (5), causing catastrophic damage and a humanitarian crisis in all three countries. Quickly becoming the deadliest and costliest tropical cyclone in the South-West Indian Ocean, Idai was labelled as “one of the worst weather-related catastrophes in the history of Africa” by United Nations Secretary-General António Guterres.[15][16] The torrential rains and destructive winds with top speeds of 195 kilometres per hour[17] caused flash floods and landslides, which caused economic losses amounting to US$ 2.2 billion. Overall, the cyclone affected three million people and caused over 1 000 fatalities. [18] [19]

In **Zimbabwe** (2) Idai affected more than 270 000 people, leaving over 340 dead and many others missing.[20] The cyclone pummelled the eastern parts of Zimbabwe mainly Chimanimani and parts of Chipinge at night, with less preparedness by the local communities as well as the government.[21] The road infrastructure was grossly damaged with more than 90% of the road networks in Chimanimani and Chipinge

[14] UNDP 2020
[15] United Nations Secretary-General Official Twitter Account
[16] United Nations Secretary-General 2019.
[17]GDACS
[18] Reliefweb 2019a
[19] AON 2019a
[20] Reliefweb 2019b
[21] Ibid.

being negatively affected, including 584 km of the roads being damaged by landslides.[22] Overall, the cyclone impacted 50 000 households and displaced over 60 000 people in the country, causing as much as US$ 622 million worth of damage.[23]

For **Malawi** (5) the year 2019 started with heavy rainfalls, which led to an increased risk of floods. When Idai hit Malawi in March, it directly affected 975 000 people and left over 125 000 homeless.[24] Due to the heavy rainfalls and floods caused by Idai, 60 people were killed and over 650 injured.[25] Malawi's economy is heavily dependent on agriculture, employing nearly 80% of the population, and it is therefore vulnerable to external shocks, particularly climatic shocks.[26]

Six weeks after the devastation of Cyclone Idai, Mozambique (1) was hit by another cyclone when category 4 Cyclone Kenneth made landfall in Northern Mozambique. Kenneth was the strongest cyclone ever recorded on the African continent with wind speeds peaking at 220 kilometres per hour and floods with a height of 2.5 metres.[27] Overall, Idai and Kenneth led to the deaths of over 600 people and over 1 600 were injured. 2.5 million people were in need of humanitarian services and over 200 000 houses were destroyed. [28] The overall damage amounted to more than US$ 3.2 billion (approximately as high as half of Mozambique's national budget), mostly in the manufacturing, infrastructure and social sectors. [29] [30]

Hurricane Dorian made landfall on the **Bahamas** (3) in September 2019 as a category 5 hurricane – the most powerful hurricane on record to hit the island state.[31] Dorian reached sustained wind speeds of 300 kilometres per hour[32] causing heavy rainfalls of 914 millimetres (about 80% of the annual average) of rain within a few hours.[33] 74 people were killed. Overall, the hurricane caused damage of US$ 3.4 billion and damaged or destroyed 13 000 houses. On Grand Bahama and Abaco, which were the two most affected islands, about 45% of the homes were damaged or destroyed.[34] Moreover, during the storm an oil spill occurred at an oil port of the Norwegian state oil and gas company Equinor on Grand Bahama, which polluted the soil and negatively impacted the marine life.[35]

In October 2019, **Japan** (4) was hit by Typhoon Hagibis, the most powerful typhoon in Japan in more than 60 years. With top wind speeds reaching 250 kilometres per

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[22] Ibid.
[23] Reliefweb 2019c
[24] Reliefweb 2019d
[25] Reliefweb 2019e
[26] World Bank 2020a
[27] UN News
[28] Reliefweb 2019f
[29] World Bank 2020b
[30] Oxfam 2020b
[31] Reliefweb 2020a
[32] Miami Herald
[33] Cambridge
[34] Guardian
[35] Zeit Online

hour, Hagibis was classified as “very strong”, which is equivalent to a category 5 hurricane. In Tokai, Kanto, and Tohoku regions, the total rainfall in 72 hours was up to between 750mm and 1 000mm (between 50% to 70% of the annual average).[36] Overall, nearly 100 people died, over 230 people were injured, and 13 000 houses were damaged, destroyed or exposed to water. In September, Japan had already been hit by Typhoon Faxai, which made landfall near Tokyo, leaving more than 900 000 homes without power. With winds of up to 210 kilometres per hour, Faxai has been one of the strongest typhoons to hit the Japanese capital in a decade.[37] The economic damage caused by the two typhoons is estimated at US$ 25 billion.[38] Moreover, Japan experienced a heatwave in August 2019, causing over 18 000 heat-related hospitalisations and killing 57 people.[39] But Japan was also hit by other types of extreme weather: In May 2019, the temperatures in the prefecture of Hokkaido had already gone up to 39.5°C, the highest figure ever recorded in the month of May anywhere in Japan.[40]

The **Islamic Republic of Afghanistan** (6) experienced several floods and landslides throughout the year, caused by heavy rainfall. The floods in March 2019 were the most devastating - approximately 120 000 people were affected, and 12 000 homes were either destroyed or damaged by the floods and mudslides.[41] Over 75 people died. In April and May 2019 another 40 people died because of deadly flash floods.[42] Furthermore, landslides occurred in January and December, killing a total of 35 people.[43][44] Due to severe droughts in 2018, the coping capacity of the people affected was already very low.[45]

India (7) was affected by the yearly monsoon season, which typically lasts from June to early September. In 2019, the monsoon conditions continued for a month longer than usual, with the surplus of rain causing major hardship. From June to end of September 2019, 110% of the normal rainfall occurred, the most since 1994.[46] The floods caused by the heavy rains were responsible for 1 800 deaths across 14 states and led to the displacement of 1.8 million people.[47] Overall, 11.8 million people were affected by the intense monsoon season with the economic damage estimated to be US$ 10 billion.[48] Furthermore, with a total of eight tropical cyclones, the year 2019 was one of the most active Northern Indian Ocean cyclone seasons

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[36] Reliefweb 2019g
[37] BBC 2019a
[38] AON 2019b
[39] The Japan Times
[40] South China Morning Post
[41] Reuters 2019
[42] Floodlist 2019a
[43] The Washington Post
[44] Reliefweb 2019h
[45] Reliefweb 2019i
[46] Earth Observatory
[47] Reliefweb 2020b
[48] AON 2019b

on record. Six of the eight cyclones intensified to become “very severe”.[49] The worst was Cyclone Fani in May 2019, which affected a total of 28 million people, killing nearly 90 people in India and Bangladesh and causing economic losses of US$ 8.1 billion.[50]

South Sudan (8) suffered because of abnormally severe flooding following heavy rainfalls lasting from June 2019 until the end of the year. These affected over 900 000 people; 620 000 of whom required immediate humanitarian assistance. The floods damaged 74 000 hectares of cultivated land, which amounts to a loss of over 70 000 metric tons of cereal.[51] South Sudan required US$ 61.5 million to respond to immediate flood-induced damage.[52] Despite the floods, bush fires intensified and spread due to strong winds and hit four villages in South Sudan’s Western Bahr el Ghazal region, causing 50 fatalities and injuring over 60 more people.[53] The fires destroyed 138 houses and killed 10 000 cattle.[54]

Heavy rains caused massive flooding in **Niger** (9), mainly in the regions Maradi, Zinder and Agadez. The Niger River reached an alarming water level of 640 centimetres (the normal level being 550 centimetres), damaging houses as well as various crops and hydro-agricultural developments.[55] [56] The floods were responsible for 57 fatalities and over 16 000 destroyed houses, affecting more than 210 000 people – of which 123 000 were children.[57]

Bolivia (10) suffered due to wildfires that destroyed two million hectares of forest and grassland with almost half of the losses being protected areas with high biodiversity. It is estimated that the regeneration of the local ecosystem will take about 300 years.[58] Furthermore, Bolivia experienced heavy rainfalls and flooding throughout the year. In April 2019, 79 of the 338 municipalities were under a state of disaster and 25 were under a state of emergency. In total, 34 people died and over 23 000 families became homeless.[59] In January 2019, the Isiboro River near Gundonovia stood at 9.35 metres – about one metre above the danger mark.[60]

Countries Most Affected in the Period 2000-2019

Puerto Rico, Myanmar and **Haiti** have been identified as the most affected countries[61] in this twenty-year period. They are followed by the **Philippines, Mozambique** and the **Bahamas**. Table 2 shows the ten most affected countries over the

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[49] The Weather Channel
[50] AON 2019a
[51] Anadolu Agency
[52] Reliefweb 2019j
[53] Reliefweb 2019k
[54] Africanews
[55] Floodlist 2019b
[56] IOM
[57] Reliefweb 2020c
[58] BBC 2019b
[59] Reliefweb 2020c
[60] Floodlist 2019c
[61] Note: Puerto Rico is not an independent national state but an unincorporated U.S. territory. Nevertheless, based on its geographical location and socio-economic indicators Puerto Rico has different conditions and exposure to extreme

last two decades with their average weighted ranking (CRI score) and the specific results relating to the four indicators analysed.

weather events than the rest of the USA. The Global Climate Risk Index aims to provide a comprehensive and detailed overview of which countries and regions are particularly affected by extreme weather events. Therefore, Puerto Rico was considered separately to rest of the USA in our analysis.

Table 2: The Long-Term Climate Risk Index (CRI): The 10 countries most affected from 2000 to 2019 (annual averages)

CRI 2000-2019 (1999-2018)	**Country**	**CRI score**	Fatalities	Fatalities per 100 000 inhabitants	Losses in million US$ PPP	Losses per unit GDP in %	Number of events (2000–2019)
1 (1)	Puerto Rico	7.17	149.85	4.12	4 149.98	3.66	24
2 (2)	Myanmar	10.00	7 056.45	14.35	1 512.11	0.80	57
3 (3)	Haiti	13.67	274.05	2.78	392.54	2.30	80
4 (4)	Philippines	18.17	859.35	0.93	3 179.12	0.54	317
5 (14)	Mozambique	25.83	125.40	0.52	303.03	1.33	57
6 (20)	The Bahamas	27.67	5.35	1.56	426.88	3.81	13
7 (7)	Bangladesh	28.33	572.50	0.38	1 860.04	0.41	185
8 (5)	Pakistan	29.00	502.45	0.30	3 771.91	0.52	173
9 (8)	Thailand	29.83	137.75	0.21	7 719.15	0.82	146
10 (9)	Nepal	31.33	217.15	0.82	233.06	0.39	191

Compared to the long-term CRI 2020, which considered the period from 1999 to 2018[62], two new countries have entered the Bottom 10, while most countries have ranked similarly to the year before. Puerto Rico, Myanmar and Haiti have remained the three most affected countries over the past two decades. These rankings are attributed to the aftermath of exceptionally devastating events such as Hurricane Maria in Puerto Rico in 2017 and Hurricanes Jeanne (2004) and Sandy (2012) in Haiti. Likewise, Myanmar was struck hard by Cyclone Nargis in 2008, which was responsible for the loss of an estimated 140 000 lives as well as the loss and damage of property of approximately 2.4 million people.[63] Mozambique and the Bahamas, which are the countries that are new to the Bottom 10, also feature in a high position in the ranking as a consequence of exceptionally devastating storms. In 2019, Cyclone Idai and Kenneth made landfall in Mozambique and Hurricane Dorian hit the Bahamas.

These results emphasise the particular vulnerability, particularly in relative terms, of poor countries to climatic risks, despite the fact that the absolute monetary losses are much higher in richer countries. Loss of life, personal hardship and existential threats are also much more widespread in low-income countries.[64]

Exceptional Catastrophes or Continuous Threats?

[62] See Eckstein et al. 2019
[63] See OCHA 2012
[64] See World Bank country classifications: https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2020-2021

The Global Climate Risk Index 2021 for the period 2000–2019 is based on average values over a twenty-year period. However, the list of countries featured in the long-term Bottom 10 can be divided into two groups: firstly, those which were most affected due to exceptional catastrophes and secondly, those which are affected by extreme events on an ongoing basis.

Countries falling into the first category include Myanmar, where Cyclone Nargis in 2008 caused more than 95% of the damage and fatalities over the past two decades, and Puerto Rico, where more than 98% of the damage in both categories was caused by Hurricane Maria in 2017. With new superlatives like Cyclone Idai in March 2019 being the deadliest and costliest cyclone on record in the Indian Ocean, and one of the worst tropical cyclones ever to affect Africa and the Southern Hemisphere, it seems to be just a matter of time until the next exceptional catastrophe occurs.[65] The severe 2017 hurricane season had already made 2017 the costliest year ever in terms of global weather disasters.[66]

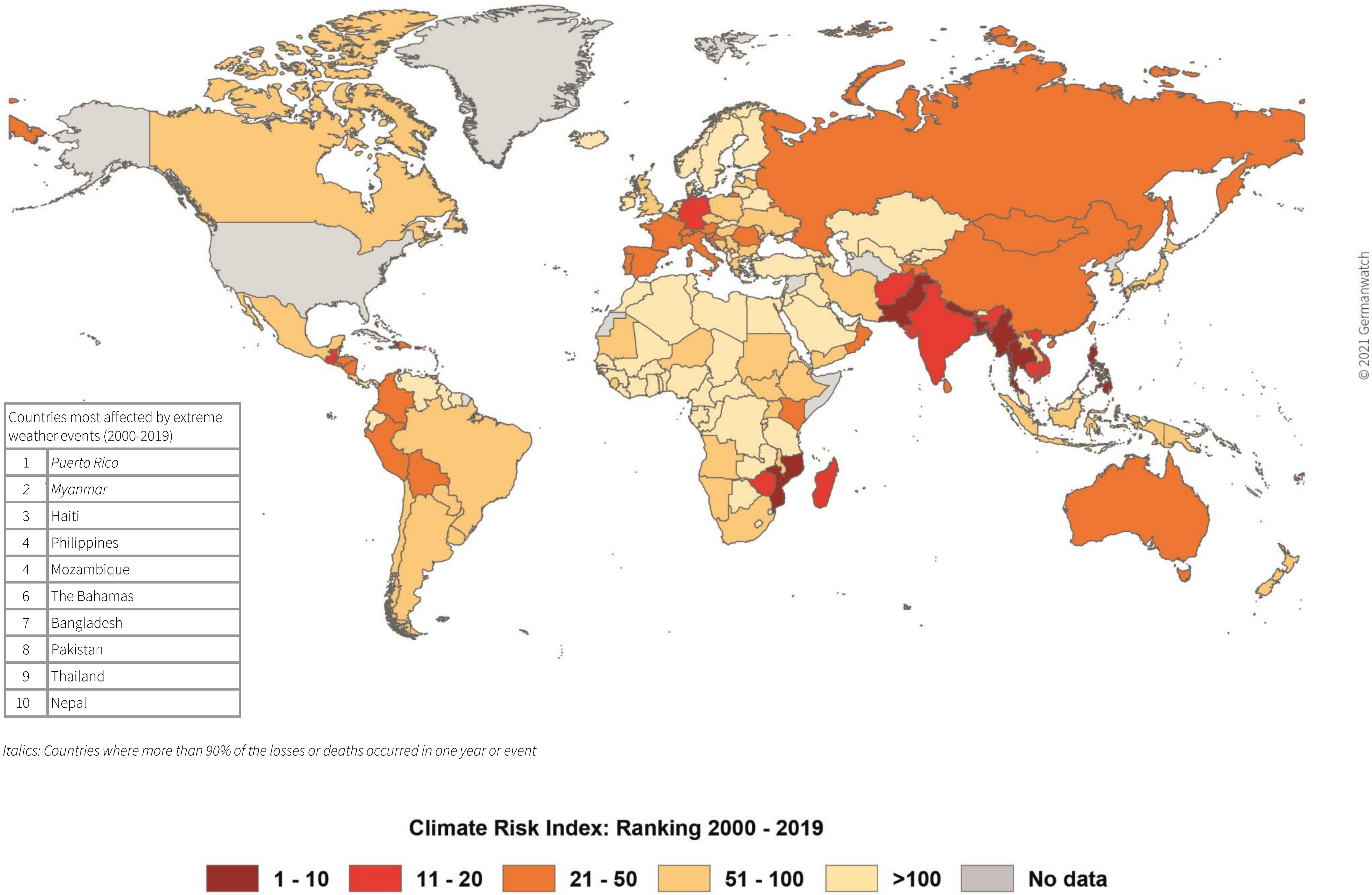
Over the last few years, the second category of countries has been gaining relevance: Countries like Haiti, the Philippines and Pakistan, that are recurrently affected by catastrophes, continuously rank among the most affected countries both in the long-term index and in the index for each respective year. Furthermore, some countries were still in the process of recovering from the previous year's impacts. One example is the Philippines, which is regularly exposed to tropical cyclones such as Bopha 2012, Hayan 2013 and Mangkhut 2018, due to its geographical location.

The appearance of some European countries among the Bottom 30 countries[67] can to a large extent be attributed to the extraordinary number of fatalities due to the 2003 heatwave, in which more than 70 000 people died across Europe. Although some of these countries are often hit by extreme events, the relative economic losses and the fatalities are usually relatively minor compared to the countries' populations and economic power due to their high coping capacity.

[65] New York Times 2019a, World Bank 2019
[66] MunichRe 2018
[67] The full rankings can be found in the Annexes.

Figure 1: World Map of the Global Climate Risk Index 2000 – 2019

Source: Germanwatch and Munich Re NatCatSERVICE



Countries most affected by extreme weather events (2000-2019)	
1	*Puerto Rico*
2	*Myanmar*
3	Haiti
4	Philippines
4	Mozambique
6	The Bahamas
7	Bangladesh
8	Pakistan
9	Thailand
10	Nepal

Italics: Countries where more than 90% of the losses or deaths occurred in one year or event

2 Effects of Climate Change on Extreme Weather Events and Ways to Deal with the Related Impacts

Extreme weather events and how they are formed is complex. Numerous interrelated factors must be taken into account when seeking to explain the causes. However, science has been able to sufficiently demonstrate that climate change has a significant effect on extreme weather events, increasing their frequency, intensity and duration. Understanding the relation between the human-induced climate crisis and extreme weather events is essential for being able to mitigate the risks and prepare for these types of events.

Back in its "Fifth Assessment Report", which was published in 2014, the Intergovernmental Panel on Climate Change (IPCC) had already stated that the risks associated with extreme events will continue to increase as the global mean temperature rises.[68] Linking particular extreme weather events to human-induced and natural climate drivers remains a scientific challenge which attribution science is trying to tackle. The field has recently taken huge leaps forward – even though gaps in knowledge and especially in data remain. In general, many studies conclude that "the observed frequency, intensity, and duration of some extreme weather events have been changing as the climate system has warmed".[69] Nevertheless, it is not trivial to investigate the impact of climate change on a single weather event as different regional circumstances need to be taken into account and data might be very limited.[70] Over the past few years, substantial research has been conducted on the attribution of extreme events to climate change, i.e. to what extend anthropogenic climate change has contributed to the events' likelihood and strength.[71] In the field known as Probabilistic Event Attribution (PEA), based on climate model experiments, studies compare the probability of an extreme weather situation, in today's world with human-caused greenhouse gas emissions, to a world without anthropogenic climate change.[72] Due to methodological improvement, "fast track attribution" is now more feasible and can be undertaken within months of the event (as opposed to decades).[73] Additionally, more knowledge has been generated on how underlying factors contributing to extreme weathers are influenced by global warming. For example, higher temperatures intensify the water cycle, leading to more droughts as well as floods due to drier soil and increased humidity.[74] Of course, these approaches can only lead to statements about the change in probability of a certain event happening.

[68] IPCC 2014a, p.12
[69] Committee on Extreme Weather Events and Climate Change Attribution et al. 2016, p. 2
[70] Hansen et al. 2016
[71] Stott et al. 2015
[72] Carbon Brief 2014
[73] Haustein et al. 2016
[74] WMO 2017

Considering this, the report "Explaining Extreme Events of 2017 from a Climate Perspective" offered findings from 17 peer-reviewed analyses. The American Meteorological Society has published such a report in its bulletin on an annual basis since 2012, analysing selected extreme weather events. Out of the 146 research findings, 70% "identified a substantial link between an extreme event and climate change".[75] Again, "scientists have identified extreme weather events that they said could not have happened without the warming of the climate through human-induced climate change."[76] Among others, one of the cited studies concluded that the intense marine heatwaves in the Tasman Sea off Australia in 2017 and 2018 would have been "virtually impossible" without climate change.[77] Another study in the report of the following year "Explaining Extreme Events of 2018 From a Climate Perspective" took a closer look at the heatwave in South Korea in the summer of 2018. It concluded that the likelihood of a 2018-like extreme heat wave with that intensity and maximum duration had increased by four times due to anthropogenic climate change.[78] For its part, the "Fourth Climate Assessment Report" (2018) considers, with a high level of confidence, a future increase in the frequency and intensity of extreme high temperature and precipitation events as the global temperature increases as being "virtually certain".[79]

The data on the countries in the CRI 2021 demonstrate how destructive extreme precipitation can be – namely through the floods and landslides, which have hit many regions in South and South East Asia and Africa – regions which now feature in the Bottom 10. Extreme precipitation is expected to increase as global warming intensifies the global hydrological cycle. Thereby, single precipitation events are expected to increase in intensity at a higher rate than global mean changes in total precipitation as outlined by Donat et al. (2016). Furthermore, those increases are expected in wet as well as dry regions.[80] A study by Lehmann et al. (2015) strengthens the scientific link between record-breaking rainfall events since 1980 and rising temperatures. According to the scientists, the likelihood of a new extreme rainfall event being caused by climate change reached 26% in 2010.[81] A study by Blöschel et al. (2017) concludes that the timing of floods is shifting due to climate change. The research focuses on Europe and shows that floods occur earlier in the year, posing timing risks to people and animals. Flooding rivers affect more people worldwide than any other natural disasters and result in multi-billion dollars of damage annually.[82] Nevertheless, the study is not fully able to single out human-induced global warming as a cause – a problem researchers on extreme weather attribution are still facing.

[75] American Meteorological Society 2018, without page number
[76] Ibid.
[77] Perkins-Kirkpatrick et al 2018, p54
[78] Wang et al. 2018
[79] Wuebbles el al. 2017
[80] Donat et al. 2016
[81] Lehmann et al. 2015
[82] Blöschl et al. 2017

Researchers explained that the sea surface temperature plays a key role in increasing storms, wind speeds and precipitation.[83] They conclude that Hurricane Harvey in 2017 would not have been able to produce such an enormous amount of rain without human-induced climate change.[84] Moreover, a study shows that torrential rains like those in 2016 in Louisiana, USA, are now 40% more likely than in pre-industrial times. The rainfall was increased because the storm was able to absorb abnormal amounts of tropical moisture on its way to the US coast, releasing three times the precipitation of Hurricane Katrina in 2005.[85]

Another example is a regional model used to analyse the occurrence of heatwaves in India, finding causalities regarding the 2016 heatwave and climate change. The model indicated that sea surface temperatures influence the likelihood of record-breaking heat.[86] Other studies have found similar results. A publication regarding the 2015 Southern African droughts also found causalities with regards to sea surface temperatures causing reduced rainfall, increased local air temperatures and more evaporation.[87]

Furthermore, there is increasing evidence on the link between extreme El Niño events and global warming. Cai et al. (2018) found that the robust increase in the variability of sea surface temperatures is “largely influenced by greenhouse-warming-induced intensification of upper-ocean stratification in the equatorial Pacific, which enhances ocean-atmosphere coupling.”[88] As a consequence, the frequency of strong El Niño events increases as well as extreme La Niña events. This finding is considered a milestone in climate research[89] and confirms past research in the field.[90]

Extreme weather events and the related risks are not the only type of risks aggravated by the influences of climate change. In addition, slow-onset processes and the related hazards, like the rising sea levels, desertification or the loss of biodiversity, are triggered or reinforced. In its latest reports, the IPCC (2019)[91] focuses on the effect of climate change on the desertification and degradation of land. It suggests that climate change will accelerate several desertification processes and that, in the future, the risks of desertification will increase. This has various implications, such as the loss of biodiversity and an increase in the likelihood of wildfires.

The effects of climate change on tropical cyclones

[83] Trenberth et al. 2015; Zhang et al. 2016
[84] Trenberth et al. 2018
[85] Climate Central 2016a
[86] Climate Central 2016b
[87] Funk et al. 2016
[88] Cai et al. 2018, p. 201.
[89] Ham Y-G 2018
[90] Cai et al. 2014, Cai et al. 2015, Yeh et al. 2009
[91] IPCC 2019

In the Climate Risk Index 2021 tropical cyclones led to six countries being listed among the Bottom 10. Mozambique (1), Zimbabwe (2) and Malawi (5) were struck by Cyclone Idai (and Kenneth), the Bahamas (3) were hit by Hurricane Dorian, in Japan (4) Typhoon Hagibis caused massive destruction, and various cyclones affected India (7).

The following info-box highlights the role of climate change in increasing the intensity of tropical cyclones and in increasing precipitation.

How will climate change affect tropical cyclones?

There is little doubt that climate change will bring about the following challenges:

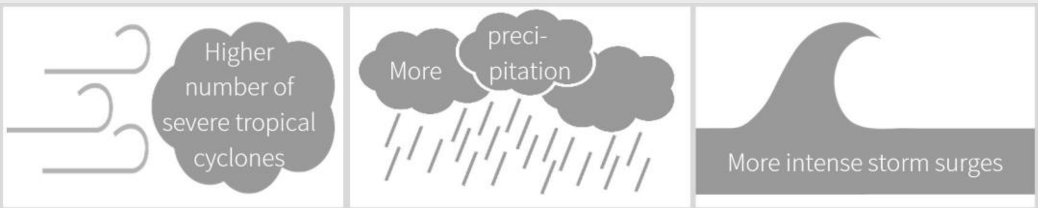


Illustration: Germanwatch

If the increase in the global mean temperature is limited to 1.5°C or even 2°C, the total *number* of tropical cyclones is actually expected to decrease. However, we also have to note that this might differ regionally. According to the IPCC 1.5°C Special Report, the *intensity* of the storms is likely to increase and more of the highest category tropical cyclones will occur. This is due to warmer oceans acting like fuel: The heat provides more energy to feed the storms, hence making them stronger and thus potentially more damaging. In addition, warmer air can absorb more moisture leading to an increase in the precipitation associated with the storms. Tropical cyclones are also getting slower. Consequently, they can release more rain on the affected area,[91] although scientific debate on this matter continues.[92] Peak wind speeds and precipitation will therefore most likely increase more significantly if average temperatures rise by 2°C compared to if they only rise by 1.5°C.[93] Further rises in sea levels will result in more severe storm surges. In 2020 the Atlantic hurricane season was so active that it has exhausted the regular alphabetical list of storm names. New storms were named after Greek letters. The Greek alphabet was used for only the second time on record.

Tropical cyclones have different names depending on where they occur. In the Atlantic and Northeast Pacific, the weather phenomenon is described as a *hurricane* whereas the term *cyclone* is used when the storm occurs in the South Pacific and Indian Ocean. The term *typhoon* describes the same weather event in the Northwest Pacific. Moreover, such storms have different scales to classify their intensity depending on the region in which they occur. There are at least five common tropical cyclone scales, and all are based on wind speeds. The line between storms and tropical cyclones is drawn very differently in different regions of the world, which makes it difficult to compare the storms based on these categories. For example, a cyclone in Australia and Fiji starts at 63 km/h, while a hurricane in the Caribbean will only be defined as such from 119 km/h upwards. Then again, the highest category of hurricanes – category five – starts at 252 km/h. In Australia and Fiji, a cyclone has to reach 280 km/h to reach the highest classification, which is also named category five. The box below describes how tropical cyclones form.

How tropical cyclones form

Vast amounts of water evaporate; humid air ascends spinning around an eye, creating a self-reinforcing process fueled by ever warmer humid air. Once tropical cyclones hit the shore, this supply is interrupted and the storm weakens. Highest wind speeds are reached directly around the eye at the so-called eyewall. Precipitation is most intense in that area as well. Huge storms can have several eyewalls.

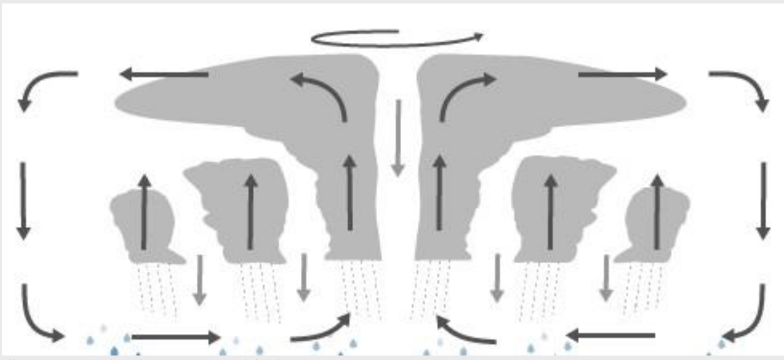


Illustration: eskp.de/CC-BY (modified).

For a tropical cyclone to form, several conditions need to be fulfilled. Usually sea temperature has to reach 26.5°C down to 50 metres below sea level. The atmosphere needs to be unstable i.e. there has to be a significant difference in air temperature at different altitudes allowing for convection. In contrast, the (vertical) wind shear should be low, otherwise the energy will be scattered over an area too large to form a strong storm. This is the main reason why tropical cyclones are extremely rare in the Southern Atlantic Ocean (NASA, 2004). High humidity in the lower to middle levels of the troposphere – the lowest layer of the Earth's atmosphere and the one where most weather takes place – contributes to the convection of air masses. Furthermore, sufficient Coriolis force is needed. Last but not least, tropical cyclones do not form out of nowhere. They need at least some form of disturbance close to the surface with a horizontal inflow of air (convergence) and a certain degree of horizontal circulation (vorticity) (NOAA 2018).

Exemplary approaches to address the impacts of tropical cyclones

The impact of the tropical cyclones in 2019 again sends a stark signal that knowledge about and pre-hazard responses to existing vulnerabilities and risk exposure remains a critical issue – even more so with climate change playing an increasing role in the intensity of tropical cyclones. Countries and communities that have been hit by cyclones are often left more vulnerable to other hazards and the impacts of climate change. In order to ensure better protection of the affected populations, adaptation measures and integrated risk management strategies are required that include the key steps of risk assessment, risk reduction, risk retention and transfer, preparedness, as well as response and recovery.[92]

Strategies to successfully deal with tropical cyclones include a variety of measures from the fields of disaster risk reduction, preparedness, adaptation and financial protection: Community-based adaptation projects, for example, can contribute to building better flood barriers[93]. An example of such a project is the planting of mangrove trees which can prevent coastal erosion[94]; a solution that is now used in Puerto Rico for instance.[95] In case of an emergency, awareness and preparation are key for people to be able to react swiftly. Training and checklists can support this,[96] and evacuation plans are essential.[97] In Bangladesh, a country particularly vulnerable to tropical cyclones, a dense network of small cyclone shelters, early warning systems, evacuation plans, reforestation schemes and increased communication has contributed to reducing cyclone-related mortality by more than 100-fold over a period of 40 years (reducing deaths from 500 000 in 1970 to 4 234 in 2007).[98] Another strategy in Bangladesh is growing crops on floating rafts, which can at least help to minimise flood damage.[99] Furthermore, regulations play a key role in addressing risks posed by tropical cyclones. To give an example, Australia has noted successes by tightening building codes: buildings are required to be constructed in a way that makes them less vulnerable to extreme winds.[100]

Furthermore, large-scale engineering projects like floodgates and dams can contribute to reducing damage. Such measures, however, are expensive, and often have adverse impacts on ecosystems.

There are already some ambitious initiatives, which aim to increase the financial resilience of the countries affected by tropical cyclones. Through pre-arranged funding that will be paid out in case of a disaster, the fiscal balance of (sub-) national governments, households and businesses can be protected. For example, the “Caribbean Catastrophe Risk Insurance Facility” (CCRIF SPC) is a regional catastrophe fund for the Caribbean and Central American governments to limit the financial impacts of devastating tropical cyclones, excessive rainfall and earthquakes. In order to do so, the insurance facility provides financial liquidity to the respective member state when a threshold is triggered. Following Hurricane Dorian, CCRIF paid out US$ 10,936,103 to the Bahamas. CCRIF’s payouts are made within 14 days of an event, but in this case CCRIF made an ‘advance payment’ of 50% of the preliminary estimated payout within 7 days to allow the government to

[92] Le Quesne et al. 2017
[93] IIED 2018
[94] Reid 2016
[95] U.S. Climate Resilience Toolkit 2017
[96] American Red Cross 2018
[97] Haque et al. 2012
[98] Haque et al. 2012
[99] Huq 2008
[100] Mason & Haynes 2010

begin to address its most pressing needs – with the remaining 50% being paid within the 14-day window which applies to all the CCRIF payouts.[101]

Another example is the "Pacific Catastrophe Risk Assessment and Financing Facility" (PCRAFI), a regional risk pool in the Pacific, which aims to provide disaster risk management and finance solutions to help increase the resilience of Pacific Island states. Countries can insure themselves against tropical cyclones, earthquakes and tsunamis. In parallel, disaster risk management work is being conducted under the Pacific Resilience Program, which aims to strengthen early warning systems and preparedness and improve countries' post-disaster response capacities.

While these initiatives are an important step forwards in addressing the particularly vulnerable countries and can help to provide the necessary financial backup in case of tropical cyclones and other extreme events, direct access to international climate finance through national entities is still fairly limited for some of the most affected countries.

Loss and damage: when adaptation and risk management reach their limits

As extreme weather events like tropical cyclones are likely to increase in quantity and/or severity with ongoing climate change, it is extremely important that more emphasis be put on the issue of loss and damage. The term loss and damage refers to the "adverse impacts of human-induced climate change that cannot be avoided by mitigation or adaptation, or that will not be avoided in the future by adaptation due to insufficient resources".[102] A main distinction can be made between economic and non-economic loss and damage. Climate change hazards cause loss and damage of, for example, resources, goods and services that are commonly traded in markets. Examples include buildings and services such as telecommunications and power. But those people who are affected also experience the loss of material and non-material items that cannot be traded. Loss and damage can be caused by extreme weather events as described in this Index, but in order to form a complete picture of the climate risk, slow-onset processes (rises in sea levels, glacier melting, etc.) also need to be included.[103]

In the international climate policy process, the topic of loss and damage is highly controversial. Particularly the question of how financing to deal with such losses and damages should be provided has so far remained unanswered (see Chapter 3).

[101] The Caribbean Catastrophe Risk Insurance Facility 2019

[102] Mace/Verheyen 2016. Mace, M./ Verheyen, R. 2016: Loss, Damage and Responsibility after COP21: All Options Open for the Paris Agreement. In: Review of European, Comparative & International Environmental Law 25 (2), 197-214.

[103] Schäfer et al. 2021

3 Status Quo of International Resilience Policy

The Climate Risk Index 2021 clearly shows that the effects of climate change are already being felt worldwide and that increasingly intense and frequent extreme weather events are a major driver of disaster losses. However, the Index also shows that developing countries are particularly affected by the impacts of climate change. Eight out of the ten countries most affected by the quantified impacts of extreme weather events in 2019 belong to the category low to lower-middle income. Five of them fall into the category Least Developed Countries. A similar picture emerges from the long-term index: Six of the ten countries most affected from 2000 to 2019 belong to the category low to lower-middle income. Climate impacts, such as increasingly intense and frequent extreme weather events, affect people in developing countries disproportionately, threatening lives and livelihoods, human security and sustainable development. These countries, and especially the most vulnerable parts of the population, are particularly affected by the damaging effects of a hazard (as, for example, their livelihood depends on fewer assets) and have a lower coping capacity (e.g. they cannot rely on savings to buffer the impacts and may need more time to rebuild and recover).

Moreover, the year 2020 has demonstrated that these countries are vulnerable to a variety of risks – Including climatic and geophysical hazards but also economic, social and health risks. The Covid-19 pandemic has led to an unprecedented humanitarian crisis. This is a particular problem for developing countries, as disaster management systems are often overburdened and the already scarce emergency funds have been exhausted. The World Bank estimates that the Covid-19 crisis could plunge up to an additional 115 million people into extreme poverty in 2020 – and this number could rise to 150 million in 2021.[104] Moreover, the Covid-19 crisis, similar to the climate crisis, will lead to a higher indebtedness of vulnerable countries.[105]

The Covid-19 pandemic has reminded us of the fact that both risk-affectedness and vulnerability are systemic and interconnected.[106] A recent study by the Red Cross Red Crescent Movement shows that of the 132 extreme weather events that occurred between January and September 2020, 90 overlapped with the Covid-19 pandemic. Globally, 51.6 million people had to simultaneously deal with the impacts of floods, droughts or storms whilst trying to contain the pandemic and deal with its consequences. It is therefore important to strengthen the resilience of the

[104] World Bank 2020c

[105] This is true for many different countries. Mozambique was forced to take US$ 118 million in debt for responding to the cyclone-induced damages due to the lack of own funds (as the sixth poorest country worldwide) and support (see CARE et al. 2019). AOSIS raised awareness for the difficult situation SIDS: "Small Island Developing States are sinking: not just from climate-induced sea level rise and other impacts, we are sinking in debt," (see https://www.aosis.org/wp-content/uploads/2020/09/AOSIS-Media-Briefing-Press-Release.pdf)

[106] Künzel/Schäfer 2020.

most vulnerable against different types of risk (i.e. climatic, geophysical, economic and health-related risks).

Comprehensive disaster risk reduction strategies can play a key role in increasing resilience to different types of risks. As part of its global targets, the Sendai Framework[107] aims to substantially increase the number of countries with national and local disaster risk reduction strategies by 2020. Only 40 of the 195 countries of the Sendai Framework have achieved this so far. Looking at the Bottom 10 of both the annual and the long-term Climate Risk Index, Japan is the only country which appears on both these lists and which has also achieved this goal. Other Bottom 10 countries like Malawi, India, Niger, the Philippines, and Nepal are working on national and local disaster risk reduction strategies; for the other countries, no specific details were available.

Adaptation efforts also help to mitigate climate impacts. In 2019, eighteen countries completed and submitted their National Adaptation Plans (NAPs) to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), five of them being Least Developed Countries (LDCs) and four being Small Island Developing States (SIDS). Moreover, at least 120 developing countries were in the process of formulating and implementing the NAPs.[108]

While the first priority should be to prevent and minimise potential losses and damages through effective mitigation, adaptation and risk reduction measures, it is no longer possible to prevent or minimise all loss and damage. Climate change is already leading to unavoidable loss and damage and will increasingly do so in the future. Taking this into account it appears essential to address the residual loss and damage, which cannot be avoided through mitigation and adaptation efforts, especially for those countries, which are particularly vulnerable to the impacts of climate change. However, **financial support** is clearly lacking – measured against the scale of what is necessary. In the direct aftermath of a disaster, it is especially the poor and vulnerable countries, which rely on **humanitarian assistance** for immediate relief and also recovery. However, as current numbers show, the amount of financial support available is far from sufficient. According to the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA), only 54% of the global humanitarian appeals[109] could be funded in 2019[110]. After cyclones Idai and Kenneth, Mozambique issued an appeal for support in dealing with the massive destruction. Only 39% of the funding was covered by July 2019[111] and just 47% by the

[107] The Sendai Framework aims to achieve the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries over the next 15 years.
[108] United Nations 2020
[109] Not only focused on extreme weather events
[110] UN OCHA 2019
[111] CARE et al. 2019

end of 2019[112]. The already indebted state was left to deal with the remaining costs on its own.

International climate financing has increased over the years and in 2018 a total of US$ 78.9 billion was provided and mobilised.[113] However, the goal to mobilise US$ 100 billion annually from 2020 onwards, which, in 2009, developed countries agreed to provide for developing countries to finance mitigation and adaptation efforts, does not seem to be met. A recent study also points to challenges regarding the amount of money labelled as climate finance provided. The argument is made that most loans are counted at their full face-value, rather than the grant equivalent – therefore repayments by the recipient countries, interest and other factors are also counted as part of climate finance.[114] In light of the ever-increasing impacts and costs of covering the related damage, it is all the more worrying that in 2018 70% of the climate finance provided was spent on mitigation efforts, whereas the share spent on adaptation funding was only about 21% of the total funding (the other 9% can be attributed to cross-cutting)[115] – thus, well below the target of 50% in order to achieve a fair balance. As it has been shown that the main amount of private climate finance mobilised is invested in mitigation efforts, the argument should be made to provide an even higher share of adaptation finance in order to avoid imbalance. The geographical distribution additionally reveals another challenge in terms of the fair distribution of the financial means: Only 8% of the funding goes to low-income countries, the majority is provided to middle-income countries (69%).[116]

Estimates of the United Nations Environmental Program (UNEP) additionally show how far these numbers are from meeting the needs of those countries struggling with climate impacts: Even with a temperature increase of below 2°C, adaptation costs are expected to increase to up to US$ 300 billion per year by 2030 – potentially rising even further[117] and this does not cover costs concerning climate related loss and damage. As no specific percentage of international climate finance has been assigned to address loss and damage, the necessary response costs will be even higher when loss and damage is taken into account[118]. For developing countries, the estimated cost of residual loss and damage could rise to between US$ 290 billion and US$ 580 billion in 2030 according to Markandya/ González-Eguino (2018).[119]

[112] UN OCHA 2020
[113] OECD 2020
[114] Oxfam 2020
[115] OECD 2020
[116] Ibid
[117] UNEP 2016
[118] Even if some funding was provided to conduct projects that also included L&D components, those costs were calculated as part of adaptation finance.
[119] Markandya, A./ González-Eguino, M. 2018: Integrated Assessment for Identifying Climate Finance Needs for Loss and Damage: A Critical Review. In: Mechler R./ Bouwer, L./ Schinko, T./ Sur-minski, S./ Linnerooth-Bayer, J. (eds): Loss and damage from climate change. Concepts, methods and policy options. Springer, 343-362.

However, reacting to the increased financial pressure due to the consequences of the Covid-19 pandemic on the most vulnerable countries and their national households, donors have provided additional support. One example for this support is the African Risk Capacity, a regional risk pool governed by the African Union. In order to ensure that climate risk management is not compromised under the challenging conditions when dealing with measures to control the Covid-19 pandemic, donors[120] offered premium support to countries, which allowed them to join the risk pool.

International climate policy developments and expectations for 2021

The disruptions caused by the Covid-19 pandemic also affected the **international climate policy agenda**. In 2020, no **UNFCCC** negotiations could be held and thus no decisions could be taken. Only the thematic bodies and committees were able to meet virtually. Therefore, no substantive progress regarding the discussions on climate finance, adaptation and loss and damage could be achieved.

However, the **Climate Ambition Summit** on December 12, 2020, announced the “Race to Resilience” campaign as the sibling to “Race to Zero”. It aims to catalyse a significant change in global ambition for climate resilience and wants to catalyse action by non-state actors that, by 2030, builds the resilience of four billion people from groups and communities, which are vulnerable to climate risks.

According to the 2020 **progress reports on the Sustainable Development Goals (SDGs)**, there is room for improvement in achieving SDG 13 (“Take urgent action to combat climate change and its impacts”). As stated in the report, the global temperature increase is not on track to meet the Paris Goals but instead could potentially reach 3.2°C by the end of the century. On the other hand, recent estimates by the **Climate Action Tracker** have calculated that global warming by 2100 could be as low as 2.1°C as a result of all the net zero pledges announced as of November 2020.[121] Nevertheless, developments are especially worrying as climate change threatens to destroy decades of progress in development[122] and could lead to severe human and national security implications, as debated in the UN Security Council in July 2020.[123] It can be seen in the long-term index, that major events undid years of development in the affected countries. The progress report also

[120] BMZ 2020
[121] Climate Action Tracker 2020
[122] United Nations 2020
[123] Experts called on the Security Council to let climate change, while “further intensifying resource competition, exacerbate conflicts and drive hundreds of millions of people from their homes” to “take center stage” in its work and debates. With great concern it was pointed to the consequences for “conflict prevention, peacemaking and sustaining peace, and risk, trapping vulnerable countries in a vicious cycle of climate disaster and conflict” if the impacts would be further ignored from a security policy perspective. (https://www.un.org/press/en/2020/sc14260.doc.htm)

pointed to the fact that those countries most vulnerable to climate change do not receive adequate financial support to deal with these impacts.

After the debate having stalled in 2020, expectations regarding progress in the discussions about the long-term finance goal and adequate support for adaptation and loss and damage have shifted to 2021 and 2022. The following milestones are worth mentioning:

- After the **Climate Ambition Summit** on December 12, 2020 did not deliver sufficient commitments to increase global (adaptation) finance, expectations for the **Global Climate Adaptation Summit** in January 2021 are especially high in this regard.
- More support, in terms of finance and capacity building through strong partnerships, is required in order to prepare those countries, which do not possess the capacity to do so on their own for the effects of climate change and in order to share successful approaches. The Santiago Network, as an outcome of COP25, could be a key milestone in providing this type of support and act as a knowledge and capacity building hub. It should be operationalised and provided with adequate financial resources soon.
- For **COP26**, adaptation and resilience[124], as well as finance[125] are part of the five priority areas of the COP Presidency. Moreover, the question of whether the US$ 100 billion goal has been met, will be high on the agenda. Discussion must lead to action and support for the most vulnerable countries and people who have to deal with climate impacts. During the upcoming climate summits one of the big issues therefore must be: How can developing countries be supported in dealing with increasing loss and damage? How can polluters, in particular, contribute to the costs?

4 Methodological Remarks

The presented analyses are based on the worldwide data collection and analysis provided by MunichRe's NatCatSERVICE.[126] "The information collated by MunichRe, the world's leading re-insurance company, can be used to document and perform risk and trend analyses on the extent and intensity of individual natural hazard events in various parts of the world."[127] Broken down by countries and territories,

[124] Helping people, economies and the environment adapt and prepare for the impacts of climate change.
[125] We need to unleash the finance which will make all of this possible and power the shift to a zero carbon economy.
[126] Note: Contrary to previous years, the underlying database for the calculation of the CRI 2021 does NOT include data for the United States of America. This results in a significantly lower number for the overall losses in PPP of the 20-year period, compared to, for instance, the number presented in the CRI 2020 (overall losses of US$ 3.54 trillion). As a comparison: Without the United States of America, the over losses in the CRI 2020 amount to US$ 2.51 trillion.
[127] MunichRe NatCatSERVICE

MunichRe collects the number of total losses caused by weather events, the number of deaths, the insured damages and the total economic damages. The last two indicators are stated in million US$ (original values, inflation adjusted).

In the present analysis, only weather-related events – storms, floods as well as temperature extremes and mass movements (heat and cold waves etc.) – are incorporated. Geological incidents like earthquakes, volcanic eruptions or tsunamis, for which data are also available, are not relevant in this context as they do not depend on the weather and therefore are not possibly related to climate change. To enhance the manageability of the large amount of data, the different categories within the weather-related events were combined. For single case studies on particularly devastating events, it is stated whether they concern floods, storms or another type of event.

It is important to note that this event-related examination does not allow for an assessment of continuous changes of important climate parameters. For instance, a long-term decline in precipitation that was shown in some African countries as a consequence of climate change cannot be displayed by the CRI. Nevertheless, such parameters often substantially influence important development factors like agricultural outputs and the availability of drinking water.

Preparing an index requires the analysis of a vast amount of data. Thus, data availability and quality play an important role as well as the underlying methodology for their collection. For instance, the accurate attribution of a human loss to a particular extreme weather event faces certain methodological boundaries that data collectors have to work with (e.g. to determine whether the death of an elderly person during a heatwave is indeed the result of the extreme temperature or due to the high age alone). Similarly, data quality and coverage may vary from country to country as well as within countries. A study by Campbell et al. (2018) found that heatwave and health impact research is not evenly distributed across the globe. They highlight that "regions most at risk from heatwaves and health impact are under-represented in the research."[128] The data analysed for the CRI rely on scientific best practice and methodologies used are constantly evolving with the view of ensuring the highest degree of accuracy, completeness and granularity.

Although certainly an interesting area for analysis, the present data do not allow for comprehensive conclusions about the distribution of damages below the national level. The respective data quality would only be sufficient for a limited number of countries. The island of Réunion, for example, would qualify for a separate treatment but data are insufficient.

Analysed Indicators

For the examination of the CRI, the following indicators were analysed:

1. number of deaths,

[128] Campbell et al. 2018

2. number of deaths per 100 000 inhabitants,
3. sum of losses in US$ in purchasing power parity (PPP) as well as
4. losses per unit of gross domestic product (GDP).

For the indicators 2–4, economic and population data primarily provided by the International Monetary Fund were taken into account. It must be added, however, that especially for small (e.g. Pacific Small Island Developing States) or extremely politically unstable countries (e.g. Somalia), the required data are not always available in sufficient quality for the entire time period observed. Those countries needed to be omitted from the analyses.

The CRI 2021 is based on the loss figures of 180 countries from the year 2019 and the period 2000 to 2019. This ranking represents the most affected countries. In each of the four categories ranking is used as a normalisation technique. Each country's index score has been derived from a country's average ranking in all four indicating categories, according to the following weighting: death toll, 1/6; deaths per 100 000 inhabitants, 1/3; absolute losses in PPP, 1/6; losses per GDP unit, 1/3.

For example, in the Climate Risk Index for 2000-2019, Bangladesh ranks 9th in annual fatalities among all countries analysed in this study, 37th in Fatalities per 100 000 inhabitants, 13th in losses and 37th in losses per unit GDP (see Annexes, Table 4). Hence, its CRI Score is calculated as follows:

CRI Score = 9 x 1/6 + 37 x 1/3 + 13 x 1/6 + 37 x 1/3 = 28.33

Only six countries have a lower CRI Score for 2000-2019, hence Bangladesh ranks 7th in this index category (see Table 2).

The Relative Consequences Also Depend on Economic and Population Growth

Identifying relative values in this index represents an important complement to the otherwise often dominating absolute values because it allows for analysing country specific data on damages in relation to real conditions and capacities in those countries. It is obvious, for example, that for richer countries like the USA or Japan damages of one billion US$ cause much less economic consequences than for the world's poorest countries, where damages in many cases constitute a substantial share of the annual GDP. This is being backed up by the relative analysis.

It should be noted that values, and hence the rankings of countries regarding the respective indicators do not only change due to the absolute impacts of extreme weather events, but also due to economic and population growth or decline. If, for example, population increases, which is the case in most of the countries, the same absolute number of deaths leads to a relatively lower assessment in the following year. The same applies to economic growth. However, this does not affect the significance of the relative approach. Society's ability of coping with damages through precaution, mitigation and disaster preparedness, insurances or the improved availability of means for emergency aid, generally grows along with increasing economic strength. Nevertheless, an improved ability does not necessarily imply enhanced implementation of effective preparation and response measures. While absolute numbers tend to overestimate populous or economically capable countries, relative values give more prominence to smaller and poorer countries. In order to consider both effects, the analysis of the CRI is based on absolute (indicators 1 and 3) as well as on relative (indicators 2 and 4) scores. Being double weighted in the average ranking of all indicators generating the CRI Score, more emphasis and therefore higher importance is given to the relative losses.

The Indicator "Losses in Purchasing Power Parity" Allows for a More Comprehensive Estimation of How Different Societies are Actually Affected

The indicator "absolute losses in US$" is identified by purchasing power parity (PPP) because using this figure expresses more appropriately how people are actually affected by the loss of US$ 1 than by using nominal exchange rates. Purchasing power parity is a currency exchange rate, which permits a comparison of, for instance, national GDPs, by incorporating price differences between countries. This means that a farmer in India can buy more crops with US$ 1 than a farmer in the USA with the same amount of money. Thus, the real consequences of the same nominal damage are much higher in India. For most countries, US$ values according to exchange rates must therefore be multiplied by a factor bigger than one.

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Annexes

CRI = Climate Risk Index; GDP = gross domestic product; PPP = purchasing power parity

Table 3: Climate Risk Index for 2019

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhabitants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
130	**Albania**	118.00	106	106	130	130
125	**Algeria**	105.17	65	95	122	127
23	**Angola**	32.33	44	50	22	14
130	**Antigua and Barbuda**	118.00	106	106	130	130
55	**Argentina**	60.00	60	86	28	50
113	**Armenia**	98.17	90	62	125	125
19	**Australia**	28.00	37	37	9	24
47	**Austria**	56.83	84	79	25	37
130	**Azerbaijan**	118.00	106	106	130	130
130	**Bahrain**	118.00	106	106	130	130
13	**Bangladesh**	23.50	7	29	20	28
130	**Barbados**	118.00	106	106	130	130
130	**Belarus**	118.00	106	106	130	130
64	**Belgium**	66.00	84	85	36	53
130	**Belize**	118.00	106	106	130	130
130	**Benin**	118.00	106	106	130	130
130	**Bhutan**	118.00	106	106	130	130
10	**Bolivia**	19.67	43	15	27	9
48	**Bosnia and Herzegovina**	57.83	98	82	45	20
117	**Botswana**	99.83	106	106	107	87
27	**Brazil**	33.67	5	32	17	58
130	**Brunei Darussalam**	118.00	106	106	130	130
119	**Bulgaria**	101.00	98	96	98	109
130	**Burkina Faso**	118.00	106	106	130	130
57	**Burundi**	61.83	26	10	121	102
84	**Cambodia**	75.83	60	63	97	86
68	**Cameroon**	67.33	32	27	104	107
62	**Canada**	65.67	90	104	16	40
130	**Cape Verde**	118.00	106	106	130	130
70	**Central African Republic**	67.50	98	92	89	17
130	**Chad**	118.00	106	106	130	130
25	**Chile**	33.00	52	59	12	8

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhab-itants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
32	**China**	42.83	4	83	3	42
116	**Chinese Taipei**	99.67	84	98	80	119
28	**Colombia**	36.33	17	18	37	64
16	**Comoros**	25.33	67	6	65	4
130	**Costa Rica**	118.00	106	106	130	130
129	**Côte d'Ivoire**	111.67	84	101	128	128
81	**Croatia**	75.17	106	106	51	41
130	**Cyprus**	118.00	106	106	130	130
107	**Czech Republic**	92.83	106	106	63	88
51	**Democratic Republic of Congo**	58.67	14	41	90	83
130	**Democratic Republic of Timor-Leste**	118.00	106	106	130	130
82	**Denmark**	75.50	72	49	75	104
75	**Djibouti**	73.00	64	5	124	120
88	**Dominica**	77.67	106	106	110	19
130	**Dominican Republic**	118.00	106	106	130	130
121	**Ecuador**	103.83	98	103	95	112
120	**Egypt**	102.00	58	99	112	122
103	**El Salvador**	91.83	80	67	111	113
130	**Eritrea**	118.00	106	106	130	130
83	**Estonia**	75.67	98	60	92	72
130	**Eswatini**	118.00	106	106	130	130
72	**Ethiopia**	69.33	39	74	67	81
75	**Fiji**	73.00	90	23	118	92
112	**Finland**	97.83	106	106	73	98
40	**France**	52.50	41	68	18	60
130	**Gabon**	118.00	106	106	130	130
108	**Georgia**	93.17	106	106	91	75
56	**Germany**	61.33	65	102	11	44
42	**Ghana**	53.33	29	30	71	80
36	**Greece**	45.00	50	34	44	54
130	**Grenada**	118.00	106	106	130	130
62	**Guatemala**	65.67	60	66	66	68
115	**Guinea**	99.17	72	72	127	126
130	**Guinea-Bissau**	118.00	106	106	130	130
130	**Guyana**	118.00	106	106	130	130
50	**Haiti**	58.33	60	51	94	47

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhab-itants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
79	**Honduras**	73.33	90	93	72	46
97	**Hungary**	85.83	106	106	55	71
100	**Iceland**	88.83	106	106	101	57
7	**India**	16.67	1	36	1	13
14	**Indonesia**	24.83	3	31	6	39
94	**Iraq**	84.33	56	77	76	110
123	**Ireland**	104.50	106	106	81	114
6	**Islamic Republic of Af-ghanistan**	16.00	11	11	33	15
18	**Islamic Republic of Iran**	27.00	22	45	8	21
128	**Israel**	108.83	90	88	129	129
35	**Italy**	43.50	46	70	7	34
130	**Jamaica**	118.00	106	106	130	130
4	**Japan**	14.50	9	20	2	18
130	**Jordan**	118.00	106	106	130	130
130	**Kazakhstan**	118.00	106	106	130	130
25	**Kenya**	33.00	15	16	49	51
130	**Kiribati**	118.00	106	106	130	130
60	**Korea. Republic of**	64.00	52	81	24	73
130	**Kosovo**	118.00	106	106	130	130
130	**Kuwait**	118.00	106	106	130	130
130	**Kyrgyz Republic**	118.00	106	106	130	130
45	**Lao People's Demo-cratic Republic**	55.17	57	28	86	66
98	**Latvia**	86.83	106	106	79	62
44	**Lebanon**	54.67	72	55	60	43
61	**Lesotho**	64.67	106	106	58	6
101	**Liberia**	89.50	106	106	109	55
80	**Libya**	73.67	67	48	93	93
130	**Lithuania**	118.00	106	106	130	130
74	**Luxembourg**	72.83	106	106	53	33
29	**Madagascar**	40.33	19	14	83	56
5	**Malawi**	15.17	20	13	35	5
99	**Malaysia**	87.33	58	78	74	118
111	**Maldives**	97.33	106	106	114	76
90	**Mali**	79.67	52	58	108	101
68	**Malta**	67.33	106	106	54	16
130	**Marshall Islands**	118.00	106	106	130	130

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhab-itants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
58	**Mauritania**	63.00	76	44	96	59
125	**Mauritius**	105.17	106	106	113	100
54	**Mexico**	59.50	31	73	26	77
130	**Micronesia**	118.00	106	106	130	130
130	**Moldova**	118.00	106	106	130	130
22	**Mongolia**	31.67	50	9	62	30
89	**Montenegro**	78.00	80	8	126	123
90	**Morocco**	79.67	35	42	117	121
1	**Mozambique**	2.67	2	3	4	2
21	**Myanmar**	31.33	24	38	30	29
113	**Namibia**	98.17	98	75	119	111
12	**Nepal**	20.00	10	7	42	27
109	**Netherlands**	97.17	106	106	59	103
66	**New Zealand**	66.33	90	76	52	52
49	**Nicaragua**	58.00	72	52	82	45
9	**Niger**	18.17	17	12	46	11
73	**Nigeria**	70.00	27	84	47	89
130	**North Macedonia**	118.00	106	106	130	130
106	**Norway**	92.33	98	94	70	99
95	**Oman**	84.67	67	35	123	124
15	**Pakistan**	25.00	8	39	14	25
127	**Panama**	108.33	106	106	102	115
51	**Papua New Guinea**	58.67	49	17	105	82
20	**Paraguay**	30.00	52	22	38	23
46	**Peru**	56.33	37	43	57	79
17	**Philippines**	26.67	13	40	15	26
93	**Poland**	80.00	76	97	40	85
37	**Portugal**	48.33	67	61	29	36
130	**Puerto Rico**	118.00	106	106	130	130
130	**Qatar**	118.00	106	106	130	130
109	**Republic of Congo**	97.17	98	89	115	96
53	**Republic of Yemen**	59.33	42	46	84	69
123	**Romania**	104.50	106	106	77	116
39	**Russia**	50.67	33	80	13	49
42	**Rwanda**	53.33	45	21	99	67
130	**Samoa**	118.00	106	106	130	130
75	**Saudi Arabia**	73.00	48	65	50	105
70	**Senegal**	67.50	106	106	43	22

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhab-itants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
105	**Serbia**	92.00	106	106	78	78
130	**Seychelles**	118.00	106	106	130	130
86	**Sierra Leone**	76.50	67	54	116	84
130	**Singapore**	118.00	106	106	130	130
87	**Slovak Republic**	77.17	76	53	87	97
103	**Slovenia**	91.83	106	106	85	74
130	**Solomon Islands**	118.00	106	106	130	130
24	**South Africa**	32.50	16	26	31	48
8	**South Sudan**	17.33	12	4	64	10
32	**Spain**	42.83	47	69	10	31
30	**Sri Lanka**	41.83	33	24	48	61
130	**St. Kitts and Nevis**	118.00	106	106	130	130
130	**St. Lucia**	118.00	106	106	130	130
130	**St. Vincent and the Grenadines**	118.00	106	106	130	130
11	**Sudan**	19.83	22	25	23	12
130	**Suriname**	118.00	106	106	130	130
118	**Sweden**	100.50	106	106	69	108
96	**Switzerland**	85.50	90	87	61	94
122	**Tajikistan**	104.33	90	91	120	117
67	**Tanzania**	66.50	27	47	88	95
34	**Thailand**	43.17	36	64	19	38
3	**The Bahamas**	6.50	30	1	5	1
41	**The Gambia**	53.17	80	33	103	35
130	**Togo**	118.00	106	106	130	130
130	**Tonga**	118.00	106	106	130	130
130	**Trinidad and Tobago**	118.00	106	106	130	130
130	**Tunisia**	118.00	106	106	130	130
64	**Turkey**	66.00	40	71	34	90
130	**Tuvalu**	118.00	106	106	130	130
31	**Uganda**	42.17	21	19	68	63
85	**Ukraine**	76.17	76	100	41	70
130	**United Arab Emirates**	118.00	106	106	130	130
102	**United Kingdom**	90.83	84	105	39	106
90	**Uruguay**	79.67	84	56	100	91
130	**Uzbekistan**	118.00	106	106	130	130
75	**Vanuatu**	73.00	106	106	106	7
130	**Venezuela**	118.00	106	106	130	130

CRI Rank	Country	CRI score	Fatalities in 2019 (Rank)	Fatalities per 100 000 inhab-itants (Rank)	Losses in million US$ (PPP) (Rank)	Losses per unit GDP in % (Rank)
38	**Vietnam**	50.17	25	57	32	65
59	**Zambia**	63.33	80	90	56	32
2	**Zimbabwe**	6.17	6	2	21	3

Table 4: Climate Risk Index for 2000–2019

Exemplary calculation: Albania ranks 134th in fatalities among all countries analysed in this study. 128th in Fatalities per 100 000 inhabitants. 113th in losses and 89th in losses per unit GDP. Hence. its CRI Score is calculated as follows:

CRI Score = 134 x 1/6 + 128 x 1/3 + 113 x 1/6 + 89 x 1/3 = 113.5

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
125	**Albania**	113.50	134	128	113	89
101	**Algeria**	92.83	34	65	87	153
87	**Angola**	84.00	51	70	79	117
56	**Antigua and Barbuda**	64.50	161	56	100	7
80	**Argentina**	77.00	61	113	21	77
156	**Armenia**	142.83	167	170	128	111
31	**Australia**	47.67	42	59	10	58
43	**Austria**	56.50	63	51	30	72
146	**Azerbaijan**	133.50	124	152	101	136
178	**Bahrain**	170.83	167	167	174	175
7	**Bangladesh**	28.33	9	37	13	37
148	**Barbados**	135.33	171	158	153	86
166	**Belarus**	156.17	136	161	145	167
53	**Belgium**	63.67	25	15	61	133
33	**Belize**	48.67	128	26	96	8
152	**Benin**	139.83	112	136	155	150
105	**Bhutan**	95.17	131	53	154	90
25	**Bolivia**	40.17	47	33	50	39
63	**Bosnia and Herzegovina**	68.17	122	111	37	14
143	**Botswana**	130.17	150	148	123	106
81	**Brazil**	79.50	17	98	16	124
176	**Brunei Darussalam**	167.50	167	151	178	179
68	**Bulgaria**	71.67	87	89	47	59

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
112	**Burkina Faso**	101.00	91	126	107	78
74	**Burundi**	74.50	75	69	126	54
14	**Cambodia**	36.17	38	35	53	28
140	**Cameroon**	128.17	83	123	136	152
93	**Canada**	87.33	77	133	15	83
150	**Cape Verde**	137.67	160	124	166	126
151	**Central African Republic**	138.83	136	147	163	120
115	**Chad**	104.67	104	138	106	71
83	**Chile**	81.33	84	116	32	70
41	**China**	56.33	5	106	1	60
36	**Chinese Taipei**	53.50	32	44	25	88
38	**Colombia**	54.83	24	49	33	87
97	**Comoros**	90.00	134	63	158	61
89	**Costa Rica**	84.50	96	81	89	80
153	**Côte d'Ivoire**	141.33	89	139	151	165
30	**Croatia**	47.00	53	19	63	64
142	**Cyprus**	129.67	149	99	147	142
82	**Czech Republic**	80.67	90	107	34	73
135	**Democratic Republic of Congo**	118.83	39	109	146	155
174	**Democratic Republic of Timor-Leste**	166.83	167	166	176	163
132	**Denmark**	118.00	146	160	52	95
65	**Djibouti**	70.33	107	32	141	55
11	**Dominica**	33.00	115	2	77	1
50	**Dominican Republic**	59.50	52	36	69	82
103	**Ecuador**	94.17	67	84	86	122
155	**Egypt**	142.17	76	157	119	172
28	**El Salvador**	43.67	65	41	57	29
129	**Eritrea**	115.83	163	168	124	36
158	**Estonia**	144.50	153	140	142	146
107	**Eswatini**	97.33	150	117	114	43
60	**Ethiopia**	66.50	27	92	54	67
19	**Fiji**	38.33	92	17	80	12
163	**Finland**	153.50	161	169	110	156

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
27	**France**	41.67	4	8	14	108
173	**Gabon**	165.83	155	150	180	180
104	**Georgia**	94.67	113	95	103	81
18	**Germany**	38.17	10	22	5	85
113	**Ghana**	101.33	54	80	112	141
75	**Greece**	75.00	69	68	49	98
24	**Grenada**	39.67	125	7	93	3
16	**Guatemala**	37.50	30	27	45	48
167	**Guinea**	159.83	128	159	173	170
109	**Guinea-Bissau**	99.17	140	102	149	51
119	**Guyana**	108.17	159	135	122	49
3	**Haiti**	13.67	13	4	41	10
44	**Honduras**	57.00	68	57	78	41
72	**Hungary**	74.00	59	48	65	112
177	**Iceland**	168.50	172	172	167	164
20	**India**	38.50	3	61	2	52
72	**Indonesia**	74.00	14	91	18	115
157	**Iraq**	143.17	93	155	120	168
137	**Ireland**	121.17	143	156	64	104
17	**Islamic Republic of Afghanistan**	37.83	12	14	75	56
97	**Islamic Republic of Iran**	90.00	41	110	29	125
136	**Israel**	120.33	108	122	92	139
22	**Italy**	39.00	6	9	12	99
54	**Jamaica**	63.83	111	77	70	24
57	**Japan**	64.83	21	90	4	92
141	**Jordan**	129.50	109	120	130	149
154	**Kazakhstan**	141.83	98	145	125	169
34	**Kenya**	52.00	36	67	42	50
131	**Kiribati**	116.33	172	172	160	11
91	**Korea. Republic of**	85.17	49	101	24	118
162	**Kuwait**	152.00	155	164	109	160
120	**Kyrgyz Republic**	109.67	77	52	159	159
52	**Lao People's Democratic Republic**	60.50	82	66	73	38
86	**Latvia**	82.83	106	62	99	84

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
132	**Lebanon**	118.00	114	114	108	129
109	**Lesotho**	99.17	146	132	121	32
164	**Liberia**	154.83	158	165	165	138
168	**Libya**	160.33	133	154	169	176
134	**Lithuania**	118.17	140	141	95	96
95	**Luxembourg**	89.00	94	13	134	140
12	**Madagascar**	34.67	31	38	55	23
62	**Malawi**	67.83	74	94	91	27
116	**Malaysia**	105.67	64	108	66	144
174	**Maldives**	166.83	172	172	171	157
121	**Mali**	110.50	95	129	116	97
147	**Malta**	134.00	163	142	139	109
172	**Marshall Islands**	164.83	172	172	179	147
85	**Mauritania**	82.00	103	79	105	63
139	**Mauritius**	124.17	143	104	138	128
59	**Mexico**	65.50	28	103	9	75
40	**Micronesia**	55.67	120	5	164	20
84	**Moldova**	81.67	131	118	71	26
48	**Mongolia**	59.17	88	46	83	46
106	**Morocco**	96.17	70	119	67	101
5	**Mozambique**	25.83	23	30	46	13
2	**Myanmar**	10.00	1	1	19	19
55	**Namibia**	64.33	81	28	111	69
10	**Nepal**	31.33	16	18	56	40
69	**Netherlands**	72.50	29	31	58	143
90	**New Zealand**	85.00	116	105	48	68
35	**Nicaragua**	53.00	66	40	88	42
64	**Niger**	68.67	60	74	98	53
114	**Nigeria**	104.33	26	115	68	151
108	**North Macedonia**	98.33	118	83	118	94
149	**Norway**	137.50	139	153	90	145
26	**Oman**	41.17	85	43	26	25
8	**Pakistan**	29.00	11	45	7	33
118	**Panama**	107.00	101	78	115	135
99	**Papua New Guinea**	90.83	72	50	135	119
61	**Paraguay**	67.00	102	100	40	30

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
45	**Peru**	57.67	33	58	39	79
4	**Philippines**	18.17	7	16	8	31
76	**Poland**	75.17	44	87	27	103
21	**Portugal**	38.67	20	12	36	76
1	**Puerto Rico**	7.17	19	3	6	6
180	**Qatar**	173.67	172	172	170	178
160	**Republic of Congo**	148.67	127	121	175	174
79	**Republic of Yemen**	76.17	48	71	85	91
41	**Romania**	56.33	56	73	22	57
32	**Russia**	48.50	2	6	17	130
117	**Rwanda**	105.83	73	72	150	134
70	**Samoa**	72.67	155	54	143	15
111	**Saudi Arabia**	100.33	57	93	51	154
138	**Senegal**	123.00	109	146	117	110
67	**Serbia & Montenegro & Kosovo**	70.83	96	112	35	35
168	**Seychelles**	160.33	172	172	172	137
92	**Sierra Leone**	85.83	55	29	156	123
179	**Singapore**	172.00	172	172	162	177
128	**Slovak Republic**	114.83	119	127	84	116
39	**Slovenia**	55.00	80	25	76	62
71	**Solomon Islands**	73.00	125	34	157	44
78	**South Africa**	76.00	45	97	31	93
100	**South Sudan**	92.67	71	75	131	102
29	**Spain**	46.50	8	11	23	113
23	**Sri Lanka**	39.50	35	42	28	45
130	**St. Kitts and Nevis**	116.00	172	172	144	18
51	**St. Lucia**	60.33	142	23	132	21
48	**St. Vincent and the Grenadines**	59.17	146	20	137	16
88	**Sudan**	84.33	46	88	74	105
171	**Suriname**	164.00	163	149	177	173
144	**Sweden**	131.33	138	163	62	131
45	**Switzerland**	57.67	40	24	44	107
47	**Tajikistan**	59.00	77	64	81	34
122	**Tanzania**	111.33	62	125	102	127
9	**Thailand**	29.83	22	60	3	17

CRI Rank	Country	CRI score	Average Fatalities 2000-2019 (Rank)	Average Fatalities per 100 000 inhabitants 2000-2019 (Rank)	Average Losses in million US$ (PPP) 2000-2019 (Rank)	Average Losses per unit GDP in % 2000-2019 (Rank)
6	**The Bahamas**	27.67	100	10	38	4
102	**The Gambia**	93.83	121	82	148	65
161	**Togo**	148.83	123	143	168	158
77	**Tonga**	75.67	163	76	129	5
159	**Trinidad and Tobago**	148.00	152	131	152	161
127	**Tunisia**	114.50	105	130	94	114
123	**Turkey**	111.83	58	137	43	148
125	**Tuvalu**	113.50	172	172	161	2
66	**Uganda**	70.67	50	85	72	66
94	**Ukraine**	88.83	37	86	60	132
165	**United Arab Emirates**	156.00	143	162	127	171
58	**United Kingdom**	65.00	18	55	20	121
96	**Uruguay**	89.83	117	96	82	74
170	**Uzbekistan**	161.17	153	171	140	166
37	**Vanuatu**	53.83	130	21	133	9
145	**Venezuela**	132.50	86	144	97	162
13	**Vietnam**	35.67	15	47	11	47
123	**Zambia**	111.83	99	134	104	100
15	**Zimbabwe**	37.33	43	39	59	22

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For further information, please contact one of our offices

Germanwatch – Bonn Office
Kaiserstrasse 201
D-53113 Bonn. Germany
Phone: +49 (0)228 / 60492-0
Fax: +49 (0)228 / 60492-19

Germanwatch – Berlin Office
Stresemannstr. 72
D-10963 Berlin. Germany
Phone: +49 (0)30 / 2888 356-0
Fax: +49 (0)30 / 2888 356 -1

E-mail: info@germanwatch.org

or visit our website:

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