World Risk Report

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Why storms turn into disasters

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World Risk Report

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Preface

For nine years, Bündnis Entwicklung Hilft and the Institute for International Law of Peace and Armed Conflict (IFHV) at Ruhr University Bochum have been united by a shared conviction. Global risks can only be effectively understood and addressed when academic analysis and humanitarian practice go hand in hand. This conviction enables us to translate well-founded data directly into concrete courses of action, working in an evidence-based and practical manner with a clear focus on the most vulnerable people worldwide.

One key insight runs through all previous editions of the WorldRiskReport. Disasters are not only natural events. Whether earthquakes, floods, or storms, it is societal vulnerability that turns them into humanitarian crises. Low- and middle-income countries are hit particularly hard, where poverty, weak infrastructure, and inadequate preparedness significantly exacerbate the consequences of extreme natural events.

This year, we are focusing on storms, one of the most common and most destructive natural hazards worldwide. Strong wind events often strike coastal regions and island nations in the Global South in particular, with devastating consequences for people, infrastructure, and economic development. And their destructive potential is growing. Climate change is further increasing the intensity of storms.

That is precisely why a publication like the WorldRiskReport is more important today than ever before. The number of extreme weather events is rising, while funding for humanitarian aid worldwide is under pressure. Climate risks, conflicts, and socioeconomic crises are intertwining to create increasingly complex emergencies. This complex situation calls for well-founded analyses, clear priorities, and the courage to shed light on uncomfortable realities.

The eleven member organizations of Bündnis Entwicklung Hilft draw on the expertise of the IFHV and external researchers to continuously improve the quality and effectiveness of their work. Together, we develop aid strategies that specifically reach those who are most at risk.

The WorldRiskReport is more than just an analysis. It is a shared mission to understand risks, assume responsibility, and drive concrete change for a more just and resilient world. With this edition, the report is being published for the first time with a completely redesigned look: fresh, modern, and ready to evolve alongside the challenges of our time.

Dr. Ilona Auer Frege
Managing Director
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Prof. Dr. Pierre Thielbörger
Managing Director
IFHV

WorldRiskReport 2026

Key findings

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How dangerous are storms?

Dr. Katrin Radtke; Dr. Ilona Auer Frege; Prof. Dr. Friederike Otto

→ Storms are not becoming more frequent, but they are becoming more intense. They often gain sudden strength just off the coast, thereby reducing the warning window.

→ Rising sea levels are creating new dangers. Coasts that were once considered safe are now facing an increased risk of flooding.

→ Storms do not affect everyone equally. In poor countries with rapidly growing coastal cities, more people are affected and protection is weaker.

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What protects societies from storms?

Philipp Kienzl

→ A state-run, nationwide civil protection system with mandatory evacuation plans, functioning early warning infrastructure and community-based disaster preparedness is essential. Informal structures can also make a decisive contribution to protection.

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Storm warning systems

Prof. Dr. Ilan Kelman; Prof. Dr. Carina Fearnley

→ Warning systems often fail to reach the most vulnerable people. Those who do not speak the language, who have difficulty walking or have no shelter are left behind despite the warning.

→ It is not the storm that causes the disaster, but people's vulnerability. Good warning systems start with this vulnerability and are developed together with those affected.

→ Warning systems are usually based on wind strength. However, it is the water from storm surges and flooding that claims the most lives. Focusing solely on wind means missing the greatest danger.

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Social protection systems

Dr. Mia Wannewitz; Dominic Sett; Gusti Ayu Ketut Surtiari

→ State assistance focuses on poverty, not vulnerability. As a result, two groups fall through the cracks: vulnerable people on middle incomes and poor people in the informal sector.

→ Where the state leaves gaps, informal networks step in. Neighborly assistance and community loans work quickly, but they are overwhelmed in the event of major disasters.

→ The two systems are not mutually exclusive. The state provides breadth, local networks provide depth. The state should support these networks, rather than replacing them.

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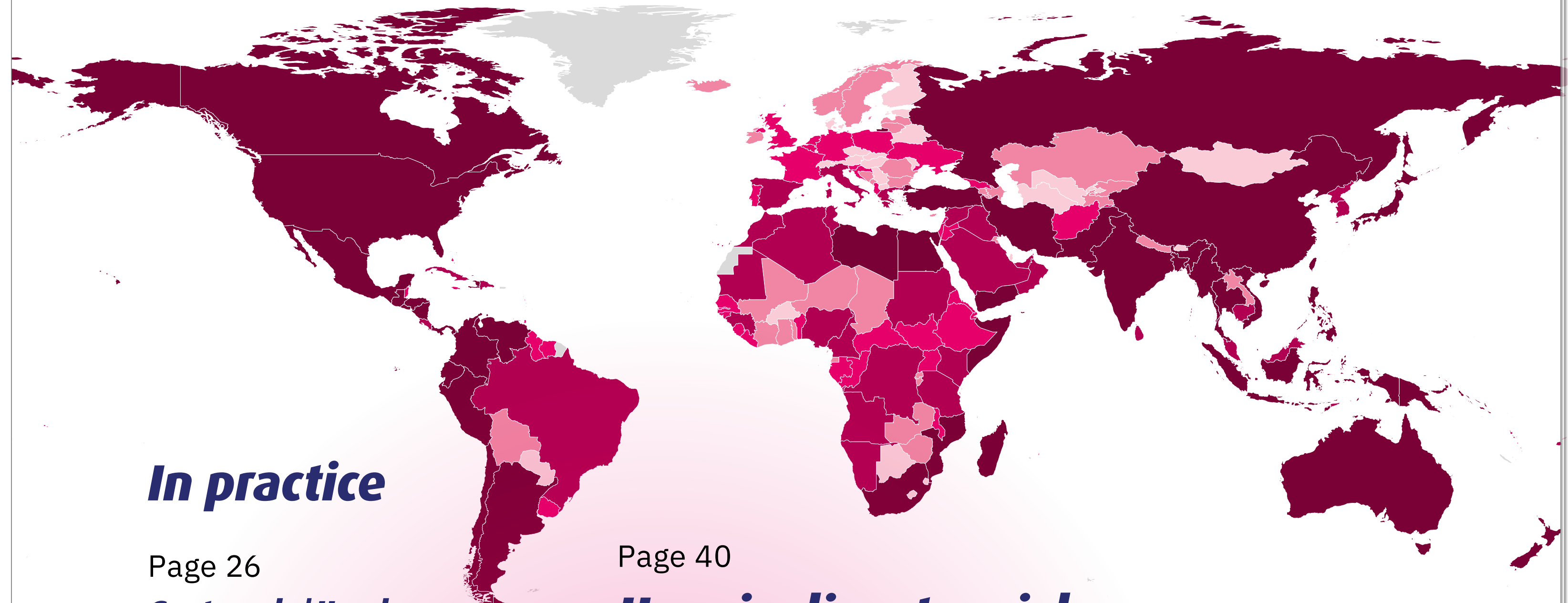
Remittances

Andrea Vismara; Dr. Rafael Prieto-Curiel

→ After storms, migrants send more money home. At a global level, these private remittances even exceed official emergency aid, yet they are largely overlooked in disaster preparedness.

→ They alleviate acute hardship, but the effect does not last. Migrants cannot keep giving money indefinitely. The structural causes of vulnerability remain.

→ Only those with relatives abroad benefit. Communities without a diaspora are excluded. Consequently, remittances exacerbate inequality.



In practice

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Guatemala | Honduras: Inclusive early warning systems for all

CBM Christian Blind Mission

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Poland: Help that comes knocking

Plan International Germany

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How is disaster risk distributed worldwide?

Daniel Weller; Annalisa Lombardo

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Overall risk

→ The ranking of the most at-risk countries has remained largely stable for the past 25 years. However, countries whose vulnerability is driven by conflict and instability are increasingly dominating the top of the list, rather than those affected by natural hazards.

RANK	COUNTRY	WORLD-RISKINDEX
1	Philippines	46.69
2	India	44.97
3	Indonesia	44.63
...		...
99	Germany	4.29
...		...
191	Andorra	0.33
191	San Marino	0.33
193	Monaco	0.21

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Regional focus: The Caribbean

→ Cuba and Haiti are equally exposed to storms. However, thanks to functioning warning systems, Cuba usually gets off lightly, while the same storm turns into a disaster in Haiti.

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Storm risk

→ No natural hazard is distributed more unevenly than storms. While 123 out of 193 countries are barely exposed to them, just ten countries bear the majority of global storm exposure.

RANK	COUNTRY	STORM-RISKINDEX
1	Philippines	69.27
2	Mexico	47.40
3	Madagascar	44.99
...		...
167	Germany	0.31
...		...
191	Luxembourg	0.18
192	Singapore	0.17
193	Monaco	0.15

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How do we lower storm risk?

Bündnis Entwicklung Hilft; Institute for International Law of Peace and Armed Conflict; Dr. Stephan Klingebiel

→ Storms turn into disasters whenever there is a lack of protection. These gaps systematically affect the most vulnerable. The report's findings lead to recommendations in three areas: early warning, social protection and disaster financing. All of them are based on the same principle: protection is only true protection if it excludes no one.

How dangerous are storms?

How dangerous are storms?

Dr. Ilona Auer Frege
Managing director
Bündnis Entwicklung Hilft

Dr. Katrin Radtke
Senior researcher
IFHV, Ruhr University Bochum

Climate change is making storms more intense, shifting their paths, and putting more and more people within their reach: what makes storms so dangerous from a physical standpoint, and why their potential for damage is growing worldwide.

When a storm is brewing over the ocean, every hour counts. Models calculate its path, authorities prepare for evacuations, and somewhere along the coast, people wait for what is to come. What happens next depends not only on wind, water, and waves, but also on whether warnings reach people in time, whether buildings can withstand the storm, and whether there will be someone to help afterward.

Storms are among the most devastating natural hazards. In terms of economic damage, they surpass every other category of extreme natural events. They rank third in terms of fatalities, after earthquakes and extreme temperatures (heat waves and cold waves) [11]. Hurricanes such as Melissa, which struck the southern coast of Jamaica in October 2025 with wind speeds of 305 kilometers per hour and later hit Cuba and the Bahamas, albeit in a somewhat weakened state, are no longer isolated incidents. Melissa killed around 90 people and caused more than 12 billion USD in damage in Jamaica alone [55]. Just the year before, Hurricane Helene had devastated several U.S. states and parts of the Caribbean, claiming around 230 lives and causing damage of about 80 billion USD [59].

According to the disaster database EM-DAT, between 2005 and 2024 an average of 108 storm events were recorded annually, claiming over 10,000 lives and causing economic losses of more than 34 billion USD per year [11].

Absolute damage figures, however, can be misleading. When measured against gross national income (GNI), the total income earned by a country's residents in a year, including earnings from abroad, a severe storm hits poorer economies disproportionately harder than wealthy industrialized nations [24]. Hurricane Katrina, which struck New Orleans in 2005, provides a clear example. With damages totaling 186.3 billion USD, it was one of the costliest storm disasters in recorded history [54]. The damage was enormous but amounted to roughly one percent of U.S. GNI. If a storm of comparable intensity strikes a poorer economy or a small island nation, it could wipe out several years' worth of economic output. This is due to the concentration of economic assets. Where large amounts of wealth are packed into a small area, absolute damage inevitably reaches record highs without capturing the actual burden on a country. Absolute figures alone can obscure the true scale of these impacts [87].

At the same time, the geographic reach of tropical cyclones is expanding. Regions that used to be storm-free are increasingly falling within the path of severe storms. When Hurricane Ophelia struck the Iberian Peninsula and Ireland in 2017, it served as an early warning sign. Tropical cyclones are shifting their maximum intensity measurably toward the poles [35]. These shifting storm tracks frequently reach regions whose building standards and emergency plans were never designed for severe storms.

These losses are on the rise. According to EM-DAT, disaster-related losses in the 1990s still amounted to about 475 billion USD. By the 2000s, they had risen to over 766 billion USD, and in the 2010s to nearly 996 billion USD. In the current decade, damages of around 792 billion USD have already been recorded. Notably, the few years of the current decade so far already account for a large share of the total losses recorded across the entire 2010s.

The term "storm" encompasses very different phenomena. The following section explains what these are and why tropical cyclones are the central focus of the WorldRiskReport.

Storms come in different forms

Cyclones, hurricanes, typhoons—the different names for tropical cyclones reflect where they form. Hurricanes form in the North Atlantic and the northeastern Pacific, typhoons in the northwestern Pacific, and cyclones in the Indian Ocean and the southwestern Pacific. They all share one requirement: warm ocean water. The key difference lies between tropical and extratropical storms.

Tropical cyclones are the central focus of the WorldRiskIndex. Not only because of their high intensity and vast extent, but also because climate change is intensifying them in particular. There is also a methodological reason. They are easily observable on a global scale, produce geographically well-differentiated wind hazards, and can be reliably linked to societal vulnerability indicators, a fundamental methodological requirement for a globally comparable risk index. A hazard can be linked to vulnerability data for the same region only once it is precisely located in space. Without this, risks cannot be compared across very different countries.

Extratropical storms form in the temperate latitudes, including Europe as well as North America, East Asia, and the Southern Hemisphere. They are less intense but bring enormous amounts of rain or snow, sudden drops in temperature, and storm surges. Due to climate change, they are seeing increasingly high levels of precipitation.

Convective storm systems form when warm, moist air rises rapidly, condenses, and releases energy. They range from simple thunderstorms to long-lived supercells, strongly rotating thunderstorm systems that are considered the most intense form of convective weather events. Supercells in their most extreme forms can give rise to tornadoes. A tornado is defined as a rotating column of air that connects the underside of a cloud to the Earth's surface and is classified on the Fujita scale (F0–F5). Tornadoes are among the strongest wind phenomena in the atmosphere, reaching speeds of more than 500 km/h. However, they are spatially confined and are usually active for only a few minutes. They typically form over land but can also occur over water (so-called waterspouts) [19].

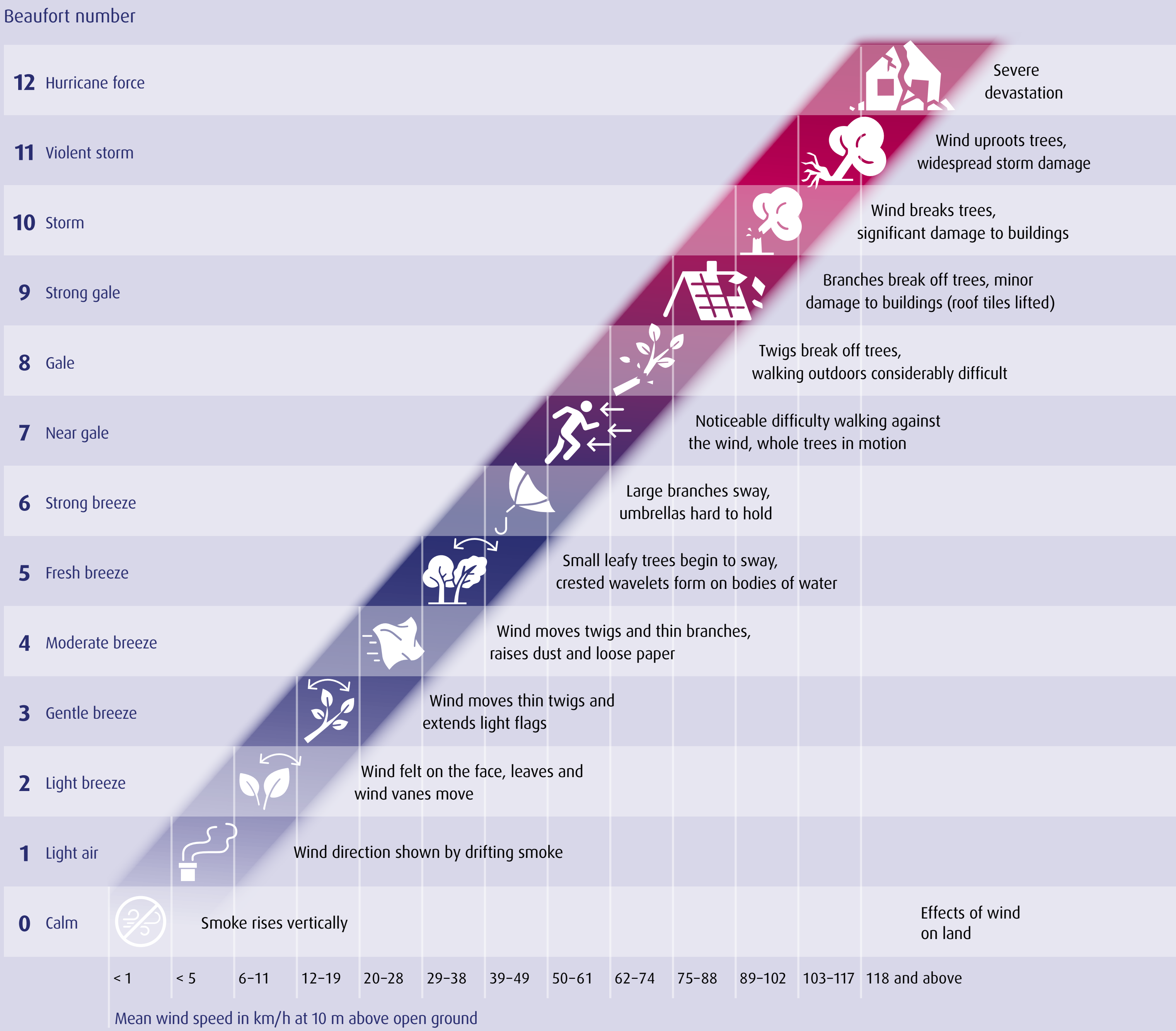
A common feature of all convective storm systems is increased rainfall due to climate change. Since warmer air holds more moisture, thunderstorms today produce more intense levels of precipitation than in the past, in a colder climate. This also makes this type of storm a significant source of damage [35].

Of all these types, tropical cyclones cause by far the greatest damage worldwide. Why they are so destructive is, first of all, a question of their physical force.

Why storms are dangerous

Not all storms are equally dangerous. The determining factors of storm danger, aside from their path which determines where the storm makes landfall and affects people, include three physical characteristics: wind speed, geographical extent, and duration. Wind speed is classified on the Beaufort scale, which has 13 levels ranging from calm to hurricane force. Starting at level 9 (75–88 km/h), wind is considered a storm; starting at level 12 (118 km/h or higher), a storm is capable of causing structures to collapse. For tropical cyclones, the Saffir-Simpson scale (Categories 1–5) applies, ranging from Category 1 (≥ 119 km/h) to Category 5 (≥ 252 km/h). Widespread damage to buildings and infrastructure starts at Category 3.

When does wind become dangerous?



Source: DWD 2022 [18]

Note:
The Beaufort scale classifies wind speeds by their observable effects on the environment and structures.

The two scales capture different things. While the Beaufort scale already ends at hurricane force, the Saffir-Simpson scale further differentiates the higher wind speeds of tropical cyclones. As wind speed increases, the damage pattern shifts, from flying objects and snapped branches to roofs being torn off and trees being uprooted.

The more extensive a storm system is, the slower-moving and longer-lasting it tends to be. Tornadoes, typically less than one kilometer wide, often remain over an area for less than ten minutes. Tropical cyclones, on the other hand, can span several hundred kilometers and gain strength over the ocean for days before making landfall. What matters here is not so much the individual gust, but the duration of the strain. What withstands a brief gust may fail after hours of sustained pressure. It is this combination of wind field characteristics, intensity, and duration that makes tropical cyclones particularly destructive.

The situation becomes even more dangerous when storms suddenly intensify just before making landfall. This phenomenon, known as rapid intensification, occurs when wind speeds increase by more than 55 km/h within 24 hours. This drastically reduces the warning window for evacuations [56]. Evacuations need lead time. Transport routes, emergency shelters, and government decisions cannot be arranged in a matter of hours. If a storm climbs several categories overnight, plans made for a weaker event suddenly fall short. Hurricane Ian in 2022, for example, intensified from a Category 2 to a Category 4 hurricane in less than 24 hours before making landfall on Florida's Gulf Coast, too late for many evacuations. Warmer ocean surface temperatures are making this phenomenon more common [15].

Storms rarely come alone. They usually strike alongside heavy rain and storm surges. Often, the initial wind damage isn't even the most significant challenge. What follows are chain reactions: Heavy rainfall causes rivers to overflow, flooding saturates the ground, and landslides block roads. Falling trees and debris can lead to infrastructural collapse when power poles and substations are damaged. Without electricity, water treatment facilities, hospitals, and communication systems fail. Rescue workers cannot reach cut-off communities, and disrupted supply chains result in long-term loss of income. Where clean drinking water becomes scarce, there is a risk of outbreaks of waterborne diseases such as cholera or hepatitis A. Many of these consequences do not emerge until long after the storm has passed. While wind damage is immediately visible, disruptions to services and infrastructure unfold over days and weeks. Cyclone Idai in 2019 (Mozambique), Hurricane Otis in 2023 (Mexico), and Hurricane Melissa in 2025 (Jamaica and Cuba) are prime examples of such cascading effects. ⟶

see figure on page 20/21

A storm surge, the storm-driven rise in sea level that can flood coastal areas, is particularly deadly. It builds when strong winds drive water ahead of the storm and low air pressure lifts the sea surface further. In shallow coastal waters, this mass of water piles up and can surge far inland. In the case of tropical cyclones, storm surges, not winds, have historically been responsible for most deaths. During the 1970 Bhola Cyclone in Bangladesh, at least 300,000 people died almost exclusively because of storm surges [58]. During Hurricane Katrina in 2005, drowning was the most common cause of death, accounting for 40 percent of fatalities [81]. Rising sea levels further exacerbate this danger. Protective structures designed for today's water levels are gradually losing their effectiveness. What is currently considered a “once-in-a-century” flood could become a regular “once-in-a-decade” event if sea levels rise by half a meter [34].

Islands and coastal cities face the highest storm risk

Storm risk is unevenly distributed, and the potential for damage is increasing, even independently of climate change, simply due to the rapid urbanization of exposed coastal areas. As more and more people live in densely populated coastal cities, informal settlements spring up in floodplains, and critical infrastructure becomes concentrated in high-risk areas, storm damage increases even if storm intensity remains the same. In the following interview, climate scientist Friederike Otto explains where and why climate change is impacting the intensification of storms.

Prof. Dr. Friederike Otto
Climate scientist
Centre for Environmental Policy
Imperial College London

How do storms develop?
A conversation with …

Prof. Dr. Friederike Otto is a climate scientist and co-founder of *World Weather Attribution* (WWA). She is considered a pioneer of attribution science, a discipline that calculates the extent to which human-induced climate change alters the frequency and intensity of extreme weather events. Her research consistently connects natural science with questions of social justice.

Are there more devastating storms today than in the past?

Yes, there is strong and rapidly growing evidence that today's storms are more destructive than those of the past. While the total number of tropical cyclones worldwide has remained relatively stable, their intensity has increased due to human-induced climate change. Thus we are seeing a rise in the proportion of the most powerful storms, those classified as category 3 to 5, which are responsible for the vast majority of devastation from tropical cyclones.

What is the reason for this?

The reason for this is climate change, that is human-induced climate change resulting from the burning of fossil fuels. As greenhouse gas concentrations rise, the atmosphere warms overall, which in turn leads to higher sea surface temperatures. When a tropical cyclone develops under these warmer conditions, it has access to more energy, increasing the intensity of its wind speeds and associated rainfall. We see this very clearly in observations, but also in climate models. Combining the two, and comparing the intensity of storms in today's climate to the intensity in a world before human-induced climate change, which is called weather or climate attribution, shows clearly that storms today are more intense. For tropical cyclones we find these in all basins, but particularly strongly in the North Atlantic.

Are there regions that are particularly affected by storms?

In recent years we've seen particularly intense cyclones in the Caribbean, North Atlantic, the region around the Philippines in the Pacific and the Indian Ocean around Madagascar. But all regions currently affected by tropical cyclones will see more intense cyclones, including those with intensities beyond anything ever observed, in the coming decades. There is much less evidence for extratropical cyclones and storms over land.

Why do storms occur in these areas particularly?

Tropical cyclones only occur in regions where sea surface temperatures are very high, they are therefore limited to the tropics and adjacent regions. However, with increasing warming these regions expand further north and south, leading to tropical cyclones now reaching areas never before affected by tropical cyclones, as we've seen with hurricane Ophelia in 2017 that reached to far north to strongly affect the Iberian Peninsula and ultimately made landfall as an extratropical storm in Ireland. Cities like New York and Boston, or Beijing and Tokyo will see tropical cyclones in the future.

Do storms differ in various regions of the world?

Yes. Outside the regions where tropical cyclones can develop we see extratropical cyclones, which in some parts of the world, like Europe also often develop over the sea, but are much less strong. They are responsible though for most of the rain during the winter months in Europe and other temperate regions. Especially in Northern Europe we see an increase in the number of these storms, which means that winters have become much wetter. Another type of storm are thunderstorms, resulting from direct convection on comparatively warm days. Because they are very small in size, we have very poor observations globally. But due to the increased water holding capacity of warmer air, when thunderstorms develop, they drop more rain than they used to in a colder climate.

Why do some storms become especially dangerous, and what are their characteristics?

Storms become dangerous when environmental conditions, such as warm ocean waters, low wind shear, and high atmospheric moisture, allow them to intensify, producing strong winds, heavy rainfall, and storm surge. Their impact is further amplified by factors like slow movement, large size, and the vulnerability of affected communities. In a warmer climate, these conditions are met more often. Damages are not only caused by high windspeeds, but to a large degree also by the associated rainfall, that can be particularly severe when storms are moving slowly, as happened with hurricane Harvey in 2017 or Melissa in 2025.

What significance will storms have in the future?

As a result in particular of the increase in more intense tropical cyclones, storms pose growing challenges for coastal cities, infrastructure, food systems, and insurance markets. Their future significance lies not only in their physical intensity, but also in how well societies adapt, through resilient infrastructure, improved forecasting, early warning systems, and climate mitigation efforts. The impacts today are already reaching the limits of what societies can adapt to, as we've seen with Hurricane Melissa in 2025, thus limiting warming to 1.5°C is crucial for societies to get a chance at adaptation.

Due to their exposure, small island nations and coastal cities face particularly high storm risk levels. The potential for damage is increasing, regardless of whether storms are becoming more intense. More and more people are living in vulnerable coastal areas. Coasts attract residents and economic activity, because that is where ports, trade, and tourism converge. This means that the economically strongest places often grow precisely where the storm risk is greatest. As a result, critical infrastructure, such as hospitals, ports, and energy grids, is increasingly concentrated in storm-prone zones. That alone is enough to exacerbate the consequences of future storms.

Nowhere is this vulnerability more pronounced than in small island developing states (SIDS). They have no protected hinterland and no means of internal evacuation. Unlike in large territorial states, no unaffected region can step in, send supplies, or shelter those affected. When a powerful cyclone strikes, the entire territory, including all hospitals, schools, roads, power grids, ports, and airports, is caught in the storm at the same time. The potential for damage is significantly increased, while the capacity to respond is minimal [95]. On top of this, the very authorities, hospitals, and emergency services meant to manage a disaster are themselves in the middle of the storm. Without international aid, reconstruction is virtually impossible. When Hurricane Maria struck Dominica in 2017, the damage amounted to 226 percent of the national GDP, more than the country's entire annual income [25].

Similar trends are evident in the coastal cities of the Global South. In Dhaka (36.6 million inhabitants) and Manila (24.7 million inhabitants), millions of people live in informal settlements and flood-prone areas, with little protection against storms and flooding [7]. Informal settlements often arise in an unplanned way on especially hazardous land, such as floodplains or unsecured slopes. Their housing is rarely built to withstand storms. Public infrastructure is often already overburdened even under normal conditions. Where residents and assets are packed into a small area, a single storm strikes vast numbers at once. And millions can hardly be brought to safety at short notice. Routes out of the city quickly become jammed, and often people have nowhere to go. The following chapter examines in detail how vulnerable these societies are to storm events, as well as their existing capacities and gaps.

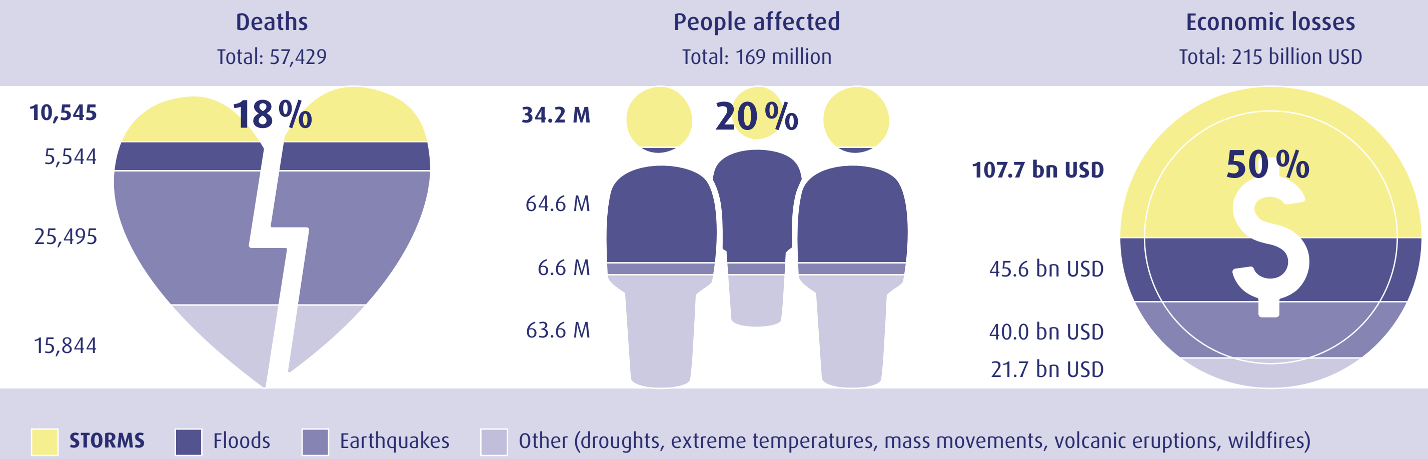
A storm's strength is not the only factor

Whether a storm turns into a disaster does not depend solely on its intensity. The WorldRiskReport therefore examines why storms become disasters and also focuses on societal failures and potential courses of action. The WorldRiskIndex defines disaster risk as the interplay between physical exposure and societal vulnerability. Exposure describes the extent to which a population is exposed to storm hazards, such as wind speeds, storm surges, and heavy rainfall. Vulnerability describes how well a society is prepared for such events and how quickly it recovers, as reflected in factors such as building standards, social safety nets, health care, early warning systems, and institutional capacities. The same wind speed can lead to very different consequences, depending on what resources a society has to counter the storm.

Storm risks can be reduced at many levels. The articles in this report examine what households and communities can contribute, from traditional knowledge and informal solidarity networks to remittances from migrants. Governmental early warning systems, evacuation plans, and storm-resistant infrastructure remain an indispensable foundation.

Insurance can also play a crucial role in the aftermath of a storm. In the Global North, it now covers about half of all storm damage. In the Global South, the figure is generally less than ten percent and can often be significantly lower. This protection gap is not accidental. It is structural. In many countries, building insurance is either unavailable or unaffordable for the majority of the population. Informal settlements, where a large share of the exposed population lives, are typically not insurable at all. Mandatory government insurance programs or disaster relief funds, which at least partially offset losses in the Global North, are largely absent [51]. This shortfall directly shapes how quickly reconstruction succeeds. Where insurance applies, money for repairs and replacements is quickly available after a storm. Where it is lacking, households must shoulder the loss on their own at first.

What role do storm disasters play in disasters worldwide?



Percentages rounded to whole numbers
Source: CRED 2026 [11], averages 2005–2024

When government aid fails to materialize and international support arrives too late, affected households have little room to maneuver. They dip into their savings, go into debt, take their children out of school, or sell means of production such as boats, fields, tools, and livestock. What begins as a stopgap measure can turn into a spiral of poverty that delays reconstruction for generations. It is such steps that destroy the basis for future income. What is sold in an emergency is missing during reconstruction, and those who drop out of school or paid work often struggle to return.

A comparison between Hurricane Ian in 2022 (USA) and Hurricane Matthew in 2016 (Haiti) makes this clear. Both storms were physically similar in intensity. Both reached Category 5 over the ocean and made landfall as Category 4 storms [53, 52]. In Florida and South Carolina, early warning systems and evacuation plans worked better. The Federal Emergency Management Agency (FEMA) and the National Guard arrived on the scene quickly, and insurance companies covered the damage. Most areas were habitable again within months. In 2016, Haiti had not yet recovered from the aftermath of the 2010 earthquake. More than half the population was undernourished, financial reserves were lacking, and drinking water was scarce. Early warnings were issued, but the population was poorly informed, and the evacuation was chaotic [98]. The infrastructure was dilapidated, and buildings were not storm-proof. The government was overwhelmed by disaster management. Political instability and corruption further slowed the crisis response, and international aid was slow to arrive. Reconstruction took years. Ultimately, it was not the storm that determined the scale of the disaster, but rather what society had to counter it with. —

Note:
Storms cause about half of global disaster damage, but a considerably smaller share of deaths.

What protects societies from storms?

Philipp Kienzl
Project lead
Communications officer
Bündnis Entwicklung Hilft

What protects societies

Whether a storm turns into a disaster depends not only on its intensity, but also on the vulnerability of the society it strikes. What vulnerability means in the context of storms, and why it is so unevenly distributed.

In October 2016, Hurricane Matthew, a Category 4 storm, first struck Haiti and shortly afterward Cuba. The meteorological conditions were nearly identical in both cases: wind speeds of up to 230 kilometers per hour, heavy rainfall, and a broad storm front. According to the U.S. National Hurricane Center, more than 500 people died in Haiti, and hundreds of thousands lost their livelihoods. In Cuba, however, not a single direct fatality was recorded. Both countries lay in the same storm path [52]. The drastically different consequences were not meteorological, but social in nature.

It is not the physical intensity of a storm alone that determines the scale of a disaster, but rather the social conditions it encounters. Storms unleash their destructive power rapidly and across a wide area, primarily through the combination of wind, storm surges, and flooding. Which people and communities are hit particularly hard is not a matter of chance.

Who is vulnerable and why

Social vulnerability begins with where and how people live. According to estimates by UN-Habitat, more than 1.1 billion people worldwide lived in slums or informal settlements in 2025, a large share of them in tropical coastal regions with high exposure to storms [88]. Structures made of corrugated iron, wooden slats, or other lightweight materials, without any anchoring to the ground and often in topographically exposed areas on hillsides, in floodplains, or in the immediate vicinity of the coast, offer little protection against wind speeds of 150 or 200 kilometers per hour. What would have resulted in a damaged roof in a storm-proof building then becomes a life-threatening situation. This structural vulnerability is not an individual failure, but the result of decades of growing social and economic inequality: a lack of property rights to the land on which people live, a lack of access to credit for solid construction, and state neglect of urban peripheries.

Physical vulnerability is compounded by social vulnerability. Women are disproportionately affected in many storm disasters [26]. There are structural reasons for this. Limited economic independence, reduced mobility, and expectations regarding societal roles can lead women to delay evacuating until children and elderly family members are safe, or to be systematically excluded from safety information. Studies on cyclone events in Bangladesh and India show that women in coastal areas die significantly more often than men [75, 69]. Older people and people with disabilities rely on external support, which cannot always be organized in time during the critical hours before a storm. People living in extreme poverty, undocumented migrants, and others without secure access to state protection systems have neither material resources nor institutional support. They are often unable to respond to an evacuation warning because they lack the means.

What safeguards societies

Whether a society can cope with the immediate impact of a storm depends on the protective and response capacities it has in place and on who has actual access to them. Early warning systems are rightly considered one of the most effective measures for reducing storm-related deaths. Bangladesh provides a striking example of what is possible: While Cyclone Bhola in 1970 claimed the lives of at least 300,000 people [100], Cyclone Sidr in 2007—one of the strongest storms in the country's history, with wind speeds of up to 260 kilometers per hour—killed approximately 3,400 people according to official figures [29]. This dramatic reduction over the decades is largely due to the systematic development of a nationwide network of cyclone shelters and a community-based early warning system.

However, even a well-developed early warning system can only fully realize its protective potential if it does more than deliver meteorological accuracy. Early warning is not merely a technical task, but an urgent social one. A warning that comes in too late, is phrased in a language people do not understand, or is disseminated through channels to which marginalized groups have no access, fails to serve its purpose. The United Nations Sendai Framework for Disaster Risk Reduction (2015–2030) [85] therefore explicitly emphasizes that early warning systems must be people-centered. This means that they must not only communicate the intensity of the approaching storm but also actively take into account the vulnerability of the affected population. Who are the people in the storm's path? Which groups cannot respond to a warning on their own? Which households need active assistance in evacuating? This primarily affects people without cell phones, access to radio, literacy skills, or the financial means for a last-minute evacuation. →

The systemic dimension

Perhaps the most serious effects storm disasters can have on highly vulnerable societies occur when multiple systems simultaneously fail. Cyclone Idai, which struck Mozambique, Zimbabwe, and Malawi in March 2019, clearly illustrates this. In the Mozambican coastal city of Beira, around 90 percent of buildings were damaged or destroyed. Roads were blocked, bridges washed away, and relief supplies could not reach affected areas for weeks. As water supply and sanitation infrastructure failed simultaneously, cholera spread rapidly. Schools, markets, and crop fields all failed at the same time [92]. The disaster struck a society whose systems were already under chronic strain before the storm and had little capacity to absorb additional shocks. The ability to structurally adapt to recurring or more intense storm events, for example, by building robust infrastructure, diversified economic structures, and resilient institutional capacities, is ultimately what distinguishes long-term resilience from persistent vulnerability.

This capacity to adapt is unevenly distributed, and where government structures fail or are inadequate, informal mechanisms and social networks often step in to fill the gap. Neighborhood associations and local solidarity networks are often the first to respond in the event of a disaster, organizing evacuations and coordinating initial relief efforts even before external aid arrives. These networks are often not considered in official disaster response plans, yet for many affected people they constitute the first real line of defense. At the same time, they too reach their limits where poverty and isolation are so severe that even communal resources are insufficient. ↗

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Remittances sent by migrants living abroad are another good example of this. In the Philippines, the world's most storm-exposed country, they accounted for around nine percent of gross domestic product in 2023, according to the World Bank [103]. Following severe typhoons, these transfers reach affected households faster and more directly than government or international emergency aid—without bureaucratic obstacles or application procedures [33]. It is this immediacy that makes them so valuable in the event of a disaster. They close real gaps in protection that should not exist in the first place. Countries and communities that cannot rely on such

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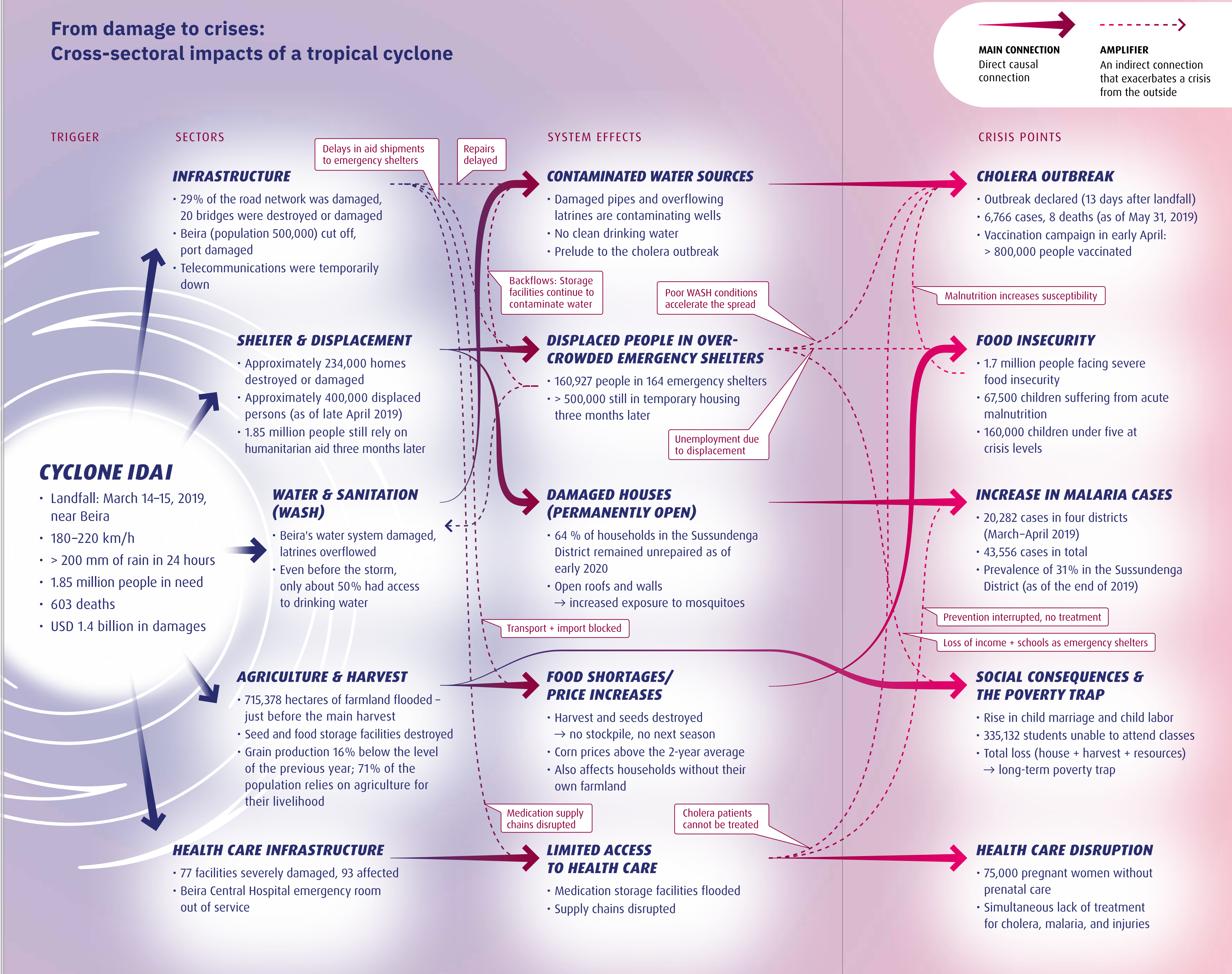
from storms?

From damage to crises: Cross-sectoral impacts of a tropical cyclone



Sources: FAO / WFP 2019 [22], Lequechane et al. 2020 [40], MISAU / INS / WHO 2019 [46], OCHA 2019 [62], Republic of Mozambique 2019 [71], Searle et al. 2023 [73], UNICEF 2019 [90]

transnational networks, resilient institutions, or government budgets remain structurally weakened after every storm and thus even more vulnerable to the next one. →

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From the structural integrity of individual homes to access to early warning and social protection systems, and on to the long-term capacities that enable societies to respond to changing storm risks, societal vulnerability to storms manifests itself on many levels simultaneously. The difference between Haiti and Cuba in October 2016 makes this clear. Cuba has a state-organized, nationwide civil protection system with mandatory evacuation plans, well-maintained early warning infrastructure, and community-based disaster preparedness. These are capacities that have been systematically built up over decades. Haiti, by contrast, was still recovering from the devastating 2010 earthquake when Matthew hit, with governmental and infrastructural capacities severely weakened [89, 82]. Where targeted investments are made in such structures, vulnerability can be reduced. This is not merely a scientific finding, but a political task requiring determined action. —

Note:
This network of effects shows, using Mozambique as an example, how an extreme storm triggers systemic risks. The simultaneous, mutually reinforcing cascades explain the intensity and duration of the crisis.

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The storm is not the disaster

Storm warning systems must reduce vulnerabilities, not just track hazards. *All-Vulnerability Warning Systems* (AVWS) consider all hazards, all time scales, and all people. They must be designed with and for the communities they serve.

The purpose of a warning system is to reduce disaster risk. Storm risk combines the hazard of a storm with vulnerability to the storm. A storm does not necessarily lead to adverse consequences. A small storm striking a care home or hospital could lead to a catastrophe, while a large storm in an uninhabited area might pass almost unnoticed.

The difference between the two situations is the consequences, meaning the casualties, damage, and disruption, suffered by people and society; that is, adverse consequences due to vulnerabilities. The root causes of disasters are vulnerabilities, rather than storms themselves. This emphasizes that reducing vulnerabilities is a far more effective means of preventing disasters than trying to modify or manage hazards [30, 41, 99].

In 1970, Bangladesh (then East Pakistan) was devastated by a cyclone which resulted in hundreds of thousands of deaths. Further cyclones in 1985 and 1991 each killed tens of thousands. Over the last decade, at least three major cyclones have swept through the country, with death tolls in the dozens—still catastrophic, but a drastic improvement. The reason lies in an adapted approach toward warning systems by treating them as long-term societal processes which cannot reduce hazard potency, but which can and should reduce vulnerabilities when implemented correctly. For Bangladesh, this process has involved education from a young age about cyclone safety, village-level warnings that are accurate and trusted, measures to evacuate people and livestock that have public acceptance, safe shelters, and livelihoods with sufficient diversity to be picked up after returning home. This form of vulnerability reduction through vulnerability-focused warning systems reduces storm risk over the long term.

Modifying storm hazards is nonetheless another strategy for reducing storm risk. Roof and wall angles alter the wind forces a building is exposed to, reducing or increasing damage. Community planning and landscape engineering can channel floods away from occupied areas into green spaces, car parks, and bodies of water.

Structures such as levees, dikes, and dams can alter flood hazards. The systems of barriers, barrages, and walls built to reduce the impact of storm surge in cities such as London, Rotterdam, and Hamburg serve this purpose. They contribute to a public sense of security against flooding—even though flood resistance, warning, and evacuation measures typically lapse and hence can cause increased vulnerability, including by paying less attention to warnings. Flood risk from storms then increases overall since, although some hazard levels are reduced, vulnerability levels increase [20].

After the Thames Barrier and related walls were built in London, the Canary Wharf area was turned into an international finance center on former wetlands which used to flood regularly. Without the increased sense of flood protection, those wetlands would still be deemed to have a high degree of flood risk. The high level of infrastructure built for Canary Wharf would likely have been reconsidered. Downstream, multiple blocks of flats have been constructed near the river's edge with one small green area left as an eco-center to demonstrate the area's former marshland status.

In this and other ways, vulnerabilities to storms can be created, perpetuated, and reduced by choices entirely independent of weather conditions. Warning systems are a key part of these processes.

Storm warnings

Storms are always multi-hazard events, comprising wind, water, and energy-related factors (including lightning). Any warning system for storms therefore needs to be what is often termed a *multi-hazard early warning system* (MHEWS). The meaning of 'early' can vary and is disputed. Knowing that cold-weather storms happen in the winter and that thunderstorms are more typical outside of the winter season already provides a season-related warning mechanism. Another seasonal warning mechanism relates to annual cyclonic storm patterns, such as when polar lows occur in Norway from October to May and typhoon season in Hong Kong from May to October. Despite these patterns, earlier and later storms can occur, which can undermine the seasonal early warning.

Days or hours of warning can be provided for the area directly in a specific storm's path. In contrast, flash flooding can manifest in minutes when a cloudburst appears even during a previously calm and sunny day. Any storm warning must be sensitive to various hazards, potentially including air temperature, precipitation type, precipitation amount, wind speed, wind direction, iciness, lightning, and tornadoes.

When a weather system with cyclonic potential is detected, a large area might have a week's warning or longer before the storm makes landfall. More precise estimates of the time, place, and strength of landfall are updated as the storm evolves. Human-caused climate change seems likely to be shortening this 'early warning' period. In October 2023, a near-shore tropical storm intensified into Category 5 Hurricane Otis in 24 hours before striking Acapulco, Mexico, with barely a few hours' notice, producing further storm-related hazards such as erosion and landslides [70].

Hurricane Otis raises another issue about cyclonic storm warnings. Tropical cyclones are typically assigned a sustained wind speed-related category from 1 to 5 on the Saffir-Simpson scale. Gusts also cause damage, especially when debris is taken into account. However, most storm-related deaths are caused by flooding, from storm surge and rainfall-related freshwater flooding. Tropical Storm Allison in 2001 was not a hurricane, yet its floodwaters devastated Houston, as did Hurricane Harvey's in 2017. A warning system focused solely on a cyclonic storm's wind speed rarely tells the whole story.

Storm warning systems face complex challenges, and tornadoes are a good example. In Tornado Alley in the USA, the usual emergency management guidelines are that tornado season runs each year from 1 January to 31 December, with the possibility of a tornado occurring each day between midnight and 11:59 pm. Consequently, 'early warning' means 'always be ready for a tornado'. If a warning system as a societal process is fully implemented, then warning fatigue need not arise. 'Always being ready for a tornado' does not necessarily require constant scanning of the skies. It means readiness, capability, and willingness to receive local tornado touchdown alerts and to follow evacuation protocols to a safe place. It is an embedded culture of knowing how to be reached by alerts, ensuring the functioning of alert mechanisms, maintaining safe shelters, and having the ability to reach and stay in those shelters without panic or stress.

Tornado warnings are sometimes issued days in advance, but actual touchdown might only happen with minutes' warning before a twister rips through a building. Those who have grown up in 'Tornado Alley' may have a degree of tornado awareness, which recent arrivals may lack. The German public does not typically have a high degree of tornado awareness, even though the country experiences one tornado per month on average and tornadoes have appeared in every month of the year [5]. Where tornado awareness is lacking, a warning of a touchdown and of actions to immediately take might not convey the urgency and seriousness of the situation.

These examples demonstrate the complexities of storm warning systems and why early warnings cannot follow a fixed timeframe. Furthermore, none of this discussion addresses the root causes of disasters; that is, vulnerabilities.

Highlighting vulnerabilities

Focusing on vulnerabilities for warning systems means a shift from highlighting hazards and MHEWS toward *All-Vulnerability Warning Systems* (AVWS). An AVWS approach neither ignores nor abandons MHEWS, since warning about particular hazards remains important. For instance, evacuating to safety means moving to the upper floors of a building for flood and landslide warnings and to basements for tornado warnings—in each case, provided that the structure will not collapse. When a storm could bring floods, landslides, and tornadoes, evacuation routes should lead to a basement outside of a potential floodplain or landslide zone, or into a non-basement, tornado-safe, and collapse-safe room.

To consider simultaneously the wide range of forms an AVWS can take depending on the type of storm hazards, two overlapping aspects must be focused on:

1. People with different vulnerabilities experience the same hazard differently.
2. A person's vulnerabilities produce similar experiences across different hazards.

On the first point: individual characteristics can produce physical vulnerabilities. For example, older women are most prone to osteoporosis. Unless they have had adequate medical prevention and treatment, they are more likely to experience bone fractures if a building they are in collapses during a storm or if they are hit by debris. People with restricted mobilities, from arthritis or using crutches or a wheelchair for example, require more time and possibly equipment to evacuate and shelter. Pre-storm planning taking them into account and ensuring equipment availability would be part of an AVWS, providing them with the same evacuation opportunities and timeframes as everyone else.

Acting prior to a storm (that is, using early warning) means that these individual vulnerabilities can be overcome through applying an AVWS. Societal choices made in developing and applying an AVWS determine whether those measures are put in place. As a result, many physical vulnerabilities emerge through socially created vulnerabilities.

Individual characteristics can produce social vulnerability traits. In some cultures, women and girls are expected to wear clothes which are not suited for running or cycling when avoiding floods or (land)slides, or when trying to reach a storm shelter. They need more time or a vehicle. They also would never remove their clothes or wear different clothes to increase their chances of survival. Some cultures do not permit women and girls to appear publicly without an accompanying man—or at all when menstruating—again hindering evacuation and sheltering.

Assault and harassment—on the basis of sex, gender, sexuality, race, ethnicity, caste, and disability, for example—are common problems when evacuating and in shelters. This forces some people to choose between the dangers of a storm and the dangers of evacuating and sheltering—a form of manufactured social vulnerability. Sometimes, employers demand that employees stay at work even when 'immediate danger to life' warnings have been issued. People who go to safe places survive but lose their jobs.

All these social conditions create vulnerabilities to storms. People without those vulnerabilities are far safer in the same storm. Addressing these vulnerabilities and alleviating the fears surrounding them are at the core of an AVWS. In Haiti, to ensure women's full participation in the warning system process, public communications involved a local female musician, local radio stations, and local graphic designers with the purpose of connecting with young girls and elderly women. Because the warning system process, by definition, is about people, working through this process can reduce vulnerabilities in the long term. Public engagement with an AVWS should, for instance, lead to menstruating women being permitted to evacuate alone and to ensure that people using wheelchairs do not need assistance to reach, be comfortable in, and leave shelters.

The second point is that a person's vulnerabilities can produce similar outcomes across different hazards. Consider again people with restricted mobilities. Without measures to support their needs, they will suffer from similar vulnerabilities regardless of the hazard. An AVWS reduces the vulnerabilities these people face in all situations.

Some people are color-blind, yet warning maps frequently represent safety, caution, and danger with green, amber/orange/yellow, and red. Color-blindness is not the cause of a map-misreading vulnerability. The choice of colors for warning maps is what creates or alleviates it. Similarly, hesitancy to leave a storm danger zone for fear of assault and harassment, or due to lack of privacy and hygiene, applies across all storm-related hazards.

All-vulnerability warning systems for storms

Recognizing why some people might be reluctant to respond to storm warnings due to preexisting vulnerabilities is central to building an AVWS. An AVWS must be designed and operated by the people using it, so that it addresses everyone's needs. As vulnerabilities are dynamic, an AVWS must adjust as people and places change. How far an AVWS can go remains an open question.

Consider the devastating July 2021 floods from several storm systems across Europe, which killed over 240 people. Silva et al. [76] simulated a variety of warning scenarios for Germany, identifying a major limitation of the warning systems at the time that hazard maps did not indicate the actual inundation extent, despite several days of warning that major flooding was expected in those areas. An AVWS could be implemented to avoid a recurrence.

The key question remains: who needs what kind of help in a specific storm? Everyone must be included for a complete warning system, recognising how their needs change. If it is considered too difficult to create and maintain an AVWS 'for all', justification would be needed for choosing those excluded. This approach is not about identifying and tracking every individual. It is about understanding potential individual and collective needs, quantitatively and qualitatively, to ensure that an AVWS meets those needs and adjusts as they change.

Anyone's vulnerabilities shift according to different factors such as their level of fatigue and stress, their dependents or dependency on people around them, and their intake of caffeine, medications, alcohol, and drugs. A fit person can break a bone, becoming less mobile while it heals, or become bedridden with flu. It is not necessary to know how many people are inebriated and to what extent at any given time. It suffices to know that people's cognitive and physical abilities span a wide range and all must be part of an AVWS. For example:

- Alerts must be audio, visual, and text, and people should be able to choose their preferred format(s).
- Information must be available in the common languages of a given area, especially since not everyone uses translation apps and since translation apps remain riddled with errors that can lead to dangerous misunderstandings.
- Evacuation routes and shelters must have step-free options and account for hygiene, privacy, and dignity needs.

Individual vulnerability dynamics can change hourly and decadally. Rather than the impossible task of gathering real-time data on every individual—aside from the ethical concerns—simulations, drills, exercises, and focus groups can help identify the strengths and potential areas for improvement of an AVWS, whether still being designed or already operational. Simulations help ensure that every individual is covered by warning systems and show how much an AVWS can and should adjust to each individual's vulnerabilities and to changes in vulnerabilities across time scales. —

Leave no one behind: *Inclusive early warning systems for all*

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Based on an interview with
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When a hurricane approaches, a good warning needs to reach all people. In Guatemala and Honduras, communities have learned that early warning systems work best when no one is left out, including those most at risk.

Luis Iván Girón has more than 20 years of experience in disaster risk reduction, risk management, and community development in Guatemala. Here he explains how inclusion transforms warnings into effective action.

Why and how do hurricanes affect the lives of people in Guatemala and Honduras?
Guatemala and Honduras are regularly affected by hurricanes and heavy rainfall because of their geographical location. The experiences following Hurricanes Eta and Iota in 2020 showed how severe consequences for affected communities can be. Especially in vulnerable regions, floods, landslides, and social disadvantage repeatedly lead to loss of lives, damage to infrastructure, and disruption of livelihoods. Effective and inclusive Early Warning Systems (iEWS) are therefore essential to identify risks early and to protect people.

What role do community Early Warning Systems play in risk management during hurricanes?
EWS are central to disaster risk management because they enable communities to act before hazards escalate. Their effectiveness depends on four interconnected elements as stipulated in the Sendai Framework, the main international framework for disaster risk reduction: understanding the risk, monitoring hazards, building resilience, and responding effectively. What we've learned is that no single element is enough. You need all four to work together.

Communities play a key role in identifying local risks and contributing to monitoring. Alerts must be communicated through accessible channels and complemented by inclusive evacuation plans, accessible shelters, and trained local groups. EWS connect scientific information with local action, which makes them one of the most effective tools to reduce disaster impacts.

Why is it important to include at-risk groups in the design and management of Early Warning Systems?
Including at-risk groups, especially persons with disabilities, and considering intersectional factors is fundamental for the effectiveness of Early Warning Systems. Structural inequalities expose these groups disproportionately to hazards and amplify the impacts they face when disasters strike. However, they are frequently overlooked in planning processes.

We have seen that when inclusion is integrated into EWS, the system becomes more accurate and responsive. Risk assessments improve because they reflect real vulnerabilities, and alerts become accessible to people with different sensory, physical, or cognitive needs. Evacuation procedures and shelters are also more effective when they consider diverse users.

Inclusion does not only improve the accessibility of warnings. It also strengthens trust and participation within the community. Persons with disabilities contribute valuable knowledge about barriers in mobility, communication, and access to information, helping to identify gaps in the system.

GUATEMALA		**HONDURAS**
Risk rank	21	11
Storm risk rank	19	18
RISK	22.41 very high	27.68 very high
EXPOSURE	15.42 very high	21.89 very high
VULNERABILITY	32.58 high	34.99 very high
STORM RISK	9.84 very high	10.04 very high

Moreover, inclusion is a legal and ethical obligation under frameworks such as the Convention on the Rights of Persons with Disabilities and the Sendai Framework. These emphasize that disaster risk reduction must be inclusive, meaning that EWS must be designed to reach everyone equally. Without this, early warning systems fail in their primary purpose: protecting all lives.

How can persons with disabilities be meaningfully included in Early Warning Systems?
Meaningful inclusion requires integrating accessibility into every stage of Early Warning Systems. This begins with mobility, ensuring that evacuation routes and shelters are accessible and that community networks exist to support those who need assistance. Physical barriers must be identified and reduced so that evacuation is realistically possible for all.

Communication is equally critical. Alerts must be delivered through multiple sensory channels, including sound, visual signals, and digital formats, to ensure they reach people with different types of disabilities. They must also use local languages and be compatible with assistive technologies. However, reaching people is not enough; messages must also be understandable. This requires clear, simple language, the use of pictograms, and repeated messaging so that individuals can interpret the alert and act quickly.

Inclusion also means participation. Persons with disabilities should be actively involved in risk mapping, monitoring, communication processes, and decision-making, as in the case of Baudilio, who collects local weather data using an automated weather station and a rain gauge.

His commitment shows how persons with disabilities can actively contribute to disaster risk reduction and strengthen the understanding of local risks.

Conclusion
Early Warning Systems are essential to reduce hurricane impacts. Their effectiveness depends not only on technology but on inclusion, participation, and accessibility. Systems that integrate persons with disabilities and strengthen local communities protect people more effectively. —

ABOUT THIS PROJECT

PERIOD	09/25–12/26
PEOPLE REACHED	1,300
BUDGET	170,000 €

cbm Vivamos mejor

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The value and limits of informal social protection in climate change

When storms strike, communities draw on each other. This article examines how informal social protection, from food sharing to collective rebuilding, complements formal systems, and where its limits lie in the face of climate change.

Storms are becoming more intense with severe cascading effects such as flooding and erosion causing significant harm to communities and economies [36]. This holds particularly true for densely populated low-lying coastal zones around the world, where increasing numbers of inhabitants and economic activities are facing rising levels of disaster risk [43]. To name just one example, Vietnam's central coast was hit by nine consecutive storms in 2021 with massive direct and indirect impact, as the storms and subsequent flooding overwhelmed local disaster risk management structures [65].

People who already were vulnerable are hit the hardest, especially those with limited financial reserves, climate-sensitive livelihoods, and little access to insurance or physical protection. In the case of the storms in central Vietnam in 2021, hazard impacts reinforced existing vulnerabilities and further reduced coping capacities due to new livelihood challenges such as financial losses and health impacts [65].

In the face of increasing climate risks, social protection systems have gained significant attention in recent years as a tool to safeguard people's well-being despite escalating threats, particularly to the most vulnerable [74]. While traditionally focusing on mitigating individual economic risks such as those linked to unemployment, illness, or old age, several social protection programs have substantially expanded their scope to address a broader range of risks, including environmental, climate, and disaster shocks [6, 32]. Additionally, new frameworks, notably Adaptive Social Protection, have evolved, aiming to integrate social protection with disaster risk management and climate change adaptation efforts [12].

In this light, countries worldwide have significantly expanded both the depth and the breadth of their formal social protection schemes [28], typically publicly funded programs and policies designed to protect people from hardship. Nonetheless, many people in need of assistance remain uncovered or inadequately covered [102]. In lower- and lower-middle-income countries, over two billion people lack access to adequate formal social protection, with the lowest relative coverage rates in lower-income countries, meaning that those who are in highest need are the least covered [102].

Informal social protection represents a valuable buffer against adverse impacts in the absence of or insufficient coverage by formal social protection [50, 78]. By and large, informal social protection means benefiting from social networks such as extended families, neighbors, or religious communities and local institutions with their respective capacities in times of need [49]. In the context of natural hazards such as storms, it can span from immediate support during the hazard (e.g. food sharing) to relocation, health assistance, and rebuilding efforts.

Building on examples from different geographical contexts, this article examines the role and limitations of formal social protection in the context of storms, explores mechanisms of informal social protection, and discusses how both forms of protection can complement each other.

Formal Social Protection (FSP) and its limits in the context of climate and disaster risks

FSP can be defined as public actions taken to cope with individual risks and deprivation in people's lives that are considered socially unacceptable [60]. This includes both specific programs aimed at particular risks for certain lifecycle stages, such as education support for children, labor market programs for the working-age population, or pension schemes for the elderly, as well as general programs designed to cover basic risks for all members of society, such as health insurance [32]. The latter are also known as social protection floors, which serve as an essential means of ensuring people's human rights to social protection [27]. Achieving social protection coverage for everyone remains a key policy goal, as exemplified by the Sustainable Development Goal (SDG) Target 1.3 on universal, nationally appropriate social protection [91]. Despite significant expansion in both coverage and depth, countries worldwide are far from realizing this goal, particularly in low-income regions [102].

<u>FSP (benefits) in the context of climate risks</u>
Social protection that tackles individual risks has faced growing challenges over the past few decades due to climate change. Increasing climate and disaster risks have significantly raised the frequency and severity of hardships for communities worldwide, including loss of welfare, livelihoods, and health [36]. Because of their large geographic scope, severe storm hazards such as hurricanes and tropical cyclones can lead to particularly widespread adverse effects. For example, the total direct economic losses from storms in the USA reached 788 billion USD over the last five years [86]. At the same time, two tropical cyclones in Mozambique left more than 2.2 million people in urgent need of assistance [86]. These two cases show how storms can cause widespread suffering and broad-ranging impacts that hit entire communities at once, also known as covariate risks, which have the potential to overwhelm the capacity of traditional social protection schemes focused on individual risks [6, 32].

As a result, new social protection frameworks have been developed to safeguard people's well-being amid the increasing risks posed by climate change. One major development was the emergence of Adaptive Social Protection (ASP). ASP aims to integrate social protection, disaster risk management, and climate change adaptation efforts to address covariate risks comprehensively [6, 12]. Although this integration is difficult to achieve at a local level, several examples of specific ASP programs exist worldwide, including those addressing storm-related risks. For example, in Indonesia, the Ministry of Maritime Affairs and Fisheries coordinates a program that provides and subsidizes fishing vessels for small-scale fishers, including during storms [61]. Storms often result in rough sea conditions and high waves that put fishers' lives at risk, forcing them to put their livelihoods on hold and thereby reducing their incomes. Therefore, the government provides fisher cooperatives with vessels to enable fishers to continue working safely despite rough sea conditions, thereby achieving important well-being benefits amid climate and disaster risks [21].

<u>FSP limits in the context of climate risks</u>
While disaster risk management, adaptation, and social protection share a common goal of addressing risks and safeguarding people's well-being, key differences exist, most notably in the definitions of risk and vulnerability [74]. While social protection has a strong focus on individual economic risks and related coping capacities to tackle poverty [28], disaster risk management and climate change adaptation have a broader understanding of risk and vulnerability, one that includes not just income but also exposure to hazards, susceptibility to harm, and the capacity to cope and adapt [36]. In essence, this means that

people can be at high risk of adverse well-being impacts without being counted as "poor" under national definitions and standards and thereby not being listed in social registries that would enable them to access social protection benefits. For example, people with middle or high incomes can be at significant risk, if they live in a coastal area highly exposed to strong winds and lack awareness of risks, preparedness, or insurance coverage. On the other hand, registries of formal (adaptive) social protection schemes are based on the notion of formality. Therefore, people living in informal settlements or whose livelihoods are in the informal sector are usually excluded from formal schemes [39]. These two aspects highlight a substantial gap: the non-poor but vulnerable and the informal poor (i.e. the most vulnerable) are often excluded from FSP schemes.

Informal Social Protection (ISP) in the context of disaster risks and livelihood challenges

In contrast to Formal Social Protection, ISP is difficult to define universally as it can take many forms. By and large, it can be understood as non-state, non-contractual mechanisms and practices through which individuals and households are enabled to cope with adverse livelihood impacts [49, 77]. In practice, this includes but is not limited to traditional support mechanisms such as resource pooling, direct support, and self-organization, provided through kin and non-kin, religious, and neighborhood networks as well as community associations, NGO and friendship networks [14, 77, 78].

Such mechanisms are particularly relevant in contexts in which state-led FSP programs cannot provide sufficient coverage due to limited budgets or weak institutional capacity [2, 49]. In Jakarta, Indonesia, for instance, narrowly defined beneficiary criteria exclude certain groups such as informal workers and urban poor informal residents from accessing social protection, leading to a "missing middle", a large group of highly vulnerable people with no formal safety net [78].

<u>ISP (benefits) in the context of climate risks</u>
In the face of such gaps, ISP structures evolve organically and are therefore well adapted to local social institutions, enjoying high levels of trust and reciprocity. People can access ISP quickly and flexibly in times of need to buffer adverse effects [77]. That is why ISP can be considered as one of many disaster risk management structures, playing a central role in prevention, mitigation, and coping [6, 50, 78].

This is supported by evidence from across the world. For instance, when Cyclone Idai and subsequent flooding struck central Mozambique in March 2019, it caused massive destruction, livelihood disruptions, and a public health crisis. Market disruptions adversely affected incomes and food security. To cope with drops in income, food scarcity, and the need for medical assistance, community members used their networks. Despite financial stress, for instance, residents shared resources and labor to rebuild their homes with materials sourced from the community. In addition, they accessed health treatment from indigenous healers and a diverse set of health providers when formal medical services were unavailable [80].

Along similar lines, ISP proved instrumental in South Asia and Latin America. In Bangladesh, empirical evidence from Cyclone Aila showcases how informal mechanisms are used for risk sharing. Mutual support among households, community savings groups, and ad hoc informal credit gave individuals access to money despite income disruptions. Such immediate access to financial means before official aid arrives helps buffer storm impacts [68]. Hurricane Maria, yet another example of a severe storm causing significant disruptions of services in Puerto Rico in 2017, demonstrates how households and communities drew on informal support systems to fulfill basic needs and reconstruct their homes. The hurricane caused cascading failures across water, electricity, and transport systems, creating prolonged household water insecurity and impeding formal relief and reconstruction pathways. To mitigate the impacts, local communities used water sharing practices [72]. In addition, support came through informal mutual aid structures, support from diasporas, and community-led informal rebuilding efforts across various municipalities following the storm in 2017.

These cross-regional examples illustrate the value of ISP structures when responding to and coping with storm impacts.

<u>ISP limits in the context of climate risks</u>
Despite its diverse benefits, ISP also bears considerable limitations and risks. First, ISP is inherently limited in scope, scale and depth. Networks are often exclusive and limited in size, i.e. not accessible for everyone and limited in network capacities [77]. Therefore, ISP alone cannot solve fundamental development challenges such as long-term impoverishment or marginalization. In addition, these limitations in scope, scale, and depth mean that ISP mechanisms can be overwhelmed in cases of large-scale disasters, such as storms followed by flooding that cause the spread of disease and market disruptions. The need for health services, market recovery, and fast reconstruction can easily surmount local network capacities.

Second, ISP builds on community ties. Communities with robust internal bonds, known as bonding social capital, and good connections to outside resources, known as bridging and linking social capital, can rely on support in times of need through their network, while communities without such strong social ties may be disadvantaged in this regard. In the case of Puerto Rico mentioned above, individuals without external connections encountered higher levels of ongoing housing instability, while those with strong network connections fared better in informal housing reconstruction [72].

Finally, successful ISP can paradoxically undermine FSP. When risks and vulnerabilities are reduced through ISP structures, governments may see less need for formal support. However, given the limits in scope and scale, ISP can only help people cope in a crisis. It cannot substitute formal, long-term social protection [50].

Outlook

Given that state governments and international organizations acknowledge the important role of social protection in the face of disasters and climate change more broadly and highlight the need for scaling up and improving current structures, what can formal social protection learn from informal social protection?

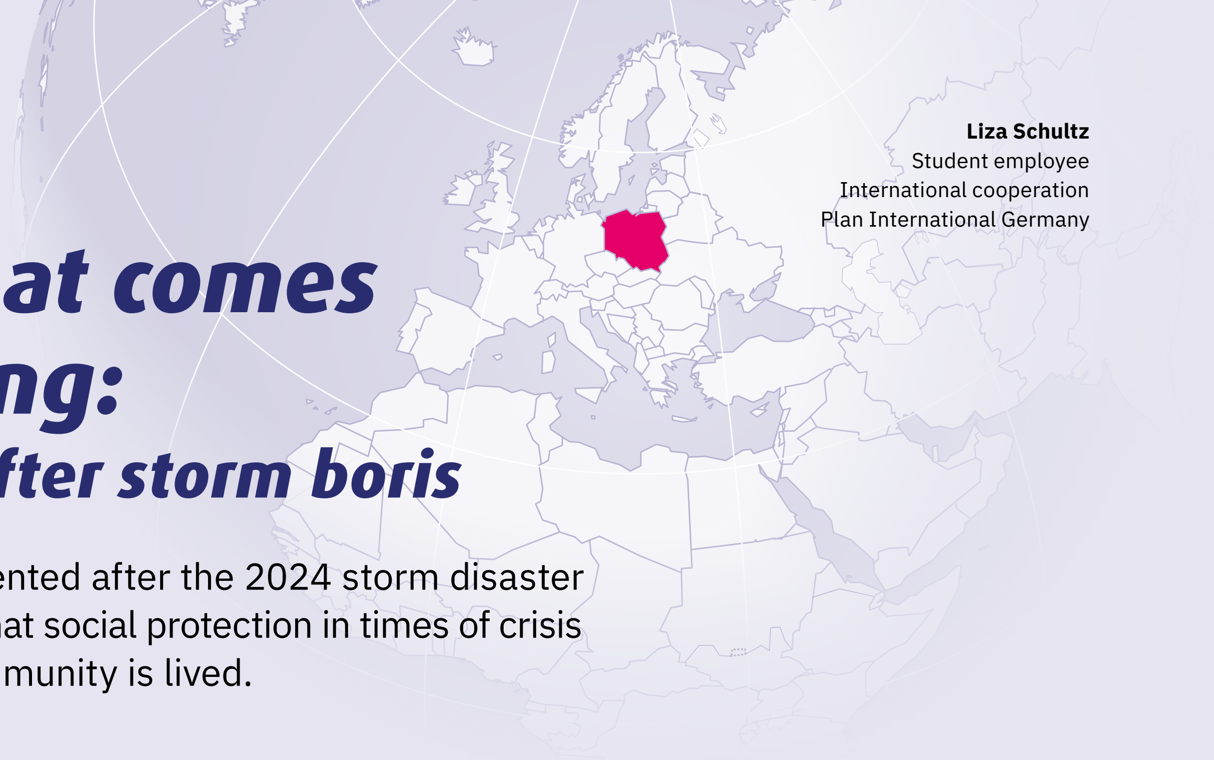
We suggest three lines of thinking about the future role of social protection in the face of interacting livelihood challenges.

First, the seemingly complementary character of informal and formal social protection raises normative questions related to the social contract underlying welfare states. FSP can provide broad coverage (horizontal expansion) for all (SP floors, SDG 1.3) while ISP could build on this to provide specific support (vertical expansion) for vulnerable groups. Welfare states need to decide who is responsible for what in a society, i.e. how responsibilities for social protection are shared among governments, communities, and individuals [38, 42].

Second, learning from ISP mechanisms is inherently context-specific and difficult to transfer into formal structures. The organic and often long-established structures and mechanisms of informal social protection are highly adapted to local contexts, making them hard to be replicated elsewhere or scaled up. Alongside this, formalizing informal social protection mechanisms is unlikely to be successful as it would reduce its inherent benefits (such as flexibility, speed, trustworthiness, and empowerment) [48, 78]. Instead, sensible locally grounded support for existing ISP structures might yield better results in expanding social protection.

Third, both forms of social protection need to move away from shock-responsive approaches to building resilience more continuously in the face of various livelihood risks. Adaptive Social Protection represents such an approach; it promotes the combination of disaster risk management, climate change adaptation, and social protection to strengthen the well-being and resilience of at-risk populations and thereby strengthening their adaptive capacities in the face of adverse climate change impacts [16, 74]. While ASP does not yet explicitly consider or integrate ISP, it could be a promising starting point to build coherence between different approaches. —

Disclaimer:
The views expressed in this contribution are those of the authors and do not necessarily reflect the position of their respective affiliations, i.e., DEval, UNU-EHS, and BRIN.



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International cooperation
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Help that comes knocking:
Support after storm boris

A project implemented after the 2024 storm disaster in Poland shows that social protection in times of crisis begins where community is lived.

In September 2024, Storm Boris struck large parts of Central Europe and caused severe damage, particularly in south-western Poland. The combination of strong winds and prolonged, intense rainfall made the storm especially destructive. As the ground was already saturated, the continued rainfall caused rivers and streams to burst their banks within a very short time. The regions of Opole, Lower Silesia, and Silesia, near the border with Czechia, were particularly affected, as many towns and villages are located along rivers or in low-lying areas. In some homes, floodwater rose to as high as 1.80 meters.

The consequences of the storm went far beyond short-term damage. Buildings were damaged, furniture became unusable, and personal belongings were lost. For many people, the storm marked a serious disruption to their livelihoods. It hit those with already limited resources the hardest, including low-income families, older people, and persons with disabilities. Many were unable to move elsewhere or repair their homes, as they lacked financial means, alternatives, or support. Even months after the storm, the situation remained strained: repairs were costly, insurance companies often did not pay, and state assistance remained insufficient in many places. For many of those affected, this marked the beginning of a long process of reconstruction. Homes and flats had to be dried out, damaged furnishings replaced, and everyday life reorganized step by step.

Trust as a Method
Against this backdrop, it became clear that many of those affected needed more than short-term emergency aid. Plan International Poland and its partner organization HumanDoc implemented a project that deliberately focused on personal proximity and flexible support. Between November 2024 and May 2025, 441 people received direct assistance.

Mobile teams visited affected people in their homes, including in Wronów, Bodzanów, and Ołdrzychowice, and spoke with them about their specific situation. This was crucial, as many residents had limited mobility, lived in isolation or had no access to information about available support. Through home visits, the teams were able to identify individual needs that are often overlooked in standardized procedures. This created space for personal conversations that showed what support individual households actually needed and which barriers were making access to existing assistance more difficult.

Based on these conversations, support could be tailored specifically to each household's circumstances. It consisted of financial assistance in the form of vouchers, as well as individual guidance and accompaniment. The vouchers could be used flexibly, for example for heating costs, medication, or building materials. Families with children, in particular, felt the consequences of the storm in everyday life. Clothes and shoes had become unusable, and school notebooks had been soaked through. The vouchers helped close these gaps and gave many households back a measure of agency—and with it, dignity.

At the same time, the teams provided advice, supported people in dealing with public authorities and accessing social services, and referred them to psychosocial support where needed. They also helped secure essential goods such as shoes, hygiene products, school supplies, and building materials for repairs and reconstruction.

A key element was cooperation with local actors. People from the communities helped identify which households had been particularly affected by going from house to house, knocking on doors, and speaking directly with residents. In this way, they built trust with those affected. Close cooperation with local authorities also made it possible to extend support beyond individual households, for example through additional funding for a hospital in Nysa and a public preschool in Paczków. Without these local structures, many affected people would have been very difficult to reach.

What initially appeared to be classic emergency assistance was, in many places, carried by neighborly support, personal relationships and community solidarity. Especially in smaller communities, neighbors often knew early on which houses had been hit particularly hard, who lived alone, or who was unable to organize help independently after the storm. Information about available assistance spread not only through official channels, but also through conversations in the community, personal contacts, and mutual care. This made visible where older people were living in isolation, where families were left to cope on their own, or where persons with disabilities needed support.

Plan International Poland and HumanDoc built precisely on these existing community structures. The selection of supported households was based not only on formal criteria, but also on conversations, local assessments, and the knowledge of the communities themselves. As a result, people could be reached who often remain invisible in standardized procedures.

The importance of this proximity is reflected, for example, in the story of Andrzej, who lives with his wife Jadwiga in Wronów. After the flood, their house was uninhabitable. Their furniture, documents, memories, and even the beehives in their garden had been destroyed. For the couple, financial assistance was important—but so was the feeling that they had not been left alone. Andrzej later described the human closeness they experienced as "far more valuable than money". Many older people living alone felt the same. After the devastating storm, they were living in fear. The teams' regular visits gave them a sense of security, not because every problem was solved immediately, but because people kept coming back, asking how they were doing.

Proximity as the Key to Effective Support
The experience of Storm Boris shows that crises can be addressed most effectively when support is provided individually and embedded in people's familiar surroundings. Those affected did not have to stand in long queues at public offices; instead, they were visited. The assistance was personal and rooted in local structures. People experienced the support as respectful and trustworthy—and local actors identified needs that no standardized form would have captured. Where standardized emergency assistance reaches its limits, direct assistance can unfold its greatest potential. —

POLAND

Risk rank	82
Storm risk rank	133
RISK medium	5.77
EXPOSURE medium	1.67
VULNERABILITY medium	19.96
STORM RISK low	0.45

ABOUT THIS PROJECT

PERIOD	11/24–05/25
PEOPLE REACHED	441
BUDGET	153,173 €

PLAN INTERNATIONAL Gibt Kindern eine Chance

HumanDoc

Andrea Vismara
Complexity Science Hub

Dr. Rafael Prieto-Curiel
Complexity Science Hub

How remittances from the diaspora help families weather the storm

Every year, international migrants send billions of dollars to their home countries. When a storm hits, they mobilize to send even more. These financial flows are among the most direct forms of disaster finance, yet they remain largely absent from global climate policy. A closer look at what they can, and cannot, do.

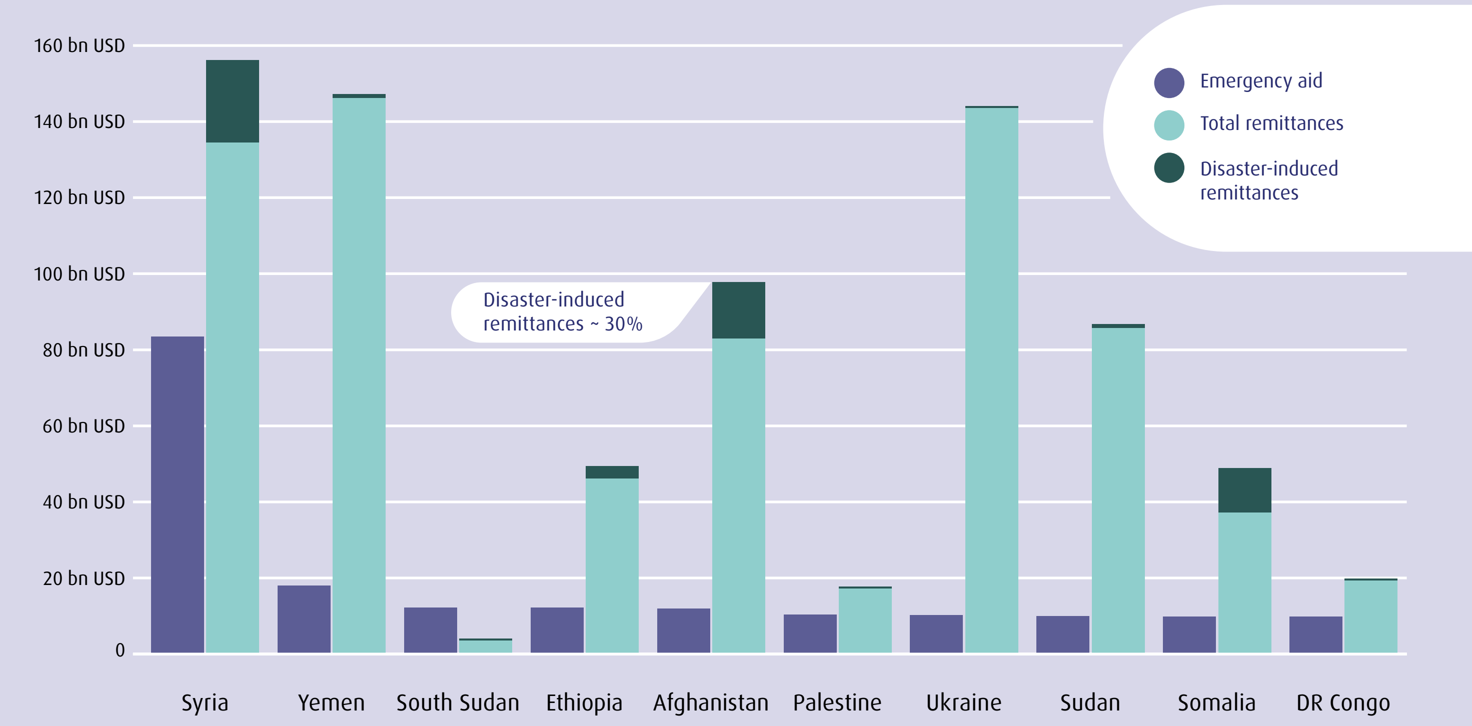
Every year, millions of people living and working abroad send money home. These transfers, known as remittances, are private financial flows from migrants to their families and communities of origin. They cover school fees and medical bills, fund small businesses, and pay for roof repairs. Around 800 million people worldwide, roughly one in nine, receive remittances from family members who have migrated [93].

Remittances finance consumption and investments but can also contribute to building disaster resilience. They do so in two ways. Before storms strike, remittances give climate-vulnerable households access to new financial resources, to build better infrastructure for example [31]. After disasters hit, evidence shows that migrants mobilize to send more money, helping communities recover [47]. Between 2010 and 2024, international migrants transferred a total of 9.1 trillion USD in remittances [96]. Of this sum, approximately 5.5 % (equivalent to 501 billion USD) was mobilized in response to storms, floods, earthquakes, and drought. Storms alone mobilized a total of 135 billion USD. To put this in perspective, the *Official Development Assistance* (ODA) for emergency responses and disaster relief over the same period amounted to a total of 293 billion USD [64].

Despite their scale and growing interests in the role of remittances in disaster resilience [83], they remain largely absent from international climate and disaster policy discussions. This article details the positive effects remittances can have on disaster adaptation and recovery.

However, remittances are not the perfect solution for future disasters. First, they are unequally distributed: households without family members abroad may receive nothing, which can deepen inequality in recipient countries [1]. Second, they are not designed as a public good and cannot be directed like aid. Third, migrants can draw on savings and take on debt to support their families after disasters, but this generosity cannot be sustained indefinitely. Lastly, a heavy reliance on remittances within an economy can push an excessive number of people to emigrate, leading to labor and skill shortages.

Emergency aid and remittances compared



Sources: OECD 2026 [64] for aid, Vismara et al. 2025 [96] for remittances

Note:
Total volume of emergency aid and remittances received by the ten countries with the highest emergency aid amounts from 2010 to 2024. The dark green bars indicate the estimated share of remittances made in response to disasters.

Yet within these constraints, remittances represent a distinctive resource: fast, direct, and grounded in relationships of trust and obligation. Understanding how they work, particularly in the context of storms, which are projected to intensify under climate change, is essential for any realistic account of how communities can cope with disasters.

How remittances build resilience: preparedness, coping, and adaptation

Resilience to storms is not only built in their aftermath. A household's or community's capacity to withstand and recover from a cyclone, hurricane, or typhoon is shaped by decisions made years earlier. Whether a roof is reinforced or the foundations of a house are raised, whether a family has savings or alternative sources of income: all of this matters when storms strike.

Remittances can contribute to this preparedness. Households that receive regular transfers from abroad show higher rates of investment in durable housing materials, greater uptake of insurance products where available, and more diversified income streams [3]. In flood-exposed and cyclone-prone areas of South Asia and the Pacific, remittances are linked to investment in drainage, raised foundations, and storm-resistant construction, adaptations that make a real difference when extreme weather arrives.

More broadly, remittances represent one of the most direct links between international migration and development. They help reduce poverty, foster economic growth in countries with less-developed financial systems, promote healthcare access and utilization, and increase school-enrollment rates.

The post-disaster response of migrant networks is also well documented. Following major storms, remittance flows to affected countries typically rise sharply in the months immediately after the event before gradually returning to pre-disaster levels. This pattern reflects a rational response: migrants receive news of damage from family members, assess the needs, and mobilize funds.

Families and communities that can rely on remittances tend to maintain higher levels of consumption after disasters. They are also better protected from the need to sell household assets or livestock to cope with the disaster-induced income loss [47]. Receiving remittances has also been linked to other positive outcomes, such as reducing the negative impacts of disasters on mental health [79]. In environments where public assistance is slow, inadequate, or absent, these private transfers can be the difference between recovery and prolonged destitution.

Storms have some distinctive features in this regard. Cyclones and hurricanes, unlike earthquakes, can often be forecast days before impact. This means that transfers can begin before landfall. Migrants may receive early warning through family networks, social media, and diaspora communication channels. Some of the most recent innovations in disaster finance, including anticipatory cash transfer schemes, have sought to mobilize remittances before the storm. At the same time, the surge in post-storm remittances cannot be sustained indefinitely. Migrants operate under real financial constraints: contributions above normal levels are typically financed by reduced personal consumption, borrowing, or drawing from personal savings. The emergency response fades with time. For communities facing long-term impacts from storms, the temporary nature of remittance surges means they can address acute need without resolving structural vulnerability.

When do remittances build resilience and when do they fall short?

The resilience-building potential of remittances is conditional, not automatic. Two broad factors determine whether a country can access remittance flows: a diaspora that can send money and functioning channels for that money to reach communities back home.

The first factor depends on the size, composition, and income levels of the diaspora. Countries with large, economically established diasporas in wealthy destination countries can mobilize substantially more than countries with small diasporas or those whose diasporas have settled in relatively low-income countries. For example, around 53% of migrants from low-income countries live in other low- and middle-income countries, and only 23% of them live in high-income countries [94]. The composition of the diaspora also matters. Diasporas composed primarily of single workers, like most of the nine million Indians living in the Persian Gulf, will transfer more than diasporas in which whole households have migrated abroad [44]. At the same time, diasporas where most migrants already send all their disposable income as remittances will have limited capacity to mobilize additional funds when disasters hit. These dynamics interact to determine how much money is mobilized and may be specific to individual diasporas.

The second factor is the quality of transfer channels. Remittances travel in many different ways. Possible transfer mechanisms include digital money transfer services such as PayPal and Wise; money transfer operators like Western Union and MoneyGram; bank transfers; or direct cash. A large part of the Islamic world relies on the Hawala, an informal value transfer system based on the trust and honor of a network of money brokers. How well these channels work depends on the availability of formal services, transfer costs, speed, and reliability, and this varies dramatically across channels and country-to-country corridors. Where transfer costs are high (the global average remains around 6.5 %, far above the 3 % target of the Sustainable Development Goals), a significant share of the intended amount is lost before it reaches the recipient. In corridors serving the most disaster-exposed countries, costs are often above average. There is also a geographic problem: most formal access points for money transfer operators and banks are concentrated in big cities, and those who live and work in remote areas cannot easily reach them. When storms strike, some access points may be closed or inaccessible. Building a resilient network of local financial service providers is key to ensuring remittances reach those who need them.

Geography of remittances and the impact of storms

The global geography of remittances reflects decades of migration history, labor market demand in destination countries, and the persistence of family and community ties across borders. The five countries that received the largest absolute volumes of remittances between 2010 and 2024 were India, Mexico, the Philippines, China, and Pakistan. These countries generally have large migrant populations abroad and established remittance channels, often linked to major migration corridors such as those to the United States and the Gulf region. This ranking is shifting however: Bangladesh was the 5th largest receiver in 2024, with Mexico dropping to 6th place [96].

Looking specifically at the remittance response to storms, the five countries that received the largest amounts over the 2010–2024 period were the Philippines, China, Cuba, Vietnam, and the Dominican Republic, for a total of 91 billion USD. The Philippines stands out with its long history of migration, well-developed remittances network, and large exposure to storms. It is estimated that an average of 550 USD per migrant per year was sent to the Philippines as a response to storm-induced disasters. Diasporas from Central America and the Caribbean also showed a high capacity to respond to storms via remittances, with Cuba, Guatemala, the Dominican Republic, and Puerto Rico having mobilized between 250 and 470 USD per migrant per year in response to storms. In terms of remittances mobilized compared to storm damages, Central America and the Caribbean mobilized especially high amounts. Both El Salvador and Puerto Rico received more than 600 USD per year per person affected by a storm over the 2010–2024 period (200,000 and 750,000 total affected, respectively, according to EM-DAT, the Global Disaster Database [13]). In comparison, the Philippines received only 25 USD per affected person (131 million USD in total). This indicates that even large and active diasporas have limits, especially under sustained and repeated disasters.

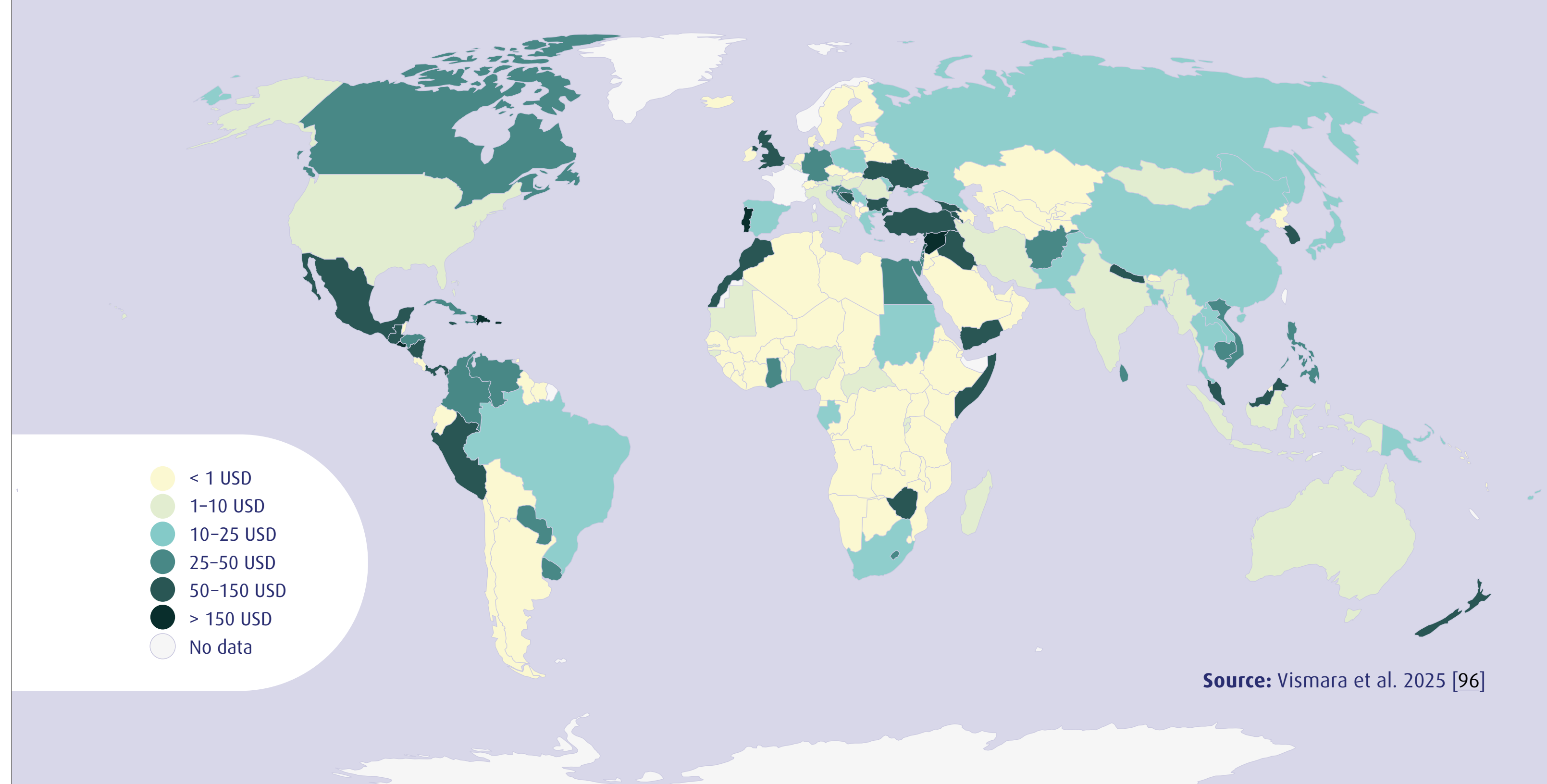
Case studies: models of diaspora response

Hurricanes Eta and Iota

In the span of two weeks in November 2020, the Caribbean coast of Central America was struck by two consecutive major hurricanes. Eta made landfall on November 3 as a Category 4 storm, while Iota followed on November 16, also reaching Category 4 at landfall. Together, they affected an estimated 8.6 million people across Nicaragua, Honduras, and Guatemala, with devastating impacts on communities and agriculture.

Note:
Average annual remittances sent per storm-affected person in the country of origin. The number is the ratio of the average annual remittances sent by recipient countries in response to storms to the average number of storm-affected people in the same country.

Remittances per storm-affected person in the country of origin



Source: Vismara et al. 2025 [96]

Infrastructure losses ran into billions of dollars. The humanitarian response was further complicated by the ongoing COVID-19 pandemic, which had already strained public services, reduced incomes, and disrupted formal remittance channels.

The diaspora response was substantial. Guatemala and Honduras received, respectively, around 2 and 1.5 billion USD in disaster-induced remittances in the six months following the storms, while Nicaragua received around 540 million USD. The difference between countries comes down to diaspora size and location. Guatemala and Honduras each have more than one million migrants living in the United States, respectively 90% and 70% of their total migrants. The largest share of the one million international migrants from Nicaragua, by contrast, is living in Costa Rica (46%), where incomes are lower and remittance capacity is more limited. In terms of remittances mobilized per person affected, migrants from Guatemala moved an estimated 800 USD during that period. In Honduras, the country that suffered the largest damages with more than 5 million people affected, the diaspora could mobilize “only” 300 USD per person affected over the six months after the disaster.

This case illustrates how the capacity of a diaspora depends heavily on who its members are and where they live. The scale of the response also inspired Mercy Corps to launch a pilot program in partnership with Remitly (a money transfer operator) to activate diasporas before a storm makes landfall. The program ran during the 2022 and 2023 hurricane seasons [45]. By integrating Central American diaspora communities into early warning communication systems and offering pre-landfall fee waivers, the program sought to transform reactive crisis transfers into anticipatory assistance. The pilot has not yet evolved into a more established mechanism.

<u>Cyclone Winston</u>
On February 20, 2016, Tropical Cyclone Winston struck Fiji as the most intense tropical cyclone ever recorded in the Southern Hemisphere, with maximum sustained winds of 295 km/h. The Fijian islands of Koro and Viti Levu bore the brunt of the storm. 44 people died, and thousands of homes were destroyed.

The remittance response was significant. Migrants from Fiji sent a total of 26 million USD in the six months after Winston made landfall, amounting to close to 500 USD per affected person. However, in Pacific island states, remittances are not just an emergency response but a structural component of the economy and household financial management. We estimate that Fiji receives close to 25% of its gross national income in remittances [96]. In this context, the distinction between before and after a disaster takes on a different character. Pacific island households are not simply drawing on remittances in crisis but are continuously supported by diaspora income in ways that shape their underlying capacity to prepare for and recover from cyclones.

At the same time, remittance infrastructure in the Pacific remains severely underdeveloped. Transfer costs are among the highest in the world, driven by widespread reliance on cash and limited uptake of digital options. The main barriers are high fees for money transfer operators, poor digital infrastructure, and the geographical remoteness of parts of the Pacific islands, where internet and electricity are not always reliable. The remittance economy also creates an incentive to emigrate. In Fiji, close to 20% of citizens live abroad, a share that risks draining the country of workers and skills. The case of Fiji illustrates both the opportunities and the challenges that remittances pose for storm resilience.

Policy implications

Remittances already play a significant, though largely uncoordinated, role in disaster preparedness and response. They are fast, flexible, and substantial, yet also uneven, constrained, and not designed as a public policy tool. To strengthen their contribution to disaster adaptation, policymakers should focus on removing barriers and further facilitating their role.

Governments in storm-prone countries should integrate remittances into national disaster risk management strategies. First, governments could offer fiscal incentives for adaptation investments. These could include tax breaks or subsidies for storm-resistant upgrades such as raised foundations or reinforced roofing. This would encourage remittance-receiving households to direct more funds towards resilience rather than short-term consumption. Second, policies should support access to financial services in rural and disaster-prone areas, including mobile money and local cash-out points. A strong remittance infrastructure is crucial for reaching those in need. Lastly, governments should not let private flows act as a substitute for public disaster support. This risks exacerbating inequality, as households without diaspora connections are left behind.

Reducing transfer costs requires a concerted effort among national and international institutions and remittance service providers. Fees remain high due to underdeveloped financial and digital infrastructure, limited competition, regulatory obstacles, and, in some cases, the difficulties faced by migrants in obtaining the necessary documentation to access official financial services. Coordinated action from local and international financial authorities is needed to increase access to and the transparency of remittance-sending services, with the aim of meeting the Sustainable Development Goal of an average remittance fee of 3% by 2030.

Finally, storms are somewhat predictable, as they tend to follow seasonal patterns and can be detected several days before landfall. This creates an opening for early warning systems that can mobilize diaspora responses before disaster strikes. Governments, international institutions, and financial services providers should work to develop schemes for diaspora engagement and remittance fee waivers in the period before and after storms. The Mercy Corps and Remitly pilot program for Central America in 2022 and 2023 offers an example. Another case comes from Fiji, where Vodafone waived fees on its remittance service for two months during the COVID-19 pandemic, causing digital transfers to grow threefold.

Ultimately, remittances are not the perfect solution for storm adaptation, but they are an important lifeline for households and communities affected by disasters. Storms are growing more intens. So is the global network of solidarity that links migrants to their homes. Integrating these lifelines into global disaster-adaptation efforts is key to building resilience. —

How is disaster risk distributed worldwide?

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How is disaster risk distributed worldwide?

Disaster risk is not simply a natural phenomenon. It emerges where hazards meet vulnerable societies. The WorldRiskIndex shows for 193 countries who is most at risk, why this barely changes—and what role storms play in this picture.

Overall risk

Disasters do not begin only when severe storms make landfall or rivers burst their banks. Disaster risk is already embedded where hazards intersect with vulnerable societies. Recent records confirm that hazardous climate conditions are worsening: in early 2026, global warming exceeded the 1.5°C threshold for three consecutive years for the first time [101]. At the same time, oceans are storing more heat than ever before [67].

What this means in practice was vividly illustrated in 2025. Hurricane Melissa struck Jamaica as the most powerful storm in the island's recorded history. In the Pacific, typhoons devastated the Philippines, Hong Kong, and southern China. The deadliest storm of the year, Tropical Storm Senyar, triggered catastrophic flooding in Indonesia, Thailand, and Myanmar. Nearly 1,500 people lost their lives, and the property damage totaled approximately 25 billion USD. Europe was not spared either: summer heatwaves led to more than 24,000 additional deaths [4].

Climate, however, tells only part of the story. The global conflict landscape has also significantly deteriorated during the same period. There are currently more ongoing armed conflicts worldwide than at any time since World War II. Roughly one in seven people live in an area affected by violence [37]. The war in Ukraine continues without a clear end in sight. In Sudan, the escalating civil war has triggered one of the most severe displacement crises of our time. Conflicts in the Democratic Republic of the Congo, Myanmar, and across the Sahel have contributed to rising instability throughout entire regions.

Global disaster risks are increasingly shaped by the overlap of extreme natural events and violent conflict. Why does the same natural event become a disaster in one country, while its impacts remain limited elsewhere? This is precisely what the WorldRiskIndex shows for the 193 countries it covers. It captures how heavily societies are exposed to natural hazards, how susceptible they are to their damaging effects, and how well they can cope with crises. This year's edition reflects on how these dynamics have evolved over the past 25 years.

Who is most at risk?

The level of disaster risk many countries face has hardly changed over this period. This is inherent to an index like this: vulnerabilities build up over decades and tend to shift only gradually. This pattern is particularly evident at the top and bottom of the ranking. The ten highest-risk countries are the Philippines, India, Indonesia, Colombia, Mexico, Myanmar, Mozambique, Russia, China, and Somalia. At the other end of the ranking are Monaco, San Marino, and Andorra. The gap between the two groups is enormous: the average risk of the ten highest-ranked countries is more than 60 times that of the ten lowest. This ratio has hardly changed in 25 years.

It comes as no surprise that the Philippines once again tops the ranking. A very high exposure score of 40.76 and a vulnerability score of 53.49 also reflect the country's significant exposure to storms: extremely powerful storms are not the exception here, but a structural reality.

The situation is similar for the most vulnerable countries in the ranking. Somalia, the Central African Republic, Chad, Sudan, South Sudan, the Democratic Republic of the Congo, Yemen, Afghanistan, Niger, and Ethiopia are shaped by conflict, political instability, or protracted humanitarian crises. This structural fragility is reflected in persistently high vulnerability scores.

25 years of vulnerability

The average global score of the WorldRiskIndex has remained virtually unchanged over the past 25 years. However, this stability is deceptive. It is the result of two contrasting trends.

By 2010, significant progress had been made across all dimensions of vulnerability. Many countries were benefiting from economic growth, increased funding for development cooperation, better food security, and improved access to clean drinking water, sanitation, electricity, and communications technology. This reflects what a quarter of a century of focused development and cooperation can achieve. Studies estimate that USAID health and development programs have prevented more than 91 million deaths over two decades, including the deaths of 30 to 35 million children [8].

China is a prime example of this trend. Over 900 million people are exposed to earthquakes, floods, storms, or sea-level rise. This figure has not changed since the start of the time series. Vulnerability levels, however, have more than halved through massive investments in education, health, infrastructure, and research. China thus demonstrates that while exposure is a geographical given, vulnerability can be shaped through policy. Even the most extreme levels of geographic exposure do not necessarily result in a high risk of disaster.

From 2010 onwards, the trend reversed: the Arab Spring led to the collapse of state structures in Syria; South Sudan descended into institutional fragility following independence; conflicts spread throughout the Sahel region. The Ukraine crisis of 2014 and its escalation in 2022 marked further ruptures.

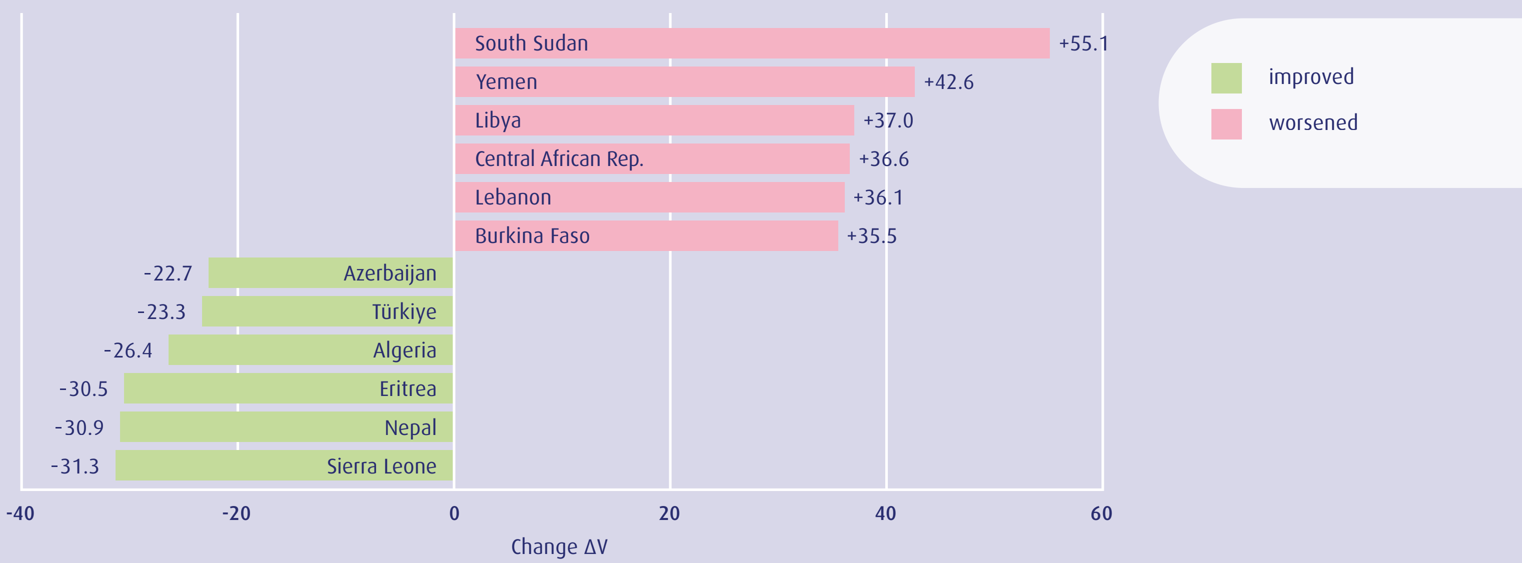
In parallel, the number of refugees, internally displaced persons, and people affected by conflict has more than doubled over the past 25 years. Conflicts have become a key driver of global vulnerability. Large-scale displacement and refugee movements strain the infrastructure of host countries and exacerbate existing supply shortages. At the same time, countries of origin lose human capital and social cohesion. In both cases, the capacity to respond effectively to extreme natural events declines. Often, coping capacities are the first to collapse, while susceptibility and adaptive capacities tend to deteriorate with a time lag.

Two countries, two paths

Yemen: Hardly any other country illustrates this dynamic more clearly. Since the onset of political instability, the country's vulnerability level has nearly tripled. All three vulnerability components now fall within the "very high" range. It is noteworthy that this deterioration began years before the conflict made international headlines. The WorldRiskIndex captures this gradual erosion of state capacities—an early warning signal that is often recognized too late by policymakers. The situation in Yemen illustrates what happens when a society reaches the point at which self-stabilization is barely possible. What would be needed is the reconstruction of state institutions, reliable basic services, and massive investments in education and infrastructure. As long as the conflict persists, this remains unrealistic.

Germany: With a score of 4.29, the country ranks 99th, in the middle of the ranking. Its exposure level is moderate (1.95), and its vulnerability is very low (9.45). Over the past 25 years, the score has fluctuated within a narrow range of 3.79 to 5.47. Germany is representative of a large group of countries that face moderate levels

How vulnerability changed: Winners and losers



Source: WorldRiskIndex 2026

Note:
Change in vulnerability score 2000 → 2026 (in points)

of risk but suffer from structural weaknesses in their adaptive capacities, which are slowly but steadily deteriorating due to a lack of investment and aging infrastructure. Even a country's stable capacities can erode over the long term as a result of external shocks, as the case of Ukraine shows.

What the data show

Since 2022, global vulnerability has been rising again. However, this deterioration is very unevenly distributed. It is concentrated among an expanding group of currently 36 fragile and conflict-affected states at the top of the ranking, while the middle remains largely stable.

The state of adaptive capacities globally is particularly alarming. They determine how well societies can prepare for future shocks and mitigate structural risks before they develop into disasters. Where these capacities are destroyed by conflict or cannot be maintained due to a lack of resources, vulnerabilities accumulate and intensify. The fact that these capacities have not improved measurably at a global level over a quarter of a century is—given that climate change will intensify exposure levels in the future, and that funding for cooperation is stagnating or even being cut—a fundamental failing.

The progress made in reducing global vulnerability through investment in health, basic services, and infrastructure up to 2010 shows that effective tools for vulnerability reduction do exist. The key question is therefore not whether they work, but whether the political will exists to apply them consistently.

When data are missing, so are solutions

The fact that the vulnerability indicators relevant to this edition could not be fully updated is more than just a technical problem. It points to structural changes in the global data and aid system.

On July 1, 2025, the US Agency for International Development (USAID) was shut down, and US development spending was halved. Many field programs were discontinued, and the data structures on which many indicators are based broke down. The consequences are clear: in the Democratic Republic of the Congo, following the discontinuation of water supply programs, cholera deaths in certain conflict zones increased by up to 361 percent [66]. In Afghanistan, numerous health centers that had previously collected epidemiological data were forced to close. In Myanmar, USAID funding was cut by just under 68 percent [10].

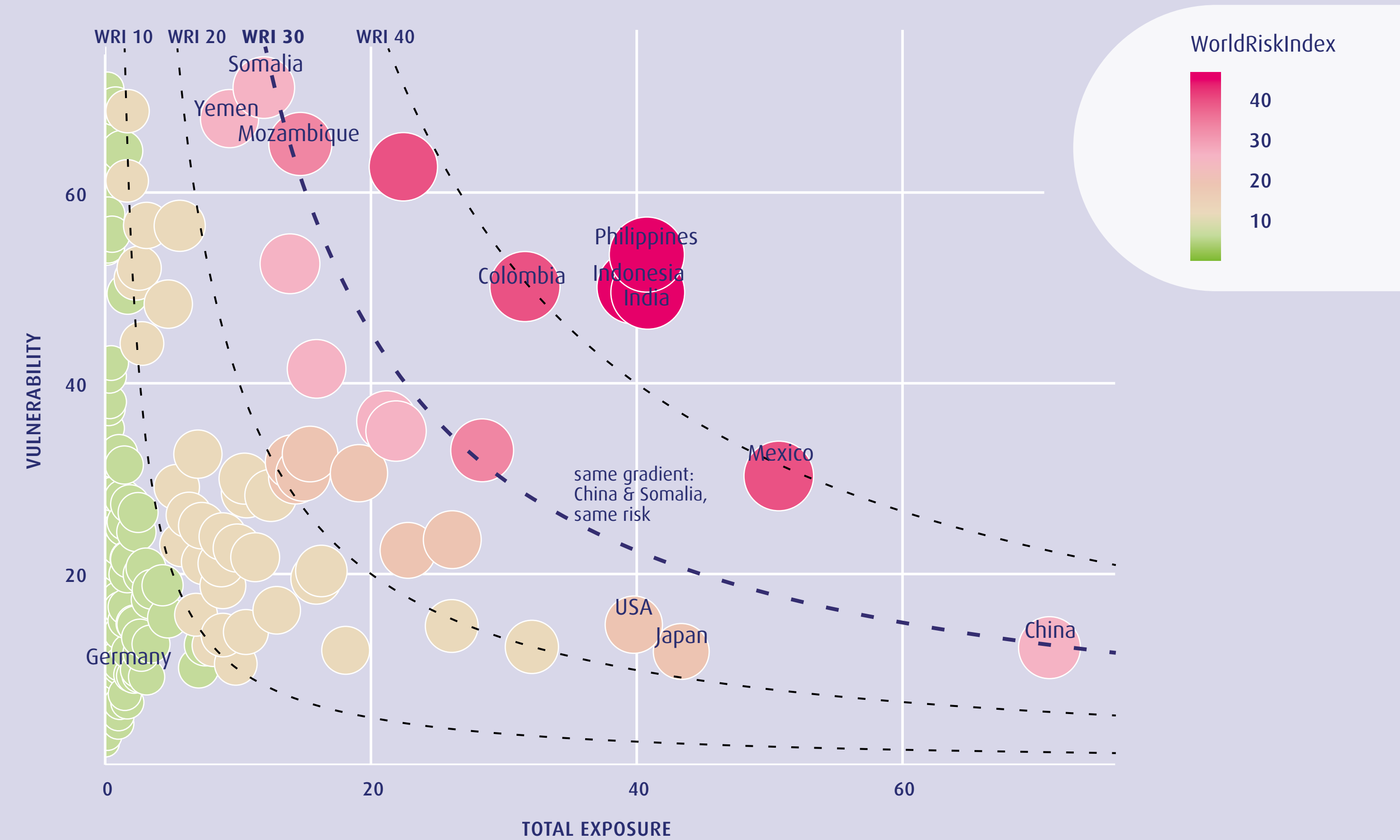
At the same time, global development funding fell by 23.1 percent in 2025, according to preliminary OECD figures, due to cuts by other donor countries, including Germany. This is the steepest decline ever recorded [63]. A Lancet simulation estimates that these cuts could cause up to 9.4 million additional preventable deaths by 2030 [8].

There is a direct link between data infrastructure and risk management: where health and care data are lacking or absent, the foundations of early warning systems and evidence-based decision-making also deteriorate. Without valid data, there can be no early warning; without early warning, there can be no needs-based allocation of resources. Humanitarian data must be coordinated globally and financed sustainably.

So far, this report has shown how disaster risk is distributed globally and why it has remained so stable over the past 25 years. However, not all natural hazards have the same effect on overall risk. One stands out clearly: tropical cyclones.

Note:
The WRI is the geometric means $W = \sqrt{E \cdot V}$; each dashed line connects countries with the same risk. China and Somalia lie on the same gradient.

Iso-risk gradients: Same risk, different causes



Source: WorldRiskIndex 2026 – all 193 countries

Storm risk

The WorldRiskIndex covers seven hazard types: earthquakes, tsunamis, coastal floodings, riverine floodings, tropical cyclones, droughts, and sea level rise. None of these is as geographically concentrated as tropical cyclones: of 193 countries, 123 are barely exposed to tropical cyclones whatsoever. The remaining 70 countries are located in three clearly distinguishable regions—the Western Pacific, the North Atlantic and the Caribbean, and the Indian Ocean. Within this group, the distribution is once again extremely concentrated: ten countries account for the vast majority of global storm exposure, while the remaining 60 are only marginally affected.

At the top of the list is the Philippines with a storm exposure of 89.71, followed by Japan (85.02), China (75.17), South Korea (74.31), Mexico (74.19), Mauritius (74.16), Madagascar (66.20), the USA (58.41), Micronesia (49.74), and Australia (49.46). The gap to the next group—Caribbean states, Vietnam, Bangladesh, and India—is extreme. Their values are below 3.55.

In seven of these countries—the Philippines, Japan, South Korea, Mexico, Mauritius, Madagascar, and the USA—storms are the dominant natural hazard, meaning they represent the highest individual score across all seven types of exposure. Tropical cyclones have a greater impact on the risk profile of these countries than earthquakes, floods, or droughts.

Note:
Japan, South Korea, and China are extremely storm-exposed but have low vulnerability; the Philippines combines both into the world's highest storm risk.

When exposure meets vulnerability

Storm exposure alone does not create disaster risk. The decisive factor is underlying societal vulnerability, which can transform a weather phenomenon into a disaster. The data show this clearly.

Japan and the USA have a similarly high or even higher exposure to tropical cyclones (85.02 and 58.41 respectively) than many countries in the Global South, yet they have a significantly lower vulnerability (11.88 and 14.69 respectively). The result is a vastly lower risk, as institutional capacities, early warning systems, building standards, and economic resilience absorb the bulk of the storm risk.

Once again, the Philippines stands out: a storm exposure score of 89.71 combined with a vulnerability score of 53.49 places it at the top of all 193 countries, with a score of 69.27. The country lies within the Western Pacific typhoon belt, which structurally shapes its exposure.

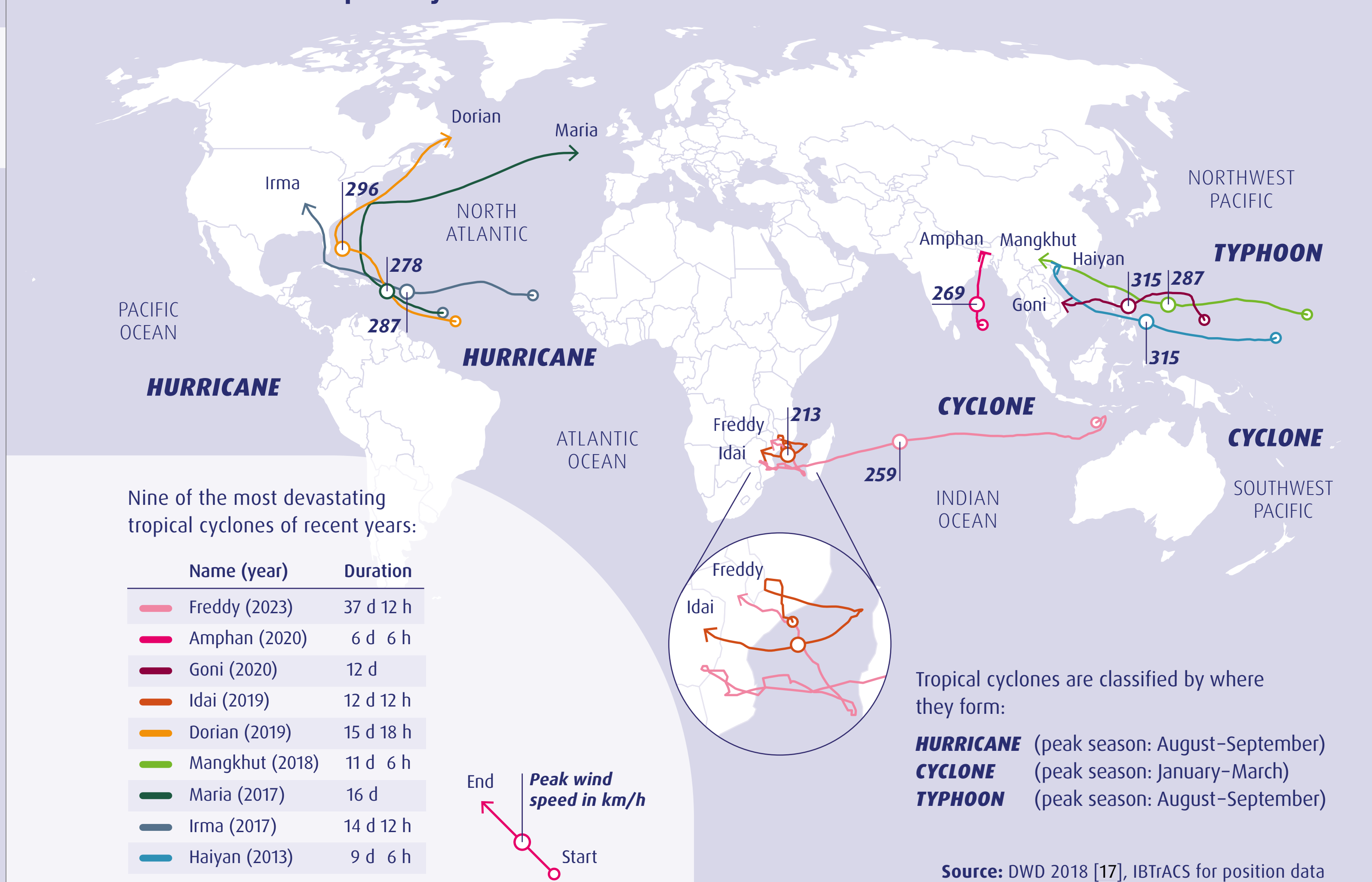
What sets the Philippines apart from all other countries is the extreme overlap of multiple hazards. A storm exposure score of 89.71 coincides with an earthquake score of 73.15, a tsunami score of 69.66, a coastal flood score of 58.14, and a sea-level rise score of 60.17. No other country in the world has such high figures across five out of seven hazard types. This makes the Philippines not only the country most at risk from storms in

Note:
Tracks and intensity of selected tropical cyclones of recent years, by region of formation.

Exposure alone does not create risk

Source: Global Cyclone Risk 2026 – 70 cyclone-exposed countries

The tracks of tropical cyclones



Nine of the most devastating tropical cyclones of recent years:

Name (year)	Duration
Freddy (2023)	37 d 12 h
Amphan (2020)	6 d 6 h
Goni (2020)	12 d
Idai (2019)	12 d 12 h
Dorian (2019)	15 d 18 h
Mangkhut (2018)	11 d 6 h
Maria (2017)	16 d
Irma (2017)	14 d 12 h
Haiyan (2013)	9 d 6 h

Tropical cyclones are classified by where they form:

HURRICANE (peak season: August–September)
CYCLONE (peak season: January–March)
TYPHOON (peak season: August–September)

Source: DWD 2018 [17], IBTrACS for position data the world—but also the country with the highest multi-hazard exposure level.

At the other end of the spectrum are Mozambique, Myanmar, India, and Bangladesh. They have a comparatively moderate level of storm exposure, but extremely high vulnerability. This combination leaves them susceptible to disasters even from storms below the threshold of tropical cyclones. When Cyclone Ditwah struck Sri Lanka in 2025, claiming 643 lives, it was not a Category 5 extreme event but a storm that hit a society with limited coping capacities.

Why does the index focus on tropical cyclones?

In the WorldRiskIndex, only tropical cyclones classified as Saffir-Simpson Categories 1, 3, and 5 are included in the storm category. This decision is in line with the United Nations' *Global Assessment Report on Disaster Risk Reduction* [84].

This focus is driven primarily by substantive considerations: tropical cyclones are the most destructive type of atmospheric extreme event. According to Gallagher Re [23], they accounted for the largest share of insured disaster losses worldwide in 2025. The WMO has recorded a long-term trend toward greater intensity while frequency remains broadly unchanged, a trend linked to rising sea surface temperatures.

Furthermore, there are methodological reasons for this focus: tropical cyclones can be modeled globally in a standardized and probabilistic manner. The Saffir-Simpson scale provides a consistent intensity classification that enables comparability across ocean basins and over decades. Extra-tropical storms, convective systems, and tornadoes are regionally significant, but their modeling is too spatially and methodologically heterogeneous for integration into global indices.

Despite these decisions, the analysis remains applicable. The societal vulnerability measured by the WorldRiskIndex is universal. A country that is ill-prepared for a Category 3 tropical cyclone is also ill-prepared for a winter storm, a convective extreme event, or storm-induced flooding. The storm exposure measure in the WorldRiskIndex assesses the most intense form of storm risk; the vulnerability, however, applies to all.

When hazard becomes certainty

Storm exposure levels in the WorldRiskIndex have remained remarkably stable over time. The global average has remained unchanged at 4.20 since 2000. This is due to the methodology: the exposure calculation is based on historical tracks, probabilistic return periods, and population data, which change only minimally over a 25-year period.

However, this stability is only a look in the rear-view mirror. Statistical evidence shows that this is set to change. The WMO points to a trend toward more intense storms: the probability of Category 4 and 5 hurricanes has increased since the 1980s. Rising sea-surface temperatures are fueling the phenomenon of rapid intensification, whereby storms gain at least 55 km/h in speed within a very short time. Hurricane Melissa in 2025, Hurricane Milton in 2024, and Typhoon Mawar in 2023 were examples of this.

When the WorldRiskIndex's exposure component is updated to incorporate the latest climate models in the coming decades, significant changes in the risk profile are to be expected—not so much due to spatial shifts in major cyclone regions as to changes in frequency and intensity. Under the same societal conditions, an increase in higher-category storms leads to greater risk along the same storm paths. For countries such as the Philippines, which already has the world's highest exposure to storms, this will exacerbate an already extreme risk profile. The most effective way to reduce this risk is to reduce vulnerability. —

The structure of the WorldRiskIndex

Risk is the interaction of the two spheres of exposure and vulnerability. It arises only where the two spheres meet. In this respect, risks only occur where populations without sufficient resilience, coping, or adaptive capacities live in regions where hazards from extreme natural events or negative impacts of climate change exist.

Exposure is the extent to which populations in hazard-prone areas are exposed to and burdened by the impacts of extreme natural events or the negative consequences of climate change. Thus, exposure consists of the aspects of hazard, which include the frequency and intensity of earthquakes, tsunamis, coastal and river flooding, cyclones, droughts, and sea level rise in an area (hazard zone), and population (hazard object).

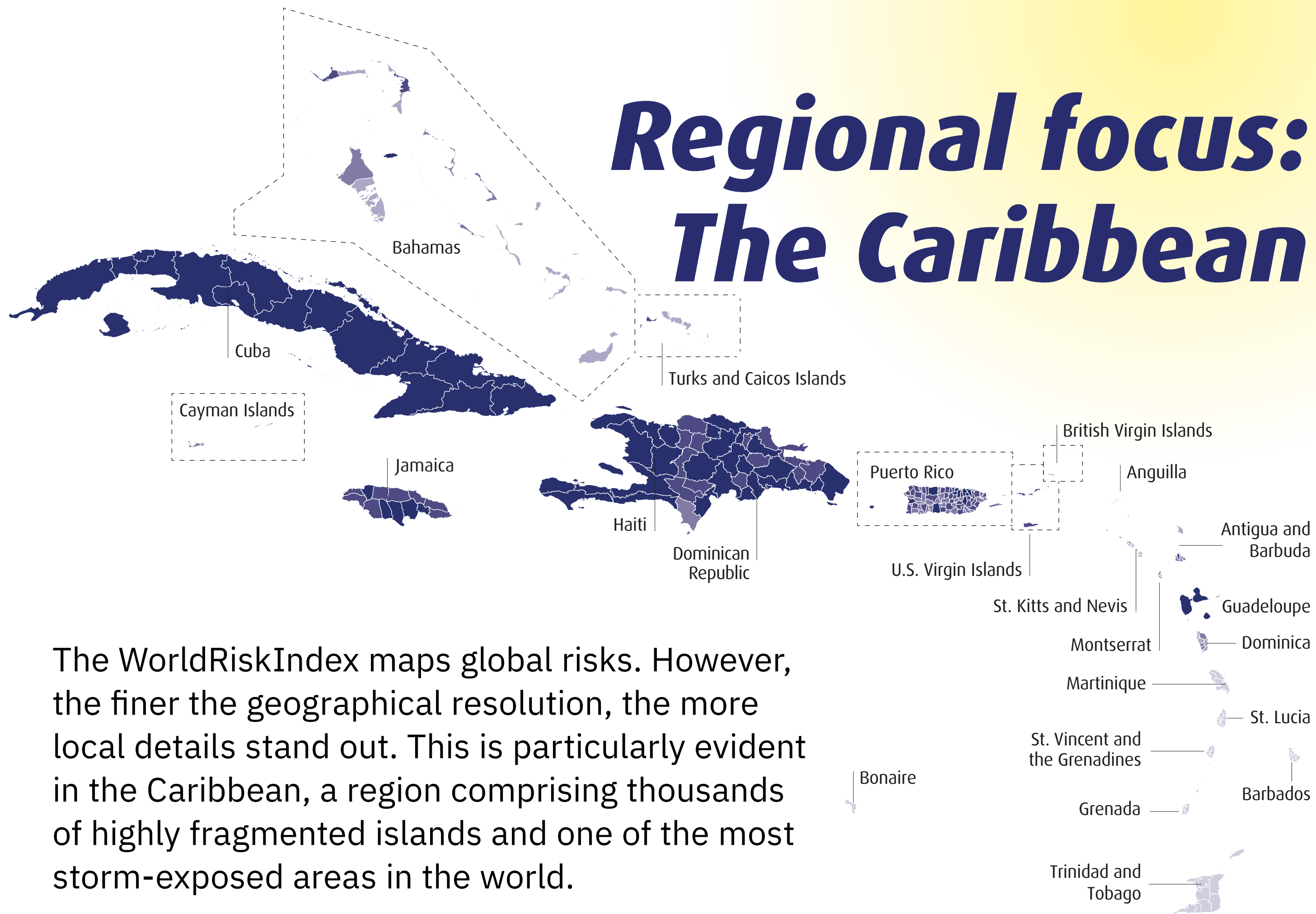
Vulnerability is the predisposition of populations to be vulnerable to damage from extreme natural events or negative impacts of climate change. As a sphere of economic, political, social, and environmental factors, vulnerability depicts the capacities and dispositions of people, households, and societies and indicates how easily and to what extent they can be destabilized, damaged, or even destroyed by extreme events. It consists of the three dimensions of susceptibility, lack of coping capacities, and lack of adaptive capacities, which are subdivided into further categories.

Susceptibility refers to structural characteristics and general conditions of societies that increase the overall likelihood of populations suffering damage from extreme natural events and entering a state of disaster. In this respect, susceptibility indicates the extent of resilience and resources of a population to mitigate the immediate consequences of extreme events.

Coping capacities refer to the abilities and measures of societies to counter adverse impacts of natural events or climate change through direct action and available resources in the form of formally or informally organized activities and measures, as well as to reduce damage in the immediate aftermath of an event and initiate recovery. Within the model of the WorldRiskIndex, the deficits in these capacities are included, which is why they are referred to as a lack of coping capacities.

Adaptive capacities, in contrast to coping capacities, refer to long-term processes and strategies to achieve anticipatory changes in societal structures and systems to counteract, mitigate, or prevent future negative impacts. Analogous to the lack of coping capacities, the lack of adaptive capacities is included in the WorldRiskIndex.

Regional focus: The Caribbean



The WorldRiskIndex maps global risks. However, the finer the geographical resolution, the more local details stand out. This is particularly evident in the Caribbean, a region comprising thousands of highly fragmented islands and one of the most storm-exposed areas in the world.

This year's analysis focuses specifically on this region and examines the extent to which Caribbean islands are exposed to tropical cyclones, ranging from moderate systems to hurricanes of the highest categories. The results are based on the methodology of the WorldRiskIndex [97].

Exposure follows a north-south gradient. Haiti, Cuba, the Dominican Republic, Jamaica, and Puerto Rico have the highest scores. They are all located in Hurricane Alley, the central corridor of Atlantic tropical cyclones. Dense coastal populations and low-lying river valleys exacerbate the risk. Haiti is the extreme case: the Port-au-Prince metropolitan area lies in a narrow, largely deforested coastal plain with deteriorating infrastructure. Tropical storms regularly trigger flash floods and landslides here. At the other end of the spectrum are Trinidad and Tobago, and Bonaire. Their near-equatorial location means that most tropical cyclones pass north of them.

How much even a few degrees of latitude can matter is illustrated by a direct comparison: New Providence in the Bahamas lies within the core of the hurricane belt. In 2019, Hurricane Dorian remained almost stationary over the archipelago for days, causing devastating damage. Bonaire, just a few degrees further south, lies almost entirely outside the typical hurricane tracks.

Regional storm exposure

very low	0.00	–	32.28
low	32.29	–	50.58
medium	50.59	–	60.59
high	60.60	–	65.88
very high	65.89	–	100.00

Yet even high exposure does not necessarily lead to high casualty figures. Cuba and Haiti both rank among the highest for storm exposure and could hardly be more different. Thanks to effective warning systems, established evacuation procedures, and coordinated local authorities, Cuba regularly weathers even powerful hurricanes with comparatively low casualty figures. Haiti is the opposite: institutional weakness, political instability, environmental degradation, and inadequate urban planning transform the same storm into a catastrophe. Not because of the wind strength, but because of the social conditions that it encounters.

This is precisely what makes the local perspective indispensable. Global indices show where risk arises. Spatially differentiated analyses show why and where interventions can be effective.

Annalisa Lombardo
Welthungerhilfe
Country director in Haiti

Same storm, different catastrophe

In the Caribbean, the climate crisis manifests above all as storms, floods, and landslides. These events increasingly occur outside the traditional hurricane season, threatening communities throughout the year. Longer and more intense droughts are yet another symptom of climate change, particularly in Haiti. This shapes household livelihoods and deepens anxieties about the future.

Communities across the larger Caribbean islands have learned at great cost that a single night can strip away homes, crops, and livestock, leave roads buried under debris or swept away by waves, and render health facilities and schools inaccessible because they are damaged or overwhelmed by displaced people.

RANK	COUNTRY	REGION	EXPOSURE
1	Cuba	Ciudad de la Habana	86.90
2	Haiti	Ouest	84.90
3	Dom. Republic	Santo Domingo	82.06
...			
311	Trinidad and Tobago	Penal-Debe	0.03
311	Trinidad and Tobago	San Fernando	0.03
315	Antigua and Barbuda	Redonda	0.01

The longer-term impacts are not only cumulative but vary significantly from country to country. Returning to pre-disaster conditions requires resources that are often simply not available. Families may rebuild, replant, and restock. But each time they do so with fewer means, and with a growing sense that recovery is always temporary. This feeling is considerably stronger in Haiti than in Cuba or the Dominican Republic. These countries face comparable hurricane exposure, yet their outcomes differ dramatically. Effective civil protection mechanisms like early warning systems, evacuation procedures, community drills, relatively coordinated local authorities, and a population accustomed to preparedness allow Cuba and the Dominican Republic to weather even powerful hurricanes with comparatively low death tolls and limited damage.

A storm that would be manageable elsewhere is often catastrophic in Haiti. The difference lies in institutional and social conditions, not in economic wealth. Weak infrastructure, limited state presence, political instability, environmental degradation, social exclusion, and inadequate urban planning all amplify vulnerability. In many Haitian neighborhoods, shaped by successive waves of unplanned urbanization, drainage systems are absent or blocked. In rural areas, hillsides are deforested, and emergency response capacity remains severely limited throughout the country.

Additionally, Haiti's poorest residents often have no choice but to settle in hazardous areas such as floodplains, unstable hillsides, or coastal zones. These are the places where land is accessible, housing is affordable, or the promise of work draws people in. For the most vulnerable, immediate economic survival consistently outweighs long-term climate risk.

Climate change is not only about the growing frequency and intensity of extreme weather events, or the cost of physical reconstruction. It is about how these events reshape communities and widen the gap between the wealthy and the poor. The social costs are high in the short term, but higher still in the long term. When social ties erode, societies find it increasingly difficult to build shared goals and act on them collectively. —

How do we lower storm risk?

How do we lower storm risk?

Storms become disasters when they strike societies that lack adequate protection. Where early warning systems are absent, social safety nets are inadequate, or people are structurally marginalized, the risk increases. Vulnerability is not immutable. It arises from social and global power imbalances and can be reduced through political decisions.

The articles in this report reveal a common pattern. In many places, there are systems designed to provide protection, but they do not reach everyone. The gaps systematically affect those who are already less visible: people without access to government services, and people without social networks that can step in to help. Ironically, it is precisely where protection is most urgently needed that the systems designed to provide it fail.

The following recommendations focus on the areas of the inclusiveness of early warning, social protection, and financial assistance, as well as the interplay between formal and informal approaches. They are based on a common principle: protection is only true protection when it reaches everyone—including those who are otherwise overlooked. None of these gaps will close on their own. Long-term action is needed, but it must start now.

Early warning must reach everyone—it must not merely register the danger

→ Early warning systems must be consistently tailored to the vulnerabilities of the affected population, not solely to the meteorological hazard. A system that provides precise warnings of a storm but fails to reach people with limited mobility, those who do not speak the local language, or those without safe access to shelters misses its purpose. Warnings must therefore be accessible in the languages spoken locally—acoustically, visually, and in writing. It is crucial not to view warning systems as a short-term technical measure, but rather as an ongoing social process.

→ Evacuation routes and emergency shelters must be barrier-free and accessible in a manner that preserves dignity. Those who avoid shelters out of fear of assault, lack of privacy, or unacceptable sanitary conditions remain unnecessarily vulnerable. The needs of particularly vulnerable groups, such as women, older adults, or people with disabilities, must be taken into account from the very beginning. This can only be achieved if these very groups are involved in designing the systems intended to protect them. Regular simulations and emergency drills reveal gaps before a real storm does.

→ At the same time, measures that reduce the hazard itself without creating new vulnerabilities must be strengthened. Technical infrastructure such as dikes and storm barriers can often create a false sense of security. It encourages settlement in at-risk areas and leads people to take warnings less seriously. Nature-based approaches, such as the restoration of wetlands or the creation of retention areas, mitigate the impacts of storms without creating new vulnerabilities. Hazard mitigation and preparedness must be considered together.

Social protection must reach everyone at risk, not just those who are formally covered

→ Social protection systems must be further developed so that vulnerability—and not merely an official poverty status—determines eligibility. Currently, those who are vulnerable but not formally classified as poor fall through the cracks. So do people working in the informal sector or living in informal settlements. Social registries and eligibility criteria must close this gap.

→ Social protection, disaster risk management, and climate adaptation must be systematically integrated. Adaptive social protection approaches build resilience not only after damage has occurred, but on an ongoing basis. They make it possible to expand benefits even ahead of an approaching storm.

→ Informal safety nets, such as neighborly assistance, community-led reconstruction, and local solidarity, must be specifically strengthened without formalizing them. Their strength lies in their flexibility, speed, and local trust. Transferring them into formal structures would destroy precisely these qualities. At the same time, informal networks must not serve as a substitute for government responsibility, as they are quickly overwhelmed in the event of large-scale disasters. What is needed is a collaborative approach in which formal systems ensure reliable basic protection for everyone, and local structures complement them, not replace them.

Disaster financing must not depend on where people come from

→ Public aid bears the primary responsibility in the event of a disaster. Private funding can supplement it, but must not replace it. Remittances are unevenly distributed: households without relatives abroad receive nothing, and existing inequalities are exacerbated. Public aid must specifically support those households and communities that cannot rely on a diaspora.

→ At the same time, private remittances from migrants are one of the fastest and most direct forms of disaster financing, and their total amount far exceeds that of humanitarian emergency aid. Their potential should be recognized and incorporated into national disaster risk management strategies. People who send money home to build storm-resistant structures or renovate existing ones should receive tax breaks. This ensures that remittances are directed toward prevention rather than just reconstruction. In addition, remittance fees should be waived in advance of a foreseeable storm so that the money arrives faster and in full.

→ The cost of remittances must be reduced. Ironically, fees are highest for remittances sent to the countries most at risk. A resilient financial infrastructure—including in rural and remote regions—is necessary to ensure that funds reach those in need even when a storm cuts off access routes. —

More climate risks, less cooperation

The erosion of international capacity to act

Dr. Stephan Klingebiel
German Institute of Development
and Sustainability

Looking back, 2015 was a true “window of opportunity”: Both the 2030 Agenda with its 17 Sustainable Development Goals (SDG) and the Paris Climate Agreement were adopted. The current situation, however, is the opposite of such a moment. The 2026 communiqué from the G7 development ministers makes no mention of the 2030 Agenda, the SDG, or climate change. The U.S. administration under President Trump has succeeded in making even non-binding international guiding principles politically taboo.

The international community thus faces a twofold challenge: climate-related extreme weather events are on the rise, while at the same time the financial and political foundations of international cooperation are eroding. Tropical cyclones, floods, and droughts cause enormous economic damage, destroy infrastructure, and exacerbate social vulnerability—particularly in fragile and low-income countries.

At the same time, international development financing is going through a worrying phase. In many OECD countries, political priorities are shifting in favor of defense, security, and geo-economic strategies. Massive budget problems and domestic conflicts over resource allocation are exacerbating this trend. Development cooperation and humanitarian aid are losing political support, particularly in Europe and the United States. Development budgets in OECD countries were cut by 23 percent in 2025—a historic decline.

This decline in significance is not merely financial in nature. It is also a reflection of a broader political shift. Right-wing populist and nationalist forces are increasingly calling international solidarity into question. International cooperation is becoming more selective, transactional, and shaped by geopolitical considerations.

This trend is particularly problematic in the context of climate-related disasters. Resilience is not built overnight, but through long-term investments in early warning systems, climate-resilient infrastructure, and effective institutions. If development cooperation and humanitarian aid are weakened, many countries’ ability to take preventive action against climate risks and manage climate-related crises will diminish.

The consequences are already evident. Humanitarian aid systems are operating at breaking point, while funding gaps are widening and the number of climate-related crises is on the rise. Vulnerable coastal regions and fragile states often lack the resources needed to respond adequately to storm events. This increases risks to political stability, food security, and social cohesion. Added to this is increasing geopolitical fragmentation. Multilateral institutions are losing their influence, while competing power centers pursue their own strategic interests. As a result, international aid risks becoming more selective—guided by geopolitical relevance rather than vulnerability and need.

Worst-case scenarios therefore lie less in individual disasters than in a gradual erosion of the collective capacity to act. If prevention remains underfunded and vulnerable states lose their capacity to adapt, there is a risk of greater economic damage, increased displacement, and growing instability in the long term.

At the same time, international politics continues to offer opportunities for constructive engagement. The Seville Conference on Development Financing (2025) demonstrated that constructive actors can join forces and make a difference. Middle powers in particular—such as Germany, Canada, South Korea, Brazil, and South Africa—can play an important role in securing the capacity for international action in selected policy areas.

However, the central challenge remains: Climate risks are global problems that require long-term international cooperation. A further withdrawal from development cooperation and humanitarian aid would therefore not only be problematic from a humanitarian perspective, but also strategically short-sighted. —

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Further information

All reports, scientific details on the methodology, datasets, and further materials are available for download at:
https://weltrisikobericht.de/worldriskreport

Bündnis Entwicklung Hilft is made up of the aid organizations Brot für die Welt, CBM Christoffel-Blindenmission, DAHW Deutsche Lepra- und Tuberkulosehilfe, German Doctors, Kindernothilfe, medico international, Misereor, Oxfam, Plan International, Terre des Hommes, Welthungerhilfe. In contexts of crises and disasters, the member organizations provide both short-term relief and long-term support in order to overcome poverty and prevent new crises.

The Institute for International Law of Peace and Armed Conflict (IFHV) of the Ruhr University Bochum is one of the leading institutions in Europe for research and teaching on humanitarian crises. With a long tradition in the scientific analysis of international humanitarian law and human rights, the Institute today combines interdisciplinary research in the fields of law, social science, geoscience, and public health.

WorldRiskIndex and StormRiskIndex 2026: country ranking

Overall Risk				Storm Risk	
CLASSIFICATION	WORLDRISKINDEX	EXPOSURE	VULNERABILITY	STORMRISKINDEX	CLASSIFICATION
very low	0.00 – 2.07	0.00 – 0.22	0.00 – 10.09	0.00 – 0.38	very low
low	2.08 – 3.35	0.23 – 0.74	10.10 – 15.97	0.39 – 0.50	low
medium	3.36 – 6.31	0.75 – 2.13	15.98 – 23.40	0.51 – 0.82	medium
high	6.32 – 13.72	2.14 – 8.76	23.41 – 32.89	0.83 – 6.56	high
very high	13.73 – 100.00	8.77 – 100.00	32.90 – 100.00	6.57 – 100.00	very high

Details on the methodology of the WorldRiskIndex, the StormRiskIndex, and their dimensions are available at https://weltrisikobericht.de/worldriskreport. Only countries that are United Nations member states are considered.

RANK	COUNTRY	WORLDRISKINDEX	EXPOSURE	VULNERABILITY	STORM-RISKINDEX	STORM-RISKRANK
1	Philippines	46.69	40.76	53.49	69.27	1
2	India	44.97	40.83	49.54	11.99	14
3	Indonesia	44.63	39.78	50.08	11.69	15
4	Colombia	39.80	31.59	50.14	10.88	17
5	Mexico	39.18	50.69	30.28	47.40	2
6	Myanmar	37.51	22.44	62.70	13.39	13
7	Mozambique	30.92	14.69	65.09	13.72	12
8	Russian Federation	30.58	28.37	32.97	8.86	23
9	China	29.54	71.06	12.28	30.38	6
10	Somalia	29.12	11.94	71.00	0.84	71
11	Honduras	27.68	21.89	34.99	10.04	18
12	Papua New Guinea	27.64	21.20	36.04	2.33	53
13	Pakistan	27.03	13.91	52.53	2.99	50
14	Bangladesh	25.70	15.91	41.51	11.18	16
15	Yemen	25.18	9.36	67.75	0.82	77
16	Viet Nam	24.83	26.12	23.60	8.82	24
17	United States of America	24.17	39.78	14.69	29.29	8
18	Madagascar	24.16	19.10	30.57	44.99	3
19	Japan	22.69	43.35	11.88	31.78	5
20	Nicaragua	22.63	22.79	22.48	7.67	28
21	Guatemala	22.41	15.42	32.58	9.84	19
22	Peru	21.31	14.89	30.50	0.55	106
23	Thailand	21.15	14.10	31.74	9.22	22
24	Ecuador	20.80	14.33	30.18	0.55	106
25	Australia	19.92	32.11	12.36	24.72	10
26	Canada	19.48	26.08	14.55	5.98	43
27	Iran	18.77	12.47	28.24	2.06	56
28	Panama	18.18	16.27	20.32	1.75	62
29	Haiti	17.81	5.61	56.51	13.96	11
30	Egypt	17.74	10.49	30.00	0.55	106
31	Venezuela	17.61	15.89	19.51	1.77	61
32	El Salvador	17.44	10.65	28.55	2.20	55
33	Argentina	15.67	11.29	21.76	0.47	127
34	Libya	15.15	4.75	48.30	0.69	94
35	South Africa	15.08	6.98	32.57	2.21	54
36	Solomon Islands	15.03	9.94	22.72	7.48	32
37	New Zealand	14.74	18.10	12.00	1.39	67
38	Türkiye	14.56	8.86	23.92	0.49	121
39	Chile	14.46	12.91	16.20	0.40	145
40	Timor-Leste	13.58	8.74	21.10	7.65	30
41	Dominican Republic	13.50	7.27	25.07	9.35	21
42	Kenya	13.28	3.12	56.55	0.75	87
43	Malaysia	12.90	8.86	18.77	1.68	63
44	Brazil	12.85	6.31	26.18	0.51	115
45	Morocco	12.59	7.45	21.26	0.46	130
46	Tanzania	12.53	5.39	29.11	2.02	57
47	Costa Rica	12.14	10.59	13.92	1.44	66
48	Syria	11.55	2.56	52.07	0.72	91
49	Vanuatu	11.54	5.77	23.08	7.67	28
50	Mauritania	11.06	2.77	44.17	0.66	95
51	Italy	10.98	8.86	13.60	0.37	156
52	Angola	10.85	2.31	50.99	0.71	92
53	Democratic Republic of Congo	10.76	1.69	68.53	0.83	73
54	North Korea	10.37	6.84	15.73	7.11	34
55	South Korea	10.20	9.83	10.58	28.04	9
56	Greece	10.10	8.14	12.53	0.35	159
57	Cameroon	10.08	1.66	61.22	0.78	84
58	Spain	9.74	7.54	12.57	0.35	159
59	Iraq	9.16	1.70	49.40	0.70	93
60	Nigeria	9.08	1.28	64.36	0.80	81
61	Saudi Arabia	9.02	4.32	18.82	0.87	70
62	United Arab Emirates	8.53	4.72	15.42	1.47	64
63	Oman	8.46	7.04	10.17	1.28	68
64	Cambodia	8.10	2.48	26.45	8.34	26
65	Micronesia	8.07	3.54	18.40	30.25	7
66	Algeria	7.96	3.07	20.64	0.45	133
67	Tunisia	7.74	3.45	17.35	0.42	141
68	Sri Lanka	7.57	2.35	24.41	1.98	58
69	Fiji	7.51	2.83	19.95	7.26	33
70	Sudan	7.34	0.78	69.03	0.83	73
71	Namibia	7.15	1.87	27.33	0.52	114
72	Guinea	6.73	1.44	31.43	0.56	103
73	Cuba	6.61	3.45	12.66	6.69	37
74	Gabon	6.30	1.56	25.47	0.50	116
75	Suriname	6.26	1.82	21.53	0.46	130
76	Eritrea	6.20	1.78	21.60	0.46	130
77	Djibouti	6.14	1.35	27.95	0.53	112
78	France	5.92	2.63	13.33	0.37	156
79	Belize	5.90	1.40	24.89	8.32	27
80	Senegal	5.86	1.05	32.69	0.57	102
81	Albania	5.79	2.28	14.72	0.38	151
82	Poland	5.77	1.67	19.96	0.45	133
83	Guyana	5.71	2.20	14.83	0.39	148
84	Tonga	5.65	2.72	11.72	6.11	42
85	Lebanon	5.38	0.52	55.63	0.75	87
86	Portugal	5.36	3.12	9.22	1.18	69
87	Uruguay	5.10	1.57	16.55	0.41	142
88	Samoa	4.98	2.49	9.95	5.43	45
89	United Kingdom	4.95	2.60	9.41	0.31	167
90	Sierra Leone	4.91	1.06	22.75	0.48	125
91	Ethiopia	4.89	0.36	66.33	0.81	80

RANK	COUNTRY	WORLDRISKINDEX	EXPOSURE	VULNERABILITY	STORM-RISKINDEX	STORM-RISKRANK
92	Croatia	4.84	1.55	15.13	0.39	148
93	Comoros	4.66	0.68	31.89	9.50	20
94	Belgium	4.61	1.79	11.89	0.34	161
95	Trinidad and Tobago	4.57	1.00	20.92	1.83	60
96	Netherlands	4.50	2.17	9.33	0.31	167
97	Israel	4.43	1.20	16.35	0.40	145
98	Ukraine	4.35	0.45	42.12	0.65	96
99	Germany	4.29	1.95	9.45	0.31	167
100	Jamaica	4.26	1.04	17.42	7.57	31
101	Jordan	4.21	0.78	22.67	0.48	125
102	Afghanistan	4.18	0.26	67.36	0.82	77
103	South Sudan	4.14	0.25	68.66	0.83	73
104	Gambia	4.09	0.59	28.38	0.53	112
105	Liberia	4.08	0.54	30.86	0.56	103
106	Georgia	4.06	0.70	23.59	0.49	121
107	Bahamas	4.04	1.18	13.83	6.77	36
108	Marshall Islands	3.89	0.77	19.61	6.57	39
109	Barbados	3.88	0.95	15.82	6.52	40
110	Slovenia	3.70	0.95	14.44	0.38	151
111	Congo	3.67	0.33	40.73	0.64	97
112	Malawi	3.60	0.34	38.05	2.47	51
113	Guinea-Bissau	3.59	0.59	21.90	0.47	127
114	Uganda	3.57	0.22	57.78	0.76	86
115	Benin	3.46	0.22	54.35	0.74	89
116	Dominica	3.43	1.12	10.52	5.49	44
117	Central African Republic	3.37	0.16	70.89	0.84	71
118	Ireland	3.32	1.48	7.43	0.27	177
119	Antigua and Barbuda	3.30	1.67	6.54	4.53	48
119	Romania	3.30	0.66	16.52	0.41	142
119	Sweden	3.30	1.07	10.16	0.32	166
122	Ghana	3.28	0.34	31.68	0.56	103
123	Latvia	3.19	0.69	14.76	0.38	151
124	Bolivia	3.17	0.35	28.76	0.54	110
124	Zambia	3.17	0.27	37.28	0.61	100
126	Cyprus	3.15	0.68	14.60	0.38	151
127	Burundi	3.07	0.15	62.86	0.79	83
128	Mauritius	3.06	0.48	19.53	38.06	4
129	Lao People's Democratic Republic	2.99	0.37	24.20	8.45	25
130	Côte d'Ivoire	2.98	0.31	28.66	0.54	110
131	Kyrgyzstan	2.96	0.23	38.09	0.62	99
132	Chad	2.88	0.12	69.34	0.83	73
132	Grenada	2.88	0.45	18.38	6.79	35
134	Bosnia and Herzegovina	2.87	0.34	24.29	0.49	121
135	Tajikistan	2.85	0.23	35.29	0.59	101
136	Montenegro	2.81	0.83	9.53	0.31	167
137	Zimbabwe	2.77	0.20	38.35	2.40	52
138	Saint Lucia	2.67	0.46	15.51	6.60	38
139	Armenia	2.66	0.23	30.73	0.55	106
139	Norway	2.66	1.10	6.43	0.25	180
141	Togo	2.65	0.13	54.06	0.74	89
142	Saint Vincent and the Grenadines	2.64	0.63	11.05	5.37	46
143	Saint Kitts and Nevis	2.49	0.74	8.40	5.06	47
144	Lithuania	2.48	0.63	9.76	0.31	167

RANK	COUNTRY	WORLDRISKINDEX	EXPOSURE	VULNERABILITY	STORM-RISKINDEX	STORM-RISKRANK
144	Rwanda	2.48	0.15	40.85	0.64	97
146	Nepal	2.47	0.24	25.37	0.50	116
147	Kiribati	2.41	0.50	11.63	0.34	161
148	Iceland	2.37	0.71	7.88	0.28	175
149	Azerbaijan	2.36	0.22	25.35	0.50	116
150	Bulgaria	2.34	0.30	18.19	0.43	137
151	Kuwait	2.29	1.01	5.21	0.23	185
152	Mali	2.27	0.08	64.17	0.80	81
153	Equatorial Guinea	2.24	0.30	16.74	0.41	142
154	Palau	2.19	0.34	14.16	6.21	41
155	Kazakhstan	2.18	0.25	19.00	0.44	135
156	Niger	2.16	0.07	66.63	0.82	77
157	Brunei Darussalam	2.07	0.99	4.31	0.21	189
158	Burkina Faso	2.06	0.07	60.58	0.78	84
159	Estonia	1.99	0.53	7.44	0.27	177
160	Serbia	1.92	0.17	21.65	0.47	127
161	Eswatini	1.90	0.14	25.80	1.90	59
162	Paraguay	1.89	0.14	25.44	0.50	116
162	Seychelles	1.89	0.51	6.97	3.84	49
164	Mongolia	1.68	0.15	18.78	0.43	137
165	Nauru	1.65	0.35	7.77	0.28	175
166	Finland	1.59	0.51	4.94	0.22	187
167	Uzbekistan	1.55	0.17	14.21	0.38	151
168	Cabo Verde	1.52	0.12	19.20	0.44	135
169	Maldives	1.51	0.23	9.86	0.31	167
170	Botswana	1.47	0.09	23.87	0.49	121
171	Tuvalu	1.42	0.14	14.34	1.47	64
172	Austria	1.37	0.16	11.80	0.34	161
172	North Macedonia	1.37	0.10	18.65	0.43	137
174	Turkmenistan	1.29	0.17	9.72	0.31	167
175	Czech Republic	1.23	0.10	15.24	0.39	148
176	Lesotho	1.22	0.06	24.67	0.50	116
177	Moldova	1.19	0.09	15.74	0.40	145
178	Switzerland	1.15	0.16	8.29	0.29	174
179	Bhutan	1.14	0.10	12.91	0.36	158
180	Denmark	1.13	0.18	7.05	0.27	177
181	Slovakia	1.03	0.10	10.57	0.33	164
182	Malta	0.98	0.15	6.36	0.25	180
183	Qatar	0.94	0.17	5.20	0.23	185
184	Bahrain	0.87	0.12	6.30	0.25	180
185	São Tomé and Príncipe	0.85	0.04	18.10	0.43	137
186	Hungary	0.82	0.11	6.15	0.25	180
187	Belarus	0.74	0.05	10.99	0.33	164
188	Singapore	0.72	0.17	3.01	0.17	192
189	Liechtenstein	0.67	0.09	4.97	0.22	187
190	Luxembourg	0.45	0.06	3.35	0.18	191
191	Andorra	0.33	0.02	5.58	0.24	184
191	San Marino	0.33	0.03	3.60	0.19	190
193	Monaco	0.21	0.02	2.28	0.15	193

Note: Tied ranks carry the same statistical information and weight.
Sorted alphabetically by country name.

WorldRiskIndex and StormRiskIndex 2026: alphabetical order

COUNTRY	WORLDRISK INDEX	WORLDRISK RANK	STORMRISK INDEX	STORMRISK RANK
Afghanistan	4.18	102	0.82	77
Albania	5.79	81	0.38	151
Algeria	7.96	66	0.45	133
Andorra	0.33	191	0.24	184
Angola	10.85	52	0.71	92
Antigua and Barbuda	3.30	119	4.53	48
Argentina	15.67	33	0.47	127
Armenia	2.66	139	0.55	106
Australia	19.92	25	24.72	10
Austria	1.37	172	0.34	161
Azerbaijan	2.36	149	0.50	116
Bahamas	4.04	107	6.77	36
Bahrain	0.87	184	0.25	180
Bangladesh	25.70	14	11.18	16
Barbados	3.88	109	6.52	40
Belarus	0.74	187	0.33	164
Belgium	4.61	94	0.34	161
Belize	5.90	79	8.32	27
Benin	3.46	115	0.74	89
Bhutan	1.14	179	0.36	158
Bolivia	3.17	124	0.54	110
Bosnia and Herzegovina	2.87	134	0.49	121
Botswana	1.47	170	0.49	121
Brazil	12.85	44	0.51	115
Brunei Darussalam	2.07	157	0.21	189
Bulgaria	2.34	150	0.43	137
Burkina Faso	2.06	158	0.78	84
Burundi	3.07	127	0.79	83
Cabo Verde	1.52	168	0.44	135
Cambodia	8.10	64	8.34	26
Cameroon	10.08	57	0.78	84
Canada	19.48	26	5.98	43
Central African Republic	3.37	117	0.84	71
Chad	2.88	132	0.83	73
Chile	14.46	39	0.40	145
China	29.54	9	30.38	6
Colombia	39.80	4	10.88	17
Comoros	4.66	93	9.50	20
Congo	3.67	111	0.64	97
Costa Rica	12.14	47	1.44	66
Côte d'Ivoire	2.98	130	0.54	110
Croatia	4.84	92	0.39	148
Cuba	6.61	73	6.69	37
Cyprus	3.15	126	0.38	151
Czech Republic	1.23	175	0.39	148
Democratic Republic of Congo	10.76	53	0.83	73
Denmark	1.13	180	0.27	177
Djibouti	6.14	77	0.53	112
Dominica	3.43	116	5.49	44
Dominican Republic	13.50	41	9.35	21
Ecuador	20.80	24	0.55	106
Egypt	17.74	30	0.55	106
El Salvador	17.44	32	2.20	55
Equatorial Guinea	2.24	153	0.41	142
Eritrea	6.20	76	0.46	130
Estonia	1.99	159	0.27	177
Eswatini	1.90	161	1.90	59
Ethiopia	4.89	91	0.81	80
Fiji	7.51	69	7.26	33
Finland	1.59	166	0.22	187
France	5.92	78	0.37	156
Gabon	6.30	74	0.50	116
Gambia	4.09	104	0.53	112
Georgia	4.06	106	0.49	121
Germany	4.29	99	0.31	167
Ghana	3.28	122	0.56	103
Greece	10.10	56	0.35	159
Grenada	2.88	132	6.79	35
Guatemala	22.41	21	9.84	19
Guinea	6.73	72	0.56	103
Guinea-Bissau	3.59	113	0.47	127
Guyana	5.71	83	0.39	148
Haiti	17.81	29	13.96	11
Honduras	27.68	11	10.04	18
Hungary	0.82	186	0.25	180
Iceland	2.37	148	0.28	175
India	44.97	2	11.99	14
Indonesia	44.63	3	11.69	15
Iran	18.77	27	2.06	56
Iraq	9.16	59	0.70	93
Ireland	3.32	118	0.27	177
Israel	4.43	97	0.40	145
Italy	10.98	51	0.37	156
Jamaica	4.26	100	7.57	31
Japan	22.69	19	31.78	5
Jordan	4.21	101	0.48	125
Kazakhstan	2.18	155	0.44	135
Kenya	13.28	42	0.75	87
Kiribati	2.41	147	0.34	161
Kuwait	2.29	151	0.23	185
Kyrgyzstan	2.96	131	0.62	99
Lao People's Democratic Republic	2.99	129	8.45	25
Latvia	3.19	123	0.38	151
Lebanon	5.38	85	0.75	87
Lesotho	1.22	176	0.50	116
Liberia	4.08	105	0.56	103
Libya	15.15	34	0.69	94
Liechtenstein	0.67	189	0.22	187
Lithuania	2.48	144	0.31	167
Luxembourg	0.45	190	0.18	191
Madagascar	24.16	18	44.99	3
Malawi	3.60	112	2.47	51
Malaysia	12.90	43	1.68	63
Maldives	1.51	169	0.31	167
Mali	2.27	152	0.80	81
Malta	0.98	182	0.25	180
Marshall Islands	3.89	108	6.57	39
Mauritania	11.06	50	0.66	95
Mauritius	3.06	128	38.06	4
Mexico	39.18	5	47.40	2
Micronesia	8.07	65	30.25	7
Moldova	1.19	177	0.40	145
Monaco	0.21	193	0.15	193
Mongolia	1.68	164	0.43	137
Montenegro	2.81	136	0.31	167
Morocco	12.59	45	0.46	130
Mozambique	30.92	7	13.72	12
Myanmar	37.51	6	13.39	13
Namibia	7.15	71	0.52	114
Nauru	1.65	165	0.28	175
Nepal	2.47	146	0.50	116
Netherlands	4.50	96	0.31	167
New Zealand	14.74	37	1.39	67
Nicaragua	22.63	20	7.67	28
Niger	2.16	156	0.82	77
Nigeria	9.08	60	0.80	81
North Korea	10.37	54	7.11	34
North Macedonia	1.37	172	0.43	137
Norway	2.66	139	0.25	180
Oman	8.46	63	1.28	68
Pakistan	27.03	13	2.99	50
Palau	2.19	154	6.21	41
Panama	18.18	28	1.75	62
Papua New Guinea	27.64	12	2.33	53
Paraguay	1.89	162	0.50	116
Peru	21.31	22	0.55	106
Philippines	46.69	1	69.27	1
Poland	5.77	82	0.45	133
Portugal	5.36	86	1.18	69
Qatar	0.94	183	0.23	185
Romania	3.30	119	0.41	142
Russian Federation	30.58	8	8.86	23
Rwanda	2.48	144	0.64	97
Saint Kitts and Nevis	2.49	143	5.06	47
Saint Lucia	2.67	138	6.60	38
Saint Vincent and the Grenadines	2.64	142	5.37	46
Samoa	4.98	88	5.43	45
San Marino	0.33	191	0.19	190
São Tomé and Príncipe	0.85	185	0.43	137
Saudi Arabia	9.02	61	0.87	70
Senegal	5.86	80	0.57	102
Serbia	1.92	160	0.47	127
Seychelles	1.89	162	3.84	49
Sierra Leone	4.91	90	0.48	125
Singapore	0.72	188	0.17	192
Slovakia	1.03	181	0.33	164
Slovenia	3.70	110	0.38	151
Solomon Islands	15.03	36	7.48	32
Somalia	29.12	10	0.84	71
South Africa	15.08	35	2.21	54
South Korea	10.20	55	28.04	9
South Sudan	4.14	103	0.83	73
Spain	9.74	58	0.35	159
Sri Lanka	7.57	68	1.98	58
Sudan	7.34	70	0.83	73
Suriname	6.26	75	0.46	130
Sweden	3.30	119	0.32	166
Switzerland	1.15	178	0.29	174
Syria	11.55	48	0.72	91
Tajikistan	2.85	135	0.59	101
Tanzania	12.53	46	2.02	57
Thailand	21.15	23	9.22	22
Timor-Leste	13.58	40	7.65	30
Togo	2.65	141	0.74	89
Tonga	5.65	84	6.11	42
Trinidad and Tobago	4.57	95	1.83	60
Tunisia	7.74	67	0.42	141
Türkiye	14.56	38	0.49	121
Turkmenistan	1.29	174	0.31	167
Tuvalu	1.42	171	1.47	64
Uganda	3.57	114	0.76	86
Ukraine	4.35	98	0.65	96
United Arab Emirates	8.53	62	1.47	64
United Kingdom	4.95	89	0.31	167
United States of America	24.17	17	29.29	8
Uruguay	5.10	87	0.41	142
Uzbekistan	1.55	167	0.38	151
Vanuatu	11.54	49	7.67	28
Venezuela	17.61	31	1.77	61
Viet Nam	24.83	16	8.82	24
Yemen	25.18	15	0.82	77
Zambia	3.17	124	0.61	100
Zimbabwe	2.77	137	2.40	52

Note: Only countries that are United Nations member states are considered. Tied ranks carry the same statistical information and weight.

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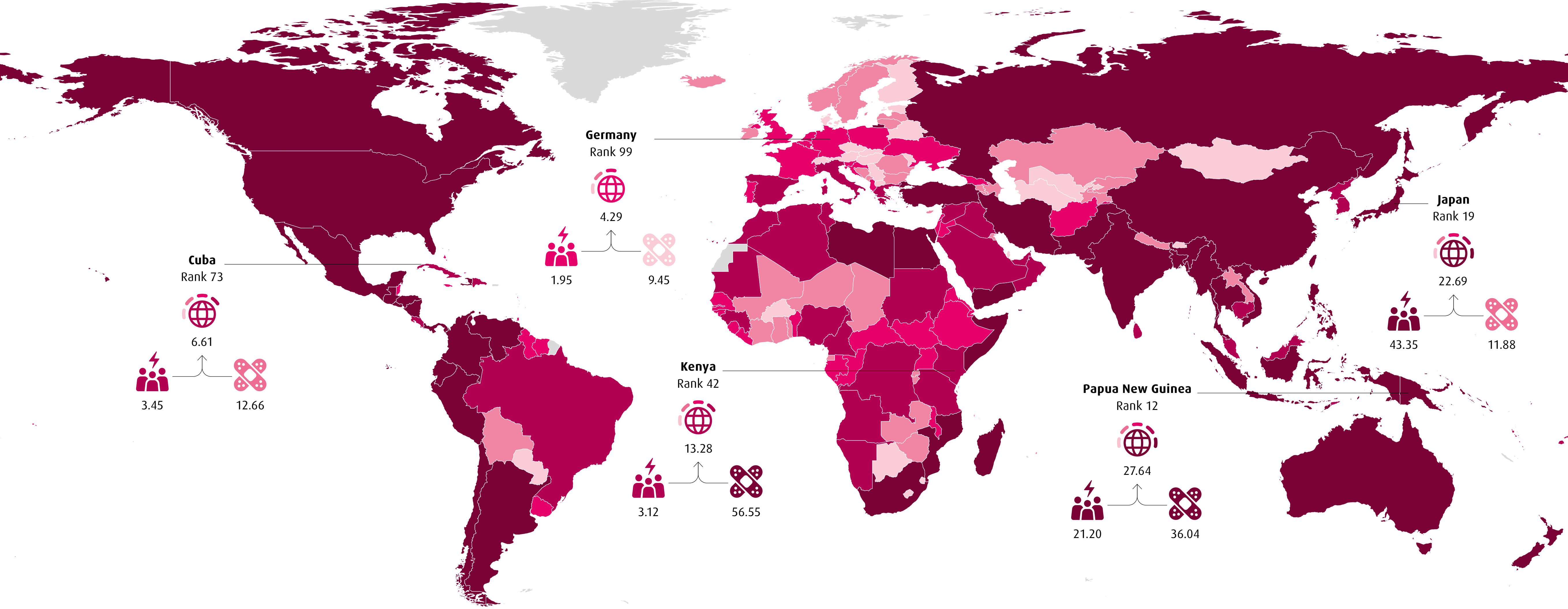
Disaster risk 2026



WORLDRISKINDEX			
very low	0.00	–	2.07
low	2.08	–	3.35
medium	3.36	–	6.31
high	6.32	–	13.72
very high	13.73	–	100.00
no data			

EXPOSURE			
very low	0.00	–	0.22
low	0.23	–	0.74
medium	0.75	–	2.13
high	2.14	–	8.76
very high	8.77	–	100.00
no data			

VULNERABILITY			
very low	0.00	–	10.09
low	10.10	–	15.97
medium	15.98	–	23.40
high	23.41	–	32.89
very high	32.90	–	100.00
no data			

Since 2022, fixed thresholds have been used to classify countries for the WorldRiskIndex and its components, enabling analyses of medium- and long-term trends. For each dimension and for the WorldRiskIndex, the medians of the quintile boundaries are calculated from the results of the past 20 years. Data sources: IFHV's own calculations based on CReSIS, EMDAT, FAO, GFDRR, IHME, IDMC, JRC, IMF, ILO, UCDP, UNESCO, UNHCR, UNDRR, WHO, World Bank, WorldPop, WID; additional information at https://weltrisikobericht.de/worldriskreport

THE 10 COUNTRIES WITH HIGHEST RISK		
1	Philippines	46.69
2	India	44.97
3	Indonesia	44.63
4	Colombia	39.80
5	Mexico	39.18
6	Myanmar	37.51
7	Mozambique	30.92
8	Russian Federation	30.58
9	China	29.54
10	Somalia	29.12

THE 10 COUNTRIES WITH HIGHEST EXPOSURE		
1	China	71.06
2	Mexico	50.69
3	Japan	43.35
4	India	40.83
5	Philippines	40.76
6	Indonesia	39.78
6	United States of America	39.78
8	Australia	32.11
9	Colombia	31.59
10	Russian Federation	28.37

THE 10 COUNTRIES WITH HIGHEST VULNERABILITY		
1	Somalia	71.00
2	Central African Republic	70.89
3	Chad	69.34
4	Sudan	69.03
5	South Sudan	68.66
6	Democratic Republic of Congo	68.53
7	Yemen	67.75
8	Afghanistan	67.36
9	Niger	66.63
10	Ethiopia	66.33

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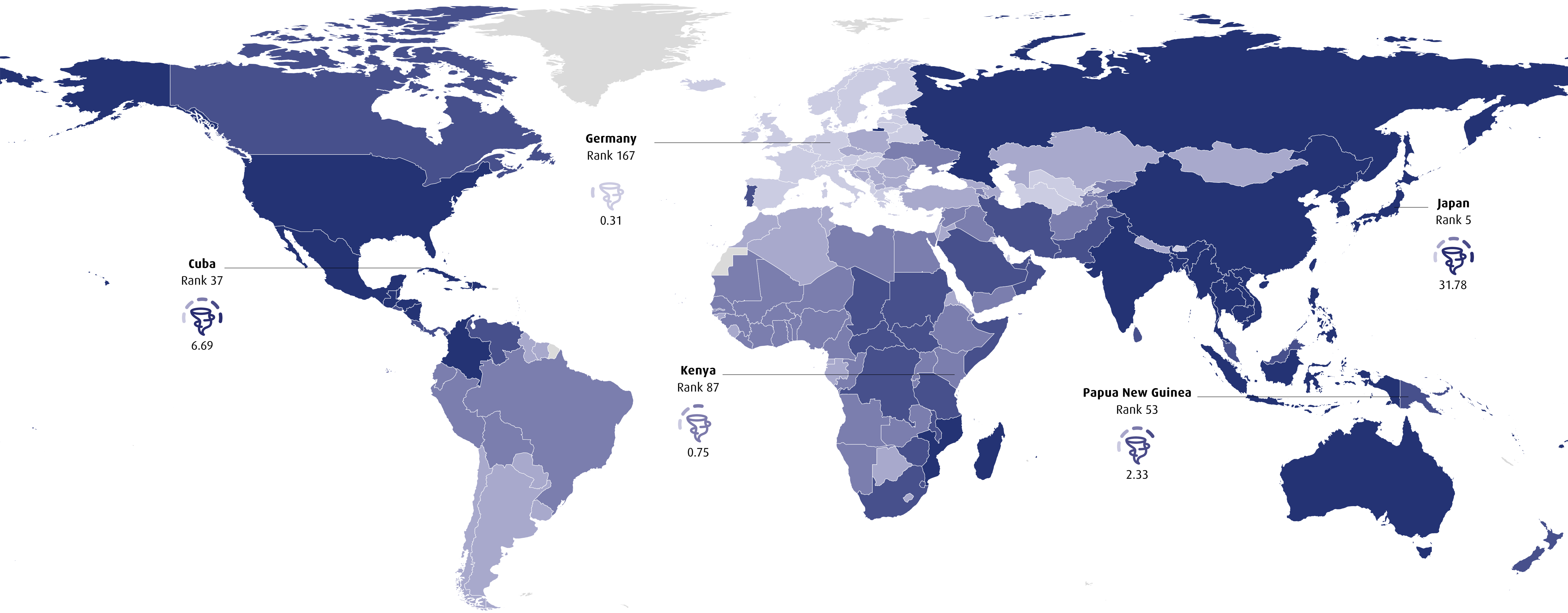
Storm risk 2026



STORMRISKINDEX

very low	0.00	–	0.38
low	0.39	–	0.50
medium	0.51	–	0.82
high	0.83	–	6.56
very high	6.57	–	100.00
no data			

Data source: IFHV's own calculations based on FAO, GFDRR, IHME, IDMC, JRC, IMF, ILO, UCDP, UNESCO, UNHCR, UNDRR, WHO, World Bank, WorldPop, WID.

THE 10 COUNTRIES WITH HIGHEST STORM RISK

1	Philippines	69.27
2	Mexico	47.40
3	Madagascar	44.99
4	Mauritius	38.06
5	Japan	31.78
6	China	30.38
7	Micronesia	30.25
8	United States of America	29.29
9	South Korea	28.04
10	Australia	24.72

THE 10 COUNTRIES WITH LOWEST STORM RISK

1	Monaco	0.15
2	Singapore	0.17
3	Luxembourg	0.18
4	San Marino	0.19
5	Brunei Darussalam	0.21
6	Liechtenstein	0.22
6	Finland	0.22
8	Qatar	0.23
8	Kuwait	0.23
10	Andorra	0.24

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