

Bündnis Entwicklung Hilft



Gemeinsam für Menschen in Not.



WorldRiskReport Analysis and prospects 2017

**WorldRiskReport
Analysis and prospects 2017**

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1 Risk analysis and disaster preparedness

The contribution of the WorldRiskReports

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1.1 Risk in a state of flux

Until recently, humans were rarely the direct cause of extreme natural events. But as a result of their interference in the natural world, they have increased the potential risk massively. The destruction of mangrove forests and coral reefs along the Southeast Asian coastline, for example, has reduced levels of protection against tidal waves and flooding. The clearing of mountain forests intensifies the rate of soil erosion and, consequently, the scale of flooding, as has been witnessed in Pakistan. Climate change and the increasingly frequent occurrence of “climate extremes” exacerbate this threat on an ongoing basis and increase the vulnerability of societies (IPCC 2014).

The WorldRiskReport’s concept of “risk” is not solely based on the probability of occurrence of natural hazards and their severity, rather it also considers human living conditions and the development status of society (Bündnis Entwicklung Hilft 2011). Prevention and the ability to react and help quickly determine

whether extreme natural events become disasters. The WorldRiskIndex, as a component of the WorldRiskReports, is created on the basis of a nuanced understanding of disaster, and calculates the risk posed to 171 countries worldwide by means of a multiplication of risk and vulnerability. This allows for the parameters of the risk assessment to be expanded. The present report for 2017 is a five-year analysis of the reports from 2012 to 2016 that prepares the groundwork for the further development of the WorldRiskIndex.

As a general rule, the following applies to the risk level of all countries: A nation that possesses sufficient financial resources and functioning national and civil-societal structures, that confronts recurring natural events with an adaptive strategy and that is prepared to invest in measures to adapt to changing conditions such as weather and climate extremes, will be less adversely impacted by natural events.

1.2 Risk analysis

The WorldRiskIndex

The WorldRiskIndex calculates the risk for 171 countries worldwide on the basis of the following four components (see figure 1):

- + Exposure to natural hazards such as earthquakes, hurricanes, flooding, drought and sea-level rise
- + Vulnerability as dependent on infrastructure, nutrition, living conditions and economic circumstances
- + Coping capacities as dependent on governance, preparedness and early warning measures, access to healthcare, social and material security
- + Adapting capacities with respect to impending natural events, climate change and other challenges.

The concept of the WorldRiskIndex, including its modular structure, has been developed by both practical experts on the ground, and scientific experts located further afield. The calculation of the index, which was performed by the Institute for Environment and Human Security of the United Nations University (UNU-EHS) in the years 2011 to 2016 and commissioned by Bündnis Entwicklung Hilft, relies on datasets that are available worldwide. The world’s nation states form the reference parameter for the index (see Chapter 2).

The WorldRiskIndex serves to provide answers to the following questions:

- + How probable is an extreme natural event and will it impact human beings?
- + How vulnerable is the population of a country to natural hazards?



Figure 1: The WorldRiskIndex and its components

- + To what extent can societies cope with acute disasters?
- + Is a society taking disaster preparedness measures against natural hazards that are expected in the future?

The representation produced using the index and its four components provides answers to these questions and brings into focus both the problems and the resulting fields of action.

Limits and weightings

Nevertheless, it is still important to keep the limits of this representation in mind: As is the case with any index, the WorldRiskIndex can only take into account indicators for which comprehensible, quantifiable data is available. For example, direct neighborhood assistance is highly important in the event of a disaster but not measurable and thus not included in the calculation. Deviations in data quality for the individual countries also

arise, for example, if data is only collected by national authorities and not by an independent international institution.

Social factors such as self-help capacities and municipal and spatial structures play a lesser role in the WorldRiskIndex than technical and economic factors, since it is more difficult to operationalize social factors - added to that fact that the corresponding data base has so far proved insufficient. This imbalanced weighting of simple, measurable technical or economic factors, which is a feature of many global analyses, should be overcome in the WorldRiskIndex in future. The modular structure of the index, which can be supplemented and expanded, allows for this issue to be overcome (Bündnis Entwicklung Hilft 2011).

Local and regional analyses

The risk within one country can vary according to region. Therefore, it is important that the calculation model of the WorldRiskIndex can also be used for small-scale analyses. It is often the case that different or additional data relevant to a risk assessment are to be found at a regional or local level. Thanks to its modular structure, the WorldRiskIndex can be used to develop an analogous local or regional risk index. This was demonstrated

by the UNU-EHS institute in the 2011 WorldRiskReport, which drew on the example of several administrative units in Indonesia (Birkmann et al. 2011).

The following applies to all levels, whether local, regional or national: The WorldRiskIndex is not a crystal ball – it does not claim to be able to predict natural events. However, it does provide comprehensive information on the action fields that arise at the stated levels of society.

1.3 Disaster preparedness

Earthquakes, as with other extreme natural events, cannot be prevented. Countries can, however, develop and implement strategies and measures so as to protect themselves from the impacts of extreme natural events and thereby limit the extent of damage. A well-founded risk analysis – and the assessments that such an analysis yields – are of central importance when it comes to disaster preparedness. By way of example: In Italy in 2016, sufficient numbers of emergency rescue services were on hand in Amatrice and the surrounding areas and were able to support

or lead relief efforts for the affected population. However, the design of newer building structures and the lack of safeguards against earthquakes in older buildings were heavily criticized. Many countries in the global South, however, have neither sufficient coping capacities nor sufficient preparedness measures with respect to potential disasters.

By interlinking exposure and vulnerability analyses, the risk assessment of the WorldRiskReports offers forward-looking conclusions for politicians and practitioners alike. With a view to the response that needs to be taken as a result, a strengthening of the entire scope of disaster management is indispensable, beginning with disaster prevention (see figure 2). This includes preparedness measures for risk minimization and compliance with building regulations, in addition to the safeguarding of infrastructure and long-term structural and institutional adaptation to the impact of extreme natural events and climate change – from a local level, all the way up to the national level.

From the perspective of Bündnis Entwicklung Hilft, a forward-looking response also implies a move away from a short-term appraisal of disasters towards a development-political approach. Emergency relief and development cooperation must constitute a consolidated effort, all the way from the planning stage to final implementation. The international

The concept of the WorldRiskReport

The foundational idea of the WorldRiskReport has remained unchanged since 2011 – the year the first edition was released:

“Whether it be an earthquake or a tsunami, a cyclone or floods, the risk of a natural event turning into a disaster always depends only partly on the force of the natural event itself. The living conditions of the people in the regions affected and the options available to respond quickly and to provide assistance are just as significant. Those who are prepared, who know what to do in the event of an extreme natural event, have a greater chance of survival. Countries that see natural hazards coming, that are preparing for the consequences of climate change and are providing the financial means required will be better prepared for the future. The WorldRiskReport contributes to an overall approach of looking at these links on a global level and drawing forward-looking conclusions regarding assistance measures, policies and reporting.” (Bündnis Entwicklung Hilft 2011)

community's current practical approach of primarily lending support once a disaster has already struck, is not beneficial in the context of impacted countries assuming "self-responsibility". In order to achieve sustainable results, long-term and forward-thinking engagement and binding outlooks are necessary. The WorldRiskReports provide action-oriented suggestions for development-political measures – with a different topic of focus every year: Logistics and Infrastructure (2016), Food Security (2015), The City as a risk Area (2014), Health and Healthcare (2013), Environmental Degradation and Disasters (2012), Governance and Civil Society (2011).

Logistics and infrastructure

Dilapidated transport routes, unsafe power grids, buildings in a state of disrepair: During extreme natural events, fragile infrastructure represents a direct threat for the local population while also delaying the effective potential for those affected to help themselves and impeding humanitarian relief. In Nepal, after the heavy earthquake of April 2015, many areas had no more access to clean water. Streets were blocked off, telephone lines were destroyed and electricity supplies came to a standstill. The country's airport was overworked because at the same time thousands were seeking to leave the country and hundreds wanted to enter to provide help.

Susceptible infrastructure and poor logistical conditions often contribute to extreme natural events also becoming humanitarian disasters. The WorldRiskReport 2016 identifies a very high need for action for the improvement of logistics and infrastructure in the highly or very highly exposed countries of Benin, Burundi, Haiti, Cambodia, Cameroon, Madagascar, Myanmar, Zimbabwe and Chad. The starting framework conditions of the individual countries can only be improved on a step-by-step basis. Safe building methods on their own are not sufficient. Central hubs such as airports, ports and depots, as well as electricity and water supplies, must be assessed all the

way down to the local level. In exposed areas, logistics experts can assess and improve the capacities, strengths and weaknesses of local infrastructure in order to boost responsiveness levels in the event of disaster.

Critical infrastructure plays a decisive role when disaster strikes, since an outage or impairment leads to supply shortages (BBK 2016). The considerable interdependencies that exist among these types of infrastructure can result in a domino effect in the case of sector failure: An outage in one sector can cause outages in other sectors, triggering a cascade of outages and damage. The majority of this critical infrastructure is essential for functioning logistics and, consequently, humanitarian logistics, and must therefore be granted particular attention in the context of disaster preparedness.

Rapid developments in fields such as information technology can offer promising opportunities for disaster management. For example, methods of analyzing the situations in disaster areas have progressed greatly in the last few years through progress in information technologies. Satellite images allow for a very precise understanding of the scale of damage and social media channels immediately provide an initial information flow from the disaster region. In addition, information technology can be used to monitor transports and local storage warehouses, for example to safeguard cold chains for medicines.

Food security

Food security is the result of the interaction between various different factors, ranging from food production and storage and access to clean water, all the way to social and political dimensions such as the right to food, healthcare, power and property relations, as well as access to resources. Extreme natural events, like drought or floods and the impacts of climate change, can massively disturb the entire food supply chain: Production, processing and procuring of food may be affected just as much as the warehousing and preparation of food.

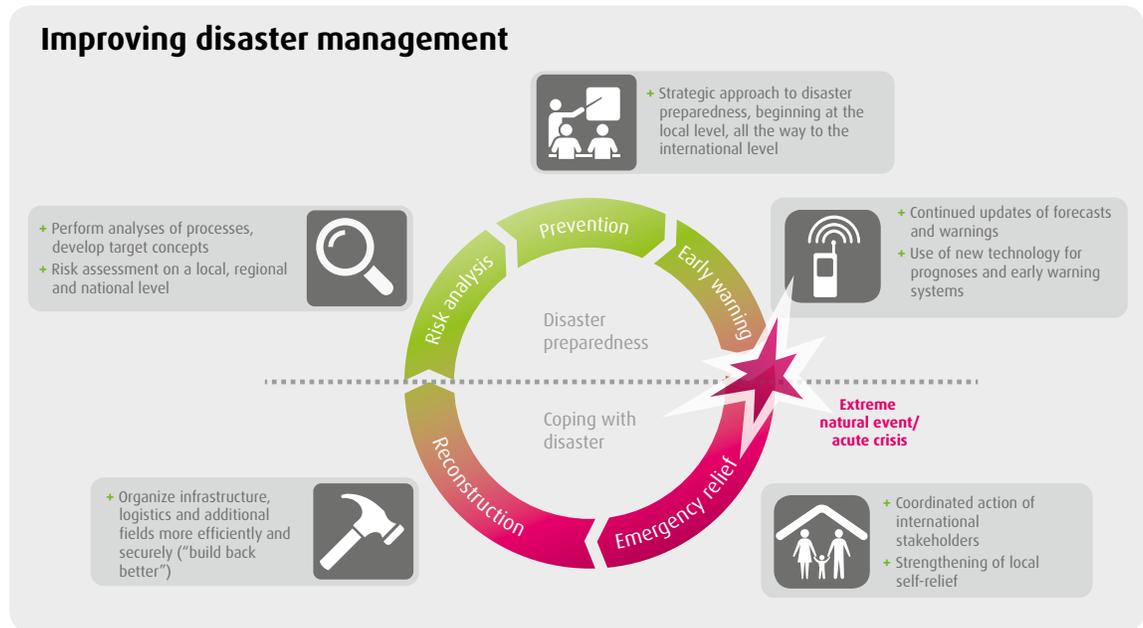


Figure 2: Disaster management cycle

Those suffering from hunger are neither in a position to stockpile supplies for a disaster, nor can they take long-term measures to adapt to disaster risks. Environmental protection and a changeover to resilient cultivation methods thus tend fall by the wayside. To reduce the disaster risk in rural areas, which are where most of those people suffering from hunger reside, a targeted strengthening of socio-economic structures is necessary, for example through the creation of alternative means of income to agriculture, the protection of land-ownership rights and the expansion of microinsurance.

The common causes of food insecurity and extreme natural events can be redressed by, for example, avoiding cultures that overstrain the soil, and by using seed that is suitable for the respective climate zone.

The city as a risk area

In rapidly growing cities in particular, municipalities face the great challenge of initiating city planning measures that reduce vulnerability. In the future, thanks to people being within reach in a relatively small area, providing for them and reducing vulnerabilities could be better achievable.

The decisive factor here is the way in which urbanization evolves: whether houses and residential developments are located in exposed zones, whether urban growth is well coordinated and whether that growth is accompanied by investment in sanitation, educational institutions and infrastructure. In areas where – opposed, or at most tolerated, by the government – only slums or informal settlements arise, urbanization becomes a severe driver of risk. However in areas where urban life and work lead to higher incomes, and where the city’s facilities, such as welfare centers, hospitals, emergency rescue services or early warning systems are made readily available, urbanization can act as a mitigating factor for risk.

It is in urban areas that good coordination of early warning mechanisms and emergency relief is particularly important. These conditions must be established early on in the context of disaster preparedness measures, and must, where necessary, be tested and accompanied by corresponding training. It is also important to reach those people who, due to disability, illness or age for example, require special protection and extra assistance.

Health and healthcare

A society with a high standard of health, and healthcare that is available and affordable for everyone, is less vulnerable to extreme natural events. At the same time, health must be viewed as a multidimensional construct that affects the vulnerability of a society in wide variety of ways. Healthcare is more than just the number of doctors and hospital beds at a society's disposal.

For example, it is often the easily avoidable infectious diseases that have fatal consequences for a society. Pneumonia and diarrhea are together responsible for 21 percent of deaths among children under five years of age (UN IGME 2017). And the illnesses themselves, even if they don't prove fatal, are still a massive barrier to development both for the child itself and for society as a whole.

A decisive driver of infectious disease is the proportion of people in a country who do not have access to closed feces disposal systems. This proportion, in percentage terms, has fallen in the last few years, but there are still 892 million people without the necessary access (WHO/UNICEF 2017). Here, disaster preparedness needs to be strengthened through the creation of secure water supplies and sanitation.

Extreme shortfalls in supply tend to occur above all in developing countries as a result of a lack of financing of healthcare and health services. The poorest people are left by the wayside: the world's most underdeveloped countries and populations that do not even have access to a subsistence-level wage of 1.25 dollars per day. Coping capacities in the event of disaster pose immense challenges for these countries in particular.

Environmental degradation and disasters

Forests and riparian wetlands or coastal ecosystems such as mangroves, coral reefs and sea-grass reduce exposure to extreme natural events. These, of course, act as natural

buffers and protective barriers that reduce the impacts of extreme natural events such as landslides or storm tides. By providing food, medicines and building materials, they reduce the vulnerability of societies. Ecosystems can also enhance coping capacities in the event of a disaster. For example, if supply lines are severed, food and fresh water can be obtained from the immediate environment – as long as that environment is intact. Intact ecosystems also have a direct influence on adapting capacities: If the environment is in good condition, there is then a greater diversity of future planning options. For example, in Haiti and other deforested areas, the opportunities for diversified strategies are greatly reduced, even though, with a view to the future, diversified opportunities for adaptation would be extremely helpful (Bündnis Entwicklung Hilft 2012).

Since the UN Conference on Sustainable Development ("Rio+20") in June 2012, it is clear that the issues of environmental degradation, poverty and disaster risk are increasingly being considered as interrelated phenomena. Now consequences need to be drawn from these debates to create sustainable disaster preparedness. The COP 23 UN climate change conference that is to take place in November 2017 offers the next opportunity in this direction.

Governance and civil society

Governmental and non-governmental development cooperation must always work towards making itself redundant. This applies also to the field of disaster risk reduction. The responsibility of national governments, particularly in high-risk countries, must therefore be strengthened. In the context of weak governance in particular, it is essential to support national governments, even before the occurrence of a disaster, in order to develop their capacities for disaster prevention and relief, and to help them in fulfilling their responsibility to protect.

It is often the case when disasters occur that, as a result of a misunderstanding of the efficiency criteria, measures are implemented solely by external stakeholders. National governments and local civil society are removed from the equation or replaced. The result is a further loss of legitimacy and a lack of coping and adapting capacities going forward. In order to break through this mechanism, and in accordance with the principle of subsidiarity, local government structures must be facilitated in particular, with the additional involvement of local civil society.

Disaster risk reduction should be legally grounded in the form of an international convention that ensures that governments of risk-affected countries assume the responsibility of protecting their own populations. This type of convention would provide a basis for inserting concrete legal claims of this nature into the national legislation of the countries that sign and ratify the convention. This would provide civil society with an important instrument for making governments accountable with respect to their responsibility to protect.

1.4 Development-political relevance

The future will also bring with it extreme natural events and other causes of disasters and acute crises. It is not enough to constantly improve disaster relief. Considerable efforts are also required in the context of governmental framework conditions - particularly in countries that are frequently impacted by disasters - and with respect to development-based cooperation.

Worldwide challenges

Wherever possible, supply channels to those affected should be self-organized while utilizing local resources, rather than “flying in” relief from abroad. International organizations should operate less often as active stakeholders themselves, and instead place their focus on the strengthening of local stakeholders. This approach is becoming more and more widespread. As a result, measures such as the allocation of vouchers or cash are becoming increasingly important in the context of internal relief. Using vouchers and cash, it is possible for local stakeholders to shop in local markets and commission manual trade work on location, thereby supporting the local economy (Bündnis Entwicklung Hilft/ United Nations University 2016). Food-only relief is increasingly losing importance, as regional markets are strengthened in its place. In addition, the reconstruction work that is performed is frequently remunerated, which

gives rise to income opportunities, for example with respect to local manual trade work.

In cases where necessary goods such as food, drinking water and building materials are not available locally, for example due to the widespread degradation or destruction caused by the disaster, humanitarian relief from abroad then remains essential. In this context, relief organizations attribute an even greater level of importance to coordination. This is implemented in the clusters established as part of the UN’s coordination work. Care has to be taken in this context that the international relief organizations do not dominate proceedings. Local organizations must continue to hold the reins when it comes to coordination committees.

Financing requirements

It would cost an additional 160 US dollars a year per person – provided across the period 2015 to 2030 – to completely eliminate hunger for all persons living in extreme poverty (FAO/ IFAD/WFP 2015a), thereby making a decisive contribution to a reduction in vulnerability. To achieve this, the international community would have to invest a total of 265 billion dollars per year to ensure long-term fulfillment of this target. This is an achievable goal, since that figure only represents 0.3 percent of the worldwide gross domestic product.

According to the UN's "Achieving Zero Hunger" report (FAO/IFAD/WFP 2015b) this money is required for social protection (67 billion US dollars per year), investment in rural development and agriculture (140 billion US dollars) and investment in urban development (58 billion US dollars).

The supply channels to refugees and internally displaced persons are particularly precarious. In 2016, extreme natural events displaced 3.5 times more people internally than violence and war (IDMC 2017). The human right to food is in many cases not guaranteed by domestic governments. Neighboring states are then overburdened and the United Nations High Commissioner for Refugees (UNHCR) and the World Food Programme (WFP) often do not have sufficient finances to deal with the problem. The UNHCR, for example, estimated its financial requirements for 2017 at 7.31 billion dollars. Full financing up to that amount by the end of the year is very unlikely, however. In the past, there has been a large discrepancy between financial requirements and delivered financing. For example, the UNHCR's donations appeal for 2016 only raised 55 percent of the target amount (UNHCR 2016).

Future modeling of climate change and its impacts show that the frequency of extreme natural events will increase along with the regeneration period for both the societies that are impacted and the affected ecosystems (Bündnis Entwicklung Hilft/United Nations University 2015). Conflict and crisis situations increase vulnerability and thus intensify negative impacts when extreme natural events occur. In this sense, disaster preparedness requires the curtailment of climate change, the development of adaptive strategies against weather-related and other disasters, and political solutions for the millions of refugees and internally displaced persons worldwide. Extensive political efforts and financial assistance are needed from international finance institutions and donor countries – specifically for the purposes of disaster preparedness.

Governmental responsibility

The interaction between governmental responsibility and the methods for influencing civil society is complex. "Weak statehood" represents a considerable problem in the context of disasters and increases the need for international relief. The starting point must be to strengthen the parameters of civil society and to demand, support and also augment governmental action. The point of intersection between reducing disaster risk and promoting good governance is a central development-political field of action. In this context, the growth of urban populations is only one of the challenges facing countries and their cities. Effective urban planning is necessary to counteract increasing urban poverty and the spread of slums and informal settlements, along with the associated protection of the general populace in the case of extreme natural events.

Paradigm shift

The WorldRiskReport serves to replace the generally widespread short-term approach to assessing disasters with a development-political approach: Aspects such as preparedness, protection of particularly vulnerable groups and risk management must be foregrounded in the context of both the analyses that are undertaken and future measures.

Unsolved problems such as resource limitations and weak governance intensify the vulnerability of societies to natural hazards, but also their deficiencies in relation to coping and adapting capacities. At the same time, these social parameters are negatively impacted by extreme natural events. In short, disasters prevent developmental progress, and a lack of developmental progress increases disaster risk (see figure 3). In order to break this vicious circle, strategies for disaster risk reduction must in future be an integral component of comprehensive strategies for sustainable development.

Deficits in disaster management and their consequences

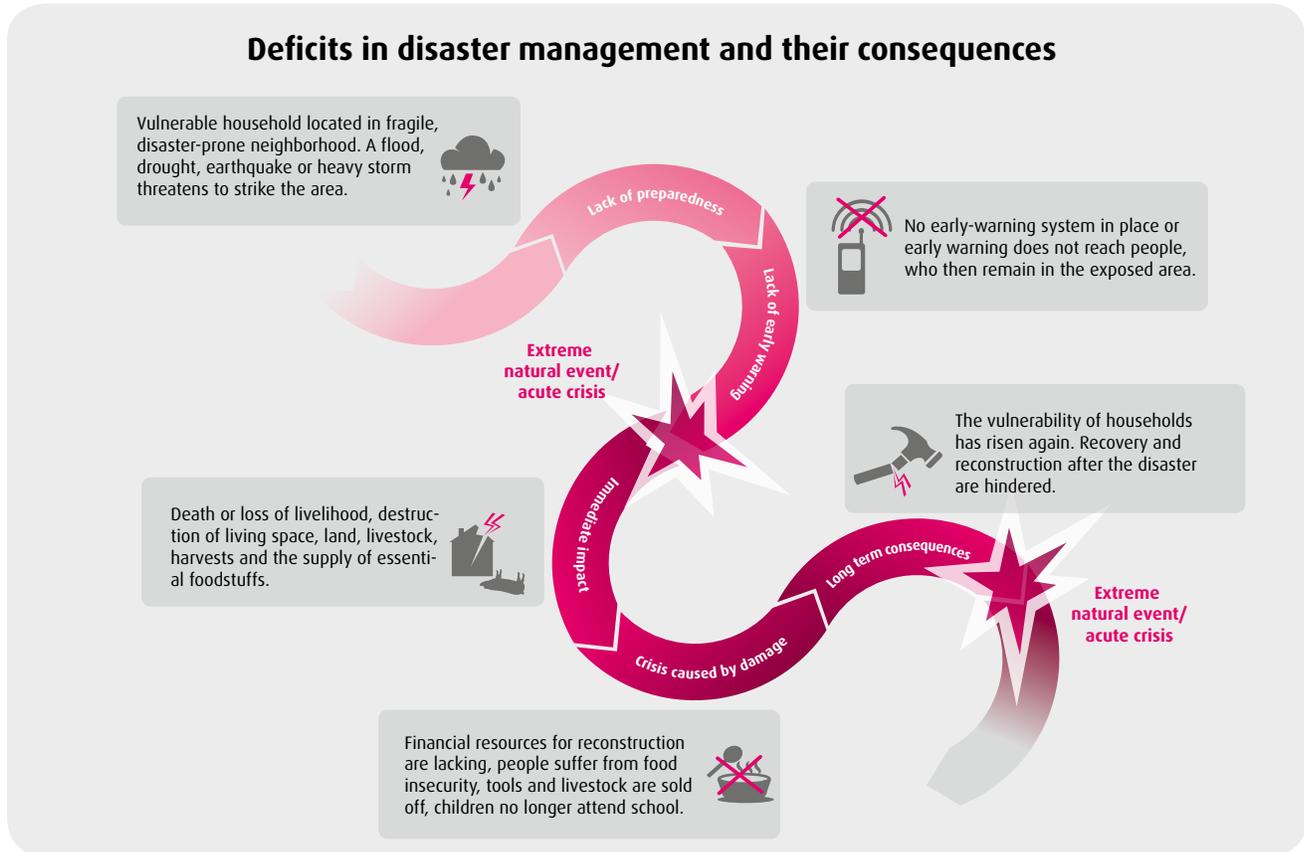
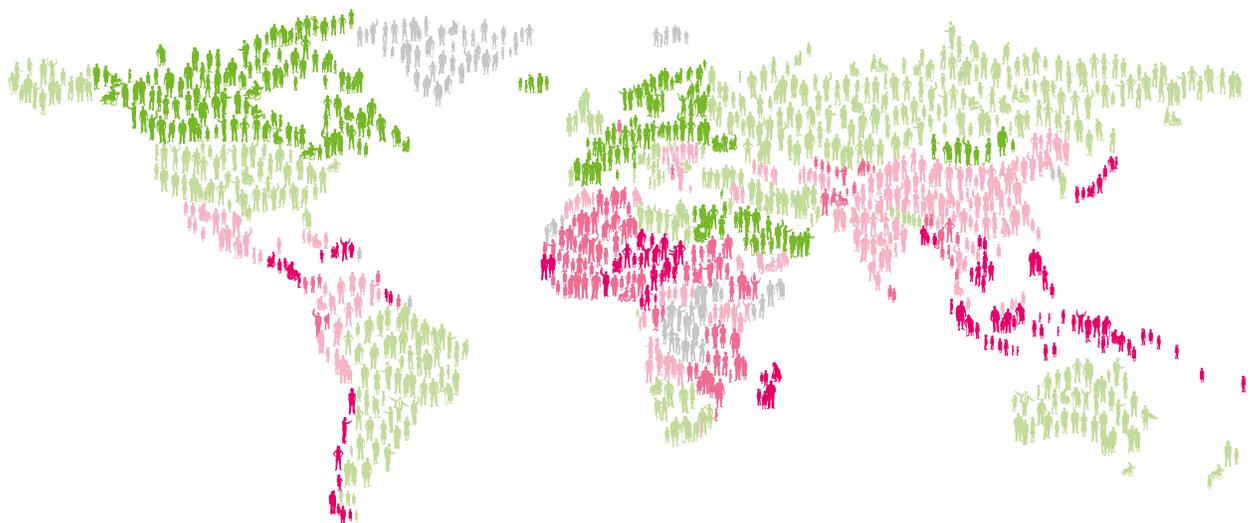


Figure 3: Downward spiral caused by insufficient disaster management

Alongside acute disasters in the wake of extreme natural events, relief organizations and the international community are also called on to respond to long-lasting disasters and crises that are generally the result of political factors, for example in Syria, Iraq, Sudan, Yemen and Afghanistan. These present humanitarian logistics with tasks that are different from those associated with acute disasters. It is not the speed of relief efforts that is decisive, rather the long-term supply of aid, a lack of access routes, safety issues and shifting political or military responsibilities represent the greatest challenges.

The concept of Bündnis Entwicklung Hilft is to integrate emergency relief and development-based cooperation into one approach, and to combine these factors to greater effect in their practical application. Risk assessment, prevention and coping and adapting strategies are components of this concept.



Strong need for action at a glance

The 15 countries with the highest exposure worldwide		The 15 countries with the highest vulnerability worldwide		The 15 countries with the highest risk worldwide	
Country	Exp. (%)	Country	Vuln. (%)	Country	Risk (%)
Vanuatu	63.66	Chad	74.36	Vanuatu	36.45
Tonga	55.27	Eritrea	73.98	Tonga	28.57
Philippines	52.46	Afghanistan	73.61	Philippines	27.69
Japan	45.91	Haiti	73.11	Guatemala	20.46
Costa Rica	42.61	Niger	72.63	Bangladesh	19.57
Brunei Darussalam	41.10	Central African Republic	72.50	Solomon Islands	18.77
Mauritius	37.35	Liberia	71.52	Costa Rica	17.16
Guatemala	36.30	Sierra Leone	71.28	Cambodia	16.92
El Salvador	32.60	Mozambique	70.11	El Salvador	16.74
Bangladesh	31.70	Guinea	70.01	Timor-Leste	16.37
Chile	30.95	Madagascar	69.30	Papua New Guinea	16.34
Netherlands	30.57	Burundi	69.30	Brunei Darussalam	16.22
Solomon Islands	29.98	Mali	69.14	Mauritius	15.11
Fiji	27.71	Guinea-Bissau	68.70	Nicaragua	14.88
Cambodia	27.65	Nigeria	67.92	Fiji	13.50

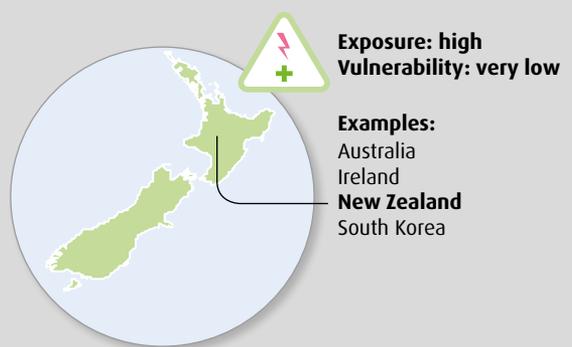
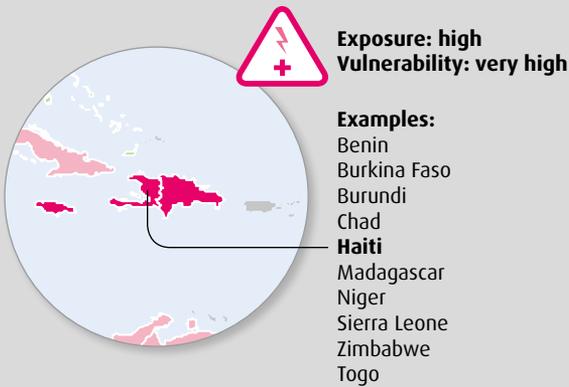
The 15 countries with the highest susceptibility worldwide		The 15 countries with the greatest lack of coping capacities worldwide		The 15 countries with the greatest lack of adaptive capacities worldwide	
Country	Sus. (%)	Country	L. of Cop. (%)	Country	L. of Ad. (%)
Madagascar	65.58	Afghanistan	92.82	Afghanistan	71.81
Mozambique	65.19	Sudan	92.57	Eritrea	70.92
Liberia	63.51	Chad	91.50	Niger	70.11
Burundi	62.96	Haiti	90.62	Mali	68.87
Chad	62.94	Yemen	90.24	Chad	68.63
United Rep. of Tanzania	62.92	Central African Republic	89.63	Sierra Leone	68.38
Eritrea	62.71	Guinea	89.58	Haiti	66.71
Zambia	62.31	Guinea-Bissau	89.14	Liberia	66.24
Central African Republic	62.25	Iraq	89.09	Guinea	66.17
Haiti	62.01	Zimbabwe	88.71	Central African Republic	65.61
Niger	60.78	Eritrea	88.31	Benin	64.68
Sierra Leone	59.18	Burundi	88.13	Pakistan	63.88
Comoros	58.61	Myanmar	88.06	Cote d'Ivoire	63.70
Malawi	57.68	Nigeria	87.86	Guinea-Bissau	63.35
Zimbabwe	57.42	Uganda	87.67	Mauritania	62.93

Data base: WorldRiskIndex, mean value calculation 2012–2016

Countries with comparable exposure levels can face different degrees of disaster risk.

The WorldRiskIndex uses a danger-exposure value to show the percentage of a nation's population, as an annual average, that could potentially be subjected to earthquakes, hurricanes, droughts and flooding and/or be affected by sea level rise of one meter (WorldRiskReport 2011). But this does not necessarily mean that countries that are highly exposed automatically exhibit a high

disaster risk. By way of example: New Zealand and Haiti are both highly exposed, but the WorldRiskIndex indicates a low disaster risk for New Zealand and, however, a very high disaster risk for Haiti. The reason for this is the second factor assessed by the WorldRiskIndex: the vulnerability of a country.



Rank	Country	WorldRiskIndex	Exposure	Vulnerability
21.	Haiti	11.89 %	16.26 %	73.11 %
119.	New Zealand	4.42 %	15.44 %	28.66 %

Data: see appendix

Vulnerability is a man-made driver of disaster risk.

Whether those persons exposed to hazards ultimately become victims of disaster in the wake of extreme natural events depends greatly on their level of vulnerability. The vulnerability of a country is determined by the societal factors that influence what a population can or cannot do in response to a natural disaster. If natural disasters strike vulnerable societies then the disaster risk is considerably greater. In the WorldRiskIndex, vulnerability is

calculated using three components: susceptibility, lack of coping capacities and lack of adaptive capacities (see page 22/23). These components are themselves derived from a series of basic indicators, such as the percentage of a population that is undernourished and the literacy rate – factors that are not a fact of nature but rather in part the result of political activity.



WorldRiskReport tell us?

Sound preparedness can reduce the disaster risk for highly exposed countries but cannot eliminate it completely.

Countries with low or very low vulnerability are well protected against extreme natural events. The driving factors behind this are, among others, robust infrastructure (WorldRiskReport 2016), a steady nutritional basis (WorldRiskReport 2015) and a functioning health system (WorldRiskReport 2013). However, if a country is as heavily exposed to extreme natural hazards as say Japan, then even the very best preventative measures can never completely

avert disaster. This was made clear as recently as 2011 when the earthquake that shook the country caused the Fukushima nuclear disaster, along with a host of other devastating effects. The WorldRiskIndex assigns exposure a sufficiently large role by giving it the same weighting as vulnerability in the calculation of disaster risk.



Japan



Rank	Exposure	Vulnerability	WorldRiskIndex
17.	45.91 %	29.33 %	13.47 %

Data: see appendix

The poor are disproportionately affected by disasters - and are more likely to die as a result.

For persons living in structurally unsound dwellings or earning low incomes, the odds of overcoming a natural disaster are much lower. In developing countries, natural disasters often result in extreme, life-threatening conditions and the destruction of a person's means of survival. In highly developed countries on the other hand, economic losses are more pronounced, with damage to infrastructure a major factor. This is illustrated clearly by a comparison between Chile and Nepal: Between 1996 and 2016,

Chile was hit by seven earthquakes, resulting in the deaths of 600 persons and damage of 30.3 billion US dollars. Nepal was struck by three earthquakes in the same period, with a loss of 9,000 human lives but economic losses of only 5.1 billion US dollars.

Poverty increases the danger of loss of life



Where wealth is greater, economic losses are higher







2 | **WorldRiskIndex: A five-year perspective**

Risk analysis 2012–2016

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Drought in East Africa, landslides in Sierra Leone, flooding in South Asia, hurricanes in the Caribbean and the United States and earthquakes in Mexico – the 2017 list of extreme natural events with drastic effects is already a long one. In East Africa, millions of people are suffering from hunger in the wake of drought, having lost livestock and their basic agricultural livelihoods. In South Asia, thousands of persons were forced to flee from flooding after the destruction of their homes. In the US, Hurricane Harvey caused

estimated damages of over 70 billion dollars. These disasters have demonstrated once more just how diverse the effects of extreme natural events can be for human populations, the agricultural sector and the infrastructure. This is because the severity of an extreme natural event is not the only factor that determines the scope of human suffering and economic damage – societal, political and economic structures influence the nature and scale of the damage in equal measure.

2.1 The concept

The WorldRiskIndex shows the disaster risk for 171 countries worldwide. It is calculated on a country-by-country basis through the multiplication of exposure (to natural hazards) and vulnerability (societal). Vulnerability is comprised of three components: susceptibility, lack of coping capacities and lack of adaptive capacities (Bündnis Entwicklung Hilft 2011). For the determination of the exposure level, the following five natural hazards are taken into account: earthquakes, hurricanes, flooding, drought and sea-level rise. Overall, the values (in percentage terms) for exposure and vulnerability in the period from 2012 to 2016 were calculated according to 28 indicators that provide information on potentially endangered areas, in addition to social, economic and ecological conditions in societies. Of those 28 indicators, five fall under the category of exposure and 23 under vulnerability. The modular composition of the four components exposure, susceptibility, lack of coping capacities and lack of adaptive capacities contained in the WorldRiskIndex, including the weighting of the individual indicators, is illustrated in Figure 4. This is a series of index values between 0 and 1 that can be represented as percentage values between 0 and 100 per cent. Every component is divided into five “classes” using quantiles, ranging from “very low” to “very high”. This enables comparisons between the 171 countries with respect to their individual components and risk value (Birkmann et al. 2011). The results are shown

in map form with the aid of geographic information systems (GIS). The description of the individual indicators and the method of calculation, in addition to the data sources used, are documented at www.WorldRiskReport.org.

For 2017, the WorldRiskIndex has not been recalculated, rather a data analysis of the years 2012 to 2016 has been undertaken. The aim of the data analysis is to deduce what developments have occurred over this five-year period. At the same time, the collated analyses also serve as a basis for the planned further development of the WorldRiskIndex (see Chapter 1 and Chapter 3).

The present data analysis has been calculated using the respective average values (arithmetic mean) for each of the 171 countries – as relates to risk, exposure, vulnerability, susceptibility, lack of coping capacities and lack of adaptive capacities – for the years 2012 to 2016. The index values from 2011 have not been taken into account in this calculation, since the 2011 index was partly based on data sources different from those used in subsequent years. Also not included are the countries São Tomé and Príncipe and Samoa, since the risk levels of both countries have not been calculated since 2014 due to a lack of data. A calculation has also been undertaken to determine the change, expressed in percentage points, which the individual countries experienced from 2012 to 2016 as relates to vulnerability and

its various components. An averages-based analysis of exposure to natural hazards is not necessary, since the employed data sets from 2012 to 2016 were not updated in this period due to unavailability of data and the actual speed of change of climactic and geophysical conditions.

In addition to the calculations of the average values of the individual countries, the median values of various groups of nations were calculated and compared in the 2017 analysis. As part of this process, the 171 countries of the WorldRiskIndex were classified in accordance with their geographical location, gross national income per capita, and their exposure and vulnerability class. Wherever average values of the individual countries are referenced in the following text, this is a reference to the arithmetic mean. On the other hand, the stated mean values of country groups

are median values. The median, in contrast to the arithmetic mean, is robust in the face of extreme outliers of a group and therefore better suited for the calculation of the group value. If the arithmetic mean were used in such cases, the extreme values of individual countries could heavily influence the group values and distort the results. The aim of the comparison of country groups is to derive conclusions on the relationships between the various groups themselves, but also on the relationship between individual countries and the groups they belong to. The country groups have been compared based on the following four descriptive statistics:

- + Median risk
- + Median exposure
- + Median vulnerability
- + Median change in vulnerability in percentage points

2.2 Five-year analyses

WorldRiskIndex 2012–2016

The WorldRiskIndex for the period 2012–2016 shows that the global hotspots for high disaster risk are located in Central America, West and Central Africa, Southeast Asia and Oceania (see graphic “Global Hotspots”). With a risk value of 36.45 percent, Vanuatu is the country with the highest risk, followed by Tonga with 28.57 percent and the Philippines with 27.69 percent. By contrast, Saudi Arabia (1.21 %), Malta (0.61 %) and Qatar (0.09 %) register the lowest disaster risk. Overall, highly developed countries demonstrating a low exposure level come out best in the risk assessment (see table “WorldRiskIndex 2012–2016” in the overview, p. 40–42). If one looks at the countries assessed in the 2012–2016 WorldRiskIndex as a totality, the average vulnerability level is 47.78 percent. This value dropped by 2.35 percentage points between 2012 and 2016. It is notable that the values of the three vulnerability components have improved to very different degrees: Susceptibility has dropped by 0.78 percentage points,

lack of coping capacities by 0.8 percentage points, and lack of adaptive capacities by 4.73 percentage points.

Country groups

The results of the country groups are illustrated in figure 5. The country group analyses focus on groups in the areas of “Geographical location” and “Income”. These and other results of the analyses are available at www.WorldRiskReport.org.

When comparing the country groups according to exposure class, it is noteworthy that the country group “Very high exposure” demonstrates the highest average vulnerability value at 51.53 percent (medium). Countries with very low exposure, on the other hand, are the least vulnerable at 41.03 percent (low). There is, however, no linear correlation across all the groups. For example, the “High exposure” country group is on average less vulnerable than the “Medium exposure” country group. A glance at the vulnerability classes makes clear

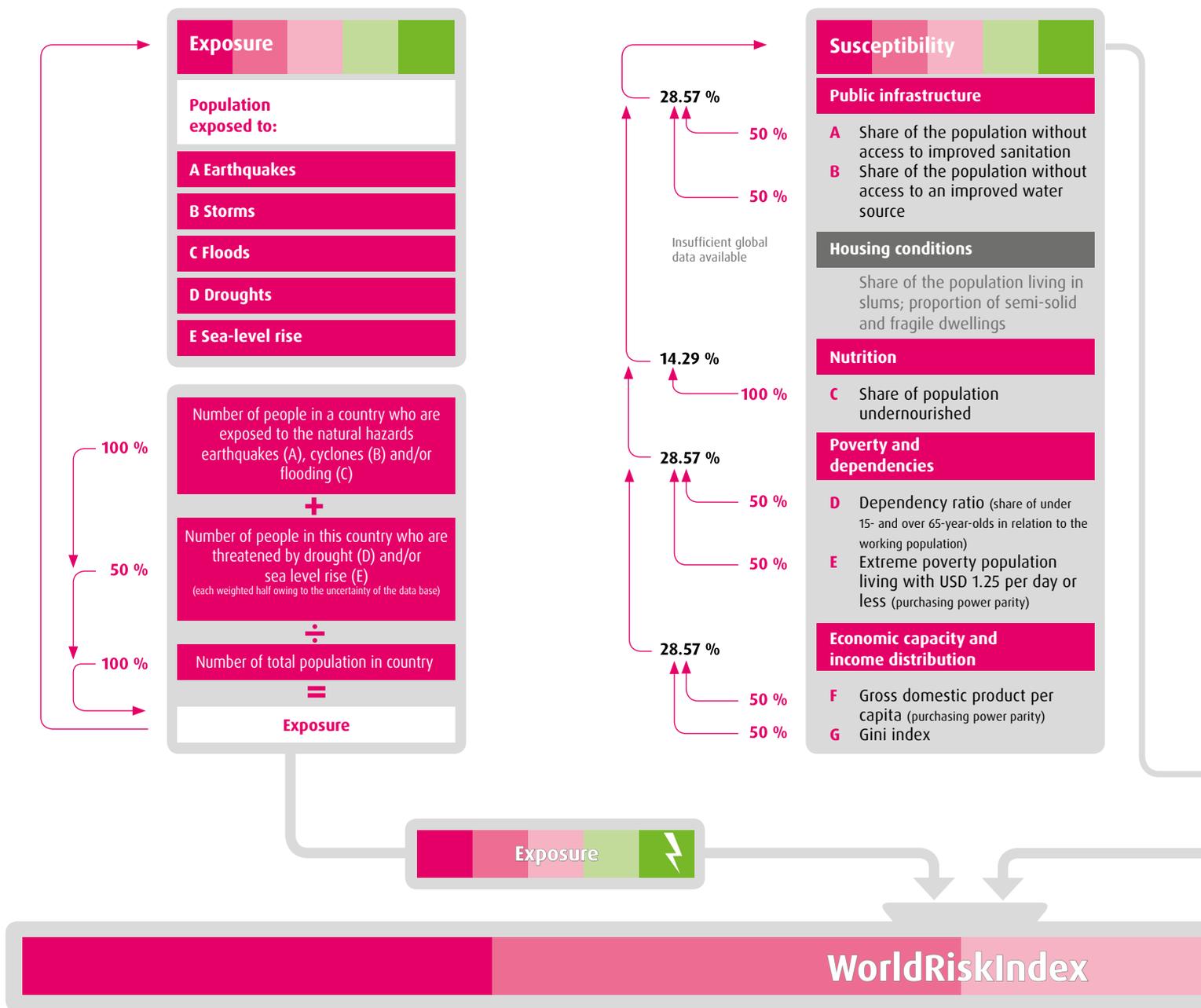
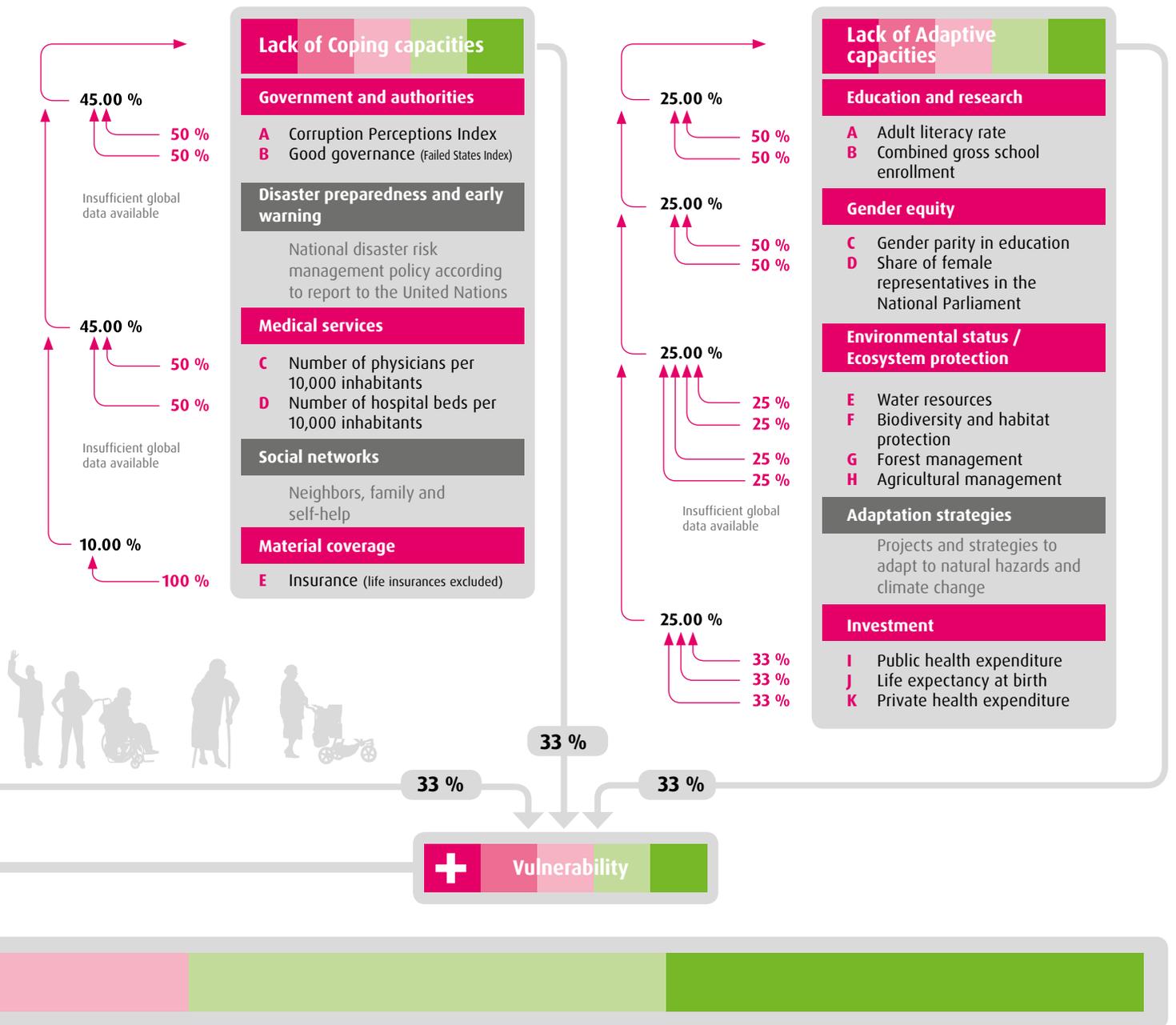


Figure 4: Calculation of the WorldRiskIndex (from WorldRiskReport 2016)

that the countries with very high vulnerability are not the most exposed to natural hazards.

Focus geographic location: In an intercontinental comparison, the African countries demonstrate the highest vulnerability level at 65.53, while European countries have the lowest. Europe is also the continent in which vulnerability has decreased the most in the period from 2012 to 2016, showing a -2.81 percent change. The worst performer with respect to change in vulnerability is Oceania. Consisting primarily of island nations, Oceania is the sole geographic region

to experience an increase in vulnerability (+0.44 percentage points). Furthermore, Oceania is the region with the highest exposure. As a result, Oceania has the highest disaster risk according to the WorldRiskIndex. In an intercontinental comparison, Europe, at 3.60 percent, exhibits not only the lowest vulnerability level but also the lowest risk. On the whole, Europe registers the narrowest range of index values in the context of exposure, vulnerability and risk values, as well as for change in vulnerability, and can thus be considered the most homogeneous region with respect to disaster risk.



Focus income distribution: When subdivided on the basis of gross national income (GNI) per capita, and in accordance with the World Bank categories “High income”, “Higher middle income”, “Lower middle income” and “Low income”, countries with high income levels show the lowest level of exposure. Conversely, the “Lower middle income” group has the greatest level of exposure to natural hazards. With respect to vulnerability, the “High income” group is the least vulnerable. Meanwhile, the group with the lowest GNI per capita registers the highest vulnerability value at 68.70 percent. This all results in

an increased risk for the groups with low income levels. The change in vulnerability assessed along the lines of income distribution does not follow a clear pattern. The “Higher middle income” group has registered the greatest change in vulnerability (-2.55 percentage points), while the group with the lowest per-capita GNI (“Low income”) has experienced the lowest degree of change (-1.77 percentage points).

	Country group	Risk \bar{x}	Exposure \bar{x}	Vulnerability \bar{x}	Change in vulnerability \bar{x}
Total	Worldwide	6.57	12.45	47.78	-2.35
Geographic location	Africa	7.96	12.45	65.53	-1.67
	The Americas	6.91	16.15	46.12	-1.94
	Asia	6.41	12.61	50.06	-2.45
	Europe	3.60	10.93	34.22	-2.81
	Oceania	14.92	26.32	54.48	0.44
Income	High income	3.33	10.23	32.50	-1.94
	Higher middle income	6.28	13.51	46.43	-2.55
	Lower middle income	7.84	13.67	57.26	-2.46
	Low income	9.62	13.17	68.70	-1.77
Exposure	Very high exposure	13.15	25.77	51.53	-1.83
	High exposure	7.71	15.00	49.40	-2.48
	Medium exposure	6.70	12.46	50.86	-2.86
	Low exposure	4.81	10.56	44.94	-2.31
	Very low exposure	2.56	7.50	41.03	-1.74
Vulnerability	Very high vulnerability	8.55	12.51	67.29	-1.66
	High vulnerability	8.24	14.65	58.15	-2.60
	Medium vulnerability	6.70	14.12	47.90	-2.42
	Low vulnerability	4.22	11.11	40.37	-2.48
	Very low vulnerability	3.33	10.82	30.91	-2.35

Figure 5: Comparison by country group (data based on WorldRiskIndex 2012–2016)

Countries compared to country groups

What does this picture look like when individual countries are compared to their respective country groups according to income and geographic location? To determine this picture, four countries from different global regions were selected to form an illustrative example. In terms of selection criteria, the nations chosen are situated in different world regions, have varying income levels, have registered significant changes in vulnerability values or are particularly relevant to the work of the member organizations of Bündnis Entwicklung Hilft. The countries in questions were then subjected to an individual assessment.

Ethiopia compared to the “Africa” and “Low income” country groups: In landlocked Ethiopia, exposure to natural hazards is low at 11.12 percent, and thus slightly below the African average (\bar{x} exposure 12.45 % – medium) and the average of the “Low income” country group (\bar{x} exposure 13.17 % – medium). With regard to vulnerability, the Ethiopian value is very high at 67.01 percent. Compared to the “Africa” country group (\bar{x} vulnerability 65.53 % – very high), Ethiopia’s vulnerability is slightly above the average value for countries in the

region. Compared to the “Low income” (\bar{x} vulnerability 68.70 % – very high) country group, Ethiopia’s vulnerability is slightly below the average for the countries in this income class. From 2012 to 2016, Ethiopia’s vulnerability decreased by 6.88 percent. When compared to Africa as a continent (\bar{x} change in vulnerability of -1.67 percentage points), Ethiopia’s vulnerability experienced a strong, above-average decrease between 2012 and 2016. The same applies to a comparison with the countries in the “Low income” group (\bar{x} change in vulnerability of -1.77 percentage points). This change in Ethiopia’s vulnerability, and with that its risk level, is the result of a clear improvement in all three vulnerability components. More specifically, the country has been able to improve its lack of adaptive capacities (-7.28 percentage points) and coping capacities (-8.37 percentage points) in recent years. Although not quite as strong an improvement, Ethiopia’s susceptibility level still fell by 4.99 percentage points between 2012 and 2016.

Bolivia compared to the “the Americas” and “Lower middle income” country groups: With a value of 8.98 percent, Bolivia’s exposure level is very low and well below the average for the Americas (\bar{x} exposure 16.15 % – high). The

same applies to a comparison between Bolivia and the “Lower middle income” country group (\bar{x} exposure 13.67 % – medium). Conversely, Bolivia registers a vulnerability level of 54.92 percent, which is considered high. In comparison to the Americas (\bar{x} vulnerability 46.12 % – medium), Bolivia’s vulnerability is thus slightly above the average for countries in this region. On the other hand, if the vulnerability value of Bolivia is compared with the value of the “Lower middle income” countries (\bar{x} vulnerability 57.26 % – high), it is slightly below the group average. Between 2012 and 2016, Bolivia’s vulnerability was reduced by 6.09 percent. Compared to “the Americas” country group (\bar{x} change in vulnerability of -1.94 percentage points), Bolivia’s vulnerability value has thus experienced an above-average decrease. Bolivia’s comparatively strong change in vulnerability is also apparent in its relationship to the value registered by the “Lower middle income” group (\bar{x} change in vulnerability of -2.46 percentage points). In Bolivia’s case, the decrease in vulnerability and the associated reduction in disaster risk are attributable to the progress made in terms of susceptibility (-7.83 percentage points) and lack of adaptive capacities (-9.77 percentage points). With respect to coping capacities, there has only been a comparatively slight improvement in the Andean country (-0.66 percentage points).

Qatar compared to the “Asia” and “High income” country groups: As is the case with most of the other states of the Arabian Peninsula, Qatar registers very low exposure with a value of 0.28 percent. Furthermore, the small-sized emirate has the lowest average exposure value of all high-income states (High income \bar{x} exposure: 10.23 % – low). The same is true of a comparison between Qatar and Asia (\bar{x} exposure 12.61 % – medium). The vulnerability of Qatar is very low at 32.25 percent, similar to the vulnerability value of the “High income” countries (\bar{x} vulnerability 32.50 % – very low). In a comparison with the “Asia” country group, (vulnerability 50.06% – medium), Qatar’s vulnerability is significantly below the average for the countries in this

region. From 2012 to 2016, Qatar’s vulnerability decreased by 8.00 percentage points, which indicates a greater-than-average change measured against the comparison value for Asia (change in vulnerability of -2.45 %). The improvement registered by Qatar becomes even clearer in a comparison with the “High income” group (\bar{x} change in vulnerability of -1.94 percentage points). Qatar’s strong decrease in vulnerability is due to its significant improvement in coping capacities and adaptive capacities (-11.45 and -12.61 percentage points respectively). By contrast, Qatar’s susceptibility has barely changed in the same period (+0.07 percentage points).

Tonga compared to “Oceania” and “Higher middle income” country groups: Tonga – the small island nation in the South Pacific – demonstrates very high exposure to natural hazards with a value of 55.27 percent. Tonga’s value is considerably higher than of the Oceania average (\bar{x} exposure 26.32 % – very high). The high exposure value of Tonga is also considerably greater than that of the “Higher middle income” group (\bar{x} exposure 13.51 % – medium). Tonga’s average vulnerability value is 51.70 percent (medium), similar to the average value of the “Higher middle income” group (46.43 %). In a comparison with the “Oceania” group (\bar{x} vulnerability 54.84 % – high) Tonga’s vulnerability is below the average for the countries in that region. From 2012 to 2016, Tonga’s vulnerability increased by 1.30 percentage points, which represents a greater-than-average increase when compared to the “Oceania” group (\bar{x} change in vulnerability of +0.44 percentage points). Tonga’s development becomes even clearer when compared to the “Higher middle income” group. The vulnerability level of this group experienced a -2.55 percent decrease during the assessment period. Despite Tonga’s comparatively high income and high developmental level, there was still no improvement in any of the three vulnerability components. In fact, all vulnerability components experienced an increase between 2012 and 2016: Susceptibility rose by 0.75 percent, lack of coping capacities by 0.49 percent and lack of adapting capacities by 2.65 percent.

2.3 Conclusions and recommendations for action

The results of the collated data analysis from the 2012 – 2016 WorldRiskIndex yield a number of central conclusions, which in turn allows for the formulation of recommendations for action as regards the developmental policy of industrial nations and disaster preparedness in high-risk countries.

+ Risk is unevenly distributed and therefore cannot be tackled in a haphazard way.

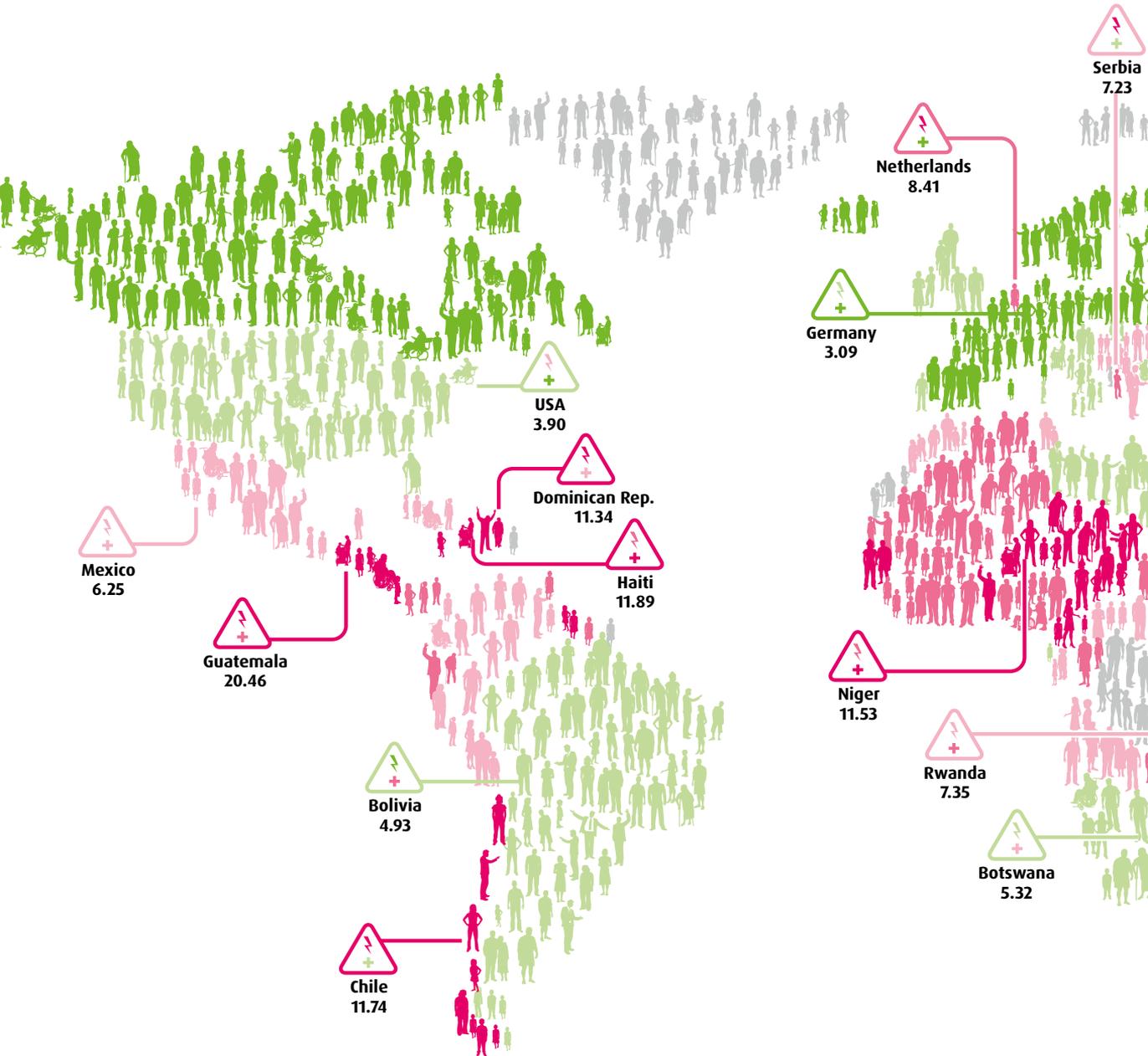
Since 2011, the WorldRiskIndex has shown that disaster risk affects some countries and regions particularly severely. In this context, it is hardly surprising that the “High income” group of nations faces the lowest level of risk. However, it is interesting to note that this low risk level is not only attributable to low vulnerability in these countries, but also low exposure. In the case of the disaster hotspots of Central America, West and Central Africa, Southeast Asia and Oceania it is notable that high exposure is mostly the result of a combination of several natural events, such as earthquakes, hurricanes, flooding and drought. Weather-related natural events such as flooding and hurricanes already cause over 70 percent of natural disasters today and will most likely be intensified in future by climate change (CRED/ UNISDR 2015). A close coordination between disaster-risk management and climate change adaptation is therefore indispensable, and must be consolidated in these regions in particular. At this point we must also ask why small developing island nations such as Tonga, of all places, which demonstrate a very high average exposure value and have been supported over the last few years in the focused creation of an integrated strategy for interlinking disaster management, climactic adjustment and sustainable development, have not only been unable to reduce their vulnerability, but have even experienced an increase in vulnerability.

+ Progress is being made in disaster risk reduction but a greater focus on coping capacities is required.

The data analysis shows that in the last five years, progress has been made in the field of adaptive capacities, in particular. Here, the international community is on the right path, thanks to the Hyogo 2005 and Sendai 2015 action plans for reducing disasters caused by natural hazards. This development will mostly likely also have a positive, long-term effect on coping capacities. The international community and NGOs should stick to their current policy of strengthening adaptive capacities, while investing in long-term measures in risk hotspots, such as Oceania, in particular. Examples include investments in consolidating education and research, equal societal participation, the protection of ecosystems and the expansion of healthcare systems. At the same time, governments in those same high-risk countries must, starting now, place a greater emphasis on coping capacities to better counteract the effects of extreme natural events in the short term. Important factors in this context are, among others, anti-corruption measures and good governance, in addition to the continued expansion of national disaster preparedness platforms and early-warning systems. The necessary initiative must grow from within the affected countries themselves. At the same time, they should receive sufficient international support in overcoming their challenges.

+ Disaster risk reduction is dependent on income levels and is therefore not sustainable without coherent economic and development policies.

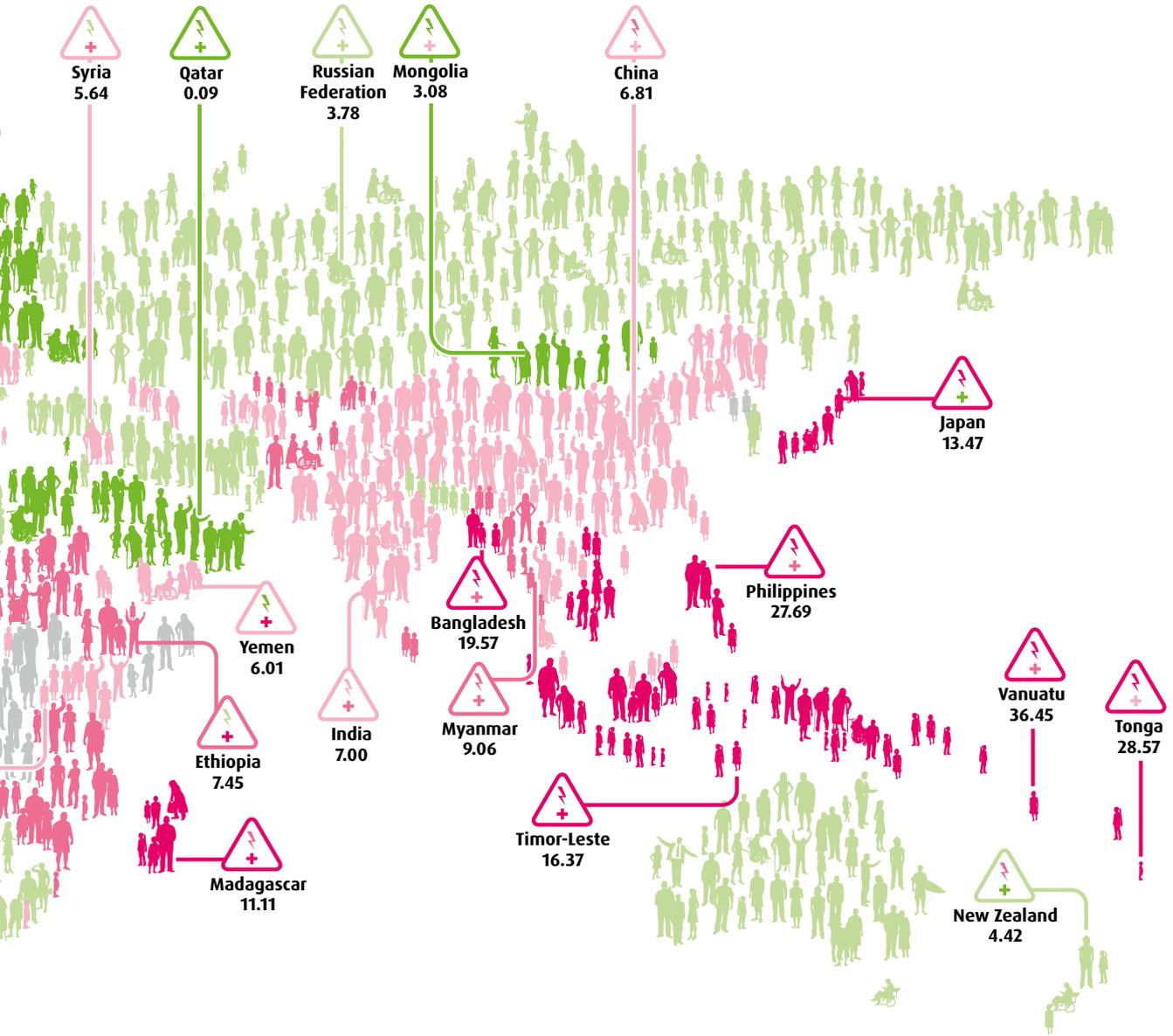
The results of the analysis of the WorldRiskIndex 2012 – 2016 show that there is a correlation between development and a reduction in vulnerability. However, the assumption that “the highest income equates to the highest reduction in vulnerability” does not add up because the scale of exposure and vulnerability also plays a decisive role. In the case of low exposure and vulnerability, wealthy countries only invest small sums in reducing their vulnerability. But it is interesting to note that there is obviously an income threshold above which vulnerability can be successfully reduced. As a result, it was not the most exposed countries with medium incomes, or the most vulnerable countries with low incomes which could bring about a particularly sizeable reduction in vulnerability – rather the countries with high middle incomes were able to achieve this. The result of this analysis makes clear once more that sustainable development and disaster risk reduction are closely interlinked. Combating poverty and generally boosting economic strength – along with an associated reduction in susceptibility – are therefore among the most important measures for disaster risk reduction.



WorldRiskIndex

Components of the WorldRiskIndex at the global and local level			
Exposure Exposure to natural hazards	Susceptibility Likelihood of suffering harm	Coping Capacities to reduce negative consequences	Adaptation Capacities for long-term strategies for societal change
Natural hazard sphere	+ Vulnerability		Societal sphere

WorldRiskIndex (WRI) in %	Exposure in %	Vulnerability in %
very low 0.09 - 3.52	very low 0.28 - 9.25	very low 26.19 - 35.56
low 3.53 - 5.62	low 9.26 - 11.53	low 35.57 - 45.11
medium 5.63 - 7.35	medium 11.54 - 13.85	medium 45.12 - 51.70
high 7.36 - 10.48	high 13.86 - 17.45	high 51.71 - 62.62
very high 10.49 - 36.45	very high 17.46 - 63.66	very high 62.63 - 74.36
no data available	no data available	no data available



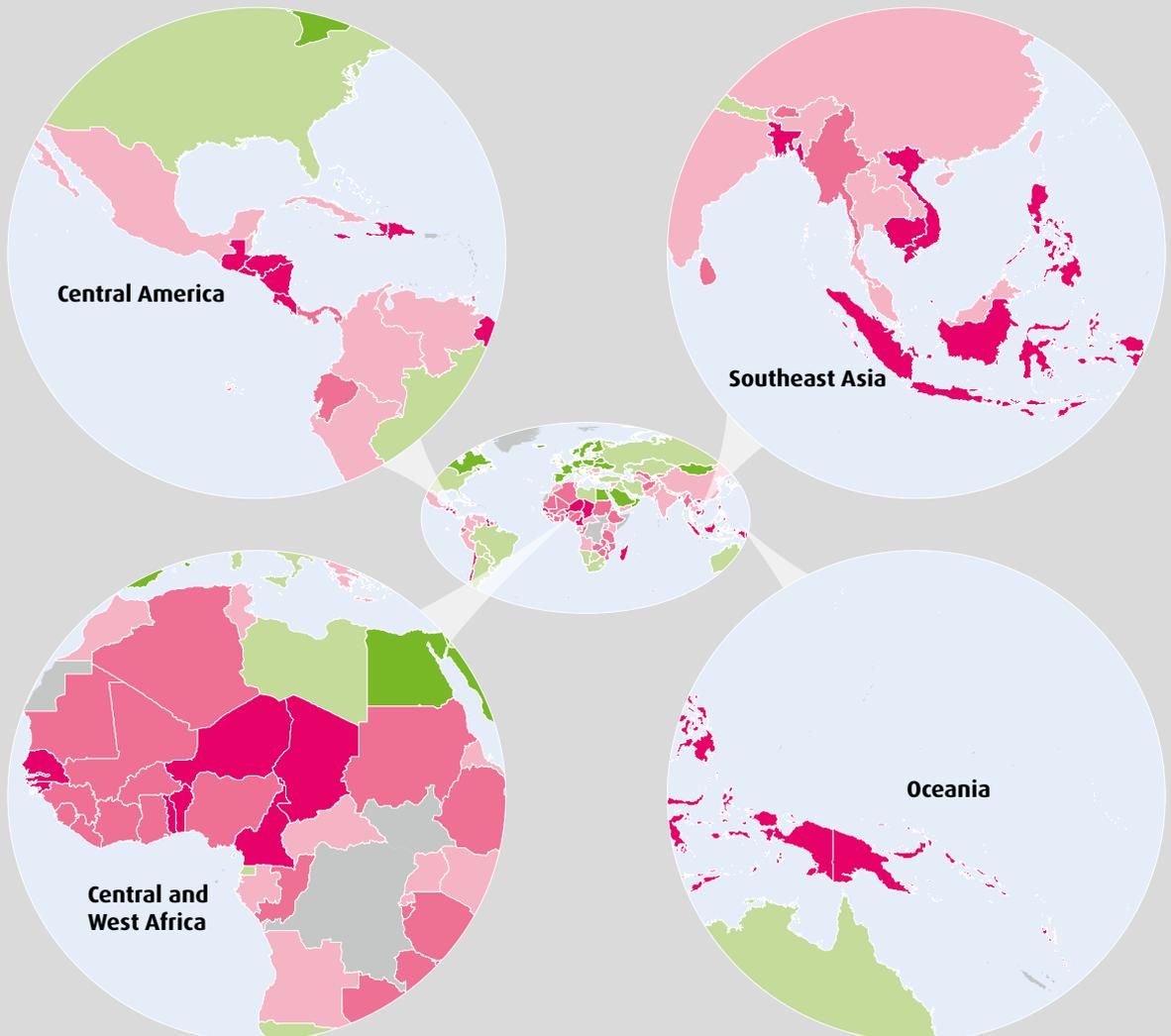
Values resulting from mean value calculation 2012–2016

Country	WRI	⚡	+	Country	WRI	⚡	+	Country	WRI	⚡	+
Bangladesh	19.57 %	31.70 %	61.72 %	India	7.00 %	11.94 %	58.62 %	Qatar	0.09 %	0.28 %	32.25 %
Bolivia	4.93 %	8.98 %	54.92 %	Japan	13.47 %	45.91 %	29.33 %	Russian Federation	3.78 %	9.38 %	40.28 %
Botswana	5.32 %	10.55 %	50.40 %	Madagascar	11.11 %	16.03 %	69.30 %	Rwanda	7.35 %	11.98 %	61.32 %
Chile	11.74 %	30.95 %	37.93 %	Mexico	6.25 %	13.84 %	45.14 %	Serbia	7.23 %	18.05 %	40.04 %
China	6.81 %	14.43 %	47.18 %	Mongolia	3.08 %	6.52 %	47.17 %	Syria	5.64 %	10.56 %	53.44 %
Dominican Rep.	11.34 %	23.14 %	49.01 %	Myanmar	9.06 %	14.87 %	60.95 %	Timor-Leste	16.37 %	25.73 %	63.61 %
Ethiopia	7.45 %	11.12 %	67.01 %	Netherlands	8.41 %	30.57 %	27.49 %	Tonga	28.57 %	55.27 %	51.70 %
Germany	3.09 %	11.41 %	27.13 %	New Zealand	4.42 %	15.44 %	28.66 %	USA	3.90 %	12.25 %	31.81 %
Guatemala	20.46 %	36.30 %	56.36 %	Niger	11.53 %	15.87 %	72.63 %	Vanuatu	36.45 %	63.66 %	57.26 %
Haiti	11.89 %	16.26 %	73.11 %	Philippines	27.69 %	52.46 %	52.78 %	Yemen	6.01 %	9.04 %	66.46 %

 **The world's regions with the highest risk: Central America, Central and West Africa, Southeast Asia and Oceania**

Global hotspots for disaster risk are found in Oceania, Southeast Asia, Central America and Central and West Africa. These areas have very high danger-exposure levels due to the threat of natural disasters such as earthquakes, hurricanes, flooding, drought and/or sea level rise, alongside frequently high levels of vulnerability. Global warming and the resulting climate change increase the intensity and frequency of weather-influenced natural disasters, for example

torrential rain and hurricanes. As a result, countries such as Vanuatu, the Philippines and Guatemala face the combined threat of earthquakes, hurricanes and flooding, but only have limited protective measures available in the event of natural disasters. They have insufficient capacities to effectively boost disaster preparedness and thus counteract serious exposure to danger.



Disproportionate number of island/coastal nations among the countries with the highest exposure

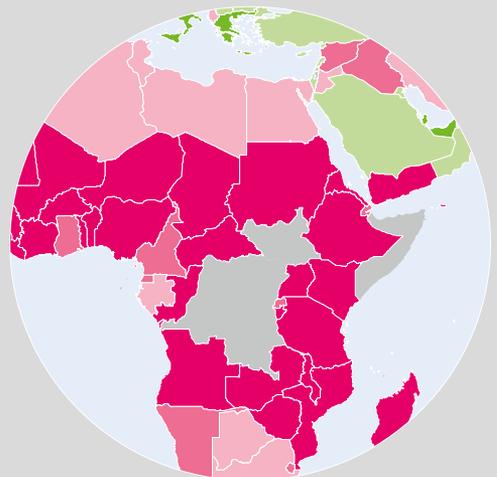
Among the 15 countries with the highest exposure levels worldwide, eight are island nations and the remaining seven are located by the sea. These countries are particularly exposed to hurricanes, flooding and rising sea levels. At the same time, coastal regions are often densely populated: Today, around 40 percent of the world's overall population lives in regions that are less than 100 km away from the coast (United Nations 2017). To make matters worse, devastating human interference in the environment increases the potential damage of extreme natural events considerably. The destruction of ecosystems such as coral reefs and mangrove forests deprive these territories of their natural protective mechanisms, for example in the case of storm flooding (WorldRiskReport 2012). Disaster protection is thus indispensable in these regions.



Classification according to appendix

Accumulation of very high vulnerability in Africa

In total, 13 of the 15 countries with the highest vulnerability ratings are found on the African continent. Outside Africa only Haiti and Afghanistan have similar degrees of disaster vulnerability compared to the likes of Chad, Eritrea, Niger and the Central African Republic. Nations such as Liberia and Zambia are admittedly only minimally exposed to natural disasters, but due to their political, economic and social circumstances, they are highly vulnerable in the event of a natural disaster. Susceptibility levels are very high in these countries while coping capacities and long-term capacities for adapting to natural hazards and climate change are inadequate. The percentage of persons who live below the poverty line and/or receive insufficient nourishment is comparatively high in these "hotspots", while medical care is poor and governmental programs, for example in the environmental protection sector, are inadequate.



Classification according to appendix





3 In a Labyrinth of Indicators

What is special about the WorldRiskReport and how can it be improved

Christopher Schrader

is a freelance science journalist, working e. g. for Süddeutsche Zeitung and Die Zeit.

Let's return once more to the topic of Vanuatu and Kiribati. Both countries are located in the South Pacific. Each appears to be the stuff of dreams for any explorer looking to leave behind the drudgery of life in Germany, particularly when it comes to the weather. But before making that dream a reality, it is helpful to take a look at the facts, beginning with the 2016 WorldRiskReport. Here we see that Vanuatu remains, after a period of several years, at the top of the list of countries whose populations are threatened by natural disasters, and whose government is incapable of protecting, or barely even helping, its citizens. Kiribati, conversely, most recently occupied position 164 of 171 on the list – just behind Sweden and way behind Germany! It should be crystal clear which country is the safer option.

This lead in is not entirely new – I've used it before, on September 5, 2013, when I reported for the Süddeutsche Zeitung on that year's WorldRiskReport. And now the publishers of that very report have asked me to write a retrospective and prospective assessment of the WorldRiskReport.* It became apparent that much of what I have to say can be understood with a view to the examples of Kiribati and Vanuatu, hence the recycling of my opening lines.

There are two key methodological factors that differentiate the WorldRiskReport and WorldRiskIndex (WRI), on which the former is based, from many other risk calculations. Firstly, the main indicators used in these reports are not monetary figures relating to shattered infrastructure and impaired economic performance, but rather the human actors that could be exposed to life-threatening dangers and, more specifically, the number of those persons as a percentage of the country's total population. In 2011, this method represented a new departure, but it has since been adopted by the United Nations

which, in March 2015 in the Japanese city of Sendai, resolved to implement a new strategy: "The two foremost goals of the Sendai Framework for Disaster Risk Reduction are geared toward the number of fatalities and affected persons per 100,000 inhabitants", says Rhea Katsanakis from the UNISDR (United Nations International Strategy for Disaster Reduction), a Geneva-based office of the UN Secretariat. "This is why the WorldRiskIndex, which has for years used the proportion of the population exposed to risk as its basis, is so interesting."

Secondly, the authors of the WorldRiskReport do not define the respective risk in the way that an actuary or environmental researcher would – as the product of damage and probability of occurrence – but rather as the product of two different factors: "exposure" and "vulnerability". The first pertains to extreme natural events that could affect a subsection of the population – in this case earthquakes, storms, flooding, drought and a rise in sea levels. The second factor relates to the shortage of all resources needed by the state and its citizens to help those people who are in immediate danger, rectify damage in the long term, and decide upon and fund preventative measures against the next occurrence.

"Disasters are socially constructed", explains Terry Cannon from the Institute of Development Studies at the University of Sussex who, as co-author of the book "At Risk: Natural Hazards, People's Vulnerability and Disasters" (Routledge, 1994 and 2004), has pioneered this approach to defining risk. "Natural hazards happen of course independently of humanity, but whether or not they lead to a disaster is determined by society. Power and resource allocation affects how much and who suffers from a hazard." This approach is frequently employed today, with the focus shifting toward the reduction of societal influences that drive vulnerability.

* Full disclosure: I have been paid a customary standard rate for writing this article, selected my own interviewees and questions, and this text has been linguistically redacted, but not edited as regards to content. Bearing in mind that I am not a scientist, but rather a journalist, I am not in a position to offer an expert opinion. My conclusions are thus in each case subjective and potentially incomplete.

This can be clearly seen in the WorldRisk-Report. Vanuatu has been at the top of the list for years, primarily because almost 64 percent of the country's population could potentially become victims of natural disasters; nowhere on earth is that percentage greater. The island republic northeast of Australia, with a population of 270,000, is located along the tropical cyclone tracks and lies on the Pacific Ring of Fire, a chain of volcanoes along a series of tectonic plate boundaries that encircle the Pacific Ocean. Severe earthquakes occur here frequently and these can also cause tsunamis (volcanic eruptions are not classified as a risk by the WorldRiskReport). In Kiribati, on the other hand, only three percent of the country's roughly 115,000 people are under threat because the country straddles the equator and international dateline in the center of the Pacific plate and is thus generally unaffected by storms in either hemisphere.

Geographical misfortune weighs heavier than misgovernment

The exposure levels of these two Pacific nations are thus considerably different, and it is this factor that determines their places in the rankings, as opposed to their vulnerability levels, which are very similar. On the vulnerability scale they are both in the top tercile – in 48th and 50th place in 2016.

When it comes to governmental shortcomings, African countries sit at the very top of the list: The Central African Republic, followed by, among others, Niger, Sierra Leone and Zimbabwe. Out of the top 20 countries in this category, 18 are in Africa. But only one of these is in the higher rankings when applying the overall risk indicator: Guinea-Bissau. In contrast, 18 of the 20 most “exposed” countries feature in the top 20 countries most at risk overall. There are two countries that manage to avoid the top positions in that list, one of which is the Netherlands. While it faces a considerable threat from natural hazards, the country can still mobilize state resources on a completely

different scale when compared to the poor nations of the global South. Japan, however, is not one of the two exceptions. It is caught in a situation analogous to that of Vanuatu, in that it faces the double threat posed by earthquakes/tsunamis and storms. It thus cannot escape the list of the 20 most dangerous countries, despite its wealth, given that 46 percent of its population is exposed to natural hazards.

Overall, exposure has a considerably greater effect on risk than vulnerability: Geographical misfortune weighs more heavily on a nation that misgovernment in this index. Assessed mathematically, it quickly becomes apparent why this is the case. The former varies more, by a factor of 212 between 0.3 and 63.7 percent, while the latter varies by a factor of three between 24.8 and 74.8 percent. This leads me to my first suggestion: Those who calculate this index in the future should attempt to create a numerical scale of vulnerability between 0 and 100 in order to further accentuate the differences. Countries such as Syria, Libya or Sudan, whose national infrastructure has been reduced to rubble, in addition to potentially imminent candidates Venezuela and Yemen, would then make dramatic movements on the list – or at least experience a shift greater than the, at most, seven or eight positions indicated by the lists published between 2012 and 2016.

Moreover, since the data on exposure have not changed since 2012 (and for drought, the data have not changed since the beginning), this explains the overall absence of change in the list. This does not only apply to the eternal frontrunner Vanuatu. Since 2012 a total of 92 countries have scarcely moved (i.e. at most five places in five years) or not moved at all in the rankings. Out of the top 20 risk-affected nations in 2016, 19 have occupied the top rankings of the list since 2012. The bottom end of the scale provides a similar picture. A handful of the usual suspects have always been there: Switzerland, Luxembourg, the Scandinavian countries, but also

the states of the Arabian Peninsula (extreme heat is not one of the natural hazards taken into consideration), followed by Israel and Egypt (political crisis is not a metric either), Grenada and Barbados in the Caribbean, and of course Kiribati.

But to be clear: The point is not to optimize this list to create a new frontrunner every year and somehow generate more interest among journalists. But the lack of change should also not be an artefact of the calculation method.

Greater focus on island nations

Bündnis Entwicklung Hilft, the body that commissions the report, is not the only institution that compiles these types of lists. The approaches taken, however, and the points of focus applied, vary from institution to institution. In its World Disaster Reports, the International Federation of Red Cross and Red Crescent Societies

(IFRC) primarily registers deaths and numbers of affected persons, albeit in absolute numbers, and they are not expressed as a proportion of the overall population. The UNISDR, on the other hand, has for many years used monetary losses – as measured against economic performance, a nation’s capital stock or its level of social expenditure – as its main barometer. The institution’s most recent document of this kind was the 2015 “Global Assessment Report” (GAR). These two international organizations share a common data source: the Centre for Research on the Epidemiology of Disasters (CRED) at the Catholic University of Louvain in Belgium (not used by the WorldRiskIndex). Another noteworthy example is Germanwatch, which publishes its annual Climate Risk Index each Fall, at the same time as the UN Climate Summit. This report is based on data provided by the Munich Re Insurance Company and compiles only the number of fatalities and the economic losses caused by past meteorological disasters (storms, floods, heatwaves).

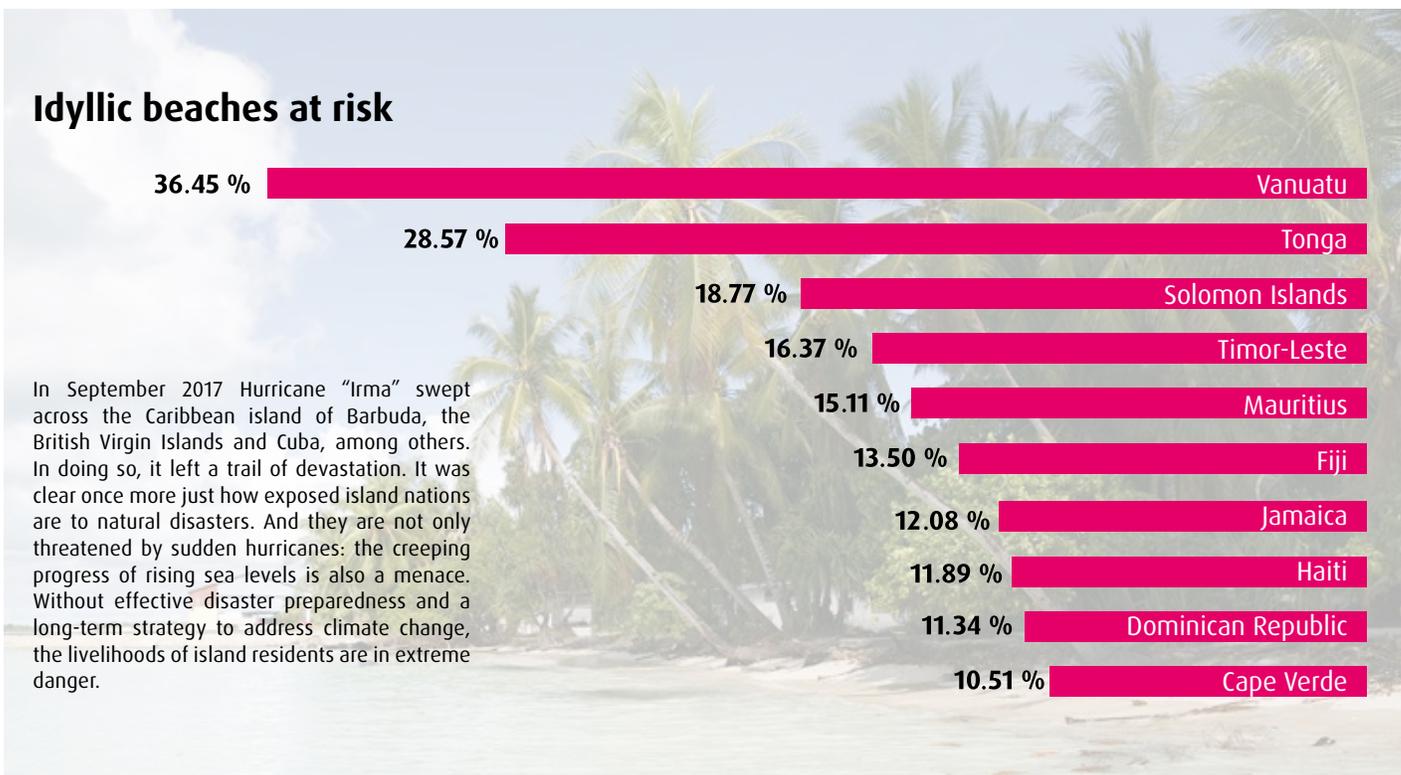


Figure 6: Selected island states among countries with very high risk in the WorldRiskIndex 2012–2016

The first thing that becomes apparent in these reports from other organizations is the greater role played by island nations. Many of these are absent from the WRI for two reasons. Firstly, the data base is often clearly insufficient for the complex calculations of the WRI. This does not only apply to crisis-ridden countries such as Somalia, South Sudan and North Korea, or micronations such as Monaco or Andorra, but also to islands and island groups such as Trinidad and Tobago, St. Lucia, Dominica, the Maldives and Samoa. Secondly, islands and regions such as Puerto Rico, Montserrat, Martinique, French Guiana, the Canary Islands, the Azores and Niue are not assessed individually, rather they are grouped together with the countries they belong to (the USA, UK, France, Spain, Portugal, New Zealand).

In both cases, the WRI is incomplete, since other indicators show that some of these regions are both very susceptible and already burdened with great losses. According to CRED, between 1994 and 2013, 37 percent of the population of Montserrat was affected by natural disasters, in St. Lucia the figure was 39 percent and in French Guiana 49 percent. Dominica comes 5th in the UNISDR report, Puerto Rico 9th – both suffered severe economic damage. In the Germanwatch organization's most recent climate risk index, Dominica ultimately took top place for 2015. Assessments of all these countries or territories would be advisable for future WorldRiskReports. This is theoretically possible, according to its creators, as the methods used in creating the WRI allow not only for calculations for nation states but also for smaller territories, all the way down to the regional level. This was demonstrated in the first edition of the report in 2011, which dealt with regions of Indonesia.

Which ranking is correct?

For the countries that occur on every list there should, in spite of different methodologies, be at least some similarities that can be observed between the various rankings. According to

the WRI, countries that are exposed to many hazards and whose state organs provide barely any protection can be assumed to have been affected more often and suffered more severe losses in the past. And indeed Vanuatu, Tonga and the Philippines, the top three of the WRI, are also found in the upper rankings of the UNISDR, which compares average annual damage caused by disasters with a country's social expenditure. And in a ranking based on IFRC data, these countries are also way out in front if the absolute numbers are expressed as a percentage of the population affected using the World Bank's population data.

But there are also contradictions. The UNISDR list, for example, ranks the Bahamas number one for damage caused by disasters (WRI ranking 122) – the country loses on average three times as much money annually from natural disasters than it can invest in social services. The top 25 places also include Grenada and the United Arab Emirates, which have comfortable positions in the 160-to-170 bracket in the WRI. There are considerable differences when it comes to Central America as well: Costa Rica, El Salvador and Nicaragua are in the WorldRiskReport top 20, with Honduras a significant distance below them in 30th place. At the UN Office there is a reverse dynamic, with Honduras in 10th place ahead of its neighbors. This may be the result of the massive damage caused by Hurricane Mitch, which killed approximately 7,000 Hondurans in 1998. The GAR only takes into account past events, while the WRI also looks forward to the future. Nevertheless, the deviation is astounding.

The CRED list of affected populations also holds a few surprises when compared to the WRI. The Belgian organization puts Eritrea and Mongolia at the forefront – nations that are way down the list of the WRI. Lesotho, Kenya and Moldova also assume very different positions. And at the very top of the CRED rankings for the period 1994 to 2013 is Kiribati. 52 percent – not three percent – of the population were reported to be affected by natural disasters.

It is not wise here to dismiss these types of differences by pointing to variances in methodology. Severe and regular financial losses resulting from natural disasters are ultimately to the detriment of any country. They are the burden undertaken by a society trying to pick itself up after a major disaster. “These types of losses undermine all efforts toward economic development”, says Rhea Katsanakis from the UNISDR. “When we talk to governments about the statistics, it mostly only starts to get interesting when figures are on the table: damage in relation to GDP.” Taking these factors into account in the WorldRiskReport would not require a complete re-evaluation of the core decisions involved in the risk assessment. The aforementioned damage relating to losses could be listed under “Vulnerability”.

What burdens countries and keeps them from fulfilling their duties

To further accentuate the scope of factors and distinguishing effects inherent to vulnerability, it would also be possible to incorporate the variables used by a team at the University of Notre Dame in creating the ND Gain Index. This index has been compiled annually since 1995 and measures a country’s vulnerability to climate change, the impact of which, in terms of increasing future meteorological risks, is insufficiently represented in the WRI from the outset. The US approach involves 3 categories: “exposure”, “sensitivity” and “capacity”.

The first category comprises, among other factors, the expected changes in crop production, ground water resources or bacterial pathogens, as well electricity generation trends in hydropower plants. The second category deals with figures on the independence of food imports, numbers of persons dwelling in slums and the percentage of people that live up to five meters above sea level. The third category essentially contains data on, among other things, disaster preparedness, surfaced roads and ecological reservations. The creators of the WRI could certainly make use of these same data sources and perhaps also the various constituent parts of the ND Gain

Index itself. Here, a number of the indicators, including food, water and infrastructure, span the entire spectrum from 0 to 100 percent, which would be of benefit, mathematically speaking, to the vulnerability metric of the WRI.

The UNISDR also recently began calculating its risk data using socio-economic data. A so-called “aggravating coefficient” in the 2016 GAR Atlas is intended to highlight the “likely impact of disaster risk in contexts with high social, economic and environmental fragility”, according to the report. It is ultimately the same approach that the WRI has pursued from the beginning, although somewhat different in terms of its mathematical design and content. 14 different indicators are incorporated into the aggravating coefficient. There is an overlap with several indicators of the WorldRiskReport but it contains, in addition, a broad set of economic factors, namely inflation, unemployment, savings, welfare spending and spending on infrastructure (such as paved roads and internet access). Based on this calculation, the Bahamas returns to the top of the list. Dominica, Grenada and Puerto Rico are also found towards the top, as is Vanuatu. Here Kiribati is also located at the bottom of the ranking.

Some more suggestions for vulnerability: Among all the circumstances that prevent countries from preparing for, and reacting effectively to, extreme natural events, a number of political and socio-economic factors seem to be absent: Violence, for example, civil war, large-scale criminality – often as the delayed effect of armed conflicts. Ethnic grievance and religious strife are other notable factors. Migration also plays a role: The flight of persons within one country or across national borders. Another totally subjective inclusion is freedom of the press. Such indicators have only factored into the WRI to a limited degree. The Fragile States Index, which is used as an indicator for good governance, also measures migration, the fragmentation of ruling elites, and the so-called “security apparatus”. However, at the end of

the day, all of these factors combined add up to only eight percent of the WRI's vulnerability score.

Could it be much simpler?

Of course, it is important to avoid facets of society being counted twice in different indicators. And if new indicators were to co-vary with older ones, not much would be gained. Mathematically speaking: There should not be any large-scale correlations between the individual indicators, insofar as this is possible. This needs to be addressed by the researchers undertaking the calculation. But the existing set of indicators should also be subjected to this check: Are these types of correlations not likely to occur in the numbers of undernourished persons and the extremely poor, who are located side by side in the subcategory of "susceptibility"? Or the index values for doctors and hospital beds per 10,000 citizens on the one hand, and public health expenditure on the other?

One final point on the broader topic of the vulnerability calculation: It would of course become increasingly complex if researchers added, say, another a dozen or dozen-and-a-half indicators to the existing 23. "Reality is too complicated to be illustrated by a global index", as was remarked already in the very first WorldRiskReport. Before this type of complexity becomes crippling, a radical simplification may help. Whoever reads the list of indicators of the Human Development Index of the UNDP, for example, will recognize a certain similarity to the vulnerability indicators of the WRI. The countries that are worst off in both lists include the Central African Republic, Chad, Eritrea and Niger, in addition to Afghanistan, while Vanuatu and Kiribati are in the top third of each ranking – in one list two places apart, in the other three.

How big is the impact?

How were the reports received and what impact did they have? The German press, for one, gave a lot of coverage but none of it

was critical. Media outlets in the Philippines, India, Australia, Papua New Guinea, Nigeria, Guatemala, Malta and the Netherlands published reports with likeminded sentiments. Peter Mucke, the CEO of Bündnis Entwicklung Hilft, states that the report has been cited in the parliaments in Manila and Jakarta. Furthermore, the German Federal Foreign Office and Federal Ministry for Economic Cooperation and Development have both attested to references to the report in proposals they have received from affected countries. Those nations drew attention to the threat they face by pointing to their ranking in the index. Occasionally the reports even receive endorsement from unwanted sources: An author from the "Eike" association, a group of German climate-change deniers, cited the WorldRiskIndex as evidence for his thesis that the Maldives are in no way threatened by climate change – after all, the island state is not mentioned in the WRI.

But while praise from conspiracy theorists need not be taken seriously, the criticisms of experts should be. Take Rhea Katsanakis, of UNISDR, who questions how governments are supposed to put the information in the WorldRiskReport to use: "They must prioritize investment in the reduction of risks, and to do that they need information". In the WRI, however, all the individual details are merged into one figure. "This is not very helpful for planning at the national level", says the Geneva-based UN employee. That said, the publishers of the WorldRiskReport do offer detailed numerical information upon request.

Terry Cannon, from the Institute of Development Studies in Brighton, levels far more drastic criticism. He claims the ranking makes a mockery of the term "risk", a concept he, among others, helped define. "The index is completely useless. Who can get any benefit from the ranking of states? It helps neither governments nor NGOs to make rational use of their money." According to the Briton, if nation states and aid organizations were to gear their efforts toward the results of this list – with the sole aim of improving a country's

Food insecurity in exposed countries

Where natural hazards coincide with unstable supply situations

The risk of an extreme natural event turning into a disaster also usually depends on the nutrition situation of the population. In order to identify the need for action, both the current state of food security (measured here by the Global Hunger Index) and a selection of influential factors (percentage calorie supply, relative food prices, the share of agriculture in the Gross Domestic Product (GDP) and the supply of clean drinking water) need to be examined. Based on these five indicators (see lower left table for details) this map of the world represents food insecurity for 16 of the 18 countries which, according to the WorldRiskReport 2015, are highly or very highly exposed to natural hazards (using its insufficient data base for food security, Papua New Guinea, the Solomon Islands, Tonga and New Zealand are not included here). The map shows that there is a special need for action to improve food security (categories II, III, and IV) with a mean value calculated on the basis of five classes per indicator in accordance with the

quintile method) regarding those countries in which exposure and food insecurity coincide. For each of the five need for action categories, the map of the world gives an example of a country with its five indicator values, here are two examples, Sierra Leone (category V) is a country that is above all very heavily threatened by droughts, it is extremely susceptible to climate, also because of the population's high economic dependence on agriculture which is reflected in its share of GDP. In contrast, Chile (category I), while highly exposed to earthquakes, has a low level of food insecurity in comparison, the reason being that there is hardly any hunger, drinking water supply is good, and the relative food prices are a good position of food for the population.

Scientific support: Stephan Lohrer, BfR - Institute of Agriculture and Public Health/University of Bonn

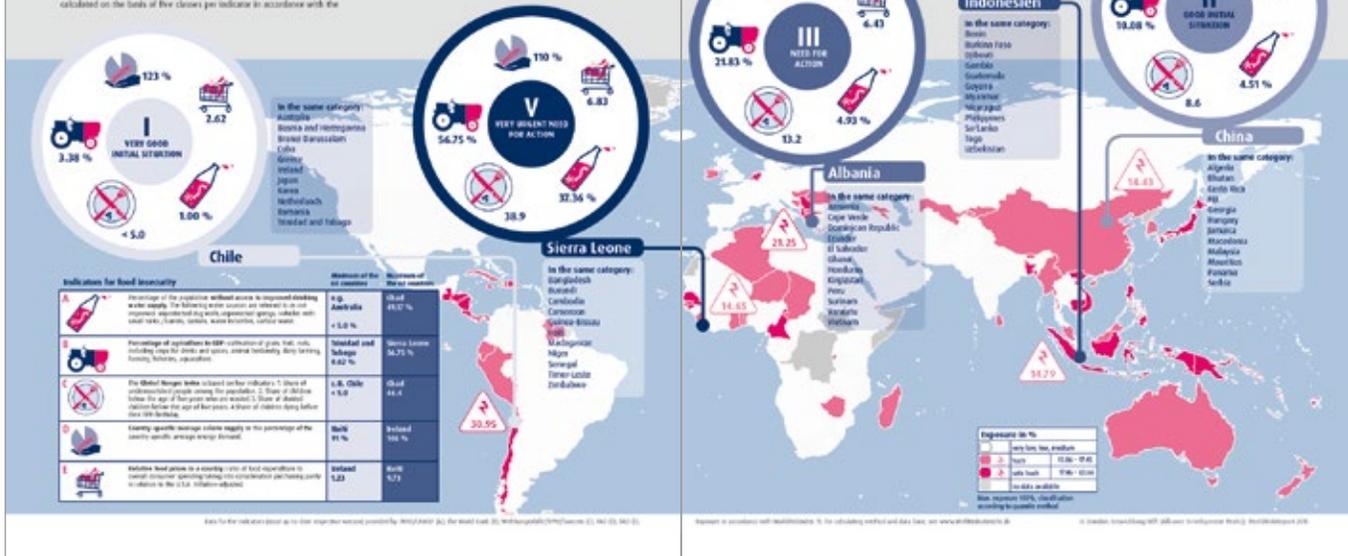


Figure 7: Global needs for action in the field of food security (world map from WorldRiskReport 2015)

ranking – this would likely not yield the best possible result in terms of aid. “Often you can achieve much by improving water access and sanitation. But in the index that would only translate into a small progress because it changes only a partial indicator.” What’s more, these types of interventions only affect vulnerability, which has a much smaller practical effect on a ranking than exposure.

The WRI’s contracting body has also had similar deliberations. From the very outset, its reports have included a focus on a central issue that stands side-by-side with the index itself. Since 2013, that central issue has gravitated closer to the individual indicators in the vulnerability index (and these issues are now placed ahead of the updated country list in the printed report). Indeed, in the last two years, this focus issue has offered a much deeper insight into the WRI: The most at-risk

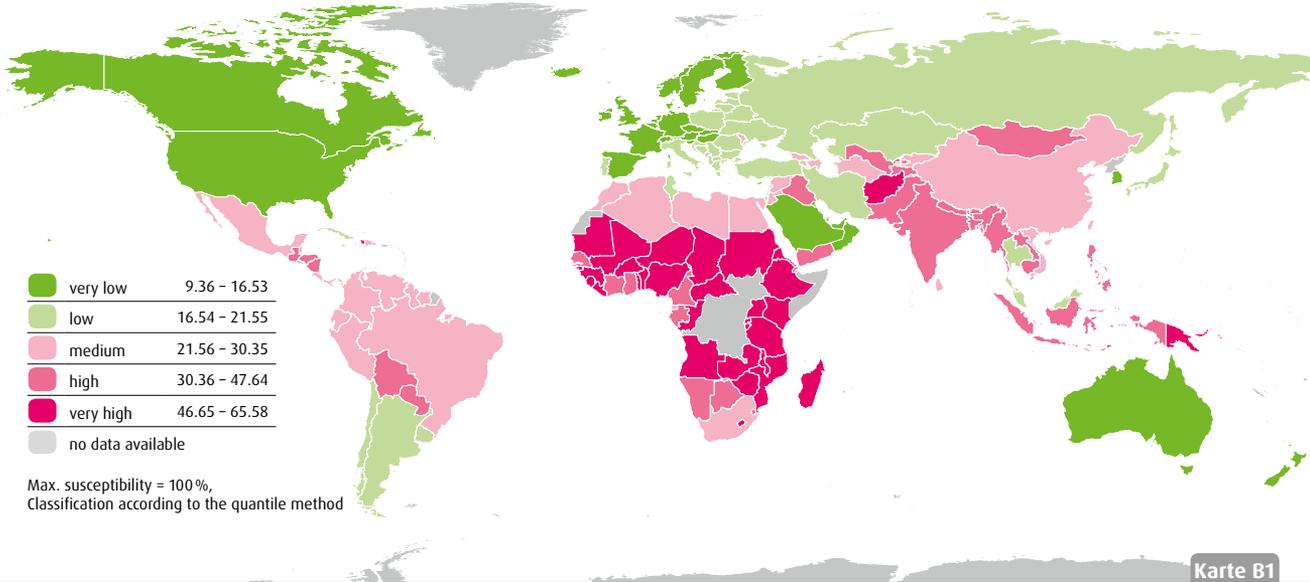
nations were studied in relation to the issues of Food Security (2015) and Infrastructure and Logistics (2016) and divided into groups, based on the need for action. These types of assessments appear better suited for steering remedial measures and aid relief – and to dampen Cannon’s outright criticism of the WRI’s calculation method.

A summary of the recommendations:

- + The exposure metric needs a more up-to-date calculation method and must place greater focus on the changing hazards associated with climate change, with the possible inclusion of heat and forest fire in the data.
- + When calculating vulnerability, the numerical range from 0 to 100 should be fully utilized, to give the vulnerability factor the same effective risk-determining weight as the exposure factor.
- + The list of countries examined should include several currently omitted island nations and territories that belong to distant, and often wealthy, countries.
- + Several indicators that affect how a country deals with natural hazards seem to be absent. These include not only the burden associated with the resulting damage, but also political and economic variables, such as civil war, violence and migration.
- + A more detailed account of the individual factors that bestow a significant risk to a country can yield priorities for developmental policy. For this reason, the central issues of the WorldRiskReport should continue to be included and possibly even expanded upon.

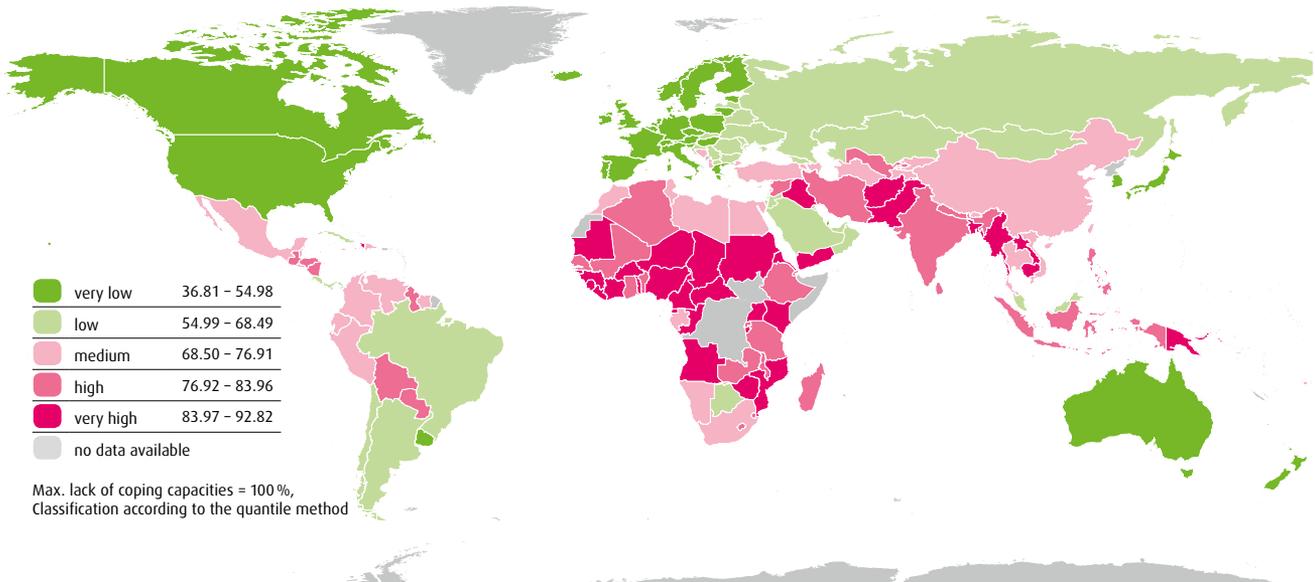
Susceptibility (mean values 2012 – 2016)

dependent on public infrastructure, nutrition, income and the general economic framework



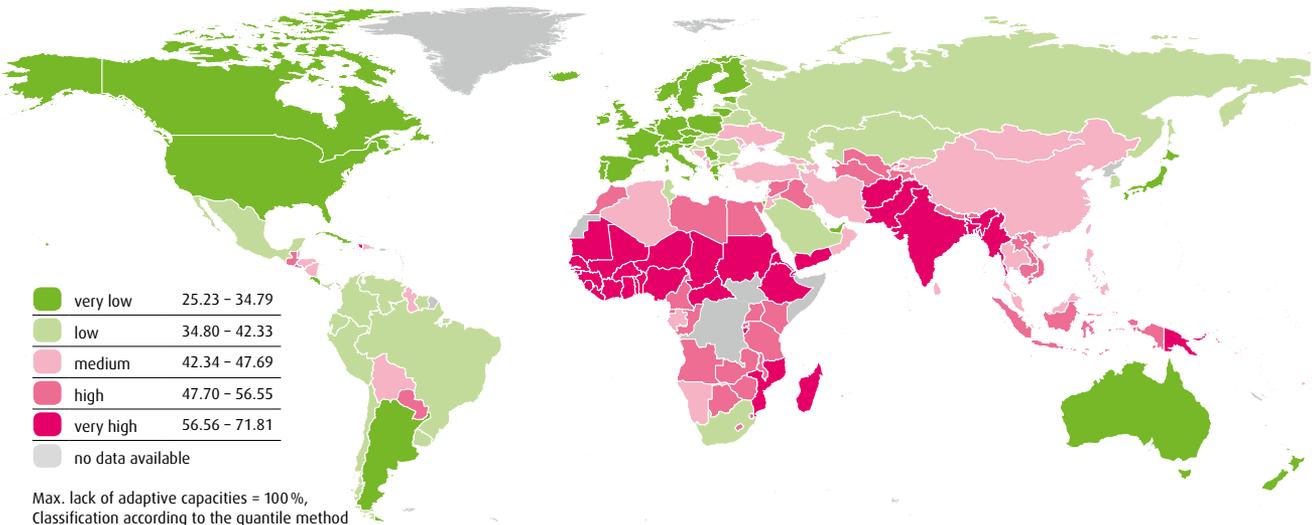
Lack of coping capacities (mean values 2012 – 2016)

dependent on governance, medical care and material security



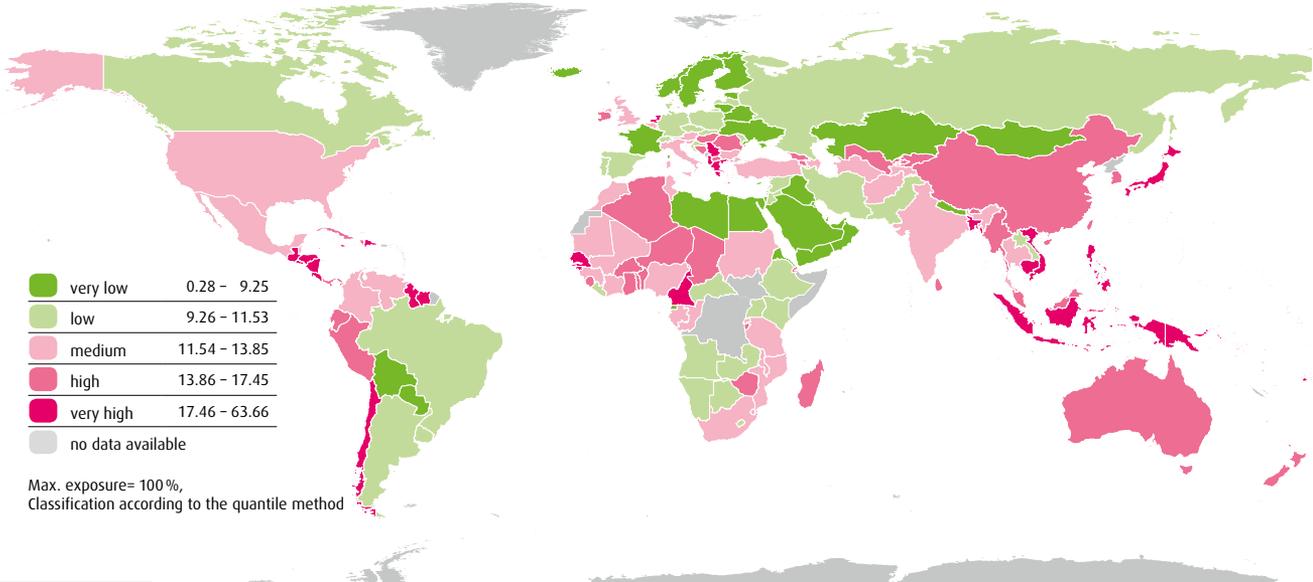
Lack of adaptive capacities (mean values 2012 – 2016)

related to future natural events and climate change



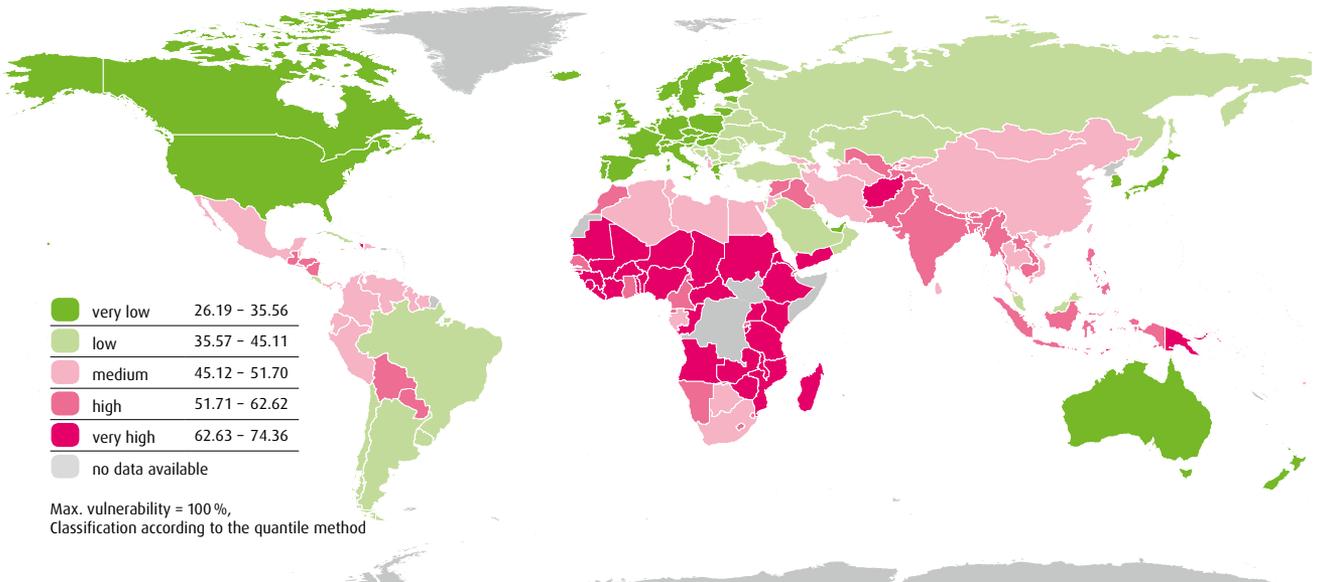
Exposure (mean values 2012 – 2016)

Exposure of the population to the natural hazards earthquakes, storms, floods, droughts and sea level rise.



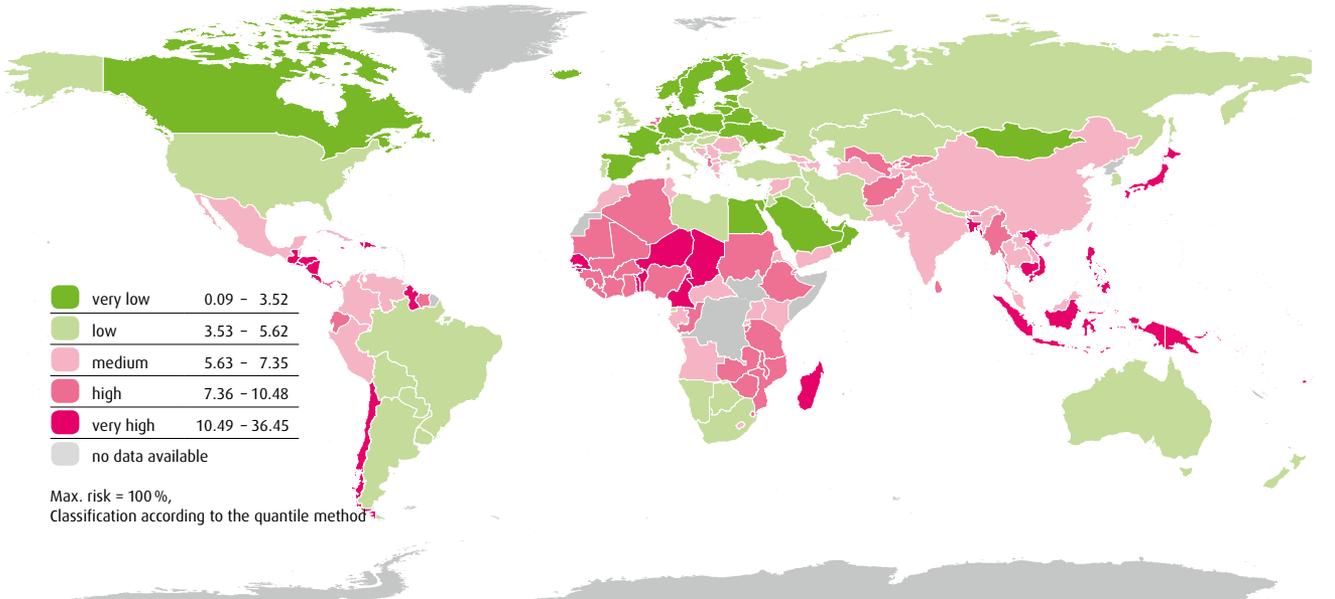
Vulnerability (mean values 2012 – 2016)

Exposure of the population to the natural hazards earthquakes, storms, floods, droughts and sea level rise.



WorldRiskIndex (mean values 2012 – 2016)

WorldRiskIndex as the result of exposure and vulnerability



Country	WRI	Rank	Country	WRI	Rank
Afghanistan	9.69 %	40.	Ethiopia	7.45 %	65.
Albania	9.93 %	39.	Fiji	13.50 %	15.
Algeria	7.76 %	59.	Finland	2.25 %	161.
Angola	6.57 %	86.	France	2.73 %	151.
Argentina	3.69 %	131.	Gabon	6.14 %	95.
Armenia	6.49 %	87.	Gambia	11.99 %	20.
Australia	4.24 %	121.	Georgia	6.64 %	84.
Austria	3.63 %	133.	Germany	3.09 %	146.
Azerbaijan	5.99 %	99.	Ghana	8.69 %	45.
Bahamas	4.14 %	124.	Greece	7.11 %	72.
Bahrain	1.77 %	164.	Grenada	1.44 %	167.
Bangladesh	19.57 %	5.	Guatemala	20.46 %	4.
Barbados	1.21 %	168.	Guinea	8.42 %	49.
Belarus	3.19 %	143.	Guinea-Bissau	13.50 %	16.
Belgium	3.33 %	141.	Guyana	11.65 %	23.
Belize	6.60 %	85.	Haiti	11.89 %	21.
Benin	11.39 %	25.	Honduras	10.82 %	31.
Bhutan	7.84 %	57.	Hungary	5.55 %	105.
Bolivia	4.93 %	111.	Iceland	1.54 %	166.
Bosnia and Herzegovina	6.31 %	93.	India	7.00 %	75.
Botswana	5.32 %	108.	Indonesia	10.49 %	33.
Brazil	4.23 %	122.	Iran (Islamic Republic of)	4.87 %	112.
Brunei Darussalam	16.22 %	12.	Iraq	4.77 %	114.
Bulgaria	4.34 %	120.	Ireland	4.56 %	118.
Burkina Faso	9.62 %	41.	Israel	2.40 %	157.
Burundi	10.48 %	35.	Italy	4.63 %	116.
Cambodia	16.92 %	8.	Jamaica	12.08 %	19.
Cameroon	11.19 %	27.	Japan	13.47 %	17.
Canada	3.13 %	144.	Jordan	4.76 %	115.
Cape Verde	10.51 %	32.	Kazakhstan	3.74 %	129.
Central African Republic	6.81 %	79.	Kenya	6.94 %	76.
Chad	11.07 %	29.	Kiribati	1.76 %	165.
Chile	11.74 %	22.	Korea, Republic of	4.80 %	113.
China	6.81 %	80.	Kuwait	3.46 %	138.
Colombia	6.76 %	81.	Kyrgyzstan	8.27 %	51.
Comoros	7.44 %	66.	Lao People's Democratic Republic	5.69 %	100.
Congo	7.40 %	68.	Latvia	3.43 %	139.
Costa Rica	17.16 %	7.	Lebanon	5.02 %	109.
Cote d'Ivoire	9.04 %	43.	Lesotho	7.03 %	74.
Croatia	4.21 %	123.	Liberia	7.84 %	58.
Cuba	6.35 %	90.	Libyan Arab Jamahiriya	3.89 %	127.
Cyprus	2.76 %	150.	Lithuania	3.06 %	148.
Czech Republic	3.52 %	137.	Luxembourg	2.55 %	154.
Denmark	2.99 %	149.	Madagascar	11.11 %	28.
Djibouti	9.99 %	37.	Malawi	8.13 %	54.
Dominican Republic	11.34 %	26.	Malaysia	6.47 %	89.
Ecuador	7.66 %	60.	Mali	8.68 %	46.
Egypt	2.30 %	159.	Malta	0.61 %	170.
El Salvador	16.74 %	9.	Mauritania	8.19 %	52.
Equatorial Guinea	4.56 %	117.	Mauritius	15.11 %	13.
Eritrea	6.32 %	92.	Mexico	6.25 %	94.
Estonia	2.45 %	156.	Mongolia	3.08 %	147.

WorldRiskIndex overview (mean values 2012–2016)

Rank	Country	WorldRiskIndex	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
1.	Vanuatu	36.45 %	63.66 %	57.26 %	35.16 %	81.19 %	55.42 %
2.	Tonga	28.57 %	55.27 %	51.70 %	28.45 %	81.45 %	45.18 %
3.	Philippines	27.69 %	52.46 %	52.78 %	32.97 %	80.92 %	44.45 %
4.	Guatemala	20.46 %	36.30 %	56.36 %	36.82 %	80.78 %	51.48 %
5.	Bangladesh	19.57 %	31.70 %	61.72 %	40.39 %	86.41 %	58.37 %
6.	Solomon Islands	18.77 %	29.98 %	62.62 %	44.37 %	85.01 %	58.47 %
7.	Costa Rica	17.16 %	42.61 %	40.28 %	21.81 %	64.49 %	34.55 %
8.	Cambodia	16.92 %	27.65 %	61.18 %	41.69 %	86.81 %	55.04 %
9.	El Salvador	16.74 %	32.60 %	51.36 %	29.64 %	75.49 %	48.96 %
10.	Timor-Leste	16.37 %	25.73 %	63.61 %	52.09 %	82.18 %	56.55 %
11.	Papua New Guinea	16.34 %	24.94 %	65.53 %	53.28 %	84.21 %	59.10 %
12.	Brunei Darussalam	16.22 %	41.10 %	39.46 %	16.44 %	63.97 %	37.96 %
13.	Mauritius	15.11 %	37.35 %	40.45 %	18.63 %	61.49 %	41.23 %
14.	Nicaragua	14.88 %	27.23 %	54.64 %	36.80 %	81.35 %	45.76 %
15.	Fiji	13.50 %	27.71 %	48.74 %	25.34 %	75.17 %	45.72 %
16.	Guinea-Bissau	13.50 %	19.65 %	68.70 %	53.60 %	89.14 %	63.35 %
17.	Japan	13.47 %	45.91 %	29.33 %	17.27 %	38.12 %	32.61 %
18.	Viet Nam	12.84 %	25.35 %	50.66 %	27.22 %	76.74 %	48.01 %
19.	Jamaica	12.08 %	25.82 %	46.79 %	26.50 %	72.02 %	41.86 %
20.	Gambia	11.99 %	19.29 %	62.18 %	44.52 %	82.97 %	59.04 %
21.	Haiti	11.89 %	16.26 %	73.11 %	62.01 %	90.62 %	66.71 %
22.	Chile	11.74 %	30.95 %	37.93 %	20.25 %	58.34 %	35.20 %
23.	Guyana	11.65 %	22.90 %	50.85 %	28.62 %	79.28 %	44.65 %
24.	Niger	11.53 %	15.87 %	72.63 %	60.78 %	87.01 %	70.11 %
25.	Benin	11.39 %	17.06 %	66.75 %	53.26 %	82.32 %	64.68 %
26.	Dominican Republic	11.34 %	23.14 %	49.01 %	28.86 %	74.04 %	44.12 %
27.	Cameroon	11.19 %	18.19 %	61.52 %	43.02 %	85.01 %	56.53 %
28.	Madagascar	11.11 %	16.03 %	69.30 %	65.58 %	83.37 %	58.95 %
29.	Chad	11.07 %	14.89 %	74.36 %	62.94 %	91.50 %	68.63 %
30.	Senegal	10.86 %	17.57 %	61.82 %	46.71 %	80.95 %	57.80 %
31.	Honduras	10.82 %	20.01 %	54.09 %	35.08 %	81.60 %	45.59 %
32.	Cape Verde	10.51 %	20.26 %	51.89 %	34.07 %	70.46 %	51.15 %
33.	Indonesia	10.49 %	19.36 %	54.19 %	32.36 %	80.94 %	49.27 %
34.	Togo	10.48 %	15.56 %	67.38 %	55.67 %	85.30 %	61.17 %
35.	Burundi	10.48 %	15.13 %	69.30 %	62.96 %	88.13 %	56.81 %
36.	Sierra Leone	10.45 %	14.65 %	71.28 %	59.18 %	86.28 %	68.38 %
37.	Djibouti	9.99 %	16.34 %	61.16 %	38.28 %	82.54 %	62.67 %
38.	Zimbabwe	9.96 %	14.96 %	66.55 %	57.42 %	88.71 %	53.54 %
39.	Albania	9.93 %	21.25 %	46.75 %	20.56 %	74.23 %	45.46 %
40.	Afghanistan	9.69 %	13.17 %	73.61 %	56.21 %	92.82 %	71.81 %
41.	Burkina Faso	9.62 %	14.32 %	67.17 %	54.76 %	84.03 %	62.71 %
42.	Myanmar	9.06 %	14.87 %	60.95 %	36.23 %	88.06 %	58.55 %
43.	Cote d'Ivoire	9.04 %	13.67 %	66.12 %	47.64 %	87.02 %	63.70 %
44.	Mozambique	8.93 %	12.73 %	70.11 %	65.19 %	84.43 %	60.71 %
45.	Ghana	8.69 %	14.48 %	60.03 %	45.58 %	77.93 %	56.57 %
46.	Mali	8.68 %	12.55 %	69.14 %	54.91 %	83.66 %	68.87 %
47.	Uzbekistan	8.64 %	16.18 %	53.40 %	30.79 %	77.88 %	51.54 %
48.	Suriname	8.48 %	18.12 %	46.80 %	28.49 %	71.25 %	40.66 %
49.	Guinea	8.42 %	12.03 %	70.01 %	54.27 %	89.58 %	66.17 %
50.	Netherlands	8.41 %	30.57 %	27.49 %	14.66 %	41.43 %	26.40 %
51.	Kyrgyzstan	8.27 %	16.63 %	49.75 %	27.01 %	76.55 %	45.70 %
52.	Mauritania	8.19 %	12.47 %	65.65 %	48.01 %	86.02 %	62.93 %
53.	Nigeria	8.19 %	12.06 %	67.92 %	54.38 %	87.86 %	61.53 %
54.	Malawi	8.13 %	12.34 %	65.88 %	57.68 %	83.92 %	56.05 %
55.	Sudan	7.97 %	11.86 %	67.20 %	51.77 %	92.57 %	57.25 %
56.	United Republic of Tanzania	7.96 %	12.01 %	66.27 %	62.92 %	83.34 %	52.53 %
57.	Bhutan	7.84 %	14.81 %	52.93 %	31.60 %	75.10 %	52.10 %
58.	Liberia	7.84 %	10.96 %	71.52 %	63.51 %	84.80 %	66.24 %
59.	Algeria	7.76 %	15.82 %	49.04 %	23.06 %	77.42 %	46.65 %

Rank	Country	WorldRiskIndex	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
60.	Ecuador	7.66 %	16.15 %	47.45 %	27.80 %	74.66 %	39.89 %
61.	Swaziland	7.64 %	12.76 %	59.91 %	45.62 %	80.72 %	53.37 %
62.	Trinidad and Tobago	7.56 %	17.54 %	43.12 %	19.28 %	69.04 %	41.03 %
63.	Sri Lanka	7.52 %	14.79 %	50.83 %	26.15 %	78.80 %	47.54 %
64.	Zambia	7.46 %	11.37 %	65.67 %	62.31 %	80.34 %	54.36 %
65.	Ethiopia	7.45 %	11.12 %	67.01 %	56.80 %	81.73 %	62.51 %
66.	Comoros	7.44 %	10.97 %	67.78 %	58.61 %	83.96 %	60.77 %
67.	Panama	7.43 %	16.45 %	45.15 %	27.74 %	67.52 %	40.19 %
68.	Congo	7.40 %	11.65 %	63.56 %	53.03 %	85.96 %	51.70 %
69.	Rwanda	7.35 %	11.98 %	61.32 %	55.14 %	79.58 %	49.24 %
70.	Serbia	7.23 %	18.05 %	40.04 %	18.55 %	66.78 %	34.79 %
71.	Tajikistan	7.16 %	12.98 %	55.15 %	35.12 %	76.41 %	53.92 %
72.	Greece	7.11 %	21.11 %	33.71 %	17.40 %	51.31 %	32.42 %
73.	Pakistan	7.11 %	11.36 %	62.54 %	37.04 %	86.71 %	63.88 %
74.	Lesotho	7.03 %	11.40 %	61.69 %	49.64 %	79.55 %	55.87 %
75.	India	7.00 %	11.94 %	58.62 %	38.22 %	80.47 %	57.17 %
76.	Kenya	6.94 %	10.69 %	64.95 %	54.20 %	85.82 %	54.82 %
77.	Peru	6.91 %	14.40 %	48.02 %	29.05 %	73.84 %	41.18 %
78.	Morocco	6.87 %	13.25 %	51.86 %	28.12 %	75.84 %	51.62 %
79.	Central African Republic	6.81 %	9.39 %	72.50 %	62.25 %	89.63 %	65.61 %
80.	China	6.81 %	14.43 %	47.18 %	26.43 %	70.41 %	44.69 %
81.	Colombia	6.76 %	13.84 %	48.84 %	28.32 %	75.95 %	42.27 %
82.	Uganda	6.66 %	10.16 %	65.53 %	55.81 %	87.67 %	53.10 %
83.	Turkmenistan	6.65 %	13.19 %	50.37 %	25.92 %	75.86 %	49.34 %
84.	Georgia	6.64 %	14.69 %	45.21 %	25.85 %	64.21 %	45.58 %
85.	Belize	6.60 %	13.31 %	49.57 %	27.91 %	74.16 %	46.63 %
86.	Angola	6.57 %	10.18 %	64.55 %	52.03 %	85.52 %	56.09 %
87.	Armenia	6.49 %	14.51 %	44.75 %	21.55 %	71.04 %	41.65 %
88.	Romania	6.47 %	15.77 %	41.06 %	21.46 %	61.54 %	40.17 %
89.	Malaysia	6.47 %	14.60 %	44.27 %	19.85 %	68.17 %	44.80 %
90.	Cuba	6.35 %	17.45 %	36.37 %	18.63 %	57.20 %	33.28 %
91.	Thailand	6.35 %	13.70 %	46.34 %	20.30 %	75.62 %	43.09 %
92.	Eritrea	6.32 %	8.55 %	73.98 %	62.71 %	88.31 %	70.92 %
93.	Bosnia and Herzegovina	6.31 %	14.02 %	44.99 %	19.55 %	70.65 %	44.75 %
94.	Mexico	6.25 %	13.84 %	45.14 %	23.57 %	71.86 %	39.99 %
95.	Gabon	6.14 %	11.95 %	51.36 %	33.04 %	75.73 %	45.30 %
96.	Republic of Macedonia	6.12 %	14.38 %	42.53 %	20.63 %	64.65 %	42.32 %
97.	Yemen	6.01 %	9.04 %	66.46 %	46.30 %	90.24 %	62.85 %
98.	Venezuela	5.99 %	13.15 %	45.56 %	23.35 %	74.79 %	38.55 %
99.	Azerbaijan	5.99 %	13.16 %	45.49 %	21.96 %	69.84 %	44.68 %
100.	Lao People's Democ. Rep.	5.69 %	9.55 %	59.60 %	40.85 %	84.89 %	53.06 %
101.	Syrian Arab Republic	5.64 %	10.56 %	53.44 %	26.33 %	83.39 %	50.59 %
102.	Tunisia	5.62 %	12.45 %	45.19 %	21.43 %	72.54 %	41.60 %
103.	South Africa	5.62 %	12.08 %	46.52 %	30.35 %	69.33 %	39.88 %
104.	Namibia	5.59 %	10.41 %	53.75 %	46.04 %	71.05 %	44.16 %
105.	Hungary	5.55 %	15.61 %	35.56 %	16.31 %	53.56 %	36.80 %
106.	Turkey	5.42 %	12.25 %	44.26 %	19.83 %	68.57 %	44.37 %
107.	Nepal	5.37 %	9.16 %	58.67 %	42.61 %	81.27 %	52.13 %
108.	Botswana	5.32 %	10.55 %	50.40 %	35.53 %	67.72 %	47.94 %
109.	Lebanon	5.02 %	11.14 %	45.11 %	20.72 %	69.91 %	44.69 %
110.	Republic of Moldova	4.98 %	11.11 %	44.77 %	23.08 %	68.09 %	43.13 %
111.	Bolivia	4.93 %	8.98 %	54.92 %	40.28 %	79.71 %	44.78 %
112.	Iran (Islamic Republic of)	4.87 %	10.19 %	47.78 %	19.19 %	80.35 %	43.81 %
113.	Korea, Republic of	4.80 %	14.89 %	32.25 %	14.52 %	46.52 %	35.73 %
114.	Iraq	4.77 %	8.08 %	59.05 %	32.05 %	89.09 %	56.00 %
115.	Jordan	4.76 %	10.53 %	45.17 %	22.77 %	68.18 %	44.55 %
116.	Italy	4.63 %	13.85 %	33.40 %	16.81 %	54.98 %	28.40 %
117.	Equatorial Guinea	4.56 %	8.22 %	55.52 %	29.87 %	85.08 %	51.60 %
118.	Ireland	4.56 %	14.74 %	30.91 %	15.78 %	45.51 %	31.43 %

Rank	Country	WorldRiskIndex	Exposure	Vulnerability	Susceptibility	Lack of coping capacities	Lack of adaptive capacities
119.	New Zealand	4.42 %	15.44 %	28.66 %	16.42 %	43.33 %	26.21 %
120.	Bulgaria	4.34 %	11.66 %	37.19 %	18.14 %	57.02 %	36.42 %
121.	Australia	4.24 %	15.05 %	28.19 %	15.05 %	42.04 %	27.48 %
122.	Brazil	4.23 %	9.53 %	44.43 %	24.80 %	67.17 %	41.32 %
123.	Croatia	4.21 %	11.53 %	36.52 %	17.75 %	56.69 %	35.13 %
124.	Bahamas	4.14 %	10.71 %	38.67 %	18.14 %	53.99 %	43.87 %
125.	Uruguay	4.03 %	11.10 %	36.33 %	20.66 %	50.78 %	37.55 %
126.	United States	3.90 %	12.25 %	31.81 %	16.53 %	48.56 %	30.36 %
127.	Libyan Arab Jamahiriya	3.89 %	7.80 %	49.93 %	25.01 %	75.81 %	48.97 %
128.	Russia	3.78 %	9.38 %	40.28 %	21.35 %	59.07 %	40.41 %
129.	Kazakhstan	3.74 %	9.11 %	41.03 %	18.08 %	62.69 %	42.33 %
130.	Paraguay	3.71 %	7.03 %	52.79 %	31.02 %	78.87 %	48.49 %
131.	Argentina	3.69 %	9.55 %	38.59 %	21.36 %	59.72 %	34.70 %
132.	Portugal	3.65 %	10.93 %	33.37 %	17.56 %	48.10 %	34.45 %
133.	Austria	3.63 %	13.60 %	26.65 %	14.26 %	36.81 %	28.88 %
134.	Slovenia	3.62 %	11.59 %	31.25 %	14.97 %	50.87 %	27.92 %
135.	United Kingdom	3.60 %	11.60 %	31.08 %	16.46 %	46.82 %	29.95 %
136.	Slovakia	3.56 %	10.21 %	34.85 %	14.25 %	55.25 %	35.05 %
137.	Czech Republic	3.52 %	10.82 %	32.50 %	14.87 %	50.32 %	32.31 %
138.	Kuwait	3.46 %	9.04 %	38.24 %	12.02 %	64.93 %	37.77 %
139.	Latvia	3.43 %	9.26 %	37.10 %	20.76 %	55.43 %	35.11 %
140.	Poland	3.35 %	9.79 %	34.22 %	17.22 %	53.72 %	31.71 %
141.	Belgium	3.33 %	11.66 %	28.54 %	15.60 %	40.40 %	29.64 %
142.	Spain	3.23 %	10.23 %	31.53 %	15.95 %	50.00 %	28.65 %
143.	Belarus	3.19 %	8.46 %	37.68 %	16.77 %	60.92 %	35.33 %
144.	Canada	3.13 %	10.25 %	30.55 %	14.85 %	45.91 %	30.90 %
145.	Ukraine	3.10 %	7.50 %	41.34 %	19.00 %	61.99 %	43.03 %
146.	Germany	3.09 %	11.41 %	27.13 %	15.11 %	37.69 %	28.57 %
147.	Mongolia	3.08 %	6.52 %	47.17 %	32.32 %	65.48 %	43.73 %
148.	Lithuania	3.06 %	8.88 %	34.49 %	18.99 %	50.36 %	34.13 %
149.	Denmark	2.99 %	10.87 %	27.54 %	14.92 %	39.47 %	28.23 %
150.	Cyprus	2.76 %	7.44 %	37.04 %	14.46 %	57.74 %	38.91 %
151.	France	2.73 %	9.25 %	29.47 %	16.17 %	43.22 %	29.03 %
152.	Oman	2.72 %	6.41 %	42.37 %	16.44 %	63.53 %	47.14 %
153.	Seychelles	2.56 %	5.99 %	42.77 %	21.60 %	63.23 %	43.47 %
154.	Luxembourg	2.55 %	9.12 %	27.95 %	12.32 %	41.17 %	30.36 %
155.	Switzerland	2.50 %	9.56 %	26.19 %	14.37 %	37.60 %	26.60 %
156.	Estonia	2.45 %	7.23 %	33.83 %	18.01 %	51.38 %	32.10 %
157.	Israel	2.40 %	6.41 %	37.42 %	19.08 %	58.65 %	34.54 %
158.	Singapore	2.36 %	7.82 %	30.14 %	14.16 %	48.83 %	27.43 %
159.	Egypt	2.30 %	4.72 %	48.75 %	21.62 %	76.91 %	47.72 %
160.	Norway	2.29 %	8.58 %	26.64 %	14.04 %	39.08 %	26.78 %
161.	Finland	2.25 %	8.19 %	27.43 %	15.45 %	38.99 %	27.86 %
162.	Sweden	2.19 %	7.97 %	27.47 %	15.08 %	40.36 %	26.96 %
163.	United Arab Emirates	1.98 %	5.93 %	33.37 %	10.39 %	56.29 %	33.44 %
164.	Bahrain	1.77 %	4.27 %	41.41 %	13.28 %	65.68 %	45.28 %
165.	Kiribati	1.76 %	3.05 %	57.69 %	42.18 %	83.19 %	47.69 %
166.	Iceland	1.54 %	5.67 %	27.19 %	14.68 %	41.67 %	25.23 %
167.	Grenada	1.44 %	3.13 %	46.12 %	24.86 %	69.20 %	44.28 %
168.	Barbados	1.21 %	3.46 %	34.99 %	16.53 %	49.96 %	38.49 %
169.	Saudi Arabia	1.21 %	2.93 %	41.14 %	16.08 %	68.49 %	38.85 %
170.	Malta	0.61 %	1.65 %	37.10 %	15.03 %	57.10 %	39.17 %
171.	Qatar	0.09 %	0.28 %	32.25 %	9.36 %	49.03 %	38.36 %

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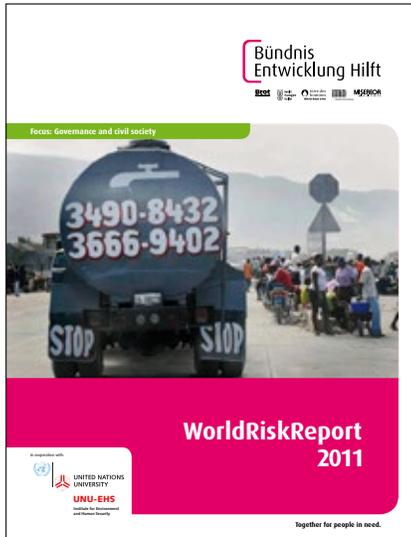
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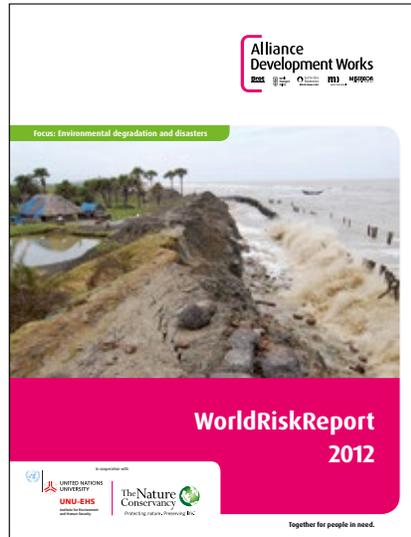
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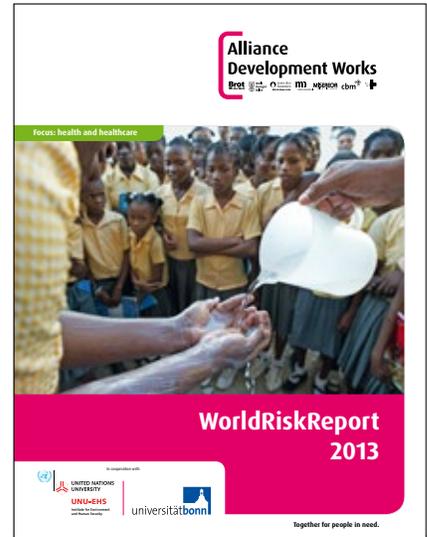
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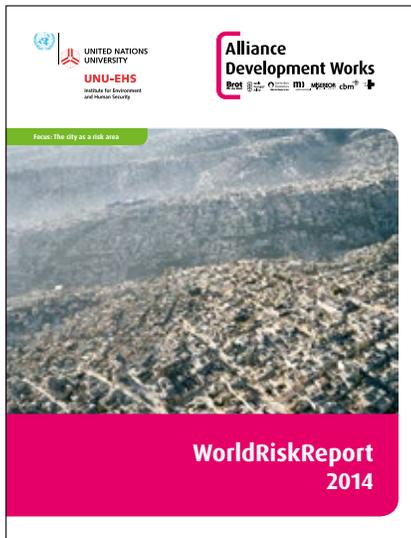
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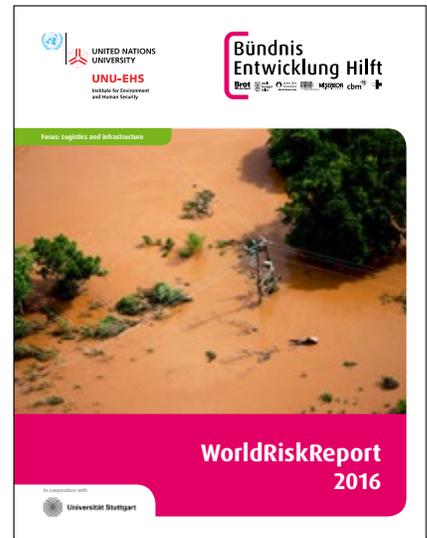
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