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THE RISK OF DISASTER-INDUCED DISPLACEMENT IN SOUTH ASIA

TECHNICAL PAPER

Justin Ginnetti and Chris Lavell

April 2015

DISASTERS
CLIMATE CHANGE AND
DISPLACEMENT

EVIDENCE FOR ACTION

PARTNERS

THE NANSEN INITIATIVE
DISASTER-INDUCED CROSS-BORDER DISPLACEMENT

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For the purpose of this report, countries are defined as independent nation states. The inclusion of contested territories does not imply any political endorsement or otherwise on IDMC's part.

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ACRONYMS

AAL	Average Annual Loss
ADB	Asian Development Bank
CAPRA	Probabilistic Risk Assessment Initiative (of ERN-AL)
CCA	Climate Change Adaptation
CRED	Centre for Research on the Epidemiology of Disasters
DARA	Development Assistance Research Associates
DDRI	Disaster Displacement Risk Index (of IDMC)
DESINVENTAR	Disaster Inventory Management System
DiDD	Disaster-induced Displacement Database (of IDMC)
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EM-DAT	Emergency Events Database (of CRED)
ERN-AL	Evaluación de Riesgos Naturales–América Latina
GAR	*Global Assessment Report* (of UNISDR)
GFDRR	Global Facility for Disaster Reduction and Recovery
GLOF	glacial lake outburst floods
GPID	Guiding Principles on Internal Displacement
GRID	Global Resource Information Database (of UNEP)
HDI	Human Development Index (of UNDP)
HFA	*Hyogo Framework for Action*
ICCRR	Indicator of Conditions and Capacities for Risk Reduction
IDMC	Internal Displacement Monitoring Centre
IDNDR	UN International Decade of Natural Disaster Reduction
IPCC	Intergovernmental Panel on Climate Change
IRR	Indicator of Conditions and Capacities for Risk Reduction (of DARA)
MPI	Multidimensional Poverty Index
PML	Probable Maximum Loss
PREVIEW	UNEP/GRID Project for Risk Evaluation, Information and Early Warning (commonly known as 'Global Risk Data Platform')
SAARC	South Asian Association for Regional Cooperation
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNISDR	United Nations Office for Disaster Risk Reduction (formerly United Nations International Strategy for Disaster Reduction)
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
WCDRR	World Conference on Disaster Risk Reduction

PREFACE

This technical paper represents an initial attempt to assess the risk of disaster-induced displacement in eight countries in South Asia – Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka.[1] It presents results from the fifth of five analyses of disaster-related displacement risk,[2] each of which corresponds with a regional consultation of the Nansen Initiative. The Nansen Initiative is a state-led process that brings together representatives from governments, international organisations, civil society, think tanks and other key actors to develop a protection agenda for people displaced across state borders by disasters and the effects of climate change.[3]

The primary intended audience for this paper are those in national governments and regional organisations responsible for reducing and managing disaster risks and for protecting the rights of internally displaced persons (IDPs) and people displaced across international borders by disasters. Given that displacement risk is largely influenced by human decisions, especially those related to development and urban planning, this paper could potentially inform decisions and reduce or avoid the risk of future displacement. In addition, humanitarian actors may also use this analysis to inform preparedness planning for disaster-induced displacement. For example, the calculations presented in this paper could help determine evacuation centre capacity, temporary shelter needs or funding needed in response to disaster-related displacement in the future.

Findings from five regional analyses have informed a consolidated report on the risk of disaster-induced displacement. Drawing on IDMC's annual *Global Estimates* and other relevant data on previously reported disaster-induced displacement, the consolidated report and the five regional analyses provide evidence-based estimates and scenarios concerning the likelihood of future displacement and how it can be mitigated. As such, it will inform the Nansen Initiative's global consultation as well as other processes such as the development of the successor agreement to the *Hyogo Framework for Action* (HFA).

The analysis below is based on probabilistic risk. It adapts a methodology that has been widely used to assess the likelihood of disaster-related economic losses and fatalities. IDMC has been testing and refining this methodology to assess the likelihood of displacement, having already published assessments of displacement risk in Central America, the South Pacific and South-east Asia.[4] A fifth technical paper, focusing on drought-induced displacement in the Horn of Africa, employed a methodology based on system dynamics modelling.[5] The aim of each report is to provide the best possible estimates of displacement risk given the available data. In this spirit of continuous improvement, IDMC invites relevant experts and interested readers to comment on and contribute to this innovative area of work.[6]

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1 Per the World Bank's regional groupings.

2 The five regions are Central America, the Pacific, the Horn of Africa, South-east Asia and South Asia.

3 For more information, see http://www.nanseninitiative.org

4 IDMC, 2013. *Technical Paper: The risk of disaster-induced displacement – Central America and the Caribbean.* (http://goo.gl/RwFnrN) Geneva: IDMC; and IDMC 2014. *Technical Paper: The risk of disaster-induced displacement in the Pacific island states.* (http://goo.gl/fsh0Zz) Geneva: IDMC.

5 IDMC, 2014. *Technical Paper: Assessing drought displacement risk for Kenyan, Ethiopian and Somali pastoralists.* (http://goo.gl/AewkDj). Geneva: IDMC.

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EXECUTIVE SUMMARY

This technical paper provides evidence-based estimates of the likelihood of disaster-induced displacement in Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka. It attempts to better quantify human displacement risk. It brings together data from several sources – notably the *Global Assessment Reports* (GARs) and the *Asia-Pacific Disaster Report* of the United Nations International Strategy for Disaster Reduction (UNISDR), national disaster loss inventory databases (DesInventar) and IDMC's *Global Estimates* – in order to better quantify human displacement risk. Applying a probabilistic risk model, it is one of the first attempts to assess how many people are at risk of being displaced by natural hazard-related disasters. It is the first attempt to do so for South Asia.

A NEW WAY OF THINKING

The study reflects an awareness of the need to see disasters as primarily social, rather than natural, phenomena. This view acknowledges the fact that humans can act and take decisions to reduce the likelihood of a disaster occurring or, at the very least, to reduce their impacts and the levels of loss and damage associated with them. Disasters are thus no longer considered as 'natural' or 'acts of God' but, instead, as something over which humans exert influence and can therefore prevent.

This reconceptualisation of disasters signifies a shift from a retrospective, post-disaster approach to an anticipatory way of thinking about and confronting the risk, not the disasters. This conceptual development was reflected in a public policy objective of focusing on disaster risk reduction (DRR). Strengthening DRR became a global priority in the 1990s, the United Nations' International Decade of Natural Disaster Reduction. Following the 2004 Indian Ocean Tsunami, UN Member States adopted the 2005 *Hyogo Framework for Action* (HFA), a ten-year plan endorsed by the UN General Assembly which aims to reduce the risk of disasters globally. The objectives codified in the HFA are currently being updated in advance of a global conference scheduled for March 2015 in Sendai, Japan, at which Member States will renew their commitment to DRR. One important outcome of the HFA process is awareness that without ability to measure losses from disasters it is not possible to know if disaster risk has been reduced.

In the context of disasters, displacement includes all forced population movements resulting from the immediate threat of, or actual, disaster situation. This is regardless of length of time displaced, distance moved from place of origin and subsequent patterns of movement, including back to place of origin or re-settlement elsewhere. Based upon existing information, and notwithstanding some notable exceptions, the vast majority of people displaced by disasters are assumed to remain within their country of residence, rather than to cross internationally recognised borders to find refuge.

Displacement is a disaster impact that is largely determined by the underlying vulnerability of people to shocks or stresses that compel them to leave their homes and livelihoods just to survive. The number of people displaced is, of course, related to the magnitude and frequency of extreme hazard events. The most significant factors are those that leave communities exposed and vulnerable with low levels of resilience. The combination of these factors often means that such communities sustain regular losses that exceed their development gains, leaving them in worse conditions as time passes by. Addressing exposure and vulnerability to hazards and increasing resilience will reduce disaster losses and displacement in the future.

Informed by this anticipatory way of thinking about disasters, the approach used in this study departs from most existing analyses in two ways.

First, while the efforts of many governments and other actors continue to emphasise post-disaster and post-displacement response and recovery this analysis is based on probabilistic risk modelling. This uses historical information available about past disasters to provide estimates that may inform policy and action to ideally prevent, or at least to prepare for, displacement before a disaster occurs.

Second, while displacement and disasters have traditionally been associated with humanitarian relief and human rights-based protection this study analyses disaster-induced displacement in the language of the disaster risk reduction and disaster risk management communities. This helps bridge the gap between pre- and post-disaster activities and stakeholder groups. In sum, this study attempts to provide entry points for humanitarian and protection actors while presenting information aimed at those responsible for disaster risk reduction, risk management and development.

REGIONAL CONTEXT

The eight countries included in this study— Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka —account for approximately 23 per cent of the entire global population. Since 1970, the population of these eight countries has grown by 140 per cent and become increasingly urban.

South Asia's population growth is mirrored by economic growth which has concentrated people and economic activities in urban areas, often located in hazard-prone areas. Consequently, people and settlements in the region are regularly exposed to multiple hazards, such as cyclones, floods, droughts, earthquakes, volcanoes and rain- and earthquake-triggered landslides.

Analysing these eight countries reveals striking contrasts. Some countries are densely populated, such as the Maldives and Bangladesh, each with more than 1,000 people per square kilometre. By contrast, there are an average of only 15 people per square kilometre in Bhutan. The Maldives is a small island state that is exposed to few hazards at present but faces several threats associated with climate change. India and Pakistan are both large, populous states with diverse geographies and millions of vulnerable people exposed to multiple hazards. By consequence, they are among the most disaster-prone countries in the world. Tens of millions of people in Bangladesh are vulnerable to cyclones, and the country is widely regarded as one of the most at-risk when it comes to future climate change impacts.

KEY FINDINGS

The eight countries in South Asia accounted for 36 per cent of the total reported displacement worldwide. The average number of people displaced each year by disasters in South Asia has not changed dramatically since the 1970s.

The Maldives (9th) and Bangladesh (11th) currently rank among the world's most densely populated countries. India, Sri Lanka and Pakistan also have high population density. Reflecting the concentration of exposure and vulnerability in urban areas, displacement events have become larger with events that displace 3 million or more people having become more frequent since the 1980s.

In South Asia, the risk of being displaced in relation to disasters is increasing, but not as fast as the overall and urban population growth rates. This suggests that reductions in vulnerability have offset these increases in exposure.

Displacement risk is unevenly distributed among countries within the region. Due to the massive differences in population size, a million people in India risk displacement for every one person in the Maldives. When population size is accounted for, however, we find that individual people in the Maldives are three times as likely to be displaced as people in India. The country in which people are most likely to be displaced by disasters is Sri Lanka, where 15,000 people per million risk being displaced every year.

The overwhelming majority of disaster spending is still being used to respond to – rather than to prevent – disasters, particularly in Pakistan. Spending on disaster response is less cost-effective than investments to reduce disaster risks and disaster relief does not always reach people who are displaced with family or friends rather than in official shelters or evacuation centres.

IDMC has not found evidence of significant cross-border displacement in relation to disasters within this region. However, major hazards have affected populations on both sides of international borders, with the 2005 Kashmir Earthquake being one example where coordinated multi-lateral and international response was required. The presence of these transboundary hazards, which also include cyclones, riverine floods as well as landslides, means there is a risk of cross-border displacement for populations living and working along these borders.

1. INTRODUCTION

To understand disasters we must not only know about the types of hazards that might affect people, but also the different levels of vulnerability of different groups of people. This vulnerability is determined by social systems and power, not by natural forces. It needs to be understood in the context of political and economic systems that operate on national and even international scales: it is these which decide how groups of people vary in relation to health, income, building safety, location of work and home, and so on.[7]

This technical paper provides evidence-based estimates of the likelihood of disaster-induced displacement in the nations belonging to the South Asian Association for Regional Cooperation (SAARC): Afghanistan, Bangladesh, Bhutan, India, the Maldives, Pakistan, Nepal and Sri Lanka. It attempts to better quantify both historic and future displacement risk within South Asia by analysing data from several sources – notably the *Global Assessment Reports* (GARs) and the *Asia-Pacific Disaster Report* of the United Nations Office for Disaster Risk Reduction (UNISDR), national disaster loss databases (DesInventar) and IDMC's *Global Estimates* and Disaster-induced Displacement Database (DiDD).

Applying a probabilistic risk model, it projects how many people are at risk of being displaced by disasters by using evidence from reported situations of disaster-induced displacement. It provides forward-looking displacement risk estimates for the next ten years at a spatial and temporal scale that, we hope, will be useful for planning and decision-making. For example, the amount of displacement risk in a particular area could determine evacuation centre capacity or temporary shelter needs.

This paper is primarily intended for those in national and regional government responsible for reducing and managing disaster risks or protecting the rights of internally displaced persons (IDPs). The study is particularly intended to inform the inter-governmental South Asia consultation of the Nansen Initiative,[8] a state-led process that focuses on cross-border displacement related to disasters and climate change. Given that displacement risk is largely influenced by human decisions – as opposed to natural hazards – the study may also be useful for informing development investment decisions that could reduce the risk of future displacement. Humanitarian actors may also be interested in the findings as a means of informing preparedness planning for disaster-induced displacement.

The countries in this study are among those most affected by disaster-induced displacement. Since 1970, sudden-onset hazards have displaced more than 300 million people. In 2013 alone, Cyclone Mahasen, Cyclone Phailin and India's monsoon flooding each displaced more than a million people.[9]

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7 Wisner, B., Blaikie,P., Cannon, T. Davis, I. 2003. At Risk (2nd ed.). London: Routledge.

8 See http://www.nanseninitiative.org

9 IDMC, 2014. *Global Estimates 2014: People displaced by disasters.* (http://goo.gl/ndUL58) Geneva: IDMC.

People in South Asia face high displacement risk due to the fact that a large number of highly vulnerable people are exposed to multiple hazards, such as tropical cyclones, floods, earthquakes, landslides, wildfires, droughts, volcanoes and tsunamis.

According to the World Bank's income classification seven of the eight countries in this study are categorised as 'low' or 'lower-middle' income. Afghanistan, Bangladesh, Bhutan and Nepal are considered least developed countries (LDCs). Nationally aggregated economic data only hints at the conditions of vulnerability within these countries. More than 47 per cent of households in Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan face multidimensional poverty, which means they experience multiple deprivations, including low income and a lack of adequate housing, education and health.[10] In Afghanistan, Pakistan and Sri Lanka people have also been displaced by conflicts, violence and human rights violations, all of which exacerbate underlying conditions of vulnerability.

[10] United Nations Development Programme (UNDP). 2014. *Human Development Report 2014: Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience.* (http://goo.gl/NgUhul) New York: UNDP.

2. DISPLACEMENT AND DISASTER RISK

2.1 APPROACHING DISPLACEMENT FROM THE PERSPECTIVE OF DISASTER RISK

This paper brings together data from several disparate sources in order to better quantify human displacement risk in South Asia. The goal is to look beyond historic displacement figures and to estimate future displacement risk within each country. As the last of five regional analyses based on a displacement risk methodology under development by IDMC, it:

- advances several considerations for modelling of displacement risk
- elaborates a new assessment methodology which is being refined for each of the five regional analyses
- seeks to yield results that are as accurate and certain as possible with available data
- brings to light the main sources of uncertainty and error
- informs continuing policy discussions related to the Nansen Initiative consultations on cross-border displacement in the context of disasters and climate change.

The findings presented here have benefitted from initial testing of the displacement risk methodology in Central America and the South Pacific. In each case, we have used the best available spatial and temporal evidence to generate displacement risk estimates. In the light of future economic, demographic and climate-related changes, these displacement risk estimates provide a look at potential, rather than historic, displacement in order to improve understanding of the implications of disaster-induced human displacement trends.

The results contained in this paper should be considered provisional. IDMC will continue to improve the probabilistic risk model methodology and incorporate more historical data as it becomes available. A complete explanation of the methodology used in the analysis has been included in IDMC's global assessment of disaster-related displacement risk.[11]

2.2 STRENGTHS AND WEAKNESSES OF THE 'RISK' APPROACH

The objective of this project is to generate probabilistic risk information that quantifies expected displacement based on both annual averages as well as the effect of disaster events of different return periods (for example, the expected number of displaced based on a 100-year return period flooding event). At this point, such a model is not possible due to various data limitations. These include:

- the absence of most small disasters from global databases
- differences in methodologies between national databases
- exceedingly short sample periods for modelling longer return period events.

The study thus focuses on providing an empirical assessment of displacement risk, utilising primarily quantitative sources but also relying on some qualitative input to help fill the gaps. It also identifies principal sources of bias and error involved in these initial quantitative estimates in order to inform future revisions to the methodology.

[11] IDMC, 2015. *Disaster-related displacement risk: Measuring the risk and assessing its drivers.* (http://goo.gl/VQkOwQ)

The general approach is to use the highest quality disaster loss data that is relevant to displacement risk to validate trends and projections. The most directly relevant of these relate to either number of homeless or number of homes destroyed after a disaster. This also informs the study's principal methodological constraint: its application to disasters that do not destroy homes but which do lead to displacement. Displacement related to these events is, necessarily, under-represented.

It is also exceedingly difficult to quantify displacement due to drought.[12] A further challenge is determining the distance and duration of displacement, both of which are hard to quantify using only loss data. Developing proxy indicators to measure the impact of loss of livelihoods will be necessary to improve the accuracy of the model and understand the duration of displacement. Improving our understanding of livelihood impacts is also necessary to quantify risks that loss data has yet to capture, such as sea-level rise or ocean acidification.

For these reasons, this paper focuses on displacement estimates related to number of people expected to be displaced using data relating to homelessness. It also uses other loss data, including the number of people affected and the number of people killed in each event to help fill in some of the gaps in loss reporting. It is hoped that as the methodology is advanced a more complex approach will help increase the predictive capacity of modelling displacement risk as well as reducing sources of uncertainty.

A key tool under development for the next stage of this methodology is the application to disaster-related displacement of the Hybrid Loss Curve approach pioneered by Evaluación de Riesgos Naturales–América Latina (ERN-AL), a Latin American research organisation. Hybrid Loss Curves have been used to assess the full spectrum of economic loss risk by joining empirical loss data from frequently occurring events with modelled results for expected losses associated with infrequently recurring events.

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12 Due to the difficulty of estimating drought-related displacement using existing methodologies, IDMC has developed a new methodology, based on a system dynamics model, to estimate drought-related displacement. An initial analysis piloting this methodology in the Horn of Africa was published in May 2014.

13 A more thorough glossary is included in the annex.

14 Adapted from Intergovernmental Panel on Climate Change (IPCC), 2012. *Managing the Risks of Extreme Events and disasters to Advance Climate Change Adaptation,* A Special Report of Working Groups I and II of the IPCC. (http://goo.gl/UWwbBw) Cambridge: Cambridge University Press, p.557.

15 UNISDR, 2009. *UNISDR Terminology on Disaster Risk Reduction.* (http://goo.gl/LIpFpW) Geneva: UN Office for Disaster Risk Reduction.

16 United Nations, 1998, *Guiding Principles on Internal Displacement.* (http://goo.gl/WHJ0WT)

17 IPCC, 2012.

BOX 1: KEY TERMS[13]

Climate change is a change in the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external pressures, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.[14]

Disaster is "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources."[15] Disasters result from a combination of risk factors: the exposure of people and critical assets to single or multiple hazards, together with existing conditions of vulnerability, including insufficient capacity or measures to reduce or cope with potential negative consequences.

Disaster risk is normally expressed as the probability of an outcome (e.g., the loss of life, injury or destroyed or damaged capital stock) resulting from the occurrence of a damaging physical event during a given period of time. In this study, the disaster outcome in question is displacement. Disaster risk is considered to be a function of **hazard**, **exposure** and **vulnerability**.

The United Nations' *Guiding Principles on Internal Displacement* state that **displacement** may occur as a result of, or in order to avoid the effects of, disasters.[16] Displacement includes all forced movements regardless of length of time displaced, distance moved from place of origin and subsequent patterns of movement, including back to place of origin or re-settlement elsewhere. This definition also encompasses anticipatory evacuations.

Exposure refers to the location and number of people, critical infrastructure, homes and other assets in hazard-prone areas.

'Natural' hazards are events or conditions originating in the natural environment that may affect people and critical assets located in exposed areas. The nature of these hazards is often strongly influenced by human actions, including urban development, deforestation, dam-building, release of flood waters and high carbon emissions that contribute to long-term changes in the global climate. Thus, their causes are often less than 'natural'.

Vulnerability is the propensity or predisposition to be adversely affected by a hazard.[17]

BOX 2: HUMAN INFLUENCE ON 'NATURAL' HAZARDS

In the 1960s and 1970s, researchers made significant advances in the understanding of natural hazards. Although humans have studied earthquakes since antiquity, modern seismology did not take root until the 1960s when scientists accepted the theory of plate tectonics. The more research on hazards progressed, the more scientists understood how human activities shape them.

For example, when low-lying coastal and riverside settlements expand to accommodate population growth, people begin moving from historically safe areas into more hazard-prone ones. Settlements climb hillsides and extend onto flood plains or land reclaimed from the sea or wetlands. This expansion increases disaster risk in two ways: exposing more people to natural hazards and changing the character of the hazards themselves. Examples from South Asia include:

- In Dhaka, Bangladesh, entire neighbourhoods have been built upon on drained bodies of water or wetlands. The soil upon which these buildings stand is prone to liquefaction – it liquefies in the event of an earthquake – thereby magnifying the danger for those now living there.[18]
- Urban growth on forested hillsides also changes the character of hazards. The removal of trees during home construction destabilises hills and reduces the capacity of the ground to absorb water, increasing the likelihood of a rain-triggered landslide – and of a home being in its way. Deforestation has been found to have increased earthquake-triggered landslide risk in rural mountainous areas of India and Pakistan.[19]
- In Mumbai, some slums have been constructed on low-lying land dredged from the sea. People who had moved onto this land were displaced during floods in July 2005. Refuse and debris commonly clog many of Mumbai's storm drains which has been found to cause or worsen flooding even in slums located on higher ground.[20]

2.3 'NATURAL' DISASTERS?

The standard nomenclature for calculating disaster risk is as a combination of **hazard**, **exposure** and **vulnerability** (Figure 2.1).[21] Two of these three components are directly influenced by humans: how many people and assets exposed to hazards and how vulnerable they are. Climate change is expected to increase disaster risks by influencing the frequency and intensity of extreme weather. Climate change will also increase disaster risk by altering average temperature and precipitation patterns, adding to the number of non-extreme (or extensive) events, and through gradual processes such as sea-level rise, exacerbating coastal flooding.

Figure 2.1: Commonly used elements and equation for disaster risk. (The exact relationship is defined differently in varying models.)

RISK = HAZARD x EXPOSURE x VULNERABILITY

It is widely accepted that disaster risk is increasing due to the fact that more people and assets are **exposed** to hazards than in the past. For example, populations continue to grow in coastal areas, regardless of the fact that they are exposed to cyclones, coastal and riverine flooding, tsunamis and sea-level rise. The problem is not only that development has created economic incentives for people to settle in exposed areas but also that those that are living in these exposed areas often do so in a highly vulnerable fashion, using inadequate masonry techniques in earthquake-prone areas and settling unstable hillsides surrounding coastal cities with high precipitation levels. The latter can lead to landslides affecting extra-legal settlements and downstream flooding caused by development-driven reductions in permeable land upstream. Some of these practices can even change the nature of the hazard, further proof of humans' influence on disaster risk (see Box 2).

Vulnerability is the most difficult of the three components of disaster risk to measure. Vulnerability is a composite indicator that is influenced by several social, economic, political and other factors. In terms of modelling risk, the identifying and weighting of vulnerability indicators, such as gross domestic product (GDP) per capita or governance capacities, is based upon statistical regression analyses of historical events. At the global level, vulnerability is generally considered to be slowly declining, although not at a sufficient pace to offset increases in exposure. When looked at locally, vulnera-

[18] UNISDR. 2011. *2011 Global Assessment Report on Disaster Risk Reduction: Revealing risk, redefining development.* (http://goo.gl/ywjV6D) Geneva: UNISDR.

[19] Peduzzi, P. 2010. Landslides and vegetation cover in the 2005 North Pakistan earthquake: a GIS and statistical quantitative approach. (http://goo.gl/V1R0aU) *Natural Hazards and Earth Systems Sciences,* 10, pp.623-640.

[20] De Sherbinin, A., A. Schiller, and A. Pulsipher. 2007. The vulnerability of global cities to climate hazards. (http://goo.gl/WZbpsm) *Environment and Urbanization,* 19(1), pp.39-64.

[21] By 'combination' we mean that each variable in the equation in Figure 2 may be expressed by a function – rather than a constant value – due to the fact that they may change over time.

bility levels vary widely. Some communities are trapped by a self-reinforcing cycle of poverty and disaster risk: unable to resist frequently occurring hazards, they experience repeated disasters that wipe out development gains. Impacts of this character are increasingly being captured in national disaster loss databases.

2.4 THE DISPLACEMENT DIMENSION: MANIFESTATION OF EXTREME DISASTER RISK

A disaster has historically been quantified in terms of the direct loss of life and capital stock that is depleted with the occurrence of the given natural event. Recently there has been greater focus on the secondary effects of disasters, which comes closer towards capturing the important component of livelihoods in the disaster risk equation. However, even this newer focus has trouble capturing the plight of those most drastically affected by the consequences of these disasters: those that must leave their own communities and livelihoods in exchange for an otherwise intolerable level of uncertainty in an attempt to survive, and eventually to hopefully find a new home and livelihood until they can return (if that is possible).

Displacement itself is a driver of future disaster risks and it places people at a higher risk of impoverishment and human rights abuses while exacerbating any pre-existing vulnerability.[22] This is especially true where homes and livelihoods are destroyed and where displacement is recurrent or remains unresolved for prolonged periods. Forced from their homes or places of residence, people often face heightened or particular protection risks such as family separation and sexual and gender-based violence, particularly affecting women and children.[23]

People displaced by disasters are thus often among the most vulnerable populations. Their only coping mechanism is to leave home to seek a new life and/or to become dependent on assistance. Thus, those displaced by disasters are the proverbial 'canary in the coal mine' in terms of manifest levels of disaster risk: these are the people most impacted on an on-going basis by the effects of a disaster.

There is a growing acceptance of the need to see disasters as primarily social, not natural, phenomena. This implies that humans can act and take decisions to reduce the likelihood of a disaster occurring or, at the very least, to reduce their impacts and the levels of loss and damage associated with them. Displacement is seen as an extreme manifestation of disaster risk in which vulnerability levels and lack of resilience are so high that natural events (both extreme and non-extreme) compel people to leave their homes and livelihoods just to survive.

The magnitude of displacement is, of course, related to the magnitude and frequency of extreme as well as non-extreme natural events. However, the social variables are what allow the construction and configuration of risk in a form that leaves those most exposed and vulnerable with few tools with which to improve their resilience levels when faced with potentially damaging natural events.

Thus, the total number of people displaced by such events, both in relative and absolute terms, provides an important quantitative measure of their underlying vulnerability. The distance of the displacement, whether to another part of the same community or to a completely different country, is also an important gauge of the level of vulnerability and/or lack of resilience of affected communities.

2.5 RISK: SHIFTING THE FOCUS FROM THE PAST TO THE PRESENT AND FUTURE

This paper contributes to a large body of existing research that has reframed the way people and states have thought about disasters.[24] This has recognised that disasters are the result of both human and natural factors and that humans can act and take decisions to reduce the likelihood of a disaster occurring. Disasters are thus no longer being perceived as 'acts of God' but, instead, as something over which humans exert influence (Figure 2.2). For example, Diderot and Adam Smith each attributed at least some of the blame for the 1769–1770 Bengal famine, which killed an estimated ten million people, to the mismanagement of the crisis by the British colonial authorities.[26]

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22 UNISDR. 2013. Chair's Summary Fourth Session of the Global Platform for Disaster Risk Reduction Geneva, 21–23 May 2013. Geneva: UNISDR.

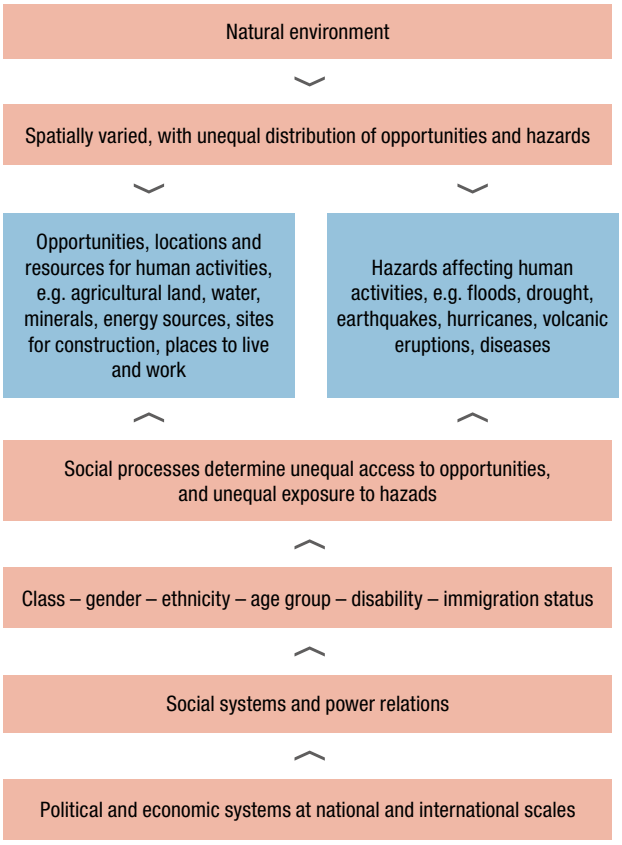
23 See the Guiding Principles on Internal Displacement, 1998 (http://www.idpguidingprinciples.org) and the *IASC Operational Guidelines on the protection of persons in situations of natural disasters,* 2011. (http://goo.gl/S4U1Ot) Also, Cernea's Impoverishment Risks and Reconstruction approach analyses forced resettlement resulting from large-scale development projects and outlines eight basic risks faced by displaced people, which are also common to disaster-induced displacement: landlessness; joblessness; homelessness; marginalisation; food insecurity; increased morbidity; loss of access to common property resources and social disarticulation. Cernea, M. 1999, "Why Economic Analysis is Essential to Re- settlement: A Sociologist's View", in Cernea, M. (ed.), *The Economics of Involuntary Resettlement: Questions and Challenges,* Washington, DC: The World Bank.

24 The history of this concept is summarised in Wisner et al. (2003), pp.10-11.

25 Hunter, W.W. 1868. *The Annals of rural Bengal.* Smith, Elder, and Co., p.34.

26 Muthu, S. 2009. *Enlightenment against Empire.* Princeton University Press.

Figure 2.2: Factors and relationships that influence disaster risk



Source: Wisner et al., 2003

The reconceptualisation of disasters signifies a shift from a retrospective (i.e., post-disaster) approach to an anticipatory way of thinking about and confronting disasters. It also extends to displacement and the way disaster responses influence future disaster risks (Figure 2.3). This conceptual development took hold in the international policy community by the 1990s, the UN's International Decade of Natural Disaster Reduction (IDNDR). The IDNDR was precursor to the UN International Strategy for Disaster Reduction (UNISDR) and the subsequent adoption of the *Hyogo Framework for Action* (HFA) by Member States in 2005. This aims by 2015 to achieve "the substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries."[27]

An important outcome of the HFA process is awareness that without the ability to measure it is not possible to know if disaster risk has been reduced. In order to measure and estimate future disaster and displacement risk, it is essential to have data about past events. These historic disaster figures represent 'realised risk' – they mark occasions in which hazards came into contact with exposed and vulnerable communities.

Measuring disaster risk (especially the risk of economic losses) is the core business of insurance and reinsurance companies. The HFA has made it a public responsibility, and one that includes measuring more than just economic losses. UNISDR has consolidated much information and research on disaster risks in its biennial *Global Assessment Reports* (GARs), making economic risk information more transparent and raising awareness of disaster mortality risk. We are augmenting this with a new methodology for enabling governments and others to more effectively assess, reduce and manage disaster displacement risk.

Disaster displacement risk has been a poorly understood and neglected issue, particularly in light of the fact that disaster-induced displacement has been increasing and is likely to continue to do so. As noted in IDMC's most recent editions of the *Global Estimates* and other global assessment of displacement risk, this trend is driven by the following factors:

- population growth and increased concentration of people and economic activities in hazard-prone areas such as coastlines and river deltas are increasing the number of number of people exposed to natural hazards
- improvements in life-saving early warning systems and evacuation planning means that more people are expected to survive disasters even as their homes are destroyed
- climate change may increase the frequency and/or severity of some hazards (hydro-meteorological hazards account for 83 per cent of all disaster-induced displacements observed during the last five years).[28]

As with mortality and economic loss risks, it is beyond the ability of any government to eliminate disaster risks entirely. Is it thus important to know which displacement risks can be reduced so that resources can be allocated in the most effective manner possible.

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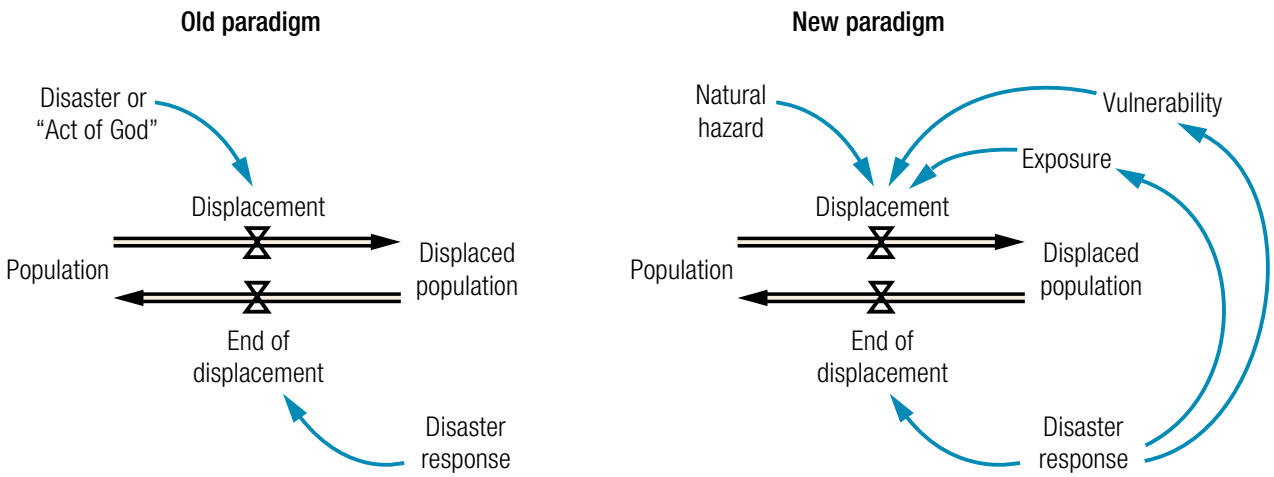
[27] United Nations Office of Disaster Risk Reduction (UNISDR), 2005. *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters.* (http://goo.gl/blropp) Geneva: UNISDR. The HFA was endorsed by UN General Assembly Resolution A/RES/60/195 following the 2005 World Disaster Reduction Conference and adopted by 168 countries.

[28] Internal Displacement Monitoring Centre (IDMC) and Norwegian Refugee Council, 2013. *Global Estimates 2012: People displaced by disasters.* (http://goo.gl/MQTydq) Geneva: IDMC; IDMC and Norwegian Refugee Council, 2014. *Global Estimates 2014: People displaced by disasters.* (http://goo.gl/mTWIzX) Geneva: IDMC.

Figure 2.3: Old and new ways of understanding disaster response in relation to disaster risk

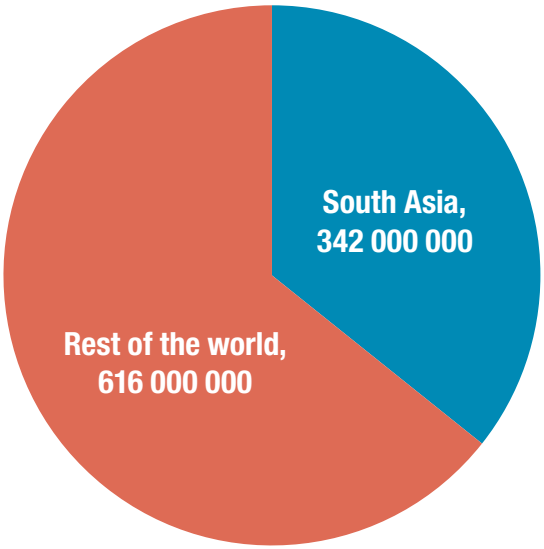


3. DISPLACEMENT RISK IN SOUTH ASIA

3.1 REGIONAL CONTEXT AND TRENDS

In the last six years, the eight countries in South Asia accounted for 36 per cent of the total number of people reported to have been displaced by disasters despite having only 23 per cent of the world's population (Figure 3.1). This reflects the fact that there are more vulnerable people exposed to hazards in this region than in Africa, the Americas, Europe and Oceania. Displacement risk in South Asia, as evidenced by the historical displacement figures, has not changed dramatically since the 1970s (Figure 3.2).

Figure 3.1: Displacement in South Asia compared to the rest of the world (1970 – 2011)



The lack of a clear trend in displacement risk is partly due to the fact that increases in exposure have been offset by reductions in vulnerability. Since 1980, the population of South Asia (a rough proxy for exposure) has increased by 77 per cent while human development scores (a proxy for reductions in vulnerability) have improved by an average of 62 per cent (Figure 3.3). These trends indicate that exposure is growing faster than in the rest of the world while vulnerability is also being reduced even more quickly compared to other countries.

South Asia's urban population is also growing more quickly than the rest of the world (Figure 3.4). The shift of South Asia's population toward urban centres has concentrated more people in hazard-prone areas. This has increased displacement risk linked to mega-events which displace more than three million people as shown in Figure 3.2. These events account for the overwhelming majority of disaster-induced displacement, though the number of small and medium-sized events have increased after 1992 – due to more comprehensive reporting of small disaster events.

Absolute displacement risk within the region is concentrated in Bangladesh, India and Pakistan which all rank among the eight most at-risk countries in the world. Sri Lanka is 13th.[29] When population size is accounted for, displacement risk is highest in Sri Lanka. This is due to a combination of large numbers of relatively vulnerable people who are also exposed to multiple hazards.

The risk of displacement is distributed unevenly within the region and is concentrated in Bangladesh, India and Pakistan (Figure 3.5). Each ranks among the eight most at-risk countries in the world, and Sri Lanka has the 13th highest level of risk.[30] The uneven distribution of absolute risk within the region is due to the large discrepancy in population size among the countries in the region: there are many more people in India, Pakistan and Bangladesh exposed to natural hazards than there are in Bhutan, the Maldives and Nepal.

[29] IDMC, 2015.

[30] IDMC, 2015.

Figure 3.2: South Asia historic modelled displacement 1970-2011 (no data for Maldives)

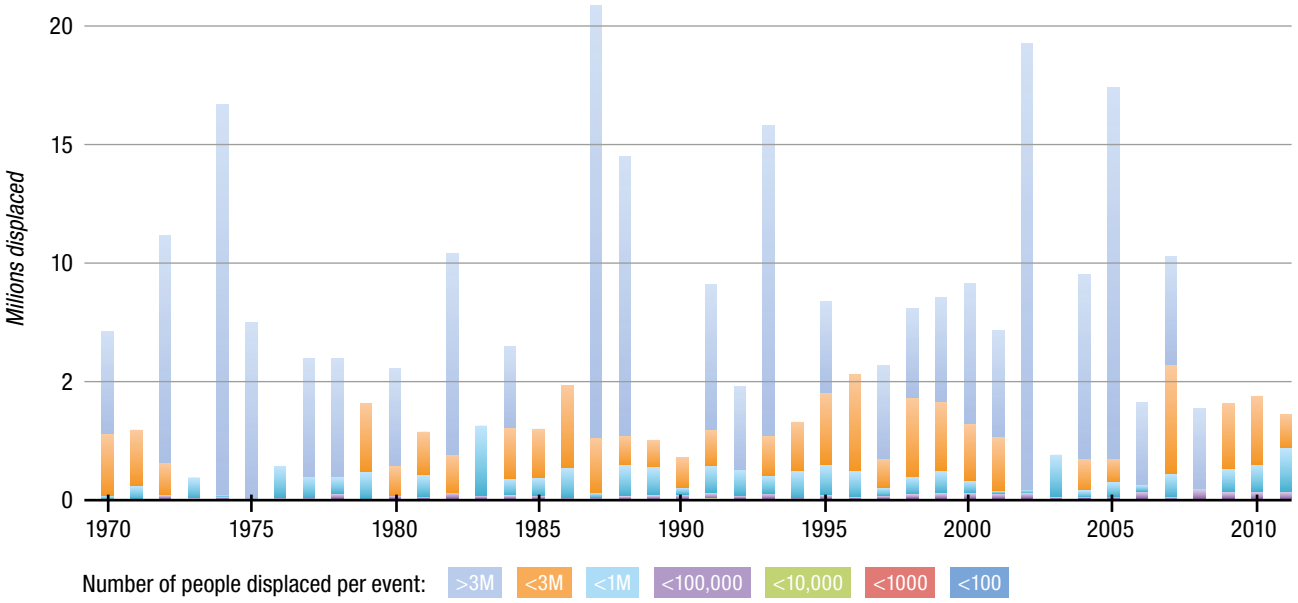
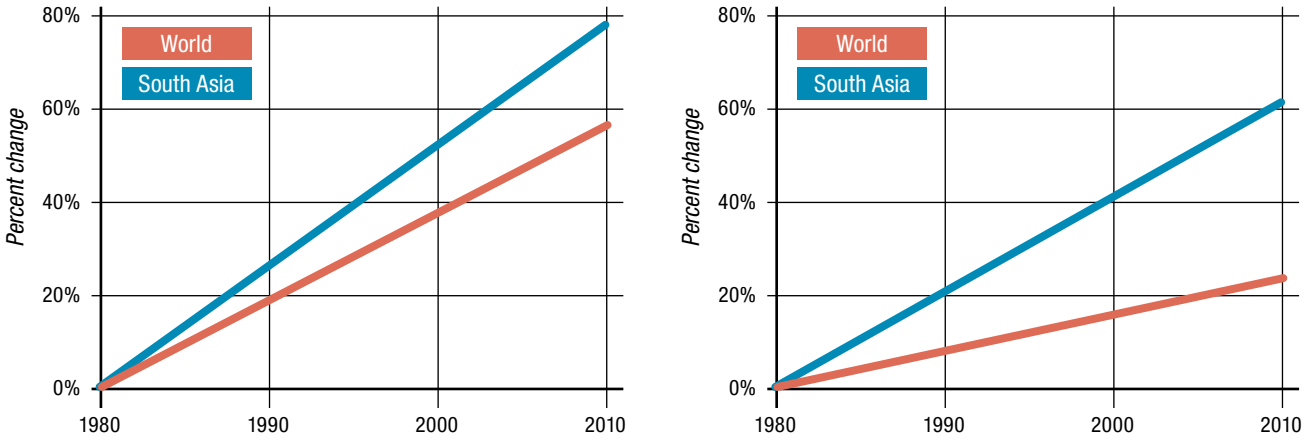
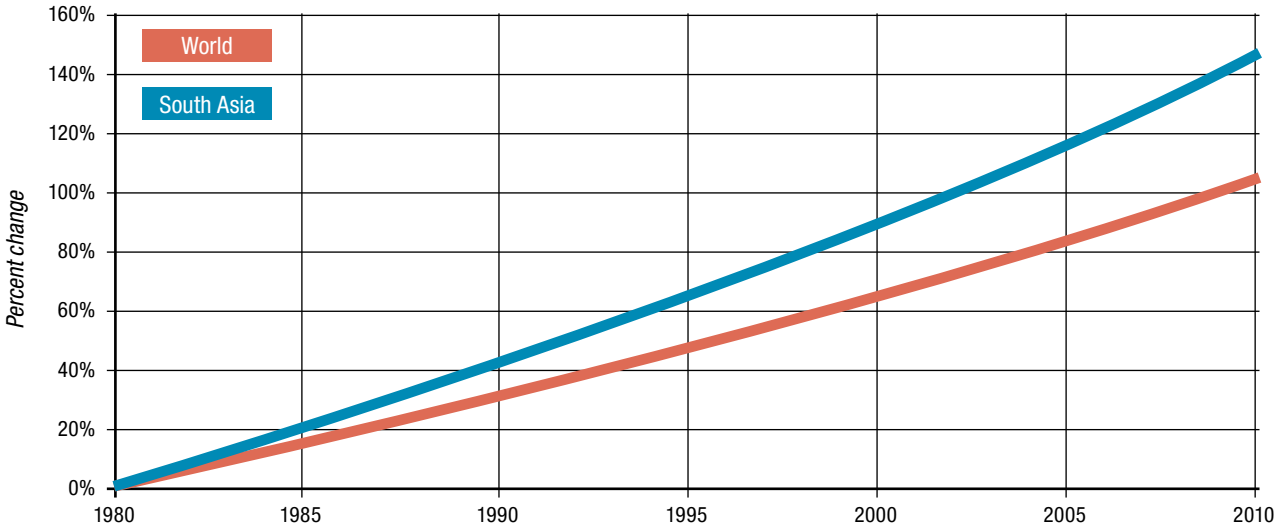


Figure 3.3: Exposure (left) and vulnerability (right) trends in South Asia since 1980



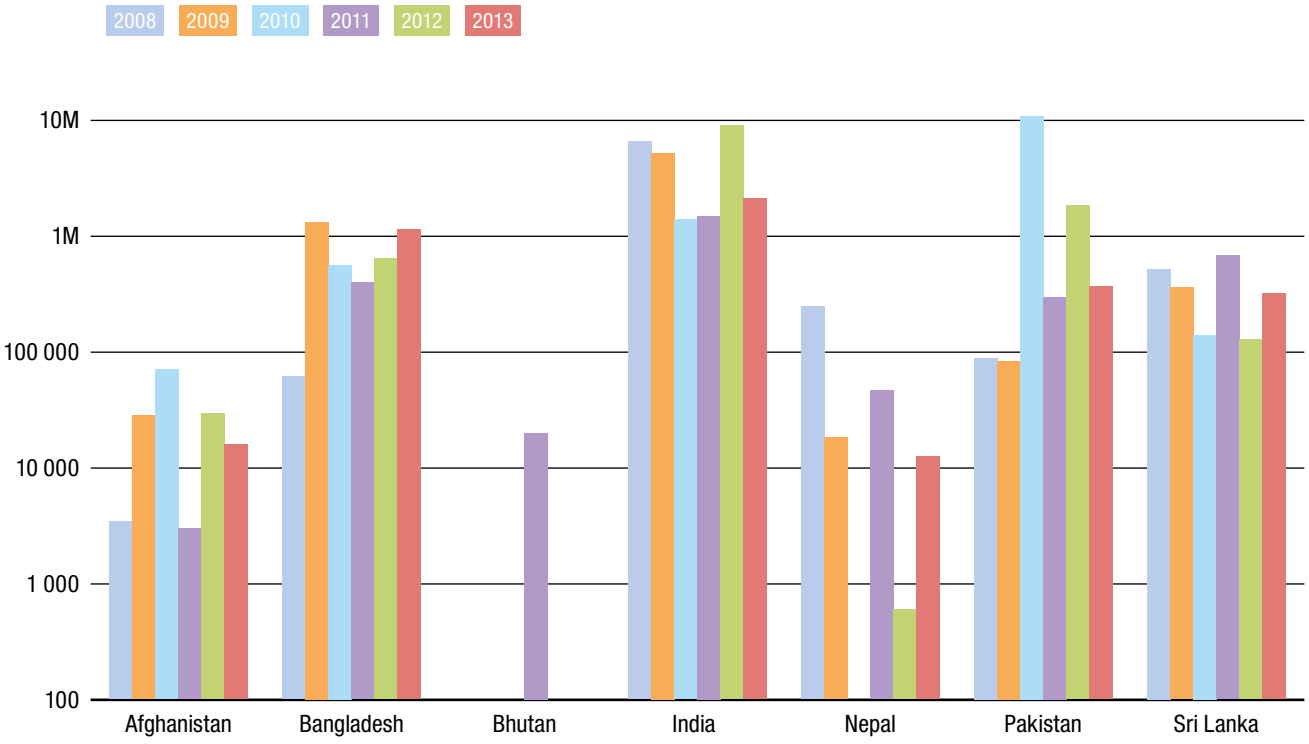
Sources: UN DESA, 2014, and UNDP, 2014

Figure 3.4: Change in size of urban population compared to 1980



Source: UN DESA, 2014

Figure 3.5: IDMC S. Asia DiDD displacement estimates 2008-2013 (log scale, no data for Maldives)



When population size is accounted for, Sri Lanka has the highest level of relative displacement risk (Figure 3.6), with Pakistan second due to the magnitude of displacement that occurred in 2010. The relative displacement risk estimates highlight the significance of variability from one year to the next. For example, when we correct for each country's population size, more people were displaced by disasters in Bhutan in one year, 2011, than were displaced in Afghanistan, Bangladesh, India and Nepal over the course of six years.

3.2 MEASURING DISPLACEMENT RISK

This paper estimates human displacement risk due to disasters. It expresses this risk using an index and by indicating the number of people expected to be displaced on average per year. These annual displacement estimates are depicted in both absolute and relative terms. 'Magnitude' is used to refer to the total number of people expected to be displaced by disasters. The absolute magnitude measure provides the estimated number of people displaced per country, while the relative measure provides the estimated number of people displaced per million inhabitants of each country. Rankings between the eight countries in terms of absolute and relative expected displacement are also provided. Colour-coded representations are used in which green corresponds to least modelled displacement risk and red the most (Table 3.1).

The displacement risk estimates were produced by using a combination of national-level disaster loss data from two of the principal loss databases combined with hazard, exposure, vulnerability and resilience proxies from several sources (Table 3.2).[31] These produce estimates of annual average displacement risk for each of the reviewed countries. For loss data, the Emergency Events Database (EM-DAT)[32] and national disaster loss databases were used, primarily for homeless/homes destroyed figures. Other disaster metrics, such as the number of people affected, were also used to estimate displacement risk because these entries were often more consistent than homeless data in both databases.

The displacement risk estimates described in this section are the result of the second prototype iteration of the model. All results should be considered purely as preliminary and very likely subject to change due to further refinements in our methodology. These factors must be kept in mind when considering the necessarily

[31] Physical exposure data which integrates hazard and exposure elements was used from UNEP's GRID PREVIEW model. Human vulnerability values from the same model were also used for each country. Resilience was measured using DARA's 2012 Index of Conditions and Capacities for Risk Reduction (IRR).

[32] EM-DAT: The OFDA/CRED International Disaster Database. (http://www.EM-DAT.be) Louvain, Belgium: Université catholique de Louvain.

Figure 3.6: IDMC DiDD South Asia relative displacement estimates 2008-2013 (per million inhabitants, no data for Maldives)

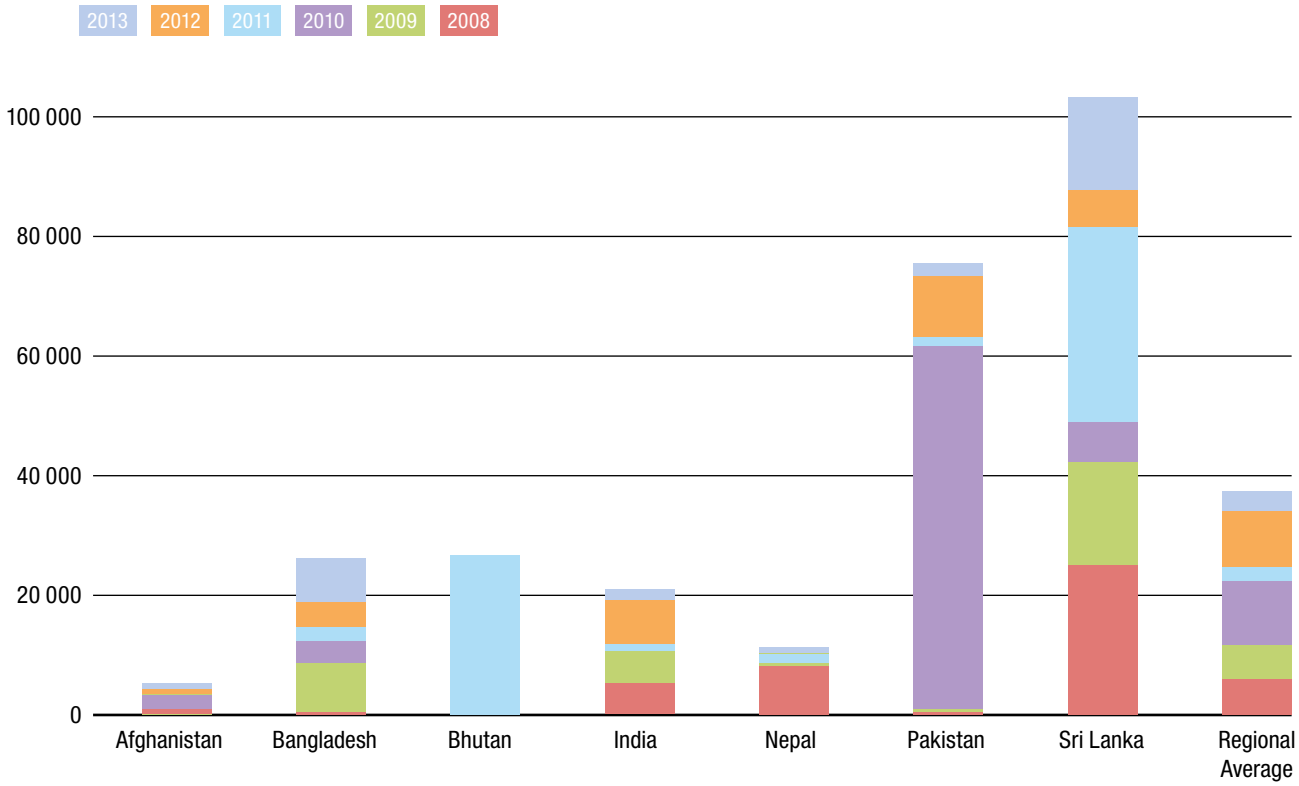


Table 3.1: Displacement risk estimates

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Afghanistan	35,516,224	137,000	5	3,900	7	2.4%
Bangladesh	156,536,136	1,486,500	3	9,500	4	4.8%
Bhutan	829,184	7,700	7	9,300	5	1.4%
India	1,292,502,640	5,314,400	1	4,100	6	4.2%
Maldives	311,724	3,700	8	11,900	2	3.3%
Nepal	32,054,000	124,100	6	3,900	7	3.1%
Pakistan	187,250,400	1,805,600	2	9,600	3	2.2%
Sri Lanka	21,529,024	325,800	4	15,100	1	2.4%

coarse nature of using an index to quantify something as complex as displacement risk. Displacement risk estimates are necessarily limited in their ability to capture the true complexity of risk scenarios that can lead to displacement. For this reason, the eight country profiles provide additional information with which to further assess displacement risk at national and sub-national levels.

Generally, modelled displacement patterns in the first prototype model were found to be line with expected results on two fronts. The risk displacement estimates were generated without knowledge of the methodology used by IDMC's Disaster-induced Displacement Database (DiDD), yet the modelled estimates generally match the reported historic figures from the DiDD. Successive prototypes of modelled historic displacement were calibrated using IDMC's DiDD dataset on a hazard-by-hazard basis.

Countries with higher Human Development Indexes and governance indicators also had better (that is, lower) relative displacement estimates. Countries with higher intrinsic hazard, exposure and vulnerability levels generally saw these factors reflected in higher estimated displacement. These results are compatible with findings from other disaster risk studies focusing on vulnerability, exposure and resilience indicators.

Table 3.2: Components of disaster-induced displacement risk

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Configu-ration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Afghanistan	143,116	14.0	1.9	1.03	117,000	3,300
Bangladesh	186,957	18.0	3.5	0.98	1,110,000	7,100
Bhutan	94,949	21.0	5.1	0.39	7,000	8,400
India	73,482	26.0	4.7	0.41	4,101,000	3,200
Maldives	115,155	21.4	5.7	0.43	3,000	9,600
Nepal	68,135	20.0	3.6	0.38	102,000	3,200
Pakistan	95,112	22.0	3.6	0.58	1,566,000	8,400
Sri Lanka	144,336	19.0	5.0	0.55	279,000	13,000

3.3 ANNUAL DISPLACEMENT RISK ESTIMATES

Modelled displacement estimates for the ten-year period between 2015 and 2024 rely on several components. Historic displacement trends have been modified to take into account exposure, vulnerability and resilience components based on several indicators from the Index of Conditions and Capacities for Risk Reduction (IRR) developed by Development Assistance Research Associates (DARA) and physical exposure and vulnerability data for countries in South Asia developed by the UN Environment Programme (UNEP).

Figure 3.7 shows the average annual modelled displacement for each of the countries in the region expected over the next ten years.[33] It is our estimate of how many people will be displaced on average per year during the coming decade. Figure 3.8 presents this same data adjusted for population size, and expresses displacement risk in terms of relative figures, that is how many people are expected to be displaced annual per million inhabitants of each country. Figure 3.7 indicates that India is expected to experience the most displacement, a consequence of it having the largest population exposed to natural hazards. Once population size is accounted for, Sri Lanka has the highest risk. In fact, our analysis of relative risk indicates that the likelihood of becoming displaced is higher for people in most of the countries in the region than it is for people in India.

3.4 ADDITIONAL FUTURE DISPLACEMENT RISK ESTIMATES

For detailed displacement risk information, as well as loss and risk figures per hazard type, refer to the national reports. Future methodological improvements, should data permit, include the disaggregation of displacement risk per hazard type. The preliminary disaster displacement numbers in Figure 3.4 list the number of people on average expected to be displaced per year. It is similar to the average annual loss (AAL) calculation commonly used in the insurance industry.

3.4.1 Loss exceedance

We are in the process of adapting ERN's Hybrid Loss Curves methodology to complement average annual displacement risk figures. Average annual displacement risk is calculated in a manner similar to insurance calculations for AAL. A key metric in measuring risk, it provides the most intuitive understanding of the risk of loss, often setting the baseline from which discussion of other calculations may ensue.

Another important component to measuring risk relates to how the year-to-year variance in the magnitude of losses affects AAL. Loss exceedance, also known as 'probable maximum loss' (PML), is used to assess the likelihood that losses may be greater or less than the AAL. PML is generally expressed as a curve with the magnitude of loss on one axis and return period (e.g., a one to 500-year range) for that given size of losses on the other axis (Figure 3.9).

[33] Due the large variance between countries, owing to differences in population size, absolute displacement risk is plotted on a logarithmic scale.

Figure 3.7: Projected annual displacement risk by country (next 10 years)

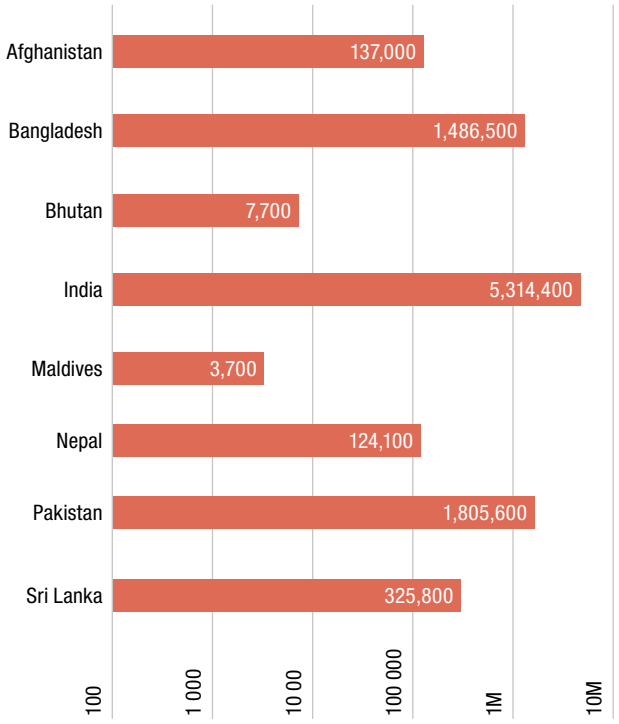


Figure 3.8: Projected annual displacement risk by country (per million habitants, next 10 years)

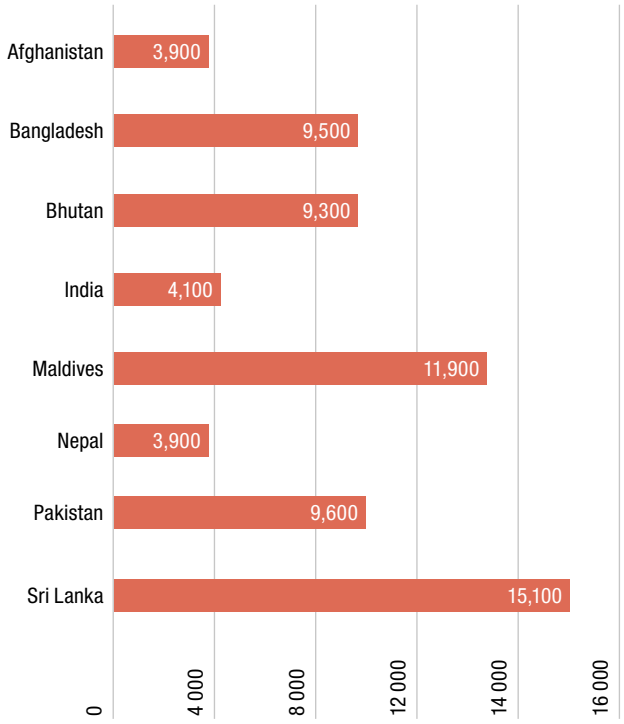
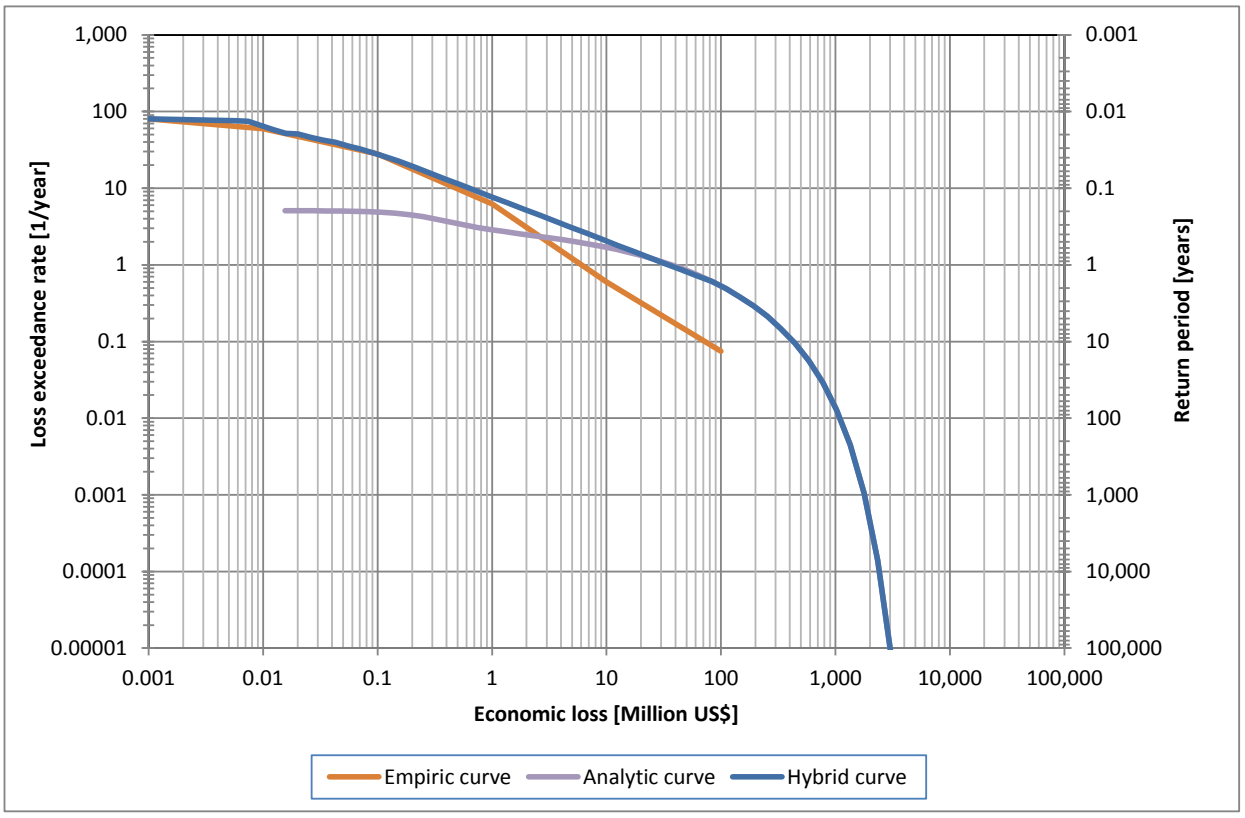


Figure 3.9: Hybrid Loss Curve of economic loss risk in Nepal



Source: ERN, 2011

Disaster displacement estimation and risk research is highly hampered by the lack of sufficient quantity or quality of data on historic displacement. This is a problem that is shared by the international disaster risk community. ERN's Hybrid Loss Curves methodology is a recent approach at working around these data limitations. To generate a PML curve, they use a convolution of several functions: a model that relies on empirical data (i.e., disaster loss figures) for frequently recurring events (e.g., one- to 50-year return periods) and a model that relies on extrapolations and other modelled approaches to determine what specific low-frequency return period events would look like in terms of losses (e.g., 50- to 500-year return periods) since these calculations would otherwise require 500+ years of empirical data. These two curves are then merged into a single curve using convolution, with the high-frequency end of the curve relying on empirical data, and the low frequency end of the curve relying on a synthetic, modelled approach due to the lack of time-series data spanning such long return period events.

3.4.2 Uncertainty

Within any risk model that utilises loss data of the nature that is available in disaster risk studies there is always a difficulty with reducing uncertainty to acceptable levels. Simply adding more datasets to an analysis where each dataset brings its own difficulties often compounds sources of error. An option is to utilise the additional data sources to create a separate model that either helps validate the first or else provides a complementary perspective. This is thus similar to the concept behind ERN's Hybrid Loss Curves which attempt to reduce uncertainty by finding relationships with proxies that can help fill data gaps. On a rudimentary level, the level of convergence between results can serve as a rough indicator of the levels of uncertainty intrinsic to each model.

The end goal of this project is to also apply a probabilistic framework of specific types of natural event magnitudes and durations at specific locations (by using hazard, exposure and vulnerability proxies) with an index constructed from available development and extensive/intensive risk indicators. This will allow the calibration of the resulting curve using historic displacement data to establish 'tipping points' at which displacement would be expected to occur if different types, frequencies and magnitudes of events were to occur.

3.5 RISK DRIVERS IN SOUTH ASIA

The factors that influence changes in hazard, exposure and vulnerability are responsible for displacement risk trends. Over the last several decades, it is assumed that hazard levels have changed gradually when compared to changes in exposure and vulnerability. This may change in the future due to the effects of climate change. Within South Asia, exposure has been increasing and vulnerability has been decreasing, roughly at the same rate. That does not, however, mean that displacement risk is unchanged. To the contrary, urbanisation and economic development patterns have radically altered the way disaster risk is configured within countries, concentrating it in urban areas where growing numbers of vulnerable people live. As explained above, this has resulted in more frequent mega-events during the occasions when hazards affect these densely populated areas. In this section we will examine in greater detail the factors that have the most influence on exposure and vulnerability in South Asia.

3.5.1 Population growth in hazard-prone areas linked to rapid, unplanned urbanisation

For the countries included in this study, the population has nearly tripled since 1950, growing by more than 20 per cent per decade until the 1990s.[34] The increase in population means that there are many more people and homes exposed to hazards than before, leading to an increase in the number of people affected and displaced by disasters.

Just as important as population growth is the location of homes and settlements. Between 1950 and 2010, South Asia's urban population grew from 16 per cent of the total population to 35 per cent.[35] Since 2000, the rate of urban growth has been particularly rapid in Afghanistan, Bhutan and the Maldives, whose urban populations have roughly doubled in the last 15 years (Table 3.3).

This rapid urbanisation has concentrated large numbers of people in hazard-prone areas. For example, flooding in Dhaka in 1998 damaged 30 per cent of the city's housing units, more than two-thirds of which were owned by lower-middle class and poor households.[36] Looking to the future, Mumbai and Khulna, Bangladesh's third largest city, have been ranked among the cities most vulnerable to future flooding due to climate change.[37]

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[34] Based on IDMC analysis of: United Nations Department of Economic and Social Affairs (UN DESA), Population Division, 2014. *World Urbanization Prospects, the 2014 revision.* (http://esa.un.org/unpd/wup/) New York: United Nations.

[35] *Ibid.*

[36] Alam, M. and Rabbani. M.D.G. 2007. Vulnerabilities and responses to climate change for Dhaka. (http://goo.gl/pLfyQY) *Environment and Urbanization,* 19(1), pp.81-97.

[37] Hallegatte, S. Green, C., Nicholls, R. J., and Corfee-Morlot, J. 2013. Future flood losses in major coastal cities. (http://goo.gl/v04DQz) *Nature Climate Change,* 3(9), pp.802-806.

Table 3.3: Signs of rapid urbanisation in South Asian countries (Source: UN DESA, 2014)

Country	Per cent growth of urban population (2000 – 2015)
Afghanistan	95
Bangladesh	76
Bhutan	110
India	46
Maldives	114
Nepal	70
Pakistan	53
Sri Lanka	14

It is not just the size and location of urban centres that accounts for present and future risk. It is also the vulnerability of the people living in, and moving to, them. The UN estimates that there are 571 million slum dwellers in the Asia-Pacific region, around 33 per cent of the region's urban dwellers and half of the world's entire population of slum dwellers.[38] In some countries the population of slum dwellers is even higher. In Bangladesh, it is estimated that 62 per cent of urban residents live in slums, followed by Nepal (58 per cent), Pakistan (47 per cent) and India (29 per cent).[39] Slums also increase disaster risks because they develop on marginal or wasteland locations that are unsuited for habitation and often dangerous. Their lack of infrastructure – drainage systems in particular – often magnifies existing flood risks.

3.5.2 Economic growth

Economic growth can either increase or decrease disaster risk. It reduces vulnerability to hazards but increases the number of people and assets exposed to hazards and changes where they are situated. Economic productivity attracts population growth, through migration and urbanisation. While concentrating businesses, knowledge and technology, and an educated labor force in urban areas can drive development, the trade-off is that these cities are often located in hazard-prone areas, in floodplains, along coastlines and rivers.[40]

This phenomenon can result from even rational decision-making – and becomes even more pronounced when one takes account of the fact that policy decisions are seldom taken on the basis of reducing disaster risk:

> *With perfect information, the population is more protected when it gets richer, the disaster probability decreases over time. But disasters become larger and larger when they occur. With myopic behavior, the interval between two disasters rapidly becomes larger than the memory of the probability estimation process, and there is over-investment in at-risk areas, making disasters more catastrophic.*[41]

In South Asia, economic growth has created greater conditions of exposure more quickly than it reduced vulnerability, thereby increasing risk and concentrating it in urban centres.

3.5.3 Unequal distribution of wealth between and within countries

Displacement risk is unevenly distributed among and within the countries of South Asia. The Maldives is the only country in the World Bank's 'upper-middle' income group, whereas Afghanistan, Bangladesh and Nepal are all ranked as 'low' (Table 3.4). A country's level of income is one of many factors one can use to assess its vulnerability, reflected in the fact that the Maldives is considered the least vulnerable country in the region (Figure 3.10).

Investments in disaster risk management reflect – and exacerbate – these differences. Wealthier countries invest more in prevention and risk reduction than poorer countries, particularly in land-use planning and the provision of safe land for low-income households (Figure 3.11). These investment patterns translate into uneven development patterns and large populations of urban poor living in unsafe areas where they lack many basic services and are exposed to hazards.

Within countries, displacement risk is concentrated in poor communities, especially among the region's large urban population living in informal settlements which, as noted above, are often located in dangerous locations such as unstable hillsides, floodplains, riverbanks and on land reclaimed from the sea.

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38 ESCAP and UNISDR, 2012.

39 UN-HABITAT. 2013. *Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements 2013.* (http://goo.gl/IohjS7) Nairobi: UN-HABITAT.

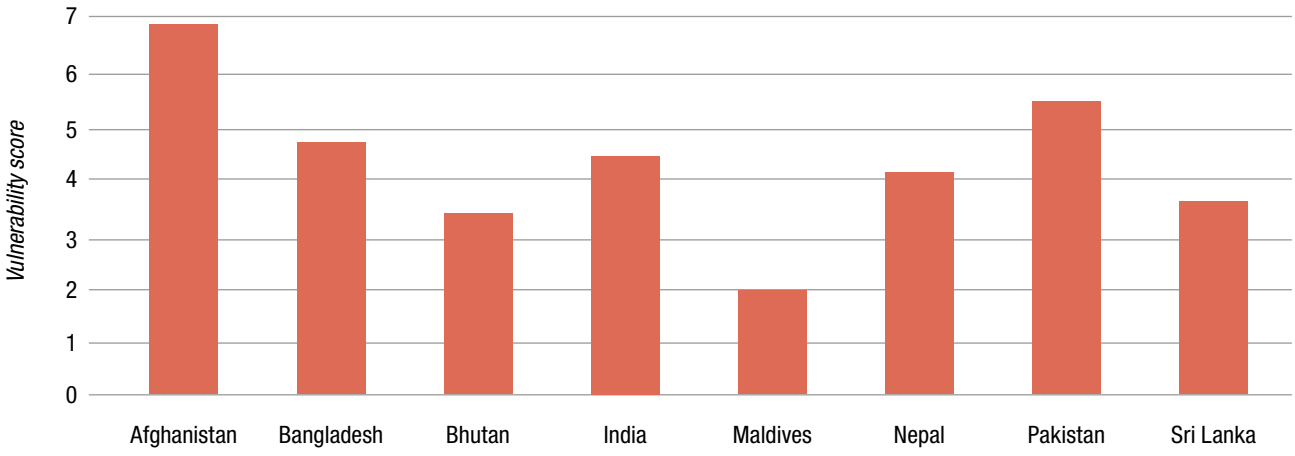
40 Jha and Stanton-Geddes, 2013.

41 Hallegatte, S. 2010. How Economic Growth and Rational Decisions Can Make Disaster Losses Grow Faster Than Wealth. *Policy Research Working Paper 5617.* Washington, DC: The World Bank.

Table 3.4: South Asian countries grouped by World Bank income category

High income	Upper-middle income	Lower income	Low income
n/a	Maldives	Bhutan	Afghanistan
		India	Bangladesh
		Pakistan	Nepal
		Sri Lanka	

Figure 3.10: Vulnerability in South Asian countries (0 = Lowest; 10 = Highest)



Source: InfoRM, 2014

3.5.4 High spending in disaster response but relatively little on DRR

Disaster spending in South Asia varies between countries and in terms of what countries prioritise. Pakistan has high displacement risk but it spends among the least on DRR (Figure 3.12). Over the past 20 years, Pakistan has received more than $5.9 billion – 5.5 per cent of all disaster-related funding worldwide.[42] Only $161.5 million of this has been spent on DRR compared to $3.3 billion on disaster response and $2.5 billion on reconstruction and rehabilitation (Figure 3.13).

Nepal spends less than $2 per person on DRR but has increased its share of pre-disaster spending since the late 1990s to the point where it is nearly what the country spends on disaster response, reconstruction and recovery (Figure 3.14). Following deadly cyclones in 1970 and 1991, Bangladesh has made enormous progress in decreasing cyclone-related mortality risk by implementing an effective early warning system, through life-saving evacuations and the construction of approximately 2,000 cyclone shelters. These efforts have increased the number of people who have survived by fleeing or having been evacuated from their homes and places of residence. Many evacuees have been unable to return to their homes for years due to unsafe conditions or the loss of land, livestock and livelihoods.[43] Similarly, the Indian government's evacuation of approximately one million people prior to Phailin's making landfall in October 2013 is another example in which life-saving measures have increased the number of people who survived and were displaced as a result of the storm.

3.5.5 Conflict exacerbating high levels of vulnerability

Conflict and generalised violence have displaced millions in South Asia in the last few years. Although comprehensive data is hard to come by, IDMC's most recently published figures estimate that approximate 2.9 million people are internally displaced (Figure 3.15) and an additional 2.2 million refugees and people living 'in refugee-like situations.'[44] The experience of being displaced has been shown to increase peoples' vulnerability and the failure of certain authorities to acknowledge this displacement only compounds the problem.[45] In India,

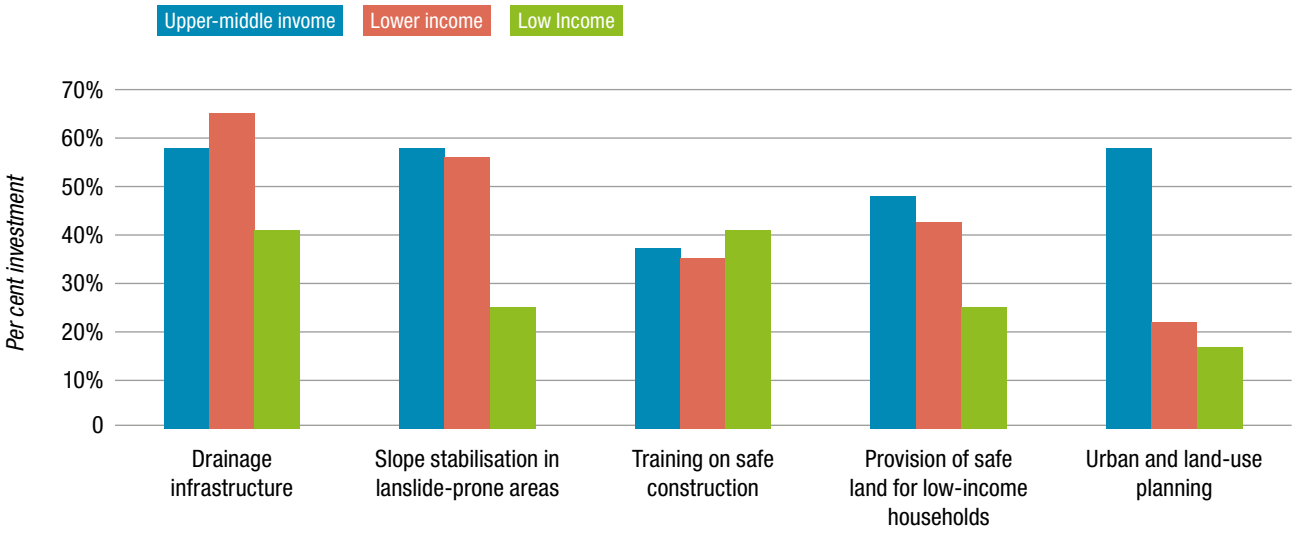
[42] Kellett, J. and Caravani, A. 2013. *Financing Disaster Risk Reduction: A 20-year story of international aid.* (http://goo.gl/RyjUK7) Washington, DC, and London: Global Facility for Disaster Reduction and Recovery and the Overseas Development Institute.

[43] IRIN. 2009. *Bangladesh: Two years after Cyclone Sidr, survivors still seeking shelter.* (http://goo.gl/m1p3lb) IRIN 20 November 2009.

[44] UNHCR. 2014. *UNHCR Mid-Year Trends 2014.* (http://www.unhcr.org/statistics/mid2014stats.zip) Geneva: UNHCR.

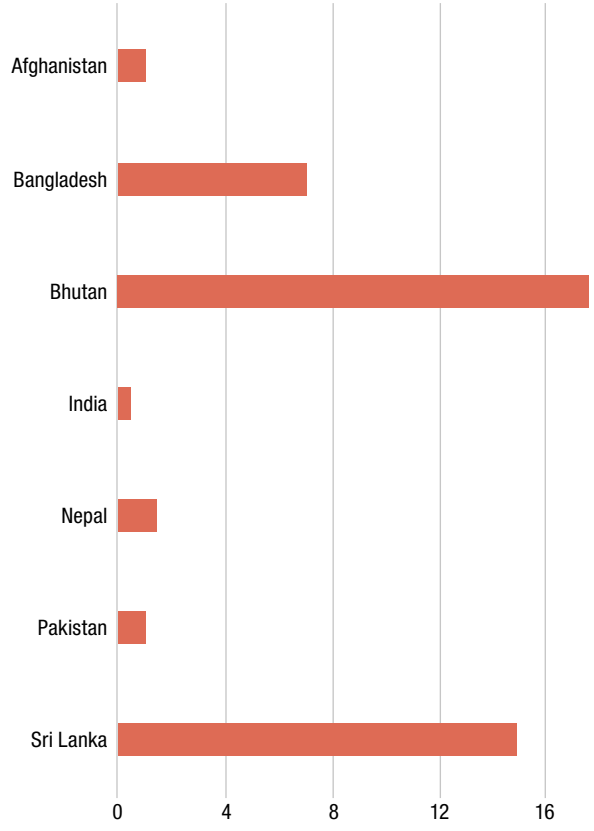
[45] IDMC. 2014. *Global Overview 2014: People internally displaced by conflict and violence.* (http://goo.gl/s2iKXg) Geneva: IDMC.

Figure 3.11: Investments in disaster risk reduction across World Bank income groups in Asia



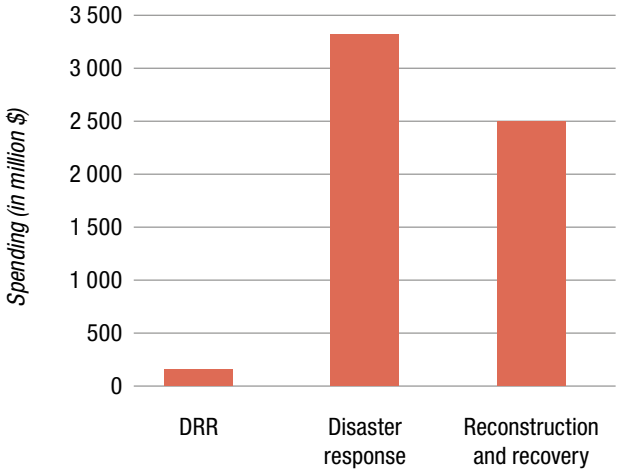
Source: Jha and Stanton-Geddes, 2013

Figure 3.12: DRR spending per capita in constant $ (1990 – 2010) (No data available for the Maldives)



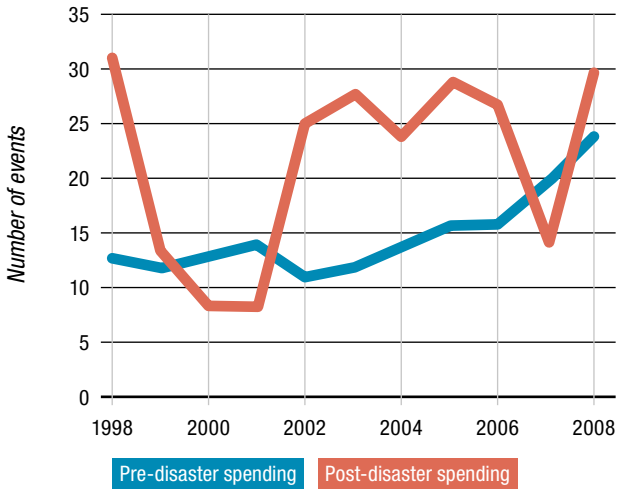
Source: Kellett and Caravani, 2013

Figure 3.13: Disaster spending in Pakistan



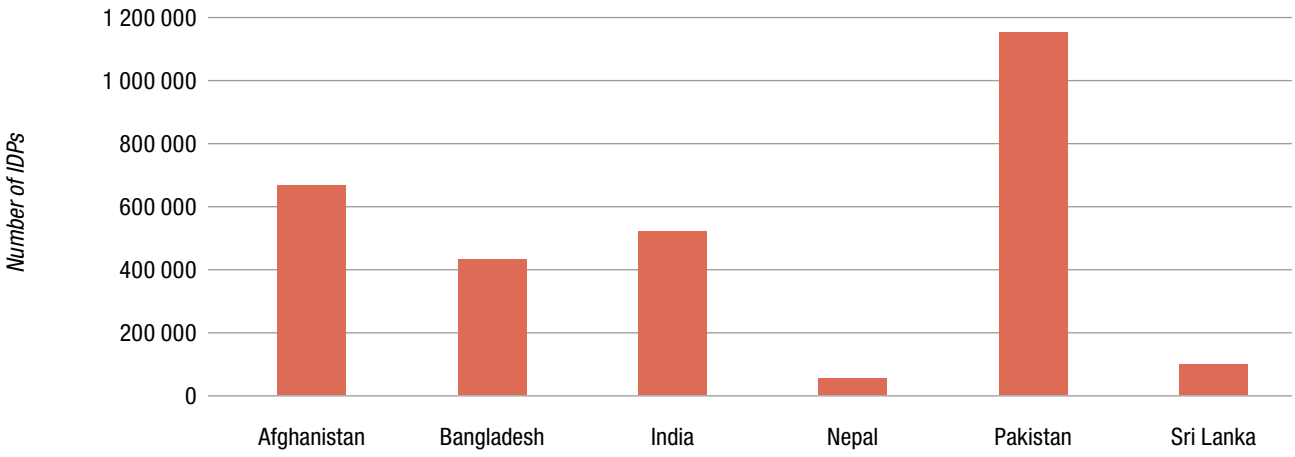
Source: Kellett and Caravani, 2013

Figure 3.14: Pre- and post-disaster spending in Nepal



Source: Jha and Stanton-Geddes, 2012

Figure 3.15: Conflict-related internal displacement in South Asia



Source: IDMC, February 2015

for example, the state government in Uttar Pradesh said that only 2,600 of the 51,000 people who fled inter-communal violence in September 2013 were still displaced at the end of the year. Local NGOs, however, put the figure ten times higher, with most IDPs living in informal settlements after their eviction from camps.[46]

In most countries the majority of IDPs live outside official IDP camps and instead prefer to stay with friends and family or in rented accommodation or informal shelters. Some have moved to urban areas, where they have better access to services and job opportunities. IDPs outside camps often have similar needs to those in them, but tend to receive far less assistance, threatening their long-term recovery. For example, a 2013 assessment of Pakistani IDPs living outside camps in Khyber Pakhtunkhwa province revealed that more than half have had to borrow money or buy essential items on credit, pushing their households further into debt.[47]

[46] *Ibid.*

[47] *Ibid.*

4. ANNEX: COUNTRY PROFILES

4.1 AFGHANISTAN

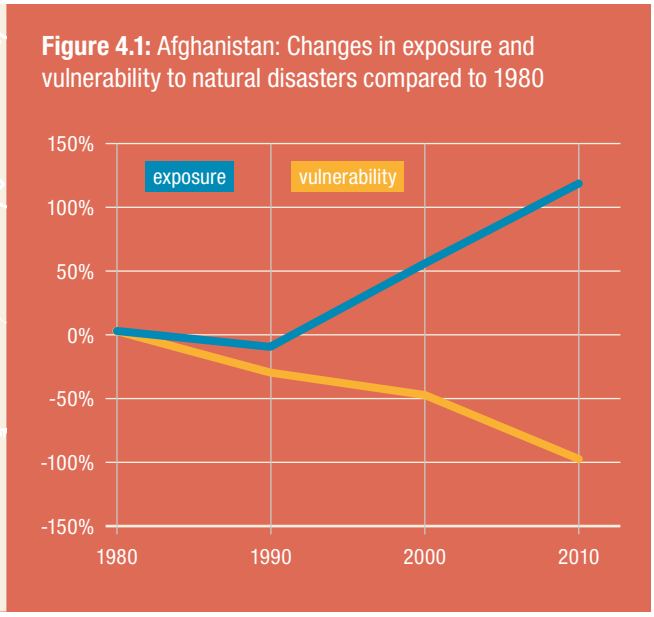


Figure 4.1: Afghanistan: Changes in exposure and vulnerability to natural disasters compared to 1980

4.1.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Afghanistan	35,516,224	137,000	5	3,900	7	2.40%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Con-figuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Afghanistan	143,116	14	1.9	1.03	117,000	3,300

4.1.2 Displacement risk configuration

Landlocked Afghanistan has a land area of approximately 652,000 square kilometres, borders Iran, Turkmenistan, Uzbekistan, Tajikistan, China and Pakistan and has a population of approximately 32 million people.[48] In 2014, Afghanistan ranked 169th in Human Development Index of the UN Development Programme.[49]

For five decades Afghans have experienced conflict and insecurity, with some 805,000 people currently internally displaced[50] and at least 2.5 million living as refugees, primarily in Iran and Pakistan.[51] The government in the capital, Kabul, has incomplete control over the country's territory, as a result of the conflict with the Taliban and other insurgents, generalised violence, mountainous topography, harsh climate and poor transport infrastructure.

Exposure to hazards

Afghanistan's topography is dominated by mountain ranges that occupy all but the north-central and southwestern regions of the country, which are plains and desert. Nearly half the country is at or above 2,000 meters in elevation, and the highest peaks in the northeastern Hindu Kush are more than 7,000 metres above sea level.[52]

Afghans are exposed to several hazards, most notably earthquakes, droughts and floods as well as landslides, avalanches and extreme heat and cold. Earthquakes are frequent in northern parts of the country and often trigger large landslides. Flooding and mudslides are also common, particularly during spring when snow starts melting, and extreme winter conditions and avalanches are also a recurrent feature in the mountainous areas of Afghanistan that make up approximately 63 per cent of the country.[53]

Vulnerability to hazards

Afghanistan's high levels of poverty and illiteracy, lack of income-generating opportunities, chronic health problems and poor infrastructure have resulted in high vulnerability among those living in areas exposed to these hazards.[54] Afghanistan's environment and natural resources have been severely degraded in the last 20 years. Vast areas of forest in various parts of the country have been destroyed by overgrazing and deforestation, which has had an adverse effect on flood protection, watershed management and stability of soils and hillsides.[55]

In February 1998, a 6.1 magnitude earthquake in the northeast of Afghanistan displaced at least 24,300 people.[56] In May of that same year, another earthquake occurred in the same area, displacing at least 45,000 people.[57] In both cases, civil conflict complicated the response.[58] Poor infrastructure has also impeded responses to disaster-related displacement. For example, in 2003, avalanches in Sheva (Badakshan) damaged and destroyed settlements, but due to the region's inaccessibility timely assistance was not provided. When mudslides occurred in Bamiyan, heavy equipment could not reach the site and communication and logistics also could not be established due to lack of infrastructure.[59]

More recently, in 2009, flooding, flood-triggered landslides and avalanches in Takhar, Sar-i-Pul, Baghlan and Badakhshan provinces left at least 800 families (approximately 5,920 people) displaced for months.[60] In 2010, military personnel rescued some 2,000 Afghans from flooding in Nangahar and Kunar.[61] And in 2011, 3,000 Afghans were displaced by floods related to snow melt.[62] In June 2012, approximately 500 families (3,700 people) were displaced by flooding linked to melting snow in the Hindu Kush and by heavy rains.[63]

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48 UN DESA, 2014.

49 UNDP, 2014.

50 UNHCR. 2014. UNHCR Monthly IDP update, 31 December 2014, p.1. (http://goo.gl/UFgQV3) Geneva: UNHCR.

51 EU Humanitarian Aid and Civil Protection department (ECHO). 2014. Afghanistan fact sheet, August 2014, p.1. (http://goo.gl/9h92bH) Brussels: ECHO.

52 Afghanistan Disaster Knowledge Network. 2009. Afghanistan Country Page. (http://goo.gl/ngam2k)

53 Afghanistan Disaster Knowledge Network. 2009. Afghanistan – Hazard Profile. (http://goo.gl/NR0DES)

54 Ramsey, A. 2010. *Afghanistan: Disaster Management and Emergency Preparedness.* (http://goo.gl/xAvVcG) Norfolk: Civil-Military Fusion Centre.

55 Afghanistan Disaster Knowledge Network. 2009. *Afghanistan Disaster Profile.* (http://goo.gl/xzAsQ4)

56 UN OCHA. 1998. *Afghanistan - Earthquake OCHA Situation Report No. 7.* (http://goo.gl/Zxgbc3)

57 Funnell, D. and Parish, R. 2005. *Mountain Environments and Communities.* Routledge. p.131

58 *Ibid.*

59 Afghanistan Disaster Knowledge Network. 2009. *Afghanistan – Hazard Profile.* (http://goo.gl/NR0DES)

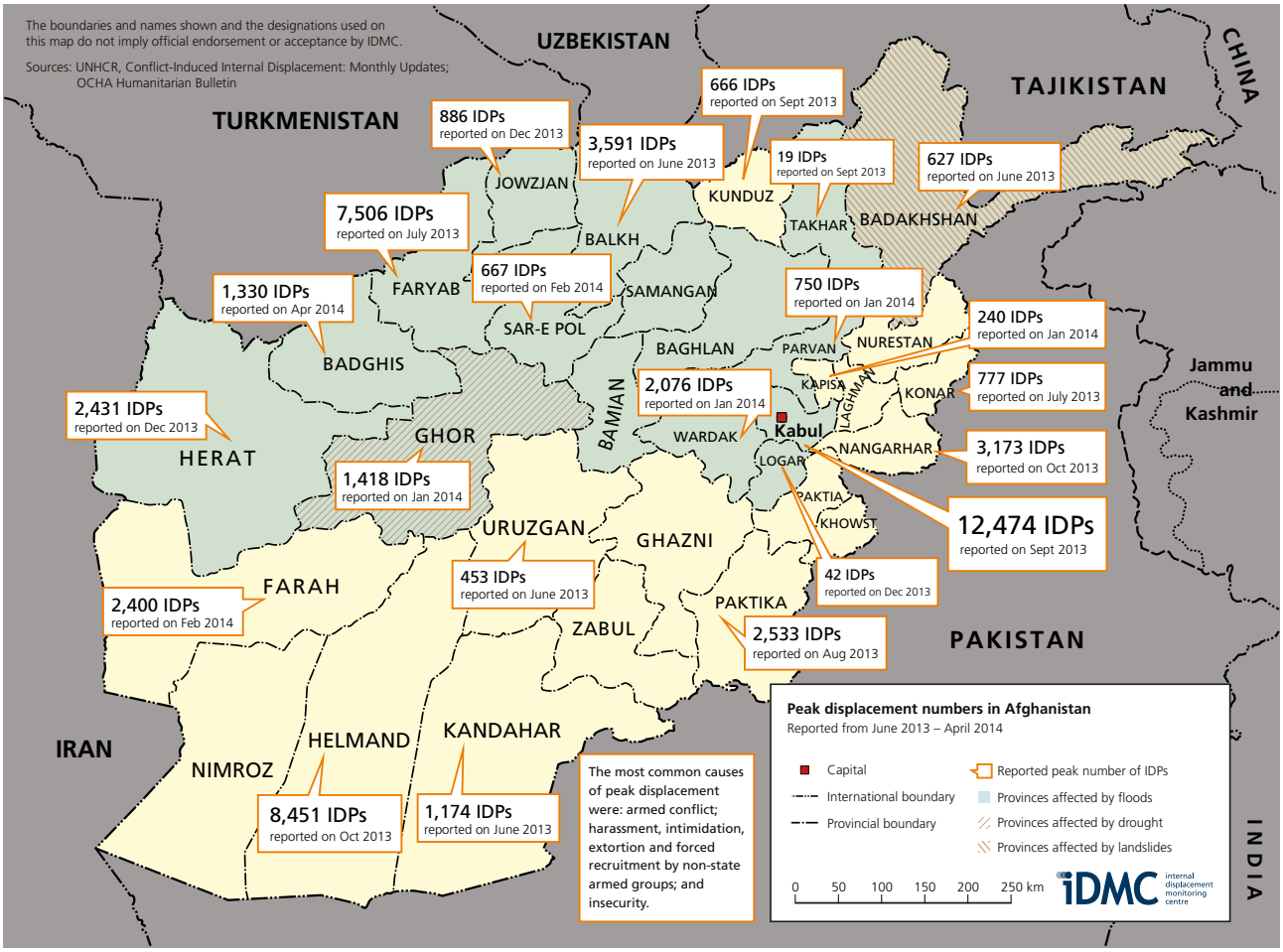
60 IRIN. 2009. *Afghanistan – Flood-affected families need shelter before winter.* (http://goo.gl/53mi8A) IRIN, 1 July 2009.

61 Reuters. 2010. "Dozens Killed and Stranded by Afghanistan Floods." (http://goo.gl/ociwrI) Reuters, 31 July 2010.

62 IDMC. 2012. *Global Estimates 2011: People displaced by natural hazard-induced disasters.* (http://goo.gl/j5brIQ) Geneva: IDMC.

63 UN OCHA. 2012. *Humanitarian Bulletin – Afghanistan.* (http://goo.gl/RWRchG) Kabul: UN OCHA-Afghanistan.

Figure 4.2: Conflict related internal displacement in Afghanistan



Source: IDMC

Afghanistan experienced significant droughts in 2006, 2008 and 2011 which affected 3.9 million people.[64] IDMC has not yet developed a drought-related displacement model so it is not known how many people were displaced by these disasters.

Afghanistan has enacted a Law on disaster response, management and preparedness,[65] a National Disaster Management Plan[66] and a National IDP policy.[67] The disaster response law and disaster management policy do not address displacement, but the IDP policy states that:

> *Displacement following natural disasters can also be attributed to the lack of early and effective recovery efforts to assist people to rebuild their homes, their farms and their irrigation systems, to restock seeds and animals, and to restore basic services (water, health, education). Frustration at being unable to restart their livelihoods or to access services can trigger their departure, usually towards urban centers. Thus, early recovery is a key element for the prevention of displacement and all relevant line ministries... will prioritize this in their strategies and programs and in the implementation of this Policy.*[68]

It remains to be seen how effectively the government will be able to operationalise these recently adopted legal and policy instruments so as to reduce and manage the country's displacement risk.

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64 EM-DAT. 2014. *Country Profile – Afghanistan.* (http://goo.gl/CSAVa9) Louvain, Belgium: Université catholique de Louvain.

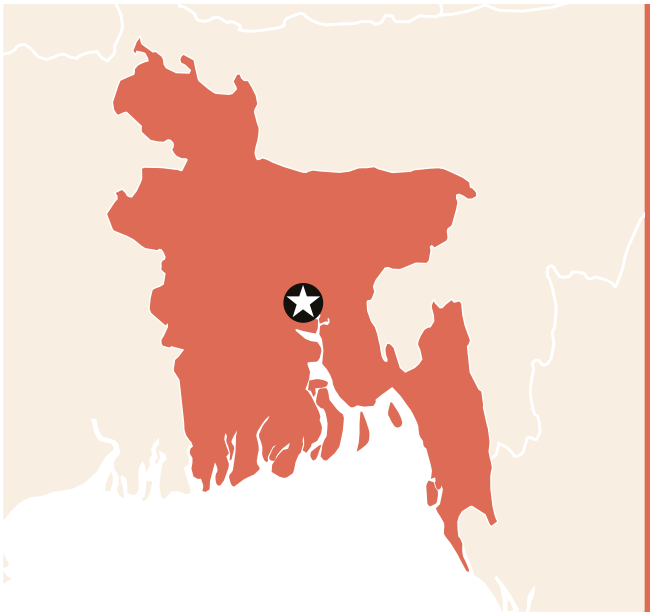
65 Government of Afghanistan. 2012. *Law on disaster response, management and preparedness in the Islamic State of Afghanistan.* (http://goo.gl/p87z2Z) Kabul: Government of Afghanistan.

66 Government of Afghanistan. 2010. *National Disaster Management Plan.* Kabul: Government of Afghanistan.

67 Government of Afghanistan, Ministry of Refugees and Repatriation. 2013. *National Policy on Internally Displaced Persons.* (http://goo.gl/sYQ0OW) Kabul: Government of Afghanistan.

68 *Op cit.*, 5.2(e).

4.2 BANGLADESH



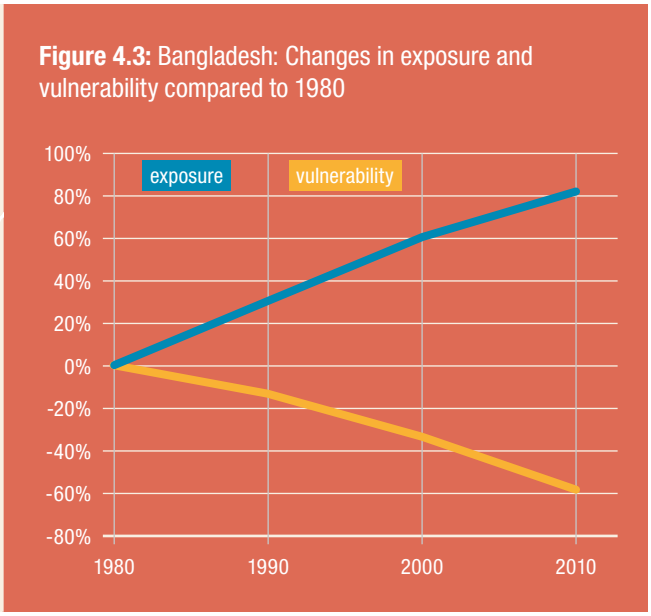


Figure 4.3: Bangladesh: Changes in exposure and vulnerability compared to 1980

4.2.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Bangladesh	156,536,136	1,486,500	3	9,500	4	4.80%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Con-figuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Bangladesh	186,957	18	3.5	0.98	1,110,000	7,100

4.2.2 Displacement risk configuration

With a population of approximately 160.4 million people, Bangladesh is the third most populous country in South Asia. Bordered by India and Myanmar to the west, north and east and the Bay of Bengal to the south, Bangladesh covers 144,000 square kilometres. Most of Bangladesh is basically a vast river plain – two thirds of the country less than five metres above sea level[69] – crisscrossed by a network or rivers. Approximately 92 per cent of the runoff from the Ganges, Brahmaputra and Meghna rivers flows through Bangladesh.[70]

Exposure to hazards

Bangladesh is exposed to multiple hazards, including floods, storm surges, associated riverbank erosion, cyclones floods, droughts and earthquakes. Approximately 30 per cent of the country experiences annual flooding during the monsoon season. Extreme flood events can submerge over 60 per cent of the country.[71] Given Bangladesh's low elevation and high exposure, it has been estimated to be the country most at risk to the impacts of climate change.[72] Up to 50 per cent of Bangladesh's urban slum dwellers may be IDPs forced to flee their rural homes as a result of riverbank erosion.[73]

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69 Cabot Venton, C., and Majumder, S. 2013. *The Economics of Early Response and Resilience: Lessons from Bangladesh.* (http://goo.gl/MstN6Y) London: Government of the United Kingdom, Department for International Development.

70 Government of Bangladesh, Ministry of the Environment and Forests. 2001. Overview. *In Bangladesh: The State of the Environment.* (http://goo.gl/MmXCkb) Dhaka: Government of Bangladesh.

71 Cabot Venton and Majumder, 2013.

72 Maplecroft, 2013. *Climate Change Vulnerability Index 2014.* (http://goo.gl/gtvCHR) Bath, UK: Maplecroft.

73 IDMC 2015. *Bangladesh: comprehensive response required to complex displacement crisis,* p.10. (http://goo.gl/6hhdZV); and IRIN. 2007. Tomorrow's Crises Today: The humanitarian impact of urbanization, September 2007, p.41. (http://goo.gl/i0M2Fg)

74 UNISDR. 2011. Revealing risk. In *2011 Global Assessment Report on Disaster Risk Reduction.* (http://goo.gl/zCnqzn) Geneva: UNISDR.

Figure 4.4:
Population exposed to floods in Bangladesh

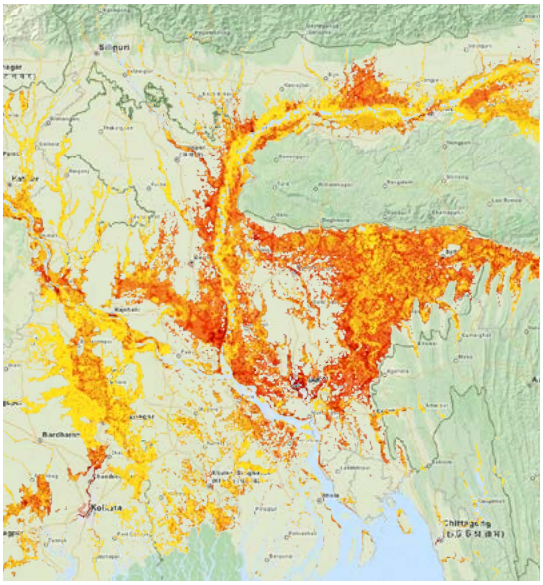
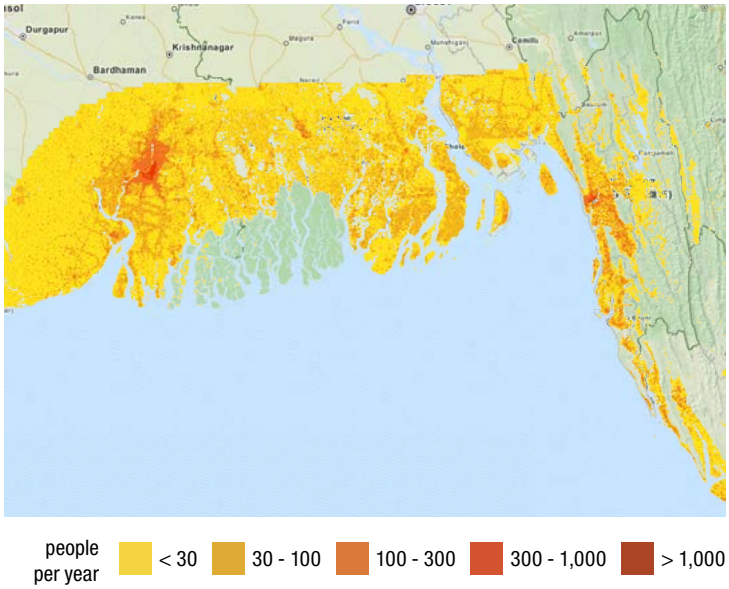


Figure 4.5:
Population exposed to tropical cyclones in Bangladesh



Source: UNEP/GRID-Geneva PREVIEW

Development and urbanisation patterns have sometimes magnified existing risks. For example, parts of Dhaka have been built upon on drained bodies of water or wetlands, and the soil upon which these buildings stand is prone to liquefaction – it liquefies in the event of an earthquake.[74] This means that earthquake-related displacement and mortality risk have increased in those parts of the city.

Vulnerability to hazards

As recently as 2011, 43.3 per cent of Bangladesh's population subsisted on $1.25 per day.[75] In 2014, Bangladesh tied with Pakistan in terms of human development, with both ranking 146th out of the 186 countries included in the Human Development Index. Approximately 58 per cent of Bangladeshis – 83.2 million people – face multidimensional poverty.[76]

In November 1970, Bhola Cyclone made landfall near the Ganges River delta in what was then East Pakistan. The storm and its surge were the deadliest cyclone in recorded history with more than 300,000 killed and an untold number displaced.[77] The government's slow and ineffective response has been cited among the factors that indirectly contributed to the breakup of Pakistan and the independence of Bangladesh in 1971.[78] In April 1991, Cyclone Gorky and its storm surge ravaged Bangladesh's Chittagong district, killing approximately 139,000 and displacing an estimated 10 million people.[79]

In the aftermath of Cyclone Gorky, the Government of Bangladesh and its partners, notably the Bangladesh Red Crescent Society, implemented a Cyclone Preparedness Programme. This and the pre-emptive evacuation of approximately three million people has been credited with the comparatively lesser death toll – less than 3,500 – caused by Super Cyclone Sidr in 2007.[80] In May 2009, Cyclone Aila struck India and Bangladesh. In Bangladesh, only 190 people were killed and 800,000 people were displaced.[81]

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75 UNDP, 2014, measured in purchasing power parity (PPP).

76 UNDP, 2014; and Alkire, S. and Santos, M.E. 2011. Acute Multidimensional Poverty: A New Index for Developing Countries. (http://hdl.handle.net/10419/48297) *Proceedings of the German Development Economics Conference,* Berlin 2011, No. 3. Oxford Poverty & Human Development Initiative (OPHI) Working Paper No. 38.

77 World Meteorological Organization (WMO) and the Université catholique de Louvain. 2014. *Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970 – 2012).* WMO-No. 1123. (http://goo.gl/IhbLEU) Geneva: World Meteorological Organization.

78 Najam, A. 2010. The cyclone that broke Pakistan's back. (http://goo.gl/NI7LKI) The *Express Tribune,* 18 August 2010; Hussain, D. 2010. Pakistan's leaders should heed the lesson of Bangladesh. (http://goo.gl/uaVaEG) The *Guardian,* 15 August 2010.

79 WMO and Université catholique de Louvain, 2014. After Bhola, Gorky was the second deadliest storm in recorded history.

80 Arjumand, H., Shahidullah, M., and Dilder, A. 2012. The Bangladesh Cyclone Preparedness Programme. A Vital Component of the Nation's Multi-Hazard Early Warning System. In *Institutional Partnerships in Multi-Hazard Early Warning Systems* (M. Golnaraghi, ed.). Berlin and Heidelberg: Springer-Verlag; and World Bank. 2010. Shelter from Storms in Bangladesh. (http://goo.gl/rNYMqU) Washington, DC: The World Bank; and Paul, B. K., Rashid, H., Islam, M. S., and Hunt, L. M. 2010. Cyclone Evacuation in Bangladesh: Tropical Cyclones Gorky (1991) vs. Sidr (2007). (http://goo.gl/lmfd3j) *Environmental Hazards* 9(1): 89–101.

81 IDMC. 2010. *Displacement due to natural hazard-induced disasters: Global Estimates for 2009 and 2010.* (http://goo.gl/wmvA7W) Geneva: IDMC.

These examples illustrate how improved life-saving disaster risk management actions, such as early warnings and evacuations, have inadvertently increased the magnitude of displacement. The challenge for Bangladesh remains how to reduce the underlying vulnerability of people both before and after hazards occur. One year after Aila, 100,000 Bangladeshis remained "displaced on mud embankments, with little food, drinking water or sanitation,"exposed to storm surges, floods and the next cyclone season.[82] Three years after the storm, housing in the cyclone-affected areas had improved but livelihoods had not: drinking water remained scarce and salinisation of soil and groundwater made rice-growing impossible, forcing those who remained into shrimp- and crab-farming on leased land.[83]

4.3 BHUTAN

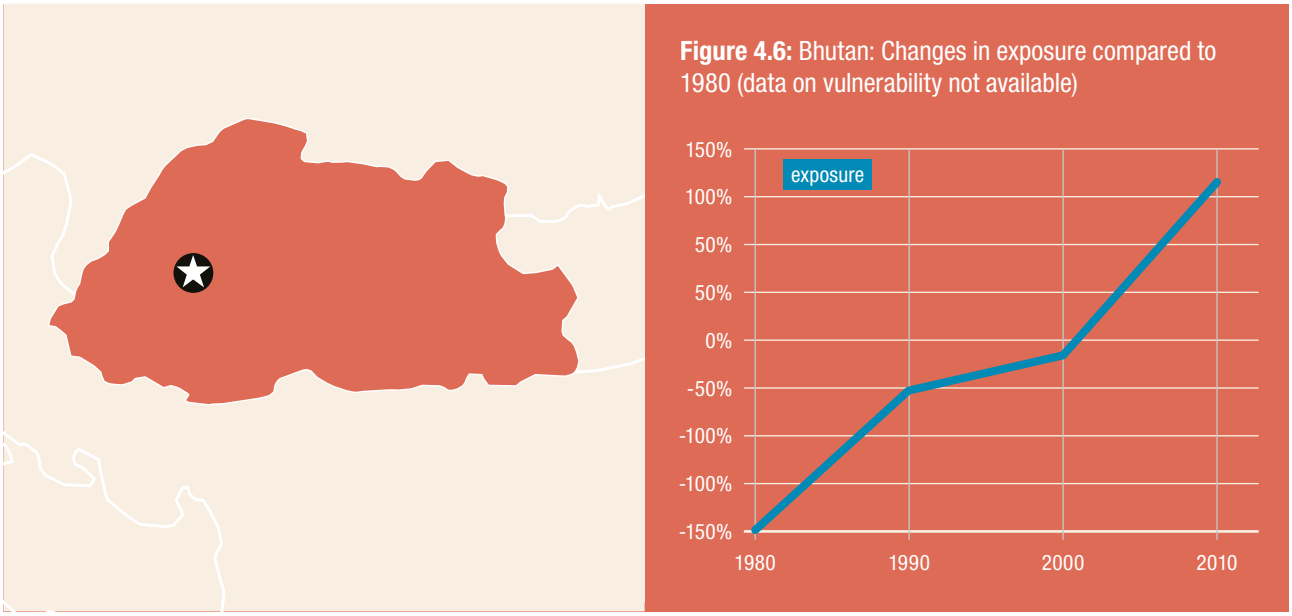


Figure 4.6: Bhutan: Changes in exposure compared to 1980 (data on vulnerability not available)

4.3.1 Displacement risk profile

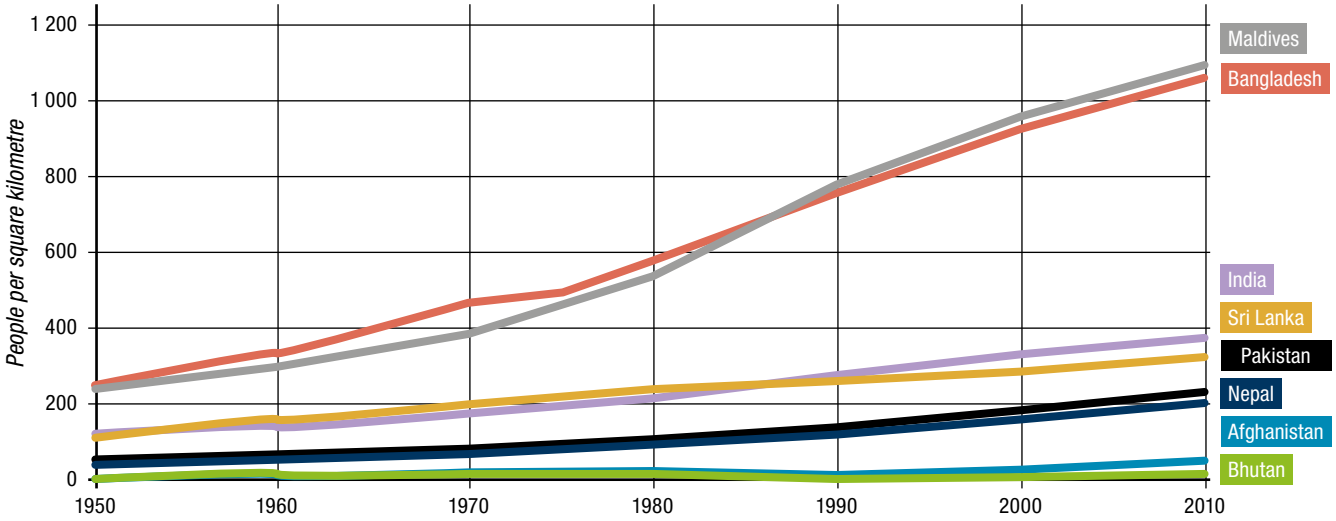
Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Bhutan	829,184	7,700	7	9,300	5	1.40%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Configuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Bhutan	94,949	21	5.1	0.39	7,000	8,400

[82] International Organization for Migration (IOM). 2010. *IOM Launches Policy Dialogue on Climate Change and Displacement.* (http://goo.gl/bDJLud) Geneva: International Organization for Migration.

[83] Tran, M. 2012. Bangladesh villagers still struggling after Cyclone Aila's devastation. (http://goo.gl/jpjwZF) The *Guardian,* 5 March 2012.

Figure 4.7: Population density in South Asia



Source: UN DESA, 2014

4.3.2 Displacement risk configuration

With an estimated population of 776,000 Bhutan is the second-least-populous country in South Asia.[84] A land-locked country on the southern slopes of the eastern Himalayas, it borders China and India and has an area of 38,000 square kilometres. Elevations range from 200 to nearly 8,000 metres, and its densely forested landscape is marked by several steep river valleys.

Exposure to hazards

Bhutan is primarily exposed to earthquake- and rain-triggered landslides, earthquakes, riparian as well as glacial lake outburst floods (GLOF), storms, droughts and forest fires.[85] There are 2,674 glacial lakes in Bhutan, of which 562 are associated with glaciers. Twenty-five are classified as 'potentially dangerous lakes' that could pose an imminent GLOF threat.[86]

Bhutan's has a low population density (Figure 4.7) and does not have a history of large disaster-related displacement events. Landslides and avalanches, the most threatening hazards to which Bhutanese are exposed, tend to be localised – while they may destroy several homes within a village, they rarely destroy multiple settlements.

Vulnerability to hazards

In terms of human development, Bhutan ranked 136th in 2014 and is on track to be on the few countries in the world to graduate out of the category of Least Developed Nations (LDCs). The Bhutanese's better living standards may mean that they are less vulnerable to hazards than comparably poor households elsewhere in South Asia.

The largest recent displacement occurred in July and August 2000, when heavy rains triggered floods that displaced more than 1,000 Bhutanese and destroyed key roads between Bhutan and India.[87] In 2009, Cyclone Aila killed 12 people and affected approximately 65,000 more Bhutanese of whom an untold number were estimated to have been displaced. Later the same year, an earthquake damaged and destroyed several thousand homes, displacing at least 7,290 people.[88]

Through implementation of DRR and climate change adaptation plans, Bhutan has begun to mitigate future disaster and displacement risks by addressing the underlying risk drivers. It has improved drainage infrastructure to reduce flood risks, stabilised slopes in landslide-prone areas, enforced new building codes to reduce earthquake risk and undertaken projects to mitigate the risk of GLOFs.[89]

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84 UN DESA, 2014.

85 Bhutan Disaster Knowledge Network. 2009. *Bhutan Hazard Profile.* (http://goo.gl/ysF9j5) Thimphu: Bhutan Disaster Knowledge Network.

86 Shrestha, B., Mool, P.K. and Bajracharya, S. R. 2007. *Impact of Climate Change on Himalayan Glaciers and Glacial Lakes: Case Studies on GLOF and Associated Hazards in Nepal and Bhutan.* (http://goo.gl/SFiV58) Kathmandu: International Centre for Integrated Mountain Development (ICIMOD); and World Bank and GFDRR, 2012.

87 UN OCHA. 2000. *Bhutan - Floods and Landslides OCHA Situation Report No. 2.* (http://goo.gl/vdHMLo).

88 UNDP. 2010. *Bhutan Recovery and Reconstruction Project Progress Report 2010.* (http://goo.gl/7uZ6pt) Thimpu: UNDP.

89 The World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR). 2012. *Disaster Risk Management in South Asia: A Regional Overview.* (http://goo.gl/9Ymdp8) Washington: The World Bank.

4.4 INDIA

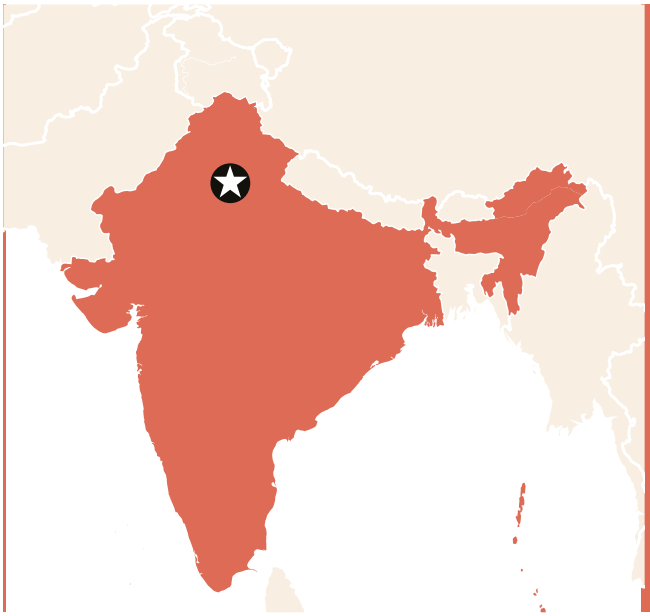
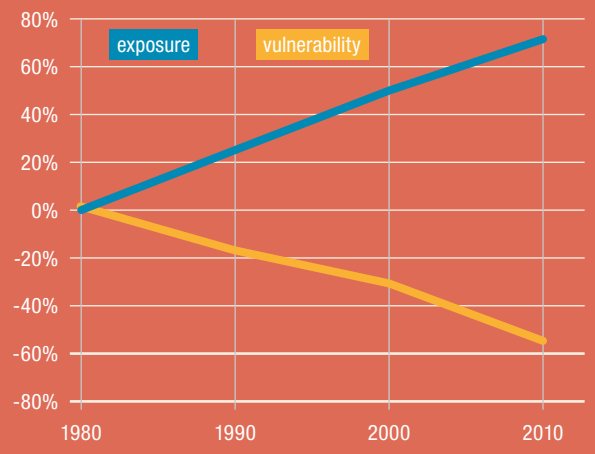


Figure 4.8: India: Changes in exposure and vulnerability compared to 1980



4.4.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
India	1,292,502,640	5,314,400	1	4,100	6	4.20%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Configuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
India	73,482	26	4.7	0.41	4,101,000	3,200

4.4.2 Displacement risk configuration

The largest country in South Asia and the seventh largest in the world, India covers 3.3 million square kilometres. India is bordered by Pakistan, Bhutan, China, Nepal, Bangladesh and Myanmar. India's 7,517 kilometres of coastline faces the Bay of Bengal, the Indian Ocean and the Arabian Sea.

Exposure to hazards

Approximately 68 per cent of India is prone to droughts, 60 per cent to earthquakes, eight per cent to floods and 75 per cent of coastline is exposed to cyclones.[90] The most flood-prone areas are the Brahmaputra, Ganges and Meghna River basins in the Indo-Gangetic-Brahmaputra plains in north and northeast India, which carry 60 per cent of the country's total river flow (Figure 4.9).

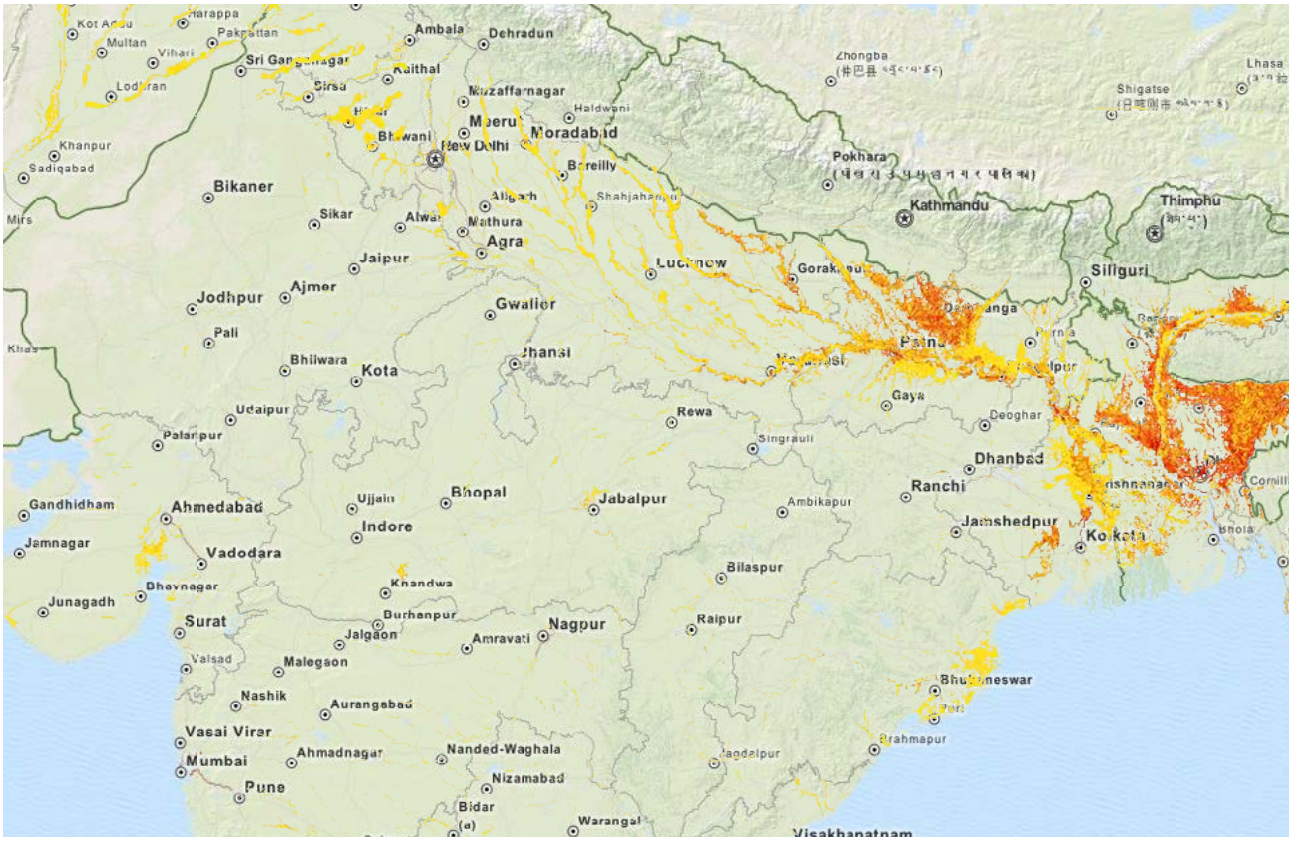
Vulnerability to hazards

India has the world's largest number of people, 632 million, living in multidimensional poverty.[91] By comparison, no other country has even 100 million people facing multidimensional poverty. Disaster-related displacement in India is both an urban and a rural problem. Urban Indians' vulnerability to hazards is very high due to rapid urban growth, unplanned development and the large numbers of people without access to adequate housing, water, health and sanitation. The 2011 census showed that in Mumbai, India's financial capital, 41 per

[90] World Bank and GFDRR, 2012.

[91] UNDP, 2014.

Figure 4.9: Population exposed to floods in northern India



Source: UNEP/GRID-Geneva PREVIEW

cent of its 20.5 million people live in slums.[92] Located on reclaimed land in low-lying areas close to marshes, Mumbai's slums are prone to flooding during the monsoon season, especially when heavy rain coincides with high tides.[93] Slums generally lack flood protection infrastructure.[94]

Since IDMC began monitoring disaster-induced displacement in 2008, India – with 26 million people displaced – has experienced the second-highest amount of displacement in the world, following only China. India's high risk is due to its large number of exposed and vulnerable people and high population density, even in rural areas. In 2013, monsoon floods displaced 1,042,000 people in the states of Bihar, Kerala, Uttarakhand, Assam, Andhra Pradesh, West Bengal and Uttar Pradesh while Cyclone Phailin displaced another million people in coastal areas of Odisha and Andhra Pradesh.[95] In 2012, monsoon flooding displaced 6.9 million Indians.[96] The 1988 Nepal-India earthquake and the 2005 Kashmir earthquake were two of the largest disaster events over the past 40 years. The 2004 Indian Ocean Tsunami heavily impacted the Andaman and Nicobar Islands as well as the eastern coastline,[97] displacing more than 382,000 people.[98]

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92 The *Guardian.* 2013. "India's Slumdog census reveals poor conditions for one in six urban dwellers." (http://goo.gl/H4tDnW) The *Guardian,* 22 March 2013.

93 Chatterjee, M. 2010. Slum dwellers response to flooding events in the megacities of India. (http://goo.gl/fkdHsb) *Mitigation and Adaptation Strategies for Global Change,* 15, pp.337-53; and McGranahan, G., Balk, D., and Anderson, B. 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. (http://goo.gl/FkF4ls) *Environment and Urbanization,* 19(1), pp.17-37.

94 Ranger, N., Hallegatte, S., Bhattacharya, S., Bachu, M., Priya, S., Dhore, K., Rafique, F., Mathur, P., Naville, N., Henriet, F., Herweijer, C., Pohit, S., and Corfee-Morlot, J. 2011. An assessment of the potential impact of climate change on flood risk in Mumbai. (http://goo.gl/bEzHVR) *Climatic Change,* 104, pp.139-167; and Revi, A. 2005. Lessons from the deluge: Priorities for multi-hazard risk mitigation. (http://goo.gl/1ASEyX) *Economic and Political Weekly,* 40(36), pp.3911-3916.

95 IDMC. 2014. *Global Estimates 2014: People displaced by disasters.* (goo.gl/mTWIzX) Geneva: IDMC.

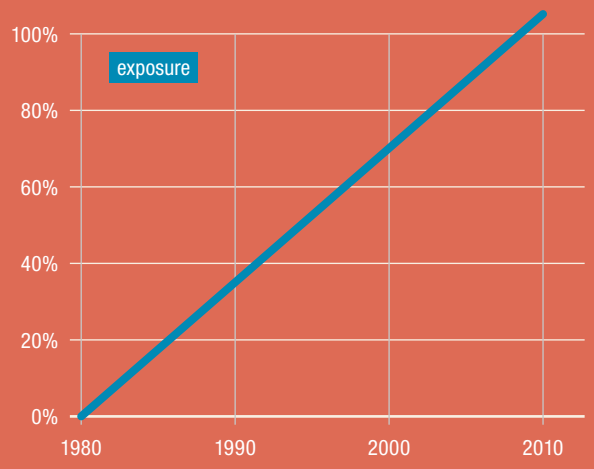
96 IDMC. 2013. *Global Estimates 2012: People displaced by disasters.* (goo.gl/MQTydq) Geneva: IDMC.

97 World Bank and GFDRR, 2012.

98 Government of India, Natural Disaster Management. 2005. Special Sitrep- 25 (No.32-5/2004-NDM-I). (http://goo.gl/P9X1YT) Delhi: Government of India Ministry of Home Affairs.

4.5 MALDIVES

Figure 4.10: Maldives: Changes in exposure compared to 1980 (Data on vulnerability not available)



4.5.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Maldives	311,724	3,700	8	11,900	2	3.30%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Configuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Maldives	115,155	21.4	5.7	0.43	3,000	9,600

4.5.2 Displacement risk configuration

The Maldives is South Asia's only small island state. An archipelago situated in the Indian Ocean, it comprises 1,196 coral islands grouped in 26 atolls, of which approximately 200 islands are inhabited. With an area of 298 square kilometres, it has the highest population density in the region. Nearly a third of the country's estimated 358,000 inhabitants living in the capital, Malé whose population has been growing rapidly, almost four times faster than the regional average (Figure 4.11).

Exposure to hazards

With an average elevation of 1.5 metres and a peak elevation of 2.4 metres, the Maldives is vulnerable to tsunamis, storm surges, cyclones and earthquakes.[99] It is also vulnerable to the effects of climate change, such as sea-level rise and ocean acidification. The Maldives' small size means it is struck by hazards infrequently. When hazards do occur, however, they can affect a large portion of the country's population.

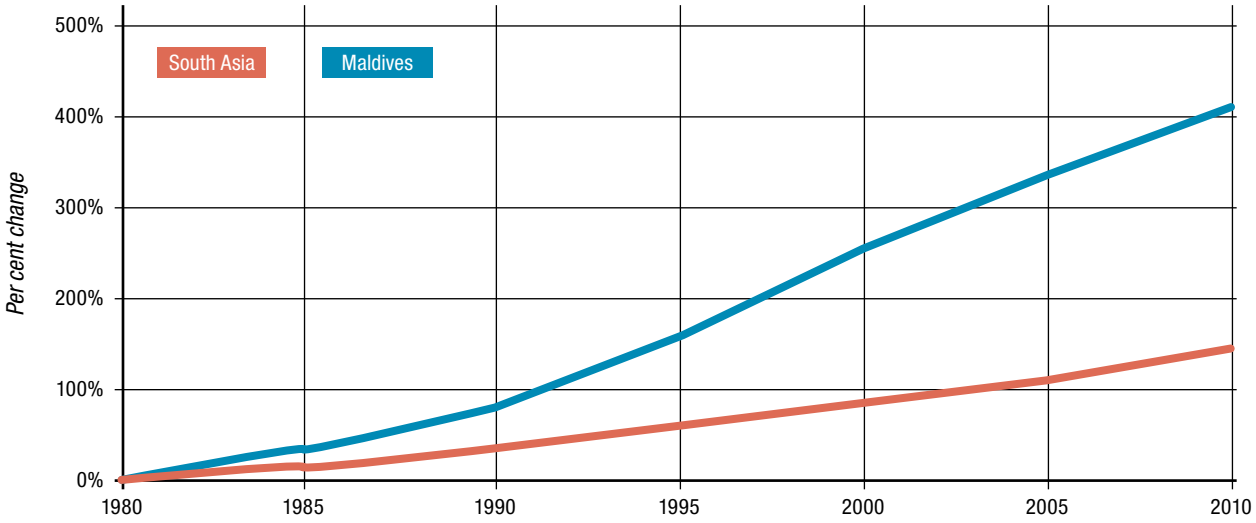
Vulnerability to hazards

The Maldives is relatively less vulnerable than the other countries in South Asia given the country's higher level of wealth. Combined, these low levels of exposure and vulnerability explain why it has had only four internationally reported disasters since 1970: one cyclone, two floods and the 2004 Indian Ocean Tsunami. The tsunami was the largest disaster in the country's history, killing 102 people and displacing nearly 30,000 more, of whom 12,000 were left homeless.[100]

[99] The World Bank and GFDRR, 2012.

[100] *Ibid.*

Figure 4.11: Change in size of urban population compared to 1980



Source: UN DESA, 2014

4.6 NEPAL

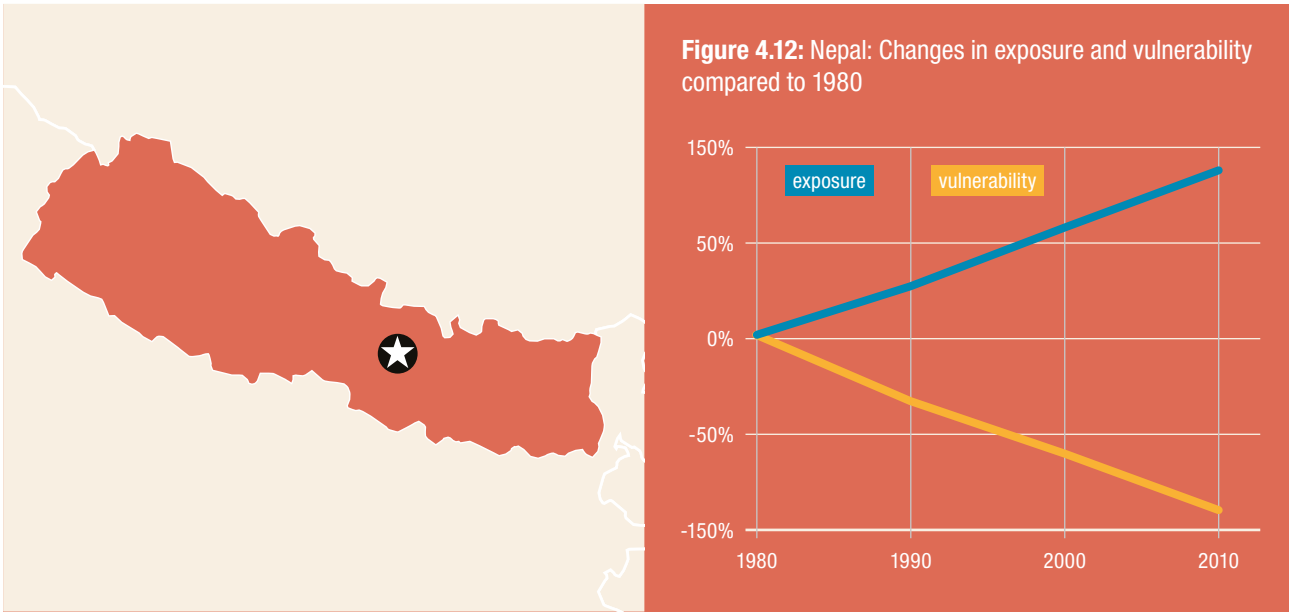


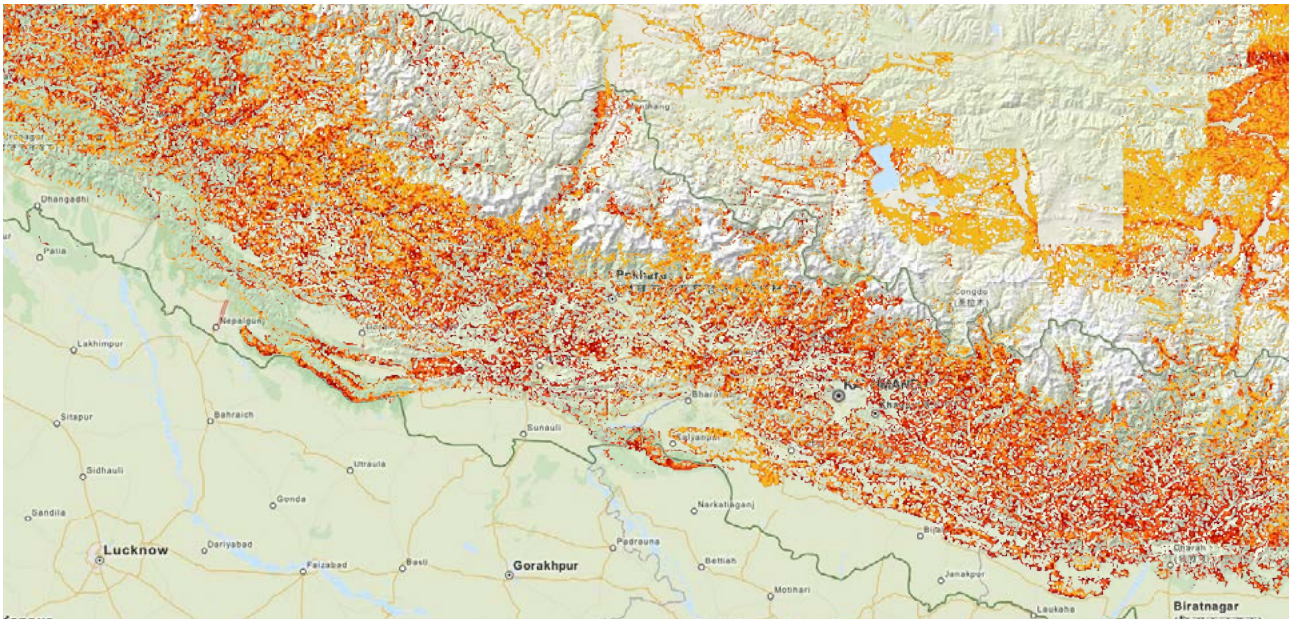
Figure 4.12: Nepal: Changes in exposure and vulnerability compared to 1980

4.6.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Nepal	32,054,000	124,100	6	3,900	7	3.10%

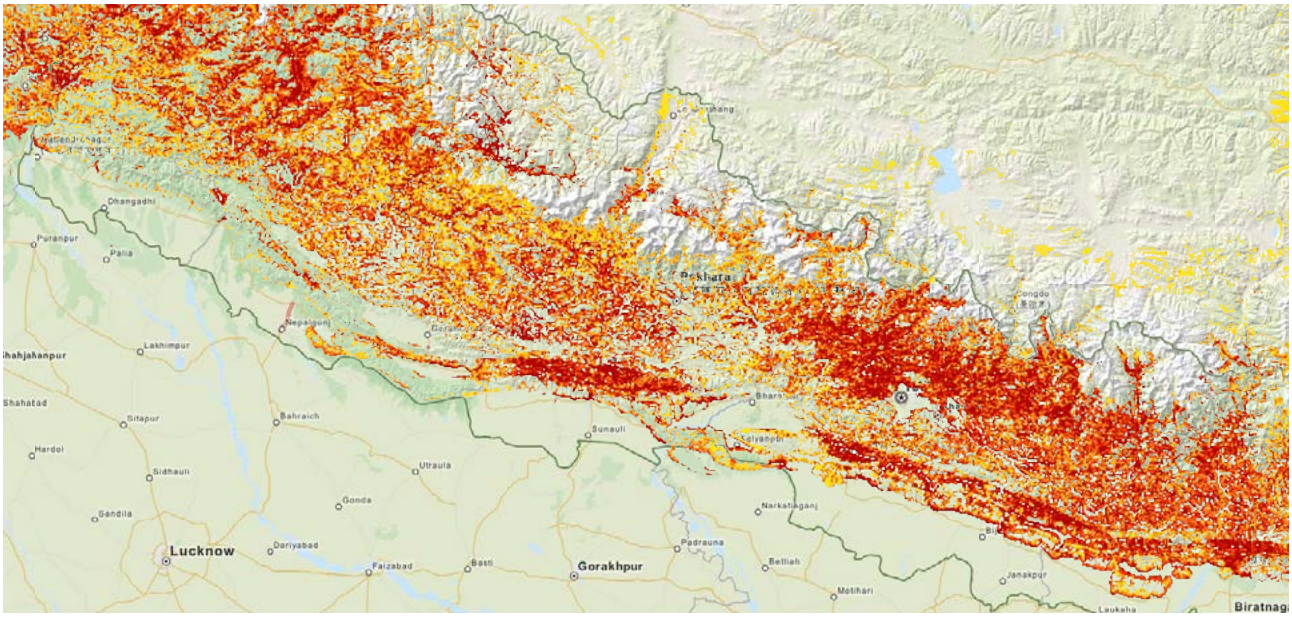
Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Con-figuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Nepal	68,135	20	3.6	0.38	102,000	3,200

Figure 4.13: Population exposed to rain-triggered landslides in Nepal



Source: UNEP/GRID-Geneva PREVIEW

Figure 4.14: Population exposed to earthquake-triggered landslides in Nepal



4.6.2 Displacement risk configuration

Nepal is a landlocked Himalayan nation between India and China with approximately 27 million inhabitants and an area of 147,181 square kilometres. Northern Nepal has several of the world's tallest peaks while the Terai in the south is fertile with a fair amount of rainfall. Kathmandu, the capital and largest city is located approximately in the centre of the country.

Exposure to hazards

Nepal has recorded 24 GLOF events – 14 of which originated within Nepal and ten which originated in China and spilled across the border.[101] The risk of future floods will increase due to climate change: the rapid decline in glacial cover due to temperature increases will increase runoff, which in turn will increase riparian floods, GLOFs and landslides.[102] Of Nepal's 1,466 identified

[101] International Centre for Integrated Mountain Development (ICIMOD). 2011. *Glacial Lakes and Glacial Lake Outburst Floods in Nepal.* (http://goo.gl/KbsHoX) Kathmandu: ICIMOD.

[102] World Bank and GFDRR, 2012.

glacial lakes, 21 are considered to pose outburst flood risk due to their size, elevation and other characteristics. More than 20,000 people currently residing in areas that would be flooded if Imja Tsho, Tsho Rolpa, Thulagi Lake and Bhote Koshi-Sun Koshi were to experience outburst floods.[103]

In addition to droughts and floods, minor earthquakes as well as rain- and earthquake-triggered landslides are a regular occurrence for most Nepalis (Figures 4.13 – 4.14). Kathmandu was last affected by a major earthquake in 1934. In contrast to countries such as Chile, which have used such tragedies to improve building codes and land-use plans, Nepal has struggled to improve the quality of its housing and infrastructure stock. The last two significant earthquakes in the 1980s affected a substantial number of Nepalese, with over 200,000 people affected by each event. On 18 August 2008, a breach of the Kosi River embankment caused flash flooding that displaced 45,000 people from the Sunsari District in Nepal, and affected about three million people from 1,704 villages in North Bihar, India. In the flood's aftermath, some displaced persons from Nepal traveled into India to flee from the deluge.

Vulnerability to hazards

Ranked 145th on the HDI, Nepal is ranked Nepal grapples with poverty and food insecurity. Droughts in 1987, 1993, 2004, 2007 and 2009 lead to food shortages, each affecting several hundred thousand people. Poverty and low state capacity explain why Nepal spends so little on DRR. Nepal has prioritised DRR spending in the last 15 years, spending nearly as much on preventive measures as on response, recovery and reconstruction.[104]

4.7 PAKISTAN

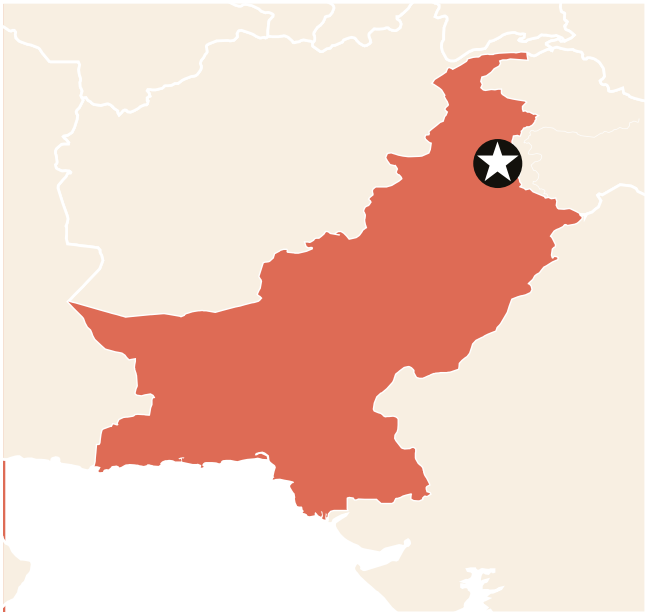
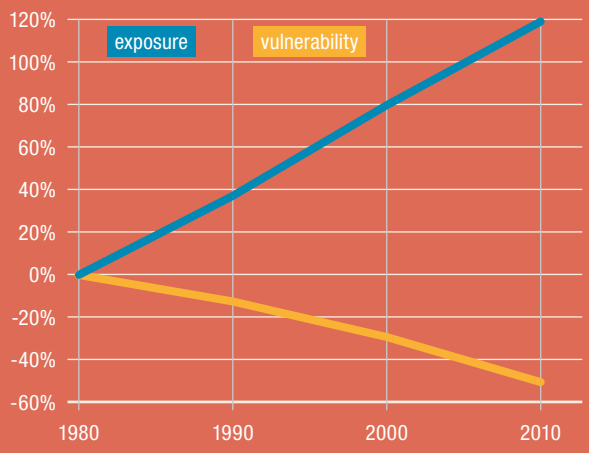


Figure 4.15: Pakistan: Changes in exposure and vulnerability compared to 1980



4.7.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Pakistan	187,250,400	1,805,600	2	9,600	3	2.20%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Configuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Pakistan	95,112	22	3.6	0.58	1,566,000	8,400

[103] ICIMOD, 2011.

[104] Shrestha, R.K., Ahlers, R., Bakker, M. and Gupta, J. 2010. Institutional dysfunction and challenges in flood control: A case study of the Kosi Flood 2008. *Economic and Political Weekly* 45(2). (http://goo.gl/Qtw6aK)

4.7.2 Displacement risk configuration

With a population of 196 million, Pakistan is the second-most populous country in the region and the seventh most populous in the world. Covering approximately 796,000 square kilometres, Pakistan lies between the Himalayas and the Arabian Sea where it has a 1,046-km coastline. Pakistan's large size results in very distinct physiographic zones, of which the most notable are the Northern Highlands (encompassing the Hindu Kush, Karakoram Range and the Himalayas), the Indus plain and the Balochistan plateau.

Exposure to hazards

Pakistan's diverse geography exposes it to a several hazards and high population density in hazard-prone areas makes the country highly susceptible to mega-events.[105] Earthquake exposure is very high in the north while flood exposure is high throughout the entire country due to the heavy runoff from the mountain rivers and the monsoon rain season.

Due to poor masonry techniques, most homes and buildings are not constructed to withstand hazards. Ineffective early warning systems have inhibited people from moving themselves and their assets out of harm's way. The government has been criticised for its lack of awareness and education on disasters and response.[106]

Vulnerability to hazards

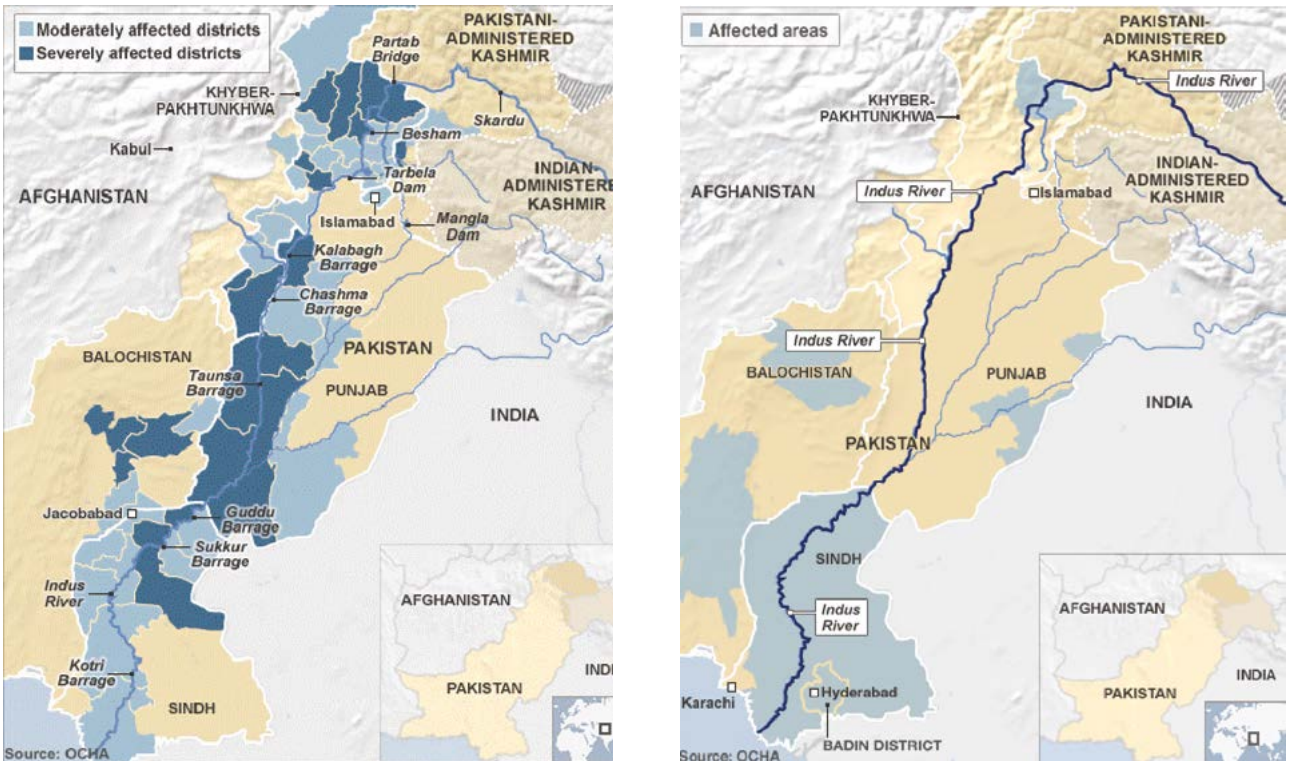
Violent clashes in the context of insurgency and counterinsurgency operations displaced an estimated five million people in the past decade, and IDMC estimates that as of June 2014 there were at least 1.15 million IDPs.[107] Many of those who have returned home to areas wrested back from Islamist militants, are struggling to recover their livelihoods, often finding that their homes have been damaged or destroyed and that they have only limited access to basic services such as healthcare and education.[108]

Many people living in conflict-affected areas are also exposed to hazards, making it difficult for the government to reduce disaster risks and respond when disasters occur.

In recent years, nearly annual flood events have displaced 11 million people in 2010, 300,000 in 2011 and 1.9 million in 2012 (Figure 4.16). [109] This repeated flooding underscores how vulnerable people are affected by frequently recurring hazards which erodes their resilience.

Earthquakes, which occur less often than floods, have caused significant concentrated damage. In October 2005, some 75,000 people died in an earthquake in Kashmir and approximately 3.5 million more were displaced.[110] In April 2013, an earthquake in Balochistan earthquake displaced approximately 140,000.[111]

Figure 4.16: Areas affected by flooding in Pakistan in 2010 (left) and 2011 (right)



Source: UN OCHA

[105] World Bank and GFDRR, 2012.

[106] World Bank and GFDRR, 2012.

[107] IDMC, 2013. *Pakistan: Internal Displacement in Brief.* (http://goo.gl/c4b1Qp). IDMC, 2014. IDMC, June 2014. Pakistan IDP figures analysis. (http://goo.gl/2OS9Tq)

4.8 SRI LANKA

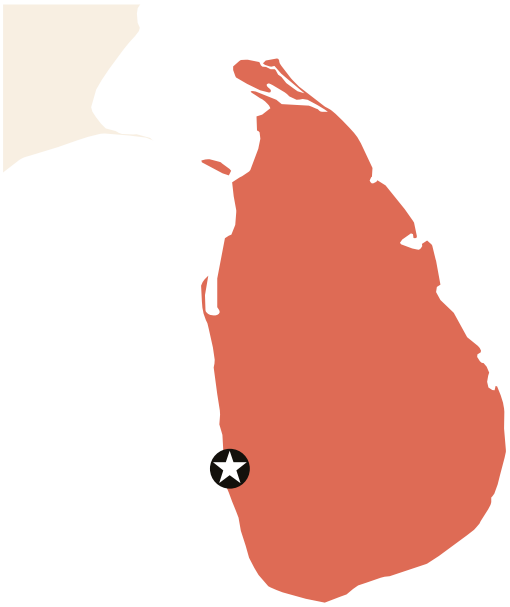
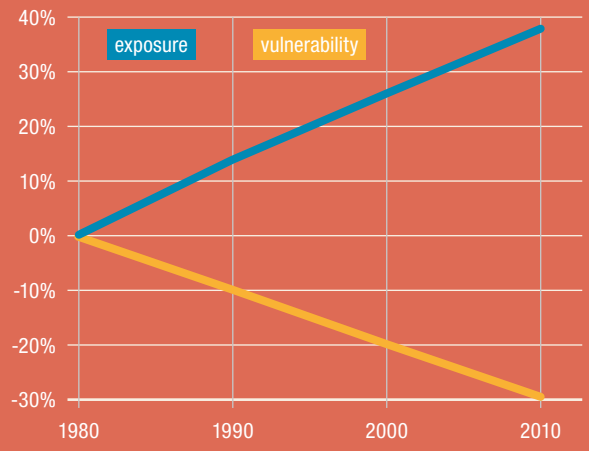


Figure 4.17: Sri Lanka: Changes in exposure and vulnerability compared to 1980



4.8.1 Displacement risk profile

Country	Population	Future Annual Displacement Risk (next 10 years)				
		Average Annual Displacement Risk	Regional Rank	Relative Annual Displacement (per 1 million people)	Regional Rank	Annual change in displacement risk
Sri Lanka	21,529,024	325,800	4	15,100	1	2.40%

Country	Risk Configuration Index				Historic Displacement	
	Relative Physical Exposure (per 1 million people)	Vulnerability	Resilience	Risk Con-figuration	Average Annual Displacement, 2013 Trend level	Relative Annual Displacement (per 1 million people), 2013 Trend level
Sri Lanka	144,336	19	5	0.55	279,000	13,000

4.8.2 Displacement risk configuration

An island nation in the Indian Ocean located off the southeast coast of India, Sri Lanka has an area of some 65,000 square kilometres and an ethnically diverse population of 21.6 million. Sri Lanka's 26-year internal armed conflict ended in May 2009 with the military victory of government forces over the insurgent Liberation Tigers of Tamil Eelam. As of December 2014 up to 90,000 people were still living in internal displacement as a result of the conflict.[112]

Exposure to hazards

Sri Lanka's geographic and climatic diversity exposes it to several types of natural hazards, with the most frequently occurring events being floods, droughts and cyclones. The mountain massif in the south-central part of the island divides the landscape into three distinctive zones – the central highlands, the plains and the coast – which results in uneven spatial and temporal distribution of rain and exposes a significant portion of the island to floods and droughts.[113] The southwest

[108] *Ibid.*

[109] IDMC. 2015. DiDD. Geneva: IDMC.

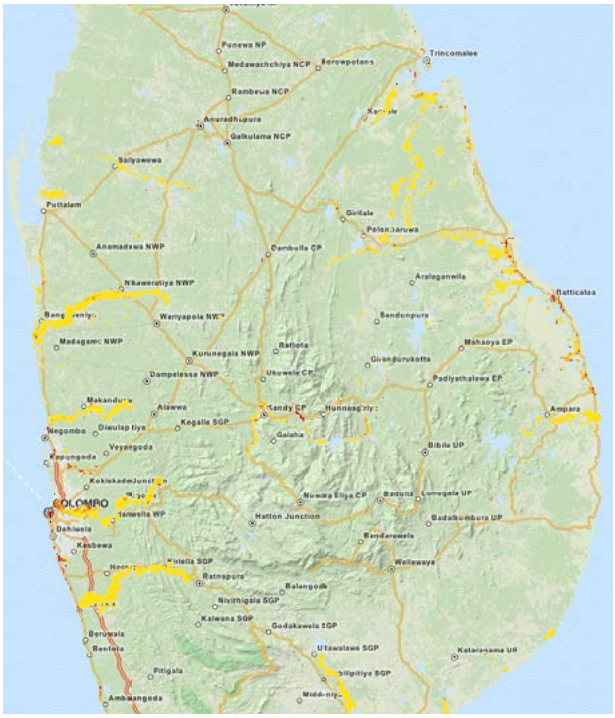
[110] British Red Cross. 2005. *South Asia information sheet – Asian earthquake appeal.* (http://goo.gl/i5lk1z) Note: The Asian Development Bank and the World Bank estimated the displacement to be in the 'millions'.

[111] IDMC. 2015. DiDD.

[112] Norwegian Refugee Council. 2014. *Submission from the Internal Displacement Monitoring Centre (IDMC) of the Norwegian Refugee Council (NRC) To the Human Rights Committee (HRCtte) For consideration at its 112 th session 31 October 2014.* (http://goo.gl/eAVQ1B); IDMC, 2015. Sri Lanka IDP figures analysis, February 2015. (http://goo.gl/hs55My) Geneva: IDMC.

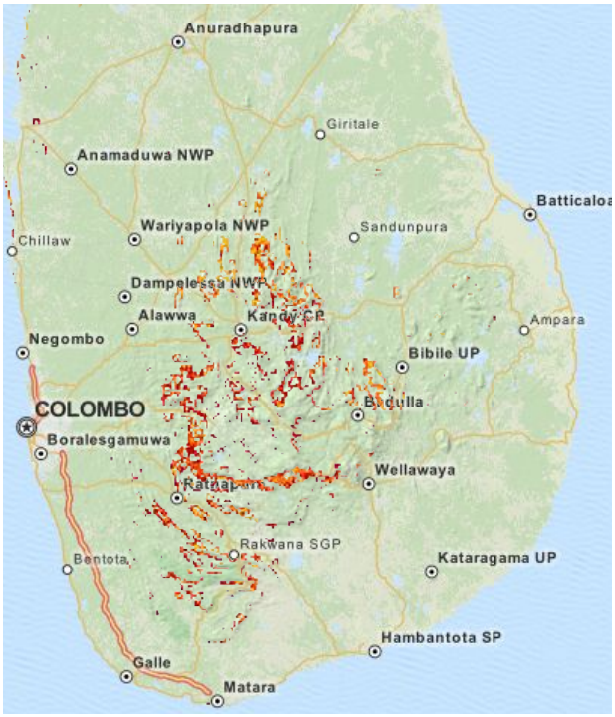
[113] World Bank and GFDRR, 2012.

Figure 4.18:
Population exposure to flooding in Sri Lanka



people per year < 30 30 - 100 100 - 300 300 - 1,000 > 1,000

Figure 4.19:
Population exposure to landslides in Sri Lanka



Source: UNEP/GRID-Geneva PREVIEW

monsoon causes severe flooding in the Western, Southern and Sabaragamuwa provinces and the northeast monsoon causes flooding in the Eastern, Northern and North-Central provinces (Figure 4.18). Coastal areas in the north and east are exposed to cyclones, and the hilly central highlands to landslides (Figure 4.19).

Vulnerability to hazards

The internal armed conflict in Sri Lanka has increased peoples' vulnerability to hazards, particularly those who were displaced by the conflict or living in conflict-affected areas. IDMC estimated that 800,000 people were displaced in 2001 in relation to the conflict.[114] The government has noted that a large proportion of the IDPs in conflict-affected and other areas "may have fallen into poverty due to the loss of employment, death or injury to the breadwinner or loss of productive assets."[115]

Deforestation and unplanned urban development have increased flood and landslide risks, particularly in urban areas.[116] Slums are located in areas with poor drainage or next to solid waste dumping sites which increases urban flood risks. Because the urban poor live in crowded housing conditions, the risk of displacement related to fire hazards is also high.[117]

During the past forty years, most disaster-related displacement has occurred in the eastern part of the country. Approximately 95 per cent of the damage and destruction to housing since the 1970s has been caused by cyclones, seasonal floods and the 2004 Indian Ocean Tsunami.[118] The November 1978 cyclone battered Sri Lanka's Eastern Province, killing an estimated 850 people and displacing as many as 400,000.[119] In 2000, another cyclone struck the country, displacing half a million people but causing fewer than ten fatalities.[120] When the Indian Ocean Tsunami struck Sri Lanka it killed 31,000 and displaced more than a million people. Five years after the disaster, 217,000 people were reportedly still living in relief camps and approximately 226,000 had moved in with friends or relatives.[121]

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[114] IDMC. 2014. Almost five years of peace but tens of thousands of war-displaced still without solution. (http://goo.gl/gtu5VQ) Geneva: IDMC.

[115] Disaster Management Centre. 2009. *Sri Lanka National Report on Disaster Risk, Poverty and Human Development Relationship.* (http://goo.gl/H987LU) Colombo: Government of Sri Lanka, Ministry of Disaster Management and Human Rights. p.20.

[116] Duryog Nivaran. 2015. *Disaster profile – Sri Lanka.* (http://goo.gl/m0xJ2o)

[117] *Ibid.*

[118] Disaster Management Centre, 2009.

[119] *Ibid.*

[120] Long, C. 2000. *Thousands homeless in cyclone-battered Sri Lanka.* (http://goo.gl/g2aPv9) DisasterRelief.org.

[121] Disaster Management Centre, 2009.

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Kälin, W. 2013. "Changing climates, moving people: Distinguishing voluntary and forced movements of people", in *Changing climate, moving people: Framing migration, displacement and planned relocation,* pp.38-43 [Koko Warner, Tamer Afifi, Walter Kälin, Scott Leckie, Beth Ferris, Susan F. Martin and David Wrathall (eds.)]. United Nations University Institute for Environment and Human Security (UNU-EHS). http://goo.gl/ykqpna

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6. KEY TERMINOLOGY

The following terms are all highly relevant for this paper. Definitions are provided for the benefit of those not already familiar with the common lexicon of disaster and climate change risk management. For further information on these terms and the underlying concepts, please refer to UNISDR (2009) *Terminology on Disaster Risk Reduction*[121]; UNISDR (2013) *Global Assessment Report*[122]; IPCC (2012) *SREX*[123] and the *Hyogo Framework for Action* (2005)[124].

The following terminology lays out the basic framework for disaster risk, its human displacement component, the constituent elements of disaster risk assessment, analysis and reduction and human displacement risk:

Disaster

> *"A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources."*
>
> ISDR (2009)

This project uses the Disaster Typology used by IDMC to categorise disasters into 'rapid' and 'slow' onset; see figure #7.1.

Figure #7.1: Disaster Typology, with displacement types covered by IDMC research. IDMC (2011)

Climate change

> *"A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use."*
>
> IPCC (2012)

> *"The IPCC definition can be paraphrased for popular communications as 'A change in the climate that persists for decades or longer, arising from either natural causes or human activity.'"*
>
> ISDR (2009)

Human Displacement

> *"Displacement addressed in this report is a result of the threat and impact of disasters. It also increases the risk of future disasters and further displacement. Being displaced puts people at a higher risk of impoverishment and human rights abuses, creating new concerns and exacerbating pre-existing vulnerability. This is especially true where homes and livelihoods are destroyed and where displacement is recurrent or remains unresolved for prolonged periods of time… The non-voluntary nature of the movement is central to the definition of displacement."*
>
> IDMC (2013)

[122] See: http://goo.gl/HgxNbz

[123] See: http://www.preventionweb.net/english/hyogo/gar/2013/en/home/index.html

[124] See: http://ipcc-wg2.gov/SREX/

[125] See: http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf

Risk

"The combination of the probability of an event and its negative consequences. This definition closely follows the definition of the ISO/IEC Guide 73. The word "risk" has two distinctive connotations: in popular usage the emphasis is usually placed on the concept of chance or possibility, such as in "the risk of an accident"; whereas in technical settings the emphasis is usually placed on the consequences, in terms of "potential losses" for some particular cause, place and period. It can be noted that people do not necessarily share the same perceptions of the significance and underlying causes of different risks."

ISDR (2009)

Disaster risk

"The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period. The definition of disaster risk reflects the concept of disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses which are often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socio-economic development, disaster risks can be assessed and mapped, in broad terms at least."

ISDR (2009)

Probabilistic Risk Analysis

"In its simplest form, probabilistic risk analysis defines risk as the product of the probability that some event (or sequence) will occur and the adverse consequences of that event [i.e. expressed by the equation Risk = Probability x Consequence]. This likelihood is multiplied by the value people place on those casualties and economic disruption… [For Disaster Risk] All three factors – hazard, exposure, and vulnerability – contribute to 'consequences.' Hazard and vulnerability can both contribute to the 'probability': the former to the likelihood of the physical event (e.g., the river flooding the town) and the latter to the likelihood of the consequence resulting from the event (e.g., casualties and economic disruption).

In [disaster risk reduction] practice, probabilistic risk analysis is often not implemented in its pure form for reasons including data limitations; decision rules that yield satisfactory results with less effort than that required by a full probabilistic risk assessment; the irreducible imprecision of some estimates of important probabilities and consequences; and the need to address the wide range of factors that affect judgments about risk."

IPCC (2012).

Risk assessment

"A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend. Risk assessments (and associated risk mapping) include: a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability including the physical social, health, economic and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities in respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process."

ISDR (2009)

Hazard

"A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. The hazards of concern to disaster risk reduction as stated in footnote 3 of the Hyogo Framework are "… hazards of natural origin and related environmental and technological hazards and risks." Such hazards arise from a variety of geological, meteorological, hydrological, oceanic, biological, and technological sources, sometimes acting in combination. In technical settings, hazards are described quantitatively by the likely frequency of occurrence of different intensities for different areas, as determined from historical data or scientific analysis."

ISDR (2009)

Exposure

"People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest."

ISDR (2009)

Vulnerability

> *"The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure. However, in common use the word is often used more broadly to include the element's exposure."*

ISDR (2009)

Resilience

> *"The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions."*

ISDR (2009); IPCC (2012)

> *"Resilience means the ability to "resile from" or "spring back from" a shock. The resilience of a community in respect to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need."*

ISDR (2009)

Capacity

> *"Capacity refers to the combination of all the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to achieve established goals. This includes the conditions and characteristics that permit society at large (institutions, local groups, individuals, etc.) access to and use of social, economic, psychological, cultural, and livelihood-related natural resources, as well as access to the information and the institutions of governance necessary to reduce vulnerability and deal with the consequences of disaster. This definition extends the definition of capabilities referred to in Sen's 'capabilities approach to development' (Sen, 1983)."*

IPCC (2012)

Extensive Risk

> *"The widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts. Extensive risk is mainly a characteristic of rural areas and urban margins where communities are exposed to, and vulnerable to, recurring localised floods, landslides storms or drought. Extensive risk is often associated with poverty, urbanization and environmental degradation."*

ISDR (2009)

Intensive Risk

> *"The risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss. Intensive risk is mainly a characteristic of large cities or densely populated areas that are not only exposed to intense hazards such as strong earthquakes, active volcanoes, heavy floods, tsunamis, or major storms but also have high levels of vulnerability to these hazards."*

ISDR (2009)

DISASTERS
CLIMATE CHANGE AND
DISPLACEMENT

EVIDENCE FOR ACTION

This is a multi-partner project funded by the European Commission (EC) whose overall aim is to address a legal gap regarding cross-border displacement in the context of disasters. The project brings together the expertise of three distinct partners (UNHCR, NRC/IDMC and the Nansen Initiative) seeking to:

1. **increase the understanding** of States and relevant actors in the international community about displacement related to disasters and climate change;
2. **equip them to plan for and manage** internal relocations of populations in a protection sensitive manner; and
3. **provide States and other relevant actors tools and guidance** to protect persons who cross international borders owing to disasters, including those linked to climate change.

NRC NORWEGIAN REFUGEE COUNCIL

iDMC internal displacement monitoring centre