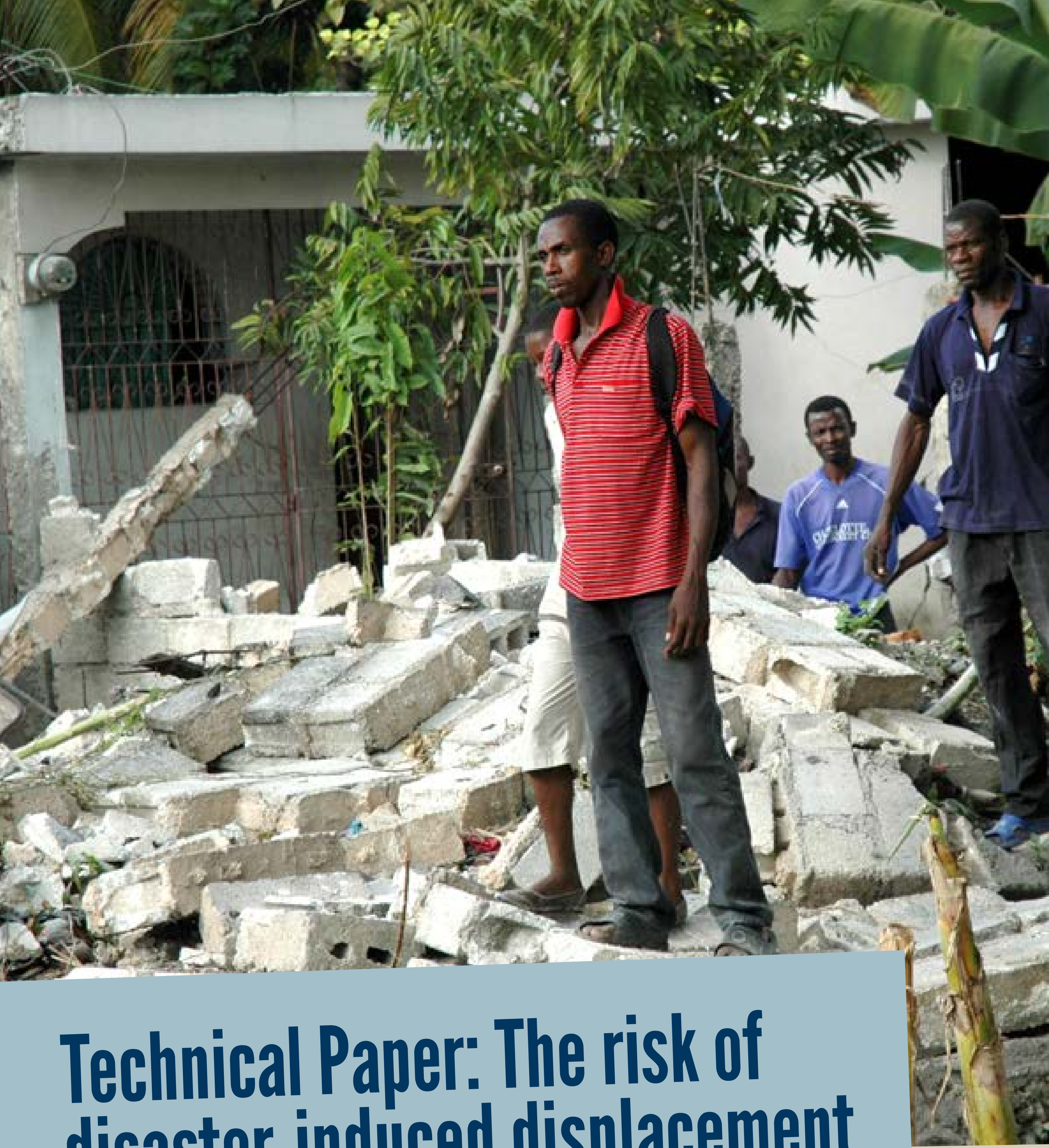

Technical Paper: The risk of disaster-induced displacement

Central America and the Caribbean

iDMC internal displacement monitoring centre

NRC NORWEGIAN REFUGEE COUNCIL

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The European Union is made up of 27 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

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Acronyms

AAL	Average Annual Loss
CAPRA	Probabilistic Risk Assessment Initiative (of ERN-AL)
CCA	Climate Change Adaptation
CEPAL	Comisión Económica para América Latina y el Caribe
CEPREDENAC	El Centro de Coordinación para la Prevención de los Desastres Naturales en América Central
CRED	Centre for Research on the Epidemiology of Disasters
DARA	Development Assistance Research Associates
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)
ENSO	El Niño Southern Oscillation
ERN-AL	Evaluación de Riesgos Naturales – América Latina
GAR	Global Assessment Report
GFDRR	Global Facility for Disaster Reduction and Recovery
GPID	Guiding Principles on Internal Displacement
GRID	Global Resource Information Database (of UNEP)
HFA	Hyogo Framework for Action
IADB	Inter-American Development Bank
ICCRR	Indicator of Conditions and Capacities for Risk Reduction
IPCC	Intergovernmental Panel on Climate Change
IRR	Indicator of Conditions and Capacities for Risk Reduction (of DARA)
LAC	Latin America and the Caribbean
PREVIEW	UNEP/GRID Project for Risk Evaluation, Information and Early Warning - Commonly known as 'Global Risk Data Platform'
SOPAC	South Pacific Applied Geoscience Commission
UNEP	United Nations Environment Programme
UNISDR	United Nations International Strategy for Disaster Reduction

Preface

This technical paper represents an initial attempt to assess the risk of disaster-induced displacement in the Central American and Caribbean countries of Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua and Panama. It presents results from the first of five planned regional analyses/consultations. They are being led by the Nansen Initiative, a state-led process that brings together representatives from states, international organisations NGOs, 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.[1]

The primary intended audience are those in national and regional governments responsible for reducing and managing disaster risks and for protecting the rights of internally displaced persons (IDPs). Given that displacement risk is largely influenced by human decisions, final outputs of the process discussed in this paper could potentially inform development decisions and reduce or avoid the risk of displacement. Humanitarian actors could use its findings to guide preparedness planning for disaster-induced displacement. The paper could help determine evacuation centre capacity, temporary shelter needs or funding needed for activities to reduce displacement risk in particular countries.

These five regional analyses serve as building blocks for a broader report on the risk of disaster-induced displacement. Informed by IDMC's *Global Estimates* and other relevant data on previously reported disaster-induced displacement, this report and the five regional analyses will provide evidence-based estimates and scenarios concerning the likelihood of future displacement—and how it can be mitigated. The following analysis is based on probabilistic risk. It models a methodology that has been widely used to assess the likelihood of disaster-related economic losses and fatalities. IDMC is, for the first time, testing this methodology to assess the likelihood of displacement.

This methodology will be refined and expanded in 2014 in regional analyses focusing on the Pacific, South Asia and South-East Asia. A fifth consultation, on displacement in the Horn of Africa, will expand on the analysis by employing a methodology based on system dynamics modelling. 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.

Executive Summary

This technical paper provides evidence-based estimates of the likelihood of disaster-induced displacement in Central American and selected Caribbean states – Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua and Panama. It represents a first attempt to better quantify human displacement risk. It brings together data from several sources – notably the *Global Assessment Reports* (GARs) of the United Nations International Strategy for Disaster Reduction (UNISDR), national disaster loss inventory databases (DesInventar) and the Internal Displacement Monitoring Centre's (IDMC) *Global Estimates* – in order to better quantify human displacement risk. Applying a probabilistic risk model, it is a first attempt to project how many people are at risk of being displaced by natural hazard based disasters.

A new way of thinking

The study reflects emerging 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 being perceived as '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 disasters. This conceptual development dates from the UN International Decade of Natural Disaster Reduction in the 1990s and is reflected in the 2005 Hyogo Framework for Action (HFA). One important outcome of the HFA process is awareness that without ability to measure it is not possible to know if disaster risk has been reduced.

In the context of disasters, displacement includes all forced or obliged population movements resulting from the immediate threat of, or actual, disaster situation 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 in relation to disasters are assumed to remain within their own country rather than to cross internationally recognised borders to find refuge.

Displacement is a disaster impact which 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 or processes. The most significant factors are those that leave exposed and vulnerable communities without the means to be resilient in the face of such hazards.

Informed by this anticipatory way of thinking about disasters, the approach used in this study departs from past 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 the following 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 protection this study analyses disaster-induced displacement in the language of the disaster risk reduction and disaster risk management communities. 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 and risk management and development.

Regional context

With the exception of Mexico, the region consists of relatively small countries with substantial populations facing recurrent large-, medium- and small-scale disasters. Countries in the north of the region have substantially increased exposure to hurricanes and tropical storms, while those in the south – but also including the Caribbean islands and southern Mexico – have higher earthquake exposure. In many cases, national resources to address substantial disaster-driven displacement events are extremely limited, readily exceeding national financial capabilities and potentially leaving many of those displaced forced to fend for themselves.

Given the region's configuration of natural hazards and vulnerability, researchers have taken early, and impor-

Table 1: Disaster displacement estimates- preliminary results

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Belize	332,000	846	10	2,547	5	Medium
Costa Rica	4,860,000	7,166	8	1,474	8	Low
Dominican Republic	10,291,000	24,543	4	2,385	6	Medium
El Salvador	6,326,000	16,791	6	2,654	4	Medium
Guatemala	15,419,000	56,587	3	3,670	2	High
Haiti	10,261,000	92,042	1	8,970	1	Very high
Honduras	8,075,000	13,714	7	1,698	7	High
Mexico	119,321,000	58,526	2	490	9	Low
Nicaragua	6,066,000	20,555	5	3,389	3	High
Panama	3,864,000	1,059	9	274	10	Low
TOTAL	184,815,000	291,828		2,755		Medium

tant, steps toward reframing the topic of disaster risk. The notion of disasters as largely man-made events was pioneered in the 1980s by members of the disaster risk reduction (DRR) and disaster risk management (DRM) community in the Latin American and the Caribbean (LAC) region. El Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC) – an inter-governmental forum for promoting regional cooperation in disaster prevention – was launched in 1987. The Latin American Network for the Social Study of Disaster Prevention (LA RED) – an independent civil society network concerned with DRR-related research, information, capacity building and education – has been active in 15 countries since 1992.

Terms and concepts used by the UN as well as by the Intergovernmental Panel on Climate Change's (IPCC) can all be traced back to research initiated in the region. The most promising advance in disaster loss information is held in the many DesInventar databases pioneered at the national level by many of the region's countries. Thus, it is fitting that the first attempts at displacement risk modelling should leverage these much more detailed loss databases.

Preliminary results and findings

In this paper, human displacement risk due to disasters and climate change has been estimated as a 'magnitude'" index expressed as the number of persons expected to be displaced on average per year. Results are provided in both absolute and relative number of displaced. A separate qualitative 'amplitude' measure expresses the general duration and harshness of the typical displacement.

The initial modelled displacement estimates were found to be line with expected results. The risk displacement estimates were generated without knowledge of the methodology used by IDMC's Disaster-induced Displacement Database (DiDD) or its estimates over the past five years, yet the preliminary results of this risk assessment process are largely in line with DiDD figures. Furthermore countries with higher Human Development Indexes, better governance indicators and higher per capita incomes 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. Both of these patterns are in line with findings of studies on vulnerability, exposure and resilience indicators in the context of disaster risk.

Key Findings:

1. Estimated displacement for the ten reviewed countries is of just under 300,000 displaced per year. Haiti, Mexico and Guatemala contribute two thirds of this total, with Belize and Panama contributing hardly anything.

2. Of the population of approximately 184 million in the studied countries there are expected to be about 2,750 people per million displaced annually per.

3. The highest relative displacement risk estimates were recorded for countries with historic patterns of civil strife and/or poor governance. In order of highest estimated displacement these are Haiti, Guatemala, Nicaragua and El Salvador.

4. Countries with high resilience scores and low hazard exposure levels – including Belize and Panama – had substantially lower displacement risk estimates.

5. Countries with intrinsically high levels of exposure to one or more hazards can effectively reduce displacement risk with proper implementation of development management tools such as building codes and land use planning. Costa Rica's long-established seismic building codes demonstrate how this may be done.

6. Extensive and slow-onset risk patterns are highly relevant to quantifying displacement risk, but difficult to extract from available data. Preliminary studies show that better analysis of these events could make them visible, thus adding significantly to the total reported number of displaced persons.

7. The studied LAC countries offer a wide range of hazard, exposure and resilience configurations, making the region a unique example of risk heterogeneity in a comparatively small area.

8. Initial estimates demonstrate the need for improvement in data sources and data quality in order to properly assess displacement risk. Regional-level data collection approaches with broad inclusion criteria and standard methodologies can help improve understanding.

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."[2]

This technical paper provides evidence-based estimates of the likelihood of disaster-induced displacement in Central America. Applying a probabilistic risk model, it begins to project how many people are at risk of being displaced by disasters by using evidence from reported situations of disaster-induced displacement. It builds upon the existing evidence base concerning disaster risk and disaster-induced displacement, particularly that which has been consolidated in the United Nations International Strategy for Disaster Reduction's (UNISDR) three *Global Assessment Reports* (GARs)[3] and the Internal Displacement Monitoring Centre's (IDMC) *Global Estimates.*[4] It provides forward-looking estimates, a spatial 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 multi-lateral consultations of the Nansen Initiative[5], 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 or avoid the risk of displacement. Humanitarian actors may also be interested in the findings as a means of informing preparedness planning for disaster-induced displacement.

This paper covers human displacement risk in the Central American and Caribbean countries of Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua and Panama. With the exception of Mexico, the region consists of relatively small countries with substantial populations facing such disaster risks as hurricanes tropical storms, earthquakes, floods, droughts, volcanic eruptions and landslides. National resources to address substantial disaster-driven displacement events are often limited, potentially exceeding national capabilities to respond adequately, thus leaving many of those displaced with little choice other than to fend for themselves.

IDMC research has found that at least 80 per cent of the world's disaster-driven displacement in the past five years has been triggered by hydro-meteorological events[6]. Although this region displays one of the highest levels of displacement risk from to geophysical events such as earthquakes and volcanoes, a significant portion of the region's displacement is from hydro-meteorological events. Due to a combination of the rugged topography, high population densities, poor enforcement of building and zoning regulations and high income inequality there

A man dismantles his home to move to higher ground after the flooding in Managua, Nicaragua. Credit: OCHA/Charles Bernimolin, November 2011 are substantial losses triggered by hydro-meteorological events, but more importantly, directly related to skewed development processes. These include disasters such as landslides affecting informal settlements at the base of steep slopes and downstream flooding caused by development-driven changes in upstream land use such as reductions in permeable surface area. The compounding effect of hydro-meteorological events occurring together with geophysical events, such as a period of high rainfall preceding an earthquake, frequently lead to much higher levels of damage and displacement.

Different economic activities each help to contribute to total displacement risk. Tourism often tends to drive development in highly exposed coastal areas where events with shorter and shorter return periods are increasingly leading to damaging events and more frequently recurring losses. Losses incurred by large tourism operators are usually covered by insurance companies while tourist industry employees are left to fend for themselves, often suffering loss of shelter and/or livelihoods. Agricultural activities are highly subject to changes in climatological patterns. With increasing stress placed on water sources, those with a limited resource base may have no choice but to move to seek alternative short- or long-term livelihoods.

The region has a mixture of both internal and external human displacement that is largely driven by access to livelihoods. Countries such as Costa Rica and Panama with income levels above regional averages tend to themselves lead responses to internal displacement. Poorer countries, such as Nicaragua and Guatemala that have suffered from a long series of disasters associated with both natural and man-made hazards, have seen long-term erosion of livelihoods. This leaves many of those displaced by disasters with little choice other than extra-legal migration to more prosperous neighbouring states where they typically settle in low-cost, high-risk areas, often putting themselves at further risk of natural disaster-driven displacement.

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 selected LAC countries. The goal is to look beyond historic displacement figures towards what future displacement risks await different regions, countries and communities. As the first of several regional analyses based on a displacement risk methodology under development by IDMC, it:

- advances several considerations for modelling of displacement risk
- sets out a new assessment methodology which will be refined and formalised in 2014
- seeks to yield results that are as accurate and certain as possible with available data
- informs discussions on displacement risk for the Nansen Initiative consultation with Central American and Caribbean countries scheduled for December 2013.

The findings presented here are the result of a pilot study and use the best available spatial and temporal evidence to generate displacement risk estimates. Especially in the light of climate change related pressures, these displacement risk estimates provide a look at potential displacement, rather than historic displacement, in order to help bring to light the implications of disaster-induced human displacement trends. As a pilot, results contained in this paper should be considered provisional as the methodology is improved and expanded. A complete explanation of the methodology used in the analysis will be published once the methodology is finalised in 2014. A draft version of the methodology document is available by contacting this paper's authors for those interested in providing feedback on the methodology.

2.2 Strengths and weaknesses of the 'risk' approach

The objective of this project is to generate probabilistic risk information that quantifies expected human 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 level of capture of loss events within differing databases, differences in methodologies between national databases and 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 qualitative input to help fill the gaps. The study identifies principal sources of bias and error involved in the initial quantitative measures.

The strength of the approach is to use high-quality disaster loss data that is most relevant to displacement risk, that which specifically relates to those left homeless after disasters. This is also relevant in relation to the study's principal methodological constraint, its application to disasters that do not destroy homes but which do lead to displacement: these are necessarily under-represented. For a similar reason, it is also exceedingly difficult to quantify displacement due to drought.[7] A further challenge is determination of the distance and duration of displacement, both of which are hard to quantify using purely loss data. Developing proxies to measure the impact of loss of livelihoods will be necessary at some point. This is also true of attempts to quantify risks that loss data has not yet captured (such as sea level rise or ocean acidification) which will also require a different approach.

For these reasons, this paper focuses principally on generating displacement estimates related to number of people expected to be displaced using data relating to homelessness. It also uses other peripheral types of loss data beyond homeless figures, 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 reduce sources of uncertainty.

Glossary of Key Terms[8]

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.[9]

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."[10] 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 a disaster 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**.

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

Vulnerability is the degree of susceptibility of these assets to suffer damage and loss due to inadequate design and construction, lack of maintenance, unsafe and precarious living conditions and lack of access to emergency services.[11]

'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'.

The United Nations' Guiding Principles on Internal Displacement (GPID) observe that **displacement** may occur as a result of, or in order to avoid the effects of, disasters.[12] 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.

People are considered displaced when they have been forced to leave their homes or places of residence and the possibility of return is not permissible, feasible or cannot be reasonably required of them. Voluntary migration is at the other end of the spectrum of population mobility. 'Voluntary' does not necessarily imply complete freedom of choice, but merely that "voluntariness exists where space to choose between realistic options still exists."[13]

A key tool under development for the next stage of this methodology is a human displacement analogue for the Hybrid Loss Curve approach pioneered by Evaluación de Riesgos Naturales-América Latina (ERN-AL), a Latin-American research organisation. This seeks to better quantify disaster risk (or, in this case, displacement risk) by joining empirical loss data for more frequently recurring events with modelled results for expected losses in the case of infrequently recurring events. The loss/return period graphs for both of these datasets can then be expressed as a single continuous curve.

2.3 'Natural' disasters?

The standard nomenclature for computing disaster risk is as a convolution[14] of hazard, exposure and vulnerability (see figure 2.1).

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 considered that disaster risk is generally increasing due to increases in exposure. For example, populations continue to grow in coastal areas regardless of the fact that they are subject to hurricanes, storm flooding, tsunami risk and sea level rise. The problem is not only that development patterns area leading to more humans settling in exposed areas but also that those that are living in these exposed areas often do so in a highly vulnerable fashion that can be a recipe of disaster. Examples include the use of inadequate masonry techniques in earthquake-prone areas and the settlement of unstable hillsides surrounding coastal cities with high precipitation levels. This leads to landslides affecting extra-legal settlements and downstream flooding caused by development-driven reductions in permeable land upstream.

Climate change and other anthropogenic causes increase hazard levels. These increases are not just through increases in magnitude and frequency of extreme (or intensive) events[15], but also due to the changing averages that may significantly increase the number of non-extreme (or extensive) events that together lead to substantial aggregate losses.

Vulnerability levels are generally considered to be slowly declining on a global level, although not at a sufficient pace to keep increases in exposure in check. When looked at from the local level, this view often breaks down as vulnerability levels vary widely with some communities locked into cycles of extreme vulnerability, such as those facing flooding from sea-level rise. Disaster loss databases report increasing losses due, in particular, to hydro-meteorological events. Considering all three of these variables together – sustained high vulnerability levels with increasing exposure and hazard levels – helps put these increases into clearer context.

2.4 The displacement dimension: manifestation of extreme disaster risk

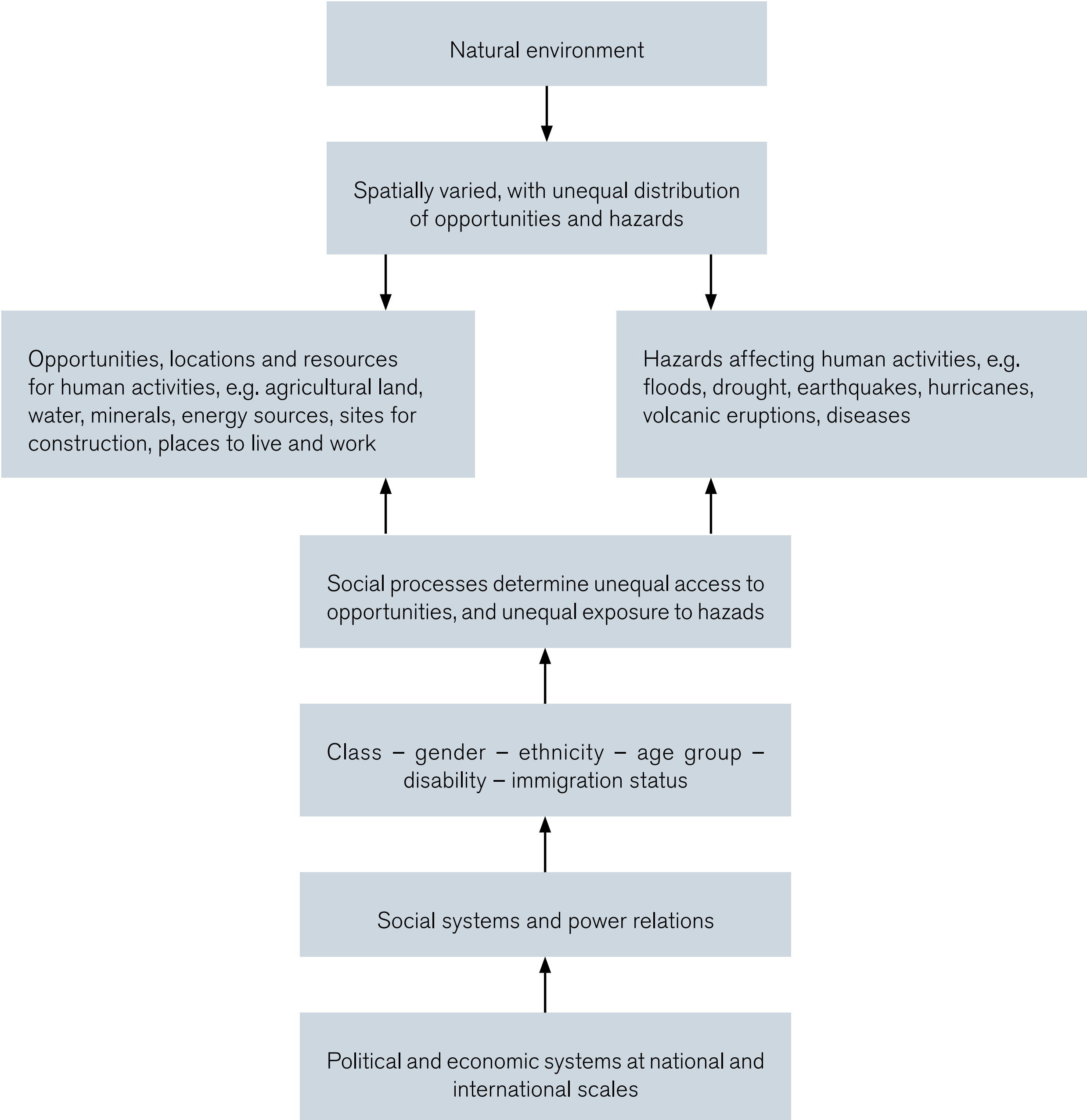
A disaster has historically been quantified in terms of the direct loss of life and capital stock that is depleted with the occurrence of the given natural event. Recently there has been greater focus on the secondary effects of disasters, which comes closer towards capturing the important component of livelihood 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.[16] 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.[17]

People displaced by naturally triggered disasters are thus often among the most vulnerable populations. Their only form of resilience is to leave home to seek a new living 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. Greater visibility of the problem could deliver aid and, more importantly, reduce or better mitigate this source of displacement risk for those most vulnerable.

The study reflects emerging awareness 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. Disasters are thus no longer being perceived as 'acts of God' but, instead, as

Figure 2.2: Factors and relationships that influence disaster risk



Source: Wisner et al., 2003

something over which humans exert influence. 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 the underlying vulnerability of these social groups. The distance of the displacement, whether to another part of the same community or to a completely different nation/state, is also an important gauge of the level of vulnerability and/or lack of resilience of the 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.[18] 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).

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. This conceptual development dates from the UN International Decade of Natural Disaster Reduction in the 1990s – the precursor to the current UN International Strategy for Disaster Reduction (UNISDR) – to the adoption in 2005 of the Hyogo Framework for Action (HFA) which 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."[19]

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. 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 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 *Global Estimates 2012*, the trend is driven by three 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).[20]

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 most effectively.

IDMC's disaster-induced displacement risk methodology is being piloted in a region in which researchers, NGOs and governments have been pioneering disaster risk reduction (DRR) and disaster risk management (DRM) for decades. The Center for Disaster Prevention in Central America (known in Spanish as El Centro de Coordinación para la Prevención de los Desastres Naturales en América Central, or CEPREDENAC) – a regional inter-governmental forum for promoting regional cooperation in disaster prevention based in Guatemala – was launched in 1987.

The Latin American Network for the Social Study of Disaster Prevention (LA RED) – an independent civil society network concerned with DRR-related research, information, capacity building and education – has been active in 15 countries in Latin America since 1992. Researchers, including Ian Burton, Omar Dario Cardona, Virginia Garcia Acosta, Ken Hewitt, Allan Lavell, Andrew Maskrey, Michael Watts, Gustavo Wilchez-Chaux and Ben Wisner, to name just a few, have helped lay the groundwork for the establishment of CEPREDENAC, the work of LA RED and how disaster risk is understood today.

For example, Susman, O'Keefe and Wisner (1983) draw on case studies of the 1976 earthquake in Guatemala and Hurricane Fifi, which stuck Honduras in 1974, to illustrate the point that disaster outcomes such as displacement are shaped by vulnerability and marginalisation.[21] Terms and concepts used in this paper, UNISDR's GARs, other UN reports as well as in the Intergovernmental Panel on Climate Change's (IPCC) Special Report Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) can all be traced to research initiated in the region.

The probabilistic risk assessment methodology used in this analysis is also based, in part, on existing projects in Central America and Colombia. These include the Probabilistic Risk Assessment Initiative (CAPRA), whose acronym derives from the initiative's original name (the Central America Probabilistic Risk Assessment) and ERN-AL.

3 Displacement risk in Central America and the Caribbean

3.1 Measuring displacement risk

In this paper, human displacement risk due to disasters and climate change has been estimated as an index expressed as the number of persons expected to be displaced on average per year. Results are provided in both absolute and relative number of displaced. A separate qualitative measure expresses the general distance and duration of the typical displacement. The terms magnitude and amplitude are used to convey these two dimensions of disaster induced displacement.

Magnitude refers to the total number of people expected to be displaced by natural disasters and climate change. 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. Rankings between the ten studied countries in terms of absolute and relative expected displacement are also provided. Colour-coded representations are used in which green equals least modelled displacement risk and red the most (see figure 3.1).

In order to properly configure displacement risk, beyond the number of people expected to be displaced, it is also important to determine how challenging and for how long those affected may be displaced. In an initial attempt to measure this variable this paper refers to the difficulty and duration of displacement as the amplitude of the displacement and represents the difficulty in living and livelihood generation together with the expected duration of displacement (from short-term to protracted to situations in which safe return is not possible). This 'amplitude' of displacement is expressed on a scale from 'low' to 'very high'.

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[22] to produce estimates of annual average displacement risk for each of the ten reviewed countries. For loss data, EM-DAT[23] and DesInventar[24] databases were used primarily for their homeless data (or 'homes destroyed') as the primary proxy for displacement. Other disaster metrics, such as number of people affected, were also used to estimate displacement risk as often these entries were more consistent than homeless data in both databases.

The displacement risk estimates described in this section are the result of the first prototype iteration of the model and, as such, all results should be considered purely as preliminary and very likely subject to change. Normalisation, as well as final ranks and scores, are currently only based on the ten countries that form the basis for this study. All results will need to be re-calibrated once a more extensive global analysis is done. This could lead to significant changes in final figures. The amplitude measure is provided solely as an example of how the final index may display results; calculation for this prototype is only handled in a very basic fashion.

All of these variables must be kept in mind when considering the necessarily 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 country reports provide additional information with which to further dimension displacement risk at national and sub-national levels.

Generally, modelled displacement patterns 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 preliminary results are largely in line with DiDD figures. Secondly, 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. This meshes with findings from disaster risk studies focusing on vulnerability, exposure and resilience indicators.

3.2 Annual displacement estimates

KEY FINDING #1: Estimated displacement for the ten reviewed countries is just under 300,000 displaced per year. Results vary, Haiti, Mexico and Guatemala contributing two thirds of this total and Belize and Panama hardly anything. Although the greatest total displacement risk rests with the most populous countries, as might well have been expected, the displacement risk averages for the individual countries show highly varied risk configurations. Almost a third of the total displacement risk comes from Haiti which has less than ten per cent of

Figure 3.1: Disaster displacement estimates- preliminary results

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Belize	332,000	846	10	2,547	5	Medium
Costa Rica	4,860,000	7,166	8	1,474	8	Low
Dominican Republic	10,291,000	24,543	4	2,385	6	Medium
El Salvador	6,326,000	16,791	6	2,654	4	Medium
Guatemala	15,419,000	56,587	3	3,670	2	High
Haiti	10,261,000	92,042	1	8,970	1	Very high
Honduras	8,075,000	13,714	7	1,698	7	High
Mexico	119,321,000	58,526	2	490	9	Low
Nicaragua	6,066,000	20,555	5	3,389	3	High
Panama	3,864,000	1,059	9	274	10	Low
TOTAL	184,815,000	291,828		2,755		Medium

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnera-bility	Resi-lience	Risk Confi-guration	Risk Configuration (Normalised)	Historic Absolute Displace-ment	Historic Relative Displacement (per 1M)
Belize	8.70	8.50	6.04	1.22	0.13	747	2,250
Costa Rica	27.85	6.50	7.43	2.44	0.32	5,431	1,118
Dominican Republic	17.46	5.25	6.14	1.49	0.17	20,915	2,032
El Salvador	20.58	7.33	6.32	2.39	0.31	12,800	2,023
Guatemala	19.77	7.00	5.25	2.64	0.35	41,916	2,718
Haiti	15.11	5.50	3.93	2.11	0.27	72,512	7,067
Honduras	8.50	7.00	5.70	1.04	0.10	12,422	1,538
Mexico	8.49	5.50	6.42	0.73	0.06	55,473	465
Nicaragua	17.79	6.25	5.72	1.95	0.24	16,533	2,725
Panama	6.11	7.00	6.15	0.70	0.05	1,009	261
TOTAL	15	6.6	5.91	2	0.20	239,757	2,220

the total population of the countries analysed. Belize's and Panama's totals, due to low historic loss levels and reasonably high resilience scores, add an almost trivial amount to the total.

KEY FINDING #2: With a total population of approximately 184 million in the studied countries, there are expected to be about 2,750 people displaced annually per million people. This measure of the relative magnitude of displacement strips away the element of a country's size to better understand how much displacement affects people at the local level between different countries. Compared to the world-wide annual average of around 4,000 displaced per million, this region's figures are still significantly below the levels seen in South-East and East Asia, much higher than the average for developed countries. Considering that many of those displaced in the region are due to events that have an important man-made component these risk estimates can be a valuable indicator of how well different levels of government and civil society are serving their constituencies in terms of displacement risk reduction.

KEY FINDING #3: The highest relative displacement risk estimates were recorded for countries with historic patterns of civil strife and/or poor governance; in order of highest estimated displacement these are Haiti, Guatemala, Nicaragua and El Salvador. Many of the populations in these countries have suffered in the recent past from civil unrest, clearly demonstrating the linkage between long-term civil conflict and underlying vulnerability patterns. Low resilience levels accumulated over years of challenging livelihoods and few alternate sources of income often lead to both higher numbers of displaced persons as well as the recurrent displacement of marginalised groups seeking sustainable livelihoods and shelter.

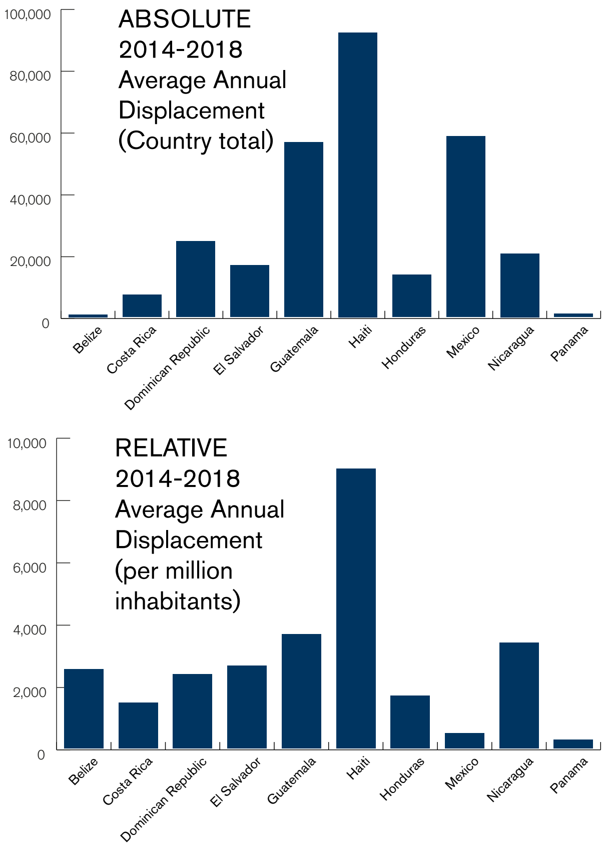
Haiti's relative displacement numbers were significantly higher than any of the other countries in the bottom third of the ranking on this measure. Although a portion of this is due to the high recent homeless figures caused by the 2010 earthquake, Haitian results illustrate the effect of an on-going combination of high hazard, high exposure, high vulnerability and low resilience levels.

KEY FINDING #4: Countries with high resilience scores and low hazard exposure levels had substantially lower displacement risk estimates; these include Belize and Panama. For example, Panama, with its low exposure to both hydro-meteorological and geophysical hazards and relatively high resilience levels, has the lowest relative displacement figures of the ten analysed countries.

It is important, however, to note that country-wide averages can often inaccurately convey the reality at the local level, where averages can mask large variances in disaster and displacement risk patterns, especially among less 'visible' marginalised groups, such as many indigenous cultures found throughout LAC.

KEY FINDING #5: Countries with intrinsically high levels of exposure to one or more hazards can effectively reduce displacement risk with proper implementation of development management tools such as building codes and land use planning, such as Costa Rica's long-standing seismic building codes demonstrate. For example, Costa Rica scored reasonably well, considering its much higher earthquake exposure data. It demonstrates how countries with high risk configurations can, over time, reduce their vulnerability levels and increase resilience in the face of on-going hazards. Costa Rica's primary displacement risk is seismic, potentially affecting a third

Figure 3.2: Absolute & Relative disaster displacement estimates



of the population. Experience with this type of risk – such as the 1910 earthquake that levelled the former capital, Cartago, and subsequent adoption of the most stringent seismic building codes in the region – demonstrates the impact of a culture of long-term prevention and mitigation.

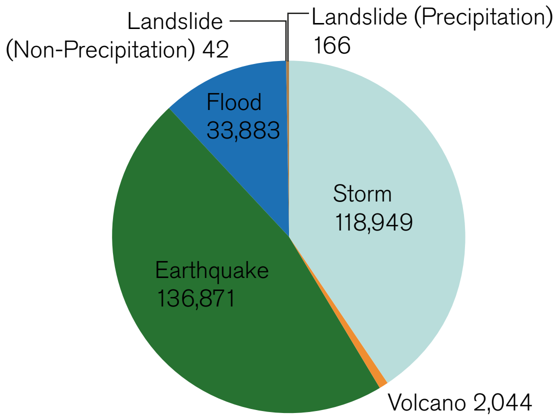
In addition to being an exemplar of hazard-resistant building practices Costa Rica illustrates the challenges that hydro-meteorological events are bringing to the region. More recent development-based risks such as floods and landslides contribute to overall displacement risk although they are not well documented due to their typically lower independent number of affected and deceased persons, both in Costa Rica and the region in general. A potential example of this bias against wide-spread but small-scale flooding and landslide events can be seen in the results for Honduras: despite impacts of Hurricane Mitch in 1998, it still scores lower on the relative displacement magnitude scale than many other countries in the region.

KEY FINDING #6: Extensive and slow-onset risk patterns are highly relevant to quantifying displacement risk, but difficult to extract from available data; preliminary studies show that better analysis of these events could make visible, and thus add significantly to the total reported number of displaced persons. Marginalised communities in El Salvador, the region's most densely populated country, are often forced to settle in higher risk areas which lead to recurring, smaller-scale internal displacement patterns largely dependent on specific year-to-year patterns of small-scale, or extensive, disaster risk. Economic and social progress since the conclusion of its civil war has helped to significantly reduce displacement as vulnerability levels have receded and livelihoods improved. However, the underlying source of risk – highly vulnerable populations living in exposed areas – is a common problem in many of the assessed countries. The DesInventar databases found in most of the reviewed countries paint a much better picture of risk at the sub-national level: recurrent, small scale losses can be found usually concentrated among a few highly exposed and/or more remote areas of each country. This can be seen in many of the loss maps found in the individual country reports.

KEY FINDING #7: The studied LAC countries offer a wide range of hazard, exposure and resilience configurations, making the region a unique example of risk heterogeneity in a comparatively small area. A wide variety of hazards, from seismic, and its related tsunami, risk to winds, rain, flooding and landslides, and the harder to quantify drought risk, make the region a good case study for learning to manage complex risk configurations. Combined with the wide variety of socio-economic conditions that exist on the ground, the region offers a complex array of potential development and risk management problems and potential solutions

Due to a combination of rugged topography, high population densities, social inequality and haphazard enforcement of land-use regulations, many of the region's losses can be directly related to development processes. These include landslides affecting extra-legal settlements and

Figure 3.3: Disaster displacement totals per type of disaster (includes data for all 10 countries in the study).



downstream flooding caused by development-driven reductions in permeable land upstream. Tourism often tends to drive development in highly exposed coastal areas where more frequent damaging events lead to recurring losses. In areas that have suffered from a long series of disasters associated with both natural and man-made hazards, the resultant long-term erosion of livelihoods has left many of those displaced by disasters with little choice other than enduring a pattern of ongoing displacement or seeking extra-legal migration to more prosperous neighbouring state. These highly vulnerable groups often settle in low-cost, high-risk areas, often putting themselves at further risk of displacement.

KEY FINDING #8: Initial estimates demonstrate the need for improvement in data sources and data quality in order to properly assess displacement risk. Regional data collection approaches with broad inclusion criteria and standard methodologies can help improve understanding. For example, Mexico posts a similarly low relative score to Panama's. It is possible that due to the large population of around 120 million Mexico's relative risk is indeed in line with Panama's. However, such a low relative score may also be indicative of methodological limitations due largely to variances in reporting of loss data. For example, Mexico's primary displacement risk hazard, drought, is not yet well reflected in the results due to relatively high reliance on homeless loss figures in this initial iteration of the displacement risk estimates. Other countries in the ten-country sample also exhibited problems with data: Belize doesn't register any housing losses whatsoever in the 40-year sample that was used from EM-DAT and official figures for Haiti's 2010 earthquake are still particularly hard to come by.

Haiti demonstrates the methodological difficulties in using the available quantitative loss data to assess displacement risk. Haiti's historic loss figures are much higher than any of the other analysed countries. However, a lack of homeless figures for any of Haiti's disaster entries in EM-DAT had the effect of reducing the effect of the 2010 earthquake's numbers as these were averaged out over the 41-year sample period used. DesInventar was consulted in order to help assess sub-national displacement risk but only contains data for the 2010 earthquake, leaving no back-up source for Haiti's historic homeless figures. Considering the importance of homeless figures as a primary proxy for displacement risk, it is difficult to draw more accurate conclusions about the magnitude of Haiti's displacement risk at this point. This points to the importance of a parallel approach, such as one based on livelihoods, in order to compensate for lack of adequate loss data.

Each of the consulted datasets offered specific challenges for computing preliminary values within reasonable margins of error. Disaster loss data, unlike insurance loss data, is highly variable from region to region and country to county, in terms of the level of coverage, accuracy of data entry and lower-thresholds for inclusion. Other components in the risk equation, such as vulnerability and resilience don't lend themselves to simple, accurate quantification. Accurately compiled loss datasets have at most around 40 years of high quality data.[25] This is mostly far too short for assessing risk from lower recurrence events. Furthermore, these data sources often exhibit large variations in data collection methodologies, especially in terms of data regarding homeless figures.[26]

3.2.1 Displacement distance and duration

It is hoped that an improved methodology for this part of the displacement risk indicator will be forthcoming. More thorough qualitative displacement amplitude results will in the future help us progress towards a more complete picture of how displacement risk is configured in the region.

Reliable qualitative displacement amplitude (distance and duration of displacement) figures are related to: country size; median GDP per capita relative to neighbouring and regional values; human development levels and future livelihood potential – prospects for restoration of livelihoods once disaster conditions return back to normal.

In terms of the preliminary amplitude findings, Costa Rica and Panama have low displacement amplitude risk scores due to their higher relative per capita incomes that enable displaced people to find suitable replacement livelihoods without having to flee or move abroad. Mexico also has a low amplitude risk score due to its large size and resultant options to displace internally, albeit at some distance from habitual places of residence. Haiti, Nicaragua, Honduras and Guatemala have higher displacement amplitude scores due to their low human development and income levels and existing migration routes that may lead displaced people to flee across a border or seek better opportunities farther away. The impact of hurricanes Mitch in 1998 and Stan in 2005 are still evident in Honduras and Guatemala where high vulnerability levels and increased exposure to hazards lead to patterns of on-going livelihood erosion. These patterns of extensive risk are similar to the gradual accumulation of losses in slow-onset disasters and also manifest the same difficulty with quantifying exactly what counts as displacement, rather than migration.

3.2.2 Future estimates

For detailed displacement risk information, as well as loss and risk figures per hazard, type refer to national reports. Future methodological improvements, should data permit, include the disaggregation of displacement risk per hazard type. The preliminary disaster displacement numbers in figure 3.1 lists the number of people on average expected to be displaced per year and can be thought of as the actuarial analogue of the kind of average annual loss (AAL) calculation commonly used in the insurance industry. Eventually a probabilistic loss exceedance model such as ERN's Hybrid Loss Curves methodology will be adopted to complement these averages with probable maximum displacement figures. Another essential element of assessing displacement risk is to realistically portray uncertainty levels behind the estimates, which will be forthcoming in a later version.

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. And just 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. 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.

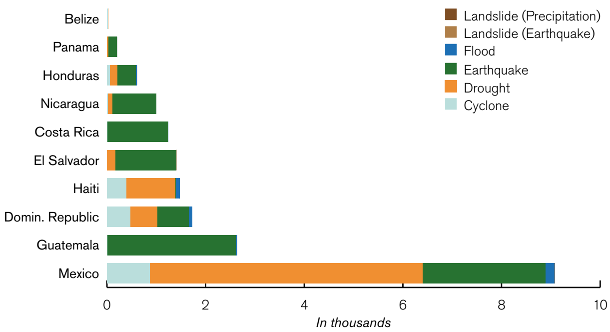
3.3 Key data

3.3.1 Hazard and exposure data

Country level data in this paper can help contextualise human displacement in the region by bringing together data on displacement-specific hazard, exposure and vulnerability components of disaster risk. The leading hazards contributing to regional displacement risk include hurricanes, tropical storms, wind storms, floods, landslides, drought, volcanoes and earthquakes. Each country has a unique configuration of several of these hazards. In general, all experience some level of displacement from floods and landslides and most have some level of earthquake risk.

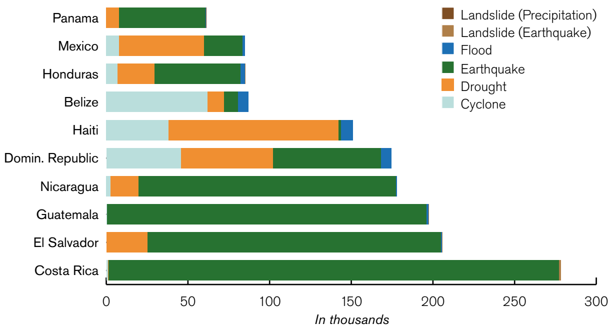
Countries in the north of the region have substantially increased exposure to hurricanes and tropical storms– including the Caribbean islands and Mexico – while those in the south have substantially higher earthquake exposure. Impacts and responses to Hurricane Mitch suggest that more intense, lower recurrence events can expose substantial portions of the populations of other Central American nations to this hazard.

Figure 3.4: Total population exposed to principal natural hazards.



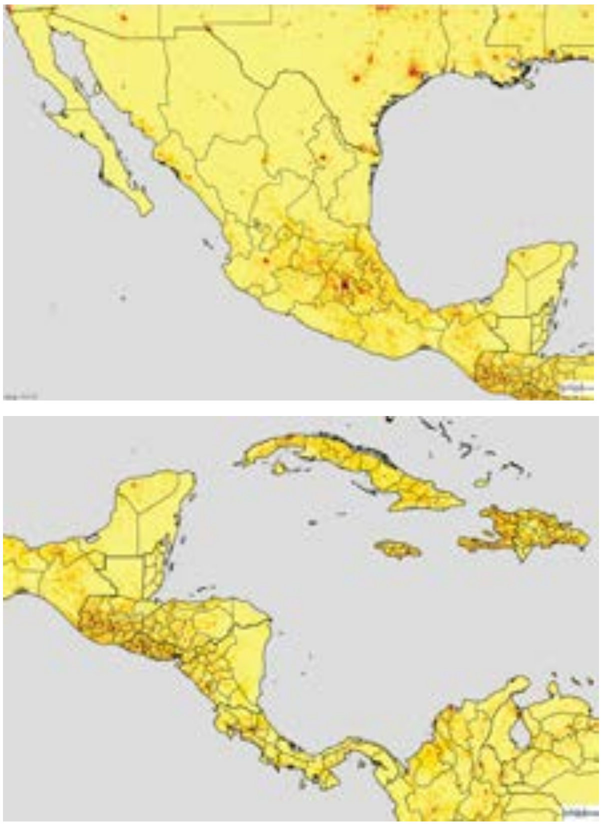
Source data: UNEP GRID Physical Exposure Data 2011

Figure 3.5: Relative population exposure to natural hazards.



Source data: UNEP GRID Physical Exposure Data 2011

Figure 3.6a, b: Population density data for Central America and the Caribbean



Source: UNEP PREVIEW

Earthquake hazard exposure is focused on the Pacific region of Central American nations and the Caribbean states of the Dominican Republic and Haiti. Highest exposure levels are found in Guatemala, El Salvador, Nicaragua, Costa Rica and the Dominican Republic even though the most significant recent seismic event in terms of displacement occurred in Haiti. All of these countries have more people exposed to earthquake hazard than to any other single type of hazard. Hazard and exposure models, such as PREVIEW developed by the UN Environmental Programme (UNEP), place total earthquake exposure above that of hydro-meteorological events in many of the analysed countries.

Cyclone hazard, including high winds and heavy rainfall, has very high exposure levels throughout all of the Dominican Republic and Haiti. Otherwise, mainland countries are limited in cyclone hazard to sections of their Caribbean coasts (except for Mexico, which also has exposure on the Pacific coast around the Baja California region). Hurricane impact, however, is difficult to measure concretely as much wider areas are often subject to related hydro-meteorological events. Hurricane Mitch is a prime example: heavy rainfall in Honduras and Guatemala led to extensive losses even though hurricane winds were not present in many affected areas.

Landslides affect a much smaller portion of the total population than either earthquakes or storms. Their frequency and the levels of damage they bring about have been recorded with increasing accuracy, thus helping to paint a much better picture of the effects of this hazard to those exposed to it. As the PREVIEW map demonstrates, this risk exists in most Central American nations as they often consist of steep slopes which can readily become unstable due to logging, agriculture, settlement and/or meteorological/geological conditions.

Storm surge hazard exists for all areas with cyclone exposure and is an important exposure consideration for displacement risk as damage levels to houses from storm surge can be quite severe. Disruption in coastal cities can have long-term effects on livelihoods. All of the studied countries have some exposure to this hazard, with Belize, Mexico, Haiti and the Dominican Republic sharing the highest absolute and relative exposure levels.

Drought exposure in the reviewed countries is one of the single largest hazards in terms of land mass covered and number of people potentially exposed. By total population, the approximately five million Mexicans exposed to drought make up the single biggest concentration of people exposed to potential displacement risk. Due to the

Figure 3.7a,b: Earthquake hazard exposure for Central America and the Caribbean

Less than 5 (people/year)
5 - 50 (people/year)
50 - 500 (people/year)
500 - 5,000 (people/year)
More than 5,000 (people/year)
Source: UNEP PREVIEW

Figure 3.8a, b: Cyclone hazard exposure for Central America and the Caribbean

Less than 10 (people/year)
10 - 100 (people/year)
100 - 1,000 (people/year)
1,000 - 10,000 (people/year)
More than 10,000 (people/year)
Source: UNEP PREVIEW

limited extent of irrigation and inefficient water management practices many of the countries in the region could suffer substantial displacement due to future drought conditions, especially in the light of climate change-driven changing averages and extremes. As an important source of displacement risk it is included here as one of the many elements to be evaluated qualitatively in terms of assessing regional displacement risk.

Flood hazard, like landslide hazard, is limited to particularly prone locations and thus has a much lower intrinsic exposure rate than hazards such as earthquakes and cyclones that impact populations over wide areas. However, flood losses have been increasing rapidly and are one of the primary hazard types closely related to skewed development processes that magnify the effects of heavy rainfall. Figure 4.9 demonstrates exposure patterns around Veracruz, Mexico. Regional maps for this hazard are not provided as the affected areas are hard to see at this scale. All nations in the reviewed set have substantial flood exposure due to mal-development and propensity for substantial flow increases to be triggered by increasingly short duration and intense storms. These events are frequent sources of both immediate displacement and longer-term induced displacement due to ongoing, repeated losses.

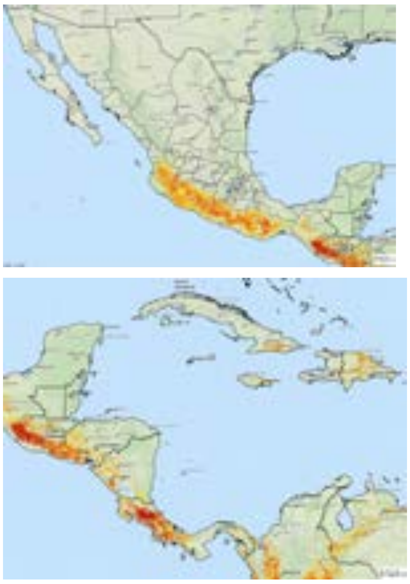
3.3.2 Vulnerability and resilience data

Vulnerability data is harder to gather than hazard or exposure information as it must be derived deductively from manifest risk (that is, via disaster loss data) by subtracting out hazard and exposure components of the overall risk. Figure 3.3 lists UNEP's ranking for vulnerability to specific hazards, utilising such a methodology. This is necessarily a difficult task as several sources of confounding (or bias) lower the certainty level: these include:

- sparse loss data in one or more pertinent categories for one or more of the reviewed countries
- relatively short sample periods for dealing with longer return period events
- social and development patterns are continually changing as societies evolve: thus loss data from one period may not be very comparable with that from a previous era
- ongoing detrimental development processes and demographic trends which inhibit the use of long-run averages.

As noted, when looked at on a hazard basis, vulnerability figures demonstrate a wide range of combinations from country to country. Costa Rica, like all countries in the region, is highly vulnerable to hydro-meteorological hazards, in particular floods and landslides. Their causes are often related to unsustainable development processes that construct many of these risks. Rain events frequently trigger localised flooding due to low-quality infrastructure. This is strongly linked to skewed development processes that lead to settlement in hazard-prone regions by marginalised social groups, such as those that end up settling on or below unstable slopes or in river flood zones.

Figure 3.9a, b: Landslide hazard exposure for Central America and the Caribbean



Less than 1 (people/year)
1 - 30 (people/year)
30 - 100 (people/year)
100 - 300 (people/year)
More than 300 (people/year)
Source: UNEP PREVIEW

Figure 3.11a, b: Drought hazard exposure for Central America and the Caribbean

Less than 10 ($*1,000/year)
10 - 100 ($*1,000/year)
100 - 1,000 ($*1,000/year)
1,000 - 10,000 ($*1,000/year)
More than 10,000 ($*1,000/year)
Source: UNEP PREVIEW

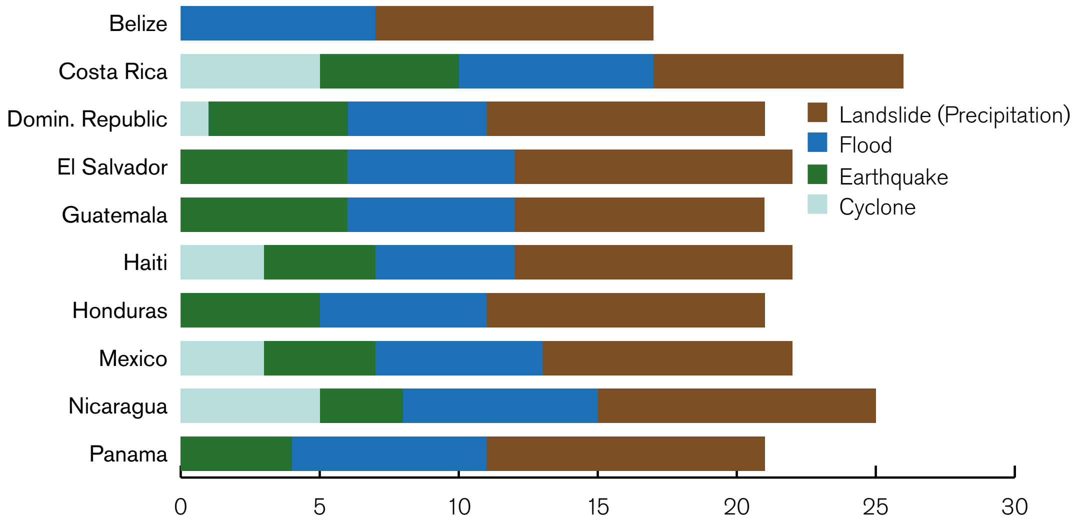
Figure 3.10a, b: Storm surge hazard exposure for Central America and the Caribbean

SScat1
SScat2
SScat3
SScat4
SScat5
Source: UNEP PREVIEW

Figure 3.12: Sample flood hazard exposure for areas of Mexico

Less than 30 (people/year)
30 - 100 (people/year)
100 - 300 (people/year)
300 - 1,000 (people/year)
More than 1,000 (people/year)
Source: UNEP PREVIEW

Figure 3.13: Vulnerability Proxy- Human vulnerability per hazard type



Source data: UNEP GRID Physical Exposure Data 2011

In order to assess displacement risk, we need to quantify the risk configurations by calculating hazard, exposure and vulnerability and to assess the given social group's ability to respond to both disasters and disaster risk. As a way of making this ability to 'bounce back' more tangible, the concept of resilience has been growing in importance in Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) research. For the purposes of this paper, we have used the Indicator of Conditions and Capacities for Risk Reduction (ICCRR) – which is commonly shortened to IRR[27] – developed by Development Assistance Research Associates (DARA) as a proxy for resilience. By combining environmental, economic, social, territorial and governance data this indicator (built from 36 individual indexes providing such information) gives us a rough picture of how well individual countries can respond to disaster and/or risk and thus how well they can prevent potential displacement.

3.3.3 Loss data

In order to examine the human displacement component of overall disaster losses, this paper focuses on recorded losses that are most associated with displacement. In EM-DAT that consisted of 561 entries for the ten countries between 1970 and 2010. Flood and storm counts vastly outnumber geophysical disasters. Landslides are least frequent, with very few total entries.

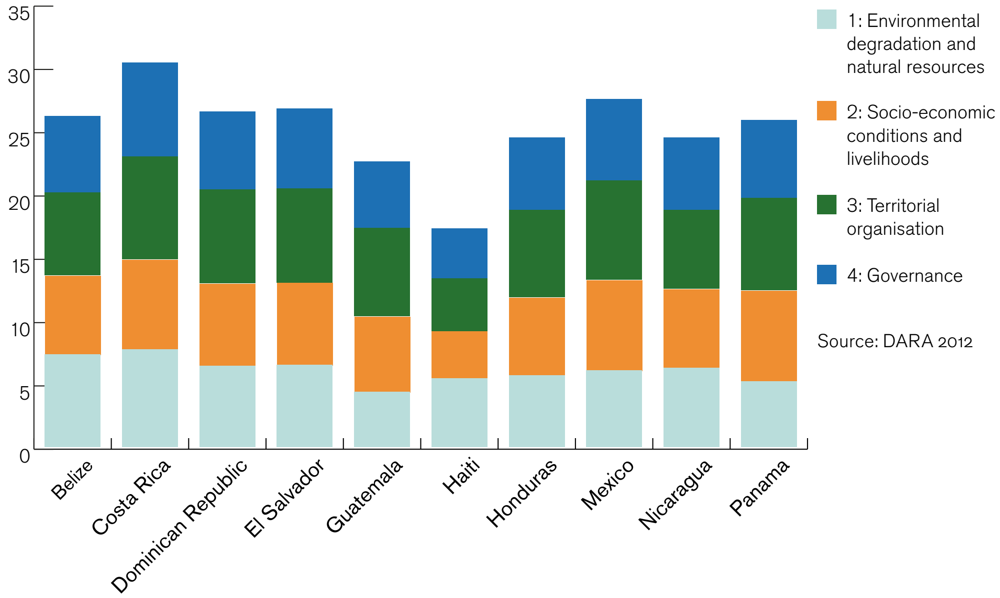
Due to the development of relatively standardised national loss databases (known as DesInventar disaster loss inventories) there is a fair amount of local-level quantitative data available. This allows us to not only understand and quantify the nature of disaster losses but also to enable modelling of displacement risk at a sub-national level. Numbers from these datasets have been used to double-check national numbers and to graphically illustrate sub-national patterns of disaster loss that are often related with displacement risk.

Generally, 'homeless' or 'destroyed houses' figures from the EM-DAT and DesInventar databases are considered the single closest proxy to displaced people. Since the databases do not always report consistent homeless/homes destroyed figures between countries and/or hazard types the number of people affected and number of people killed were factored into the total displacement estimate. Both of these figures are included for a much larger percentage of entries in the databases, making them one of the few access points for estimating displacement in lieu of figures for homeless/homes destroyed.

The DesInventar database for each of the reviewed countries has a specific focus. There are variations in fields that most often receive attention and get filled out for each recorded incident and the manner in which figures are checked, adjusted or excluded from entry. By contrast with EM-DAT, which only collects a very select set of statistics on each disaster, DesInventar databases often track many small details such as damage to specific building types (like hospitals) and houses damaged – rather than destroyed. Due to these methodological differences it is difficult to make comparisons between countries based on DesInventar data. What is quite useful is to use these datasets to configure sub-national patterns with potential displacement risk.

Figure 3.14a, b: Resilience proxy- Indicator of Conditions and Capacities for Risk Reduction (IRR)

	2012 DARA IRR (Indicator of Conditions and Capacities for Risk Reduction				
Country	1 Environmental degradation and natural resources	2 Socio-Economic conditions and livelihoods	3 Territorial organisation	4 Governance	**TOTAL SCORE**
Belize	7.31	6.26	6.54	4.05	6.04
Costa Rica	7.70	7.14	8.11	6.76	7.43
Dominican Republic	6.40	6.55	7.40	4.18	6.14
El Salvador	6.49	6.52	7.42	4.84	6.32
Guatemala	4.38	5.97	6.97	3.69	5.25
Haiti	5.41	3.77	4.15	2.39	3.93
Honduras	5.68	6.18	6.88	4.05	5.70
Mexico	6.07	7.17	7.82	4.61	6.42
Nicaragua	6.26	6.25	6.22	4.13	5.72
Panama	5.20	7.21	7.29	4.90	6.15



Source: DARA 2012

Figure 3.15: Country, hazard totals for EM-DAT entries 1970-2010

Disaster type	Mexico	Haiti	Guatemala	Honduras	Costa Rica	Nicaragua	Dominican Republic	Panama	El Salvador	Belize	Total
Flood	52	40	18	26	24	14	19	30	14	4	241
Storm	70	28	10	18	9	20	22	3	12	11	203
Earthquake	23	1	10	5	12	5	1	4	6	0	67
Volcano	8	0	9	0	4	5	0	0	1	0	27
Landslide, precipitation	8	1	6	1	1	1	0	0	2	0	20
Landslide, other	0	0	2	1	0	0	0	0	0	0	3
TOTAL	161	70	55	51	50	45	42	37	35	15	561

Source: EM-DAT 2013

4 Country Reports

4.1 Belize

4.1.1 Displacement Risk Configuration

With a population of about 350,000 people and a land mass of 23,000 square kilometres, Belize is by far the least populated country in the study. Located on the Yucatan peninsula on the Caribbean coast between Mexico and Guatemala, its population is concentrated in coastal areas. Belize is subject primarily to hydro-meteorological hazards such as hurricanes, flooding and precipitation-based landslides. The Maya Mountains in the central west of the country contains several active faults but earthquake risk is lower elsewhere.

Belize's capital was relocated in 1970 from its historic location in Belize City to the planned city of Belmopan, 80 kilometres inland, after Hurricane Hattie (1961) destroyed 75 per cent of all structures in the low-lying city.

Climate change is increasing disaster risk in many ways. Many low-lying areas are subject to increasingly recurrent flooding as well as sea water infiltration into aquifers, both of which will make livelihoods difficult to sustain. Resultant displacement could easily be mistaken for migration due to the slow-onset nature of these average-change based hazards. Ocean acidification and damage to coral reefs will also both play important roles in erosion of livelihoods. Increased hurricane activity and magnitude will inevitably lead to more frequent and larger scale displacement-inducing events.

4.1.2 Results

Belize's estimated average annual displacement risk is approximately 850 people per year in absolute terms and 2,500 per million in relative terms. Belize's relatively high level of exposure to cyclone hazard makes up the bulk of displacement risk.

Although a small country, Belize is in many ways more vulnerable to potential climate change events that many of the other larger, more geographically and economically diverse, countries. With a significant portion of livelihood potential stemming from agriculture, aquaculture and tourism in areas susceptible to disaster risk and climate change, a large scale event could lead to substantial human displacement. The average annual loss figures do not adequately capture the potential ramifications of a large event in this small country. A loss exceedance model is expected to be used in future iterations of this study.

The sub-national analysis done with the DesInventar database indicated that displacement risk was highest in the northern departments of Orange Creek, Corozal and, to a more limited extent, the department of Belize. Belize has a medium rating for displacement distance and duration. As in other small countries, alternative livelihood options

Figure #4.1.1: Disaster and climate change induced displacement estimates

Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Belize	332,000	846	10	2,547	5	Medium

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnera-bility	Resi-lience	Risk Confi-guration	Risk Configuration (Normalised)	Historic Absolute Displace-ment	Historic Relative Displacement (per 1M)
Belize	8.70	8.50	6.04	1.22	0.13	747	2,250

not involving crossing borders are limited. Potentially a storm could substantially affect most or all of the country and easily overwhelm national capacities to respond to the needs of large numbers of displaced persons.

Figure #4.1.2: Annual displacement estimates per hazard

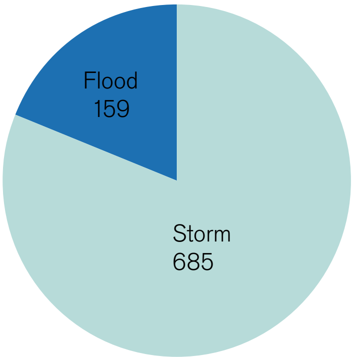
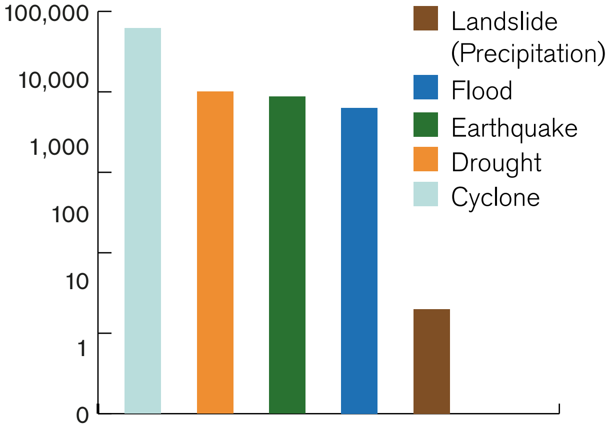


Figure #4.1.3: Relative Hazard Exposure (per million inhabitants)



Source: UNEP GRID Model, 2011

4.1.3 Key Data

Hazard exposure levels in Belize primarily consist of hurricane (or cyclone - with 2/3 of the total exposed), followed by drought, earthquake and flood. Belize's human exposure to disaster is much more limited than that of neighbouring countries. This is due to the small absolute exposure resulting from its small population coupled with one of the lowest overall exposure values.

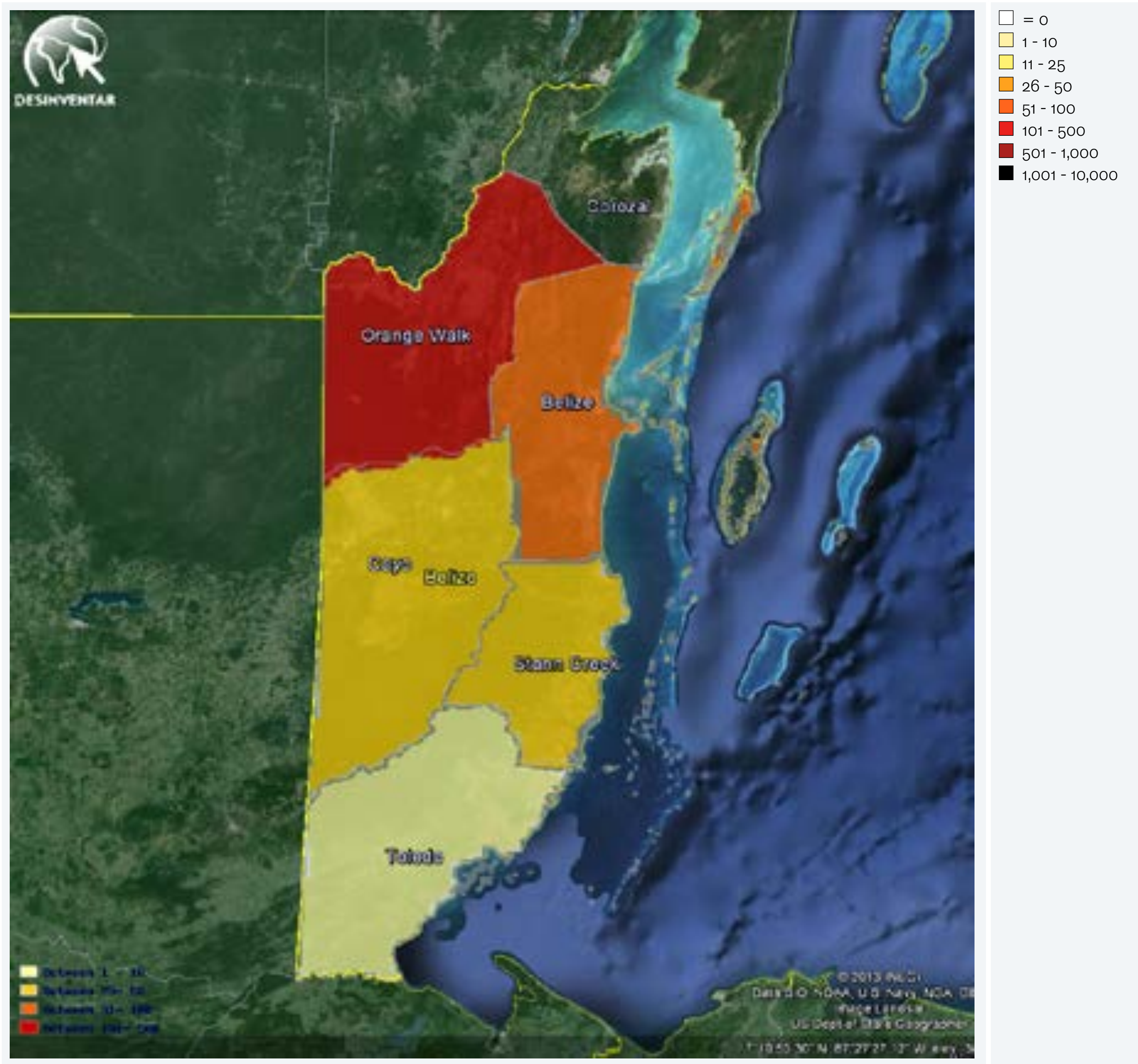
Belize provides a unique methodological challenge to assessing displacement risk due to the near absence of loss data in international datasets. For example, in EM-DAT Belize contains no homeless entries for the period from 1970 to 2010. This is possibly due to the higher threshold placed on events with less than ten deaths or 100 people affected and/or related to reporting differences from EM-DAT sources. DesInventar figures were also relatively low, with no region reporting over a total of 1,000 homes destroyed in the 43-year sample. Historically more than one large event has triggered much more substantial damage than these totals would indicate. Other countries in the region may have suffered more than their long-term statistical average during the sample period. Neither of these cases is handled explicitly by the disaster displacement risk index.

Figure #4.1.5: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Belize	Earthquake	41 yrs	0	0	0.0
	Flood	41 yrs	0	1,405	0.0
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	0	0.0
	Storm	41 yrs	0	6,049	1.7
	Volcano	41 yrs	0	0	0.0
Belize Total		41 yrs	0	7,454	1.7

Source EM-DAT disaster loss database

Figure #4.1.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

4.2 Costa Rica

4.2.1 Displacement Risk Configuration

Crisscrossed with faults, Costa Rica is the meeting place of two tectonic plates. Its 51,000 square kilometres are largely mountainous, with clearly differentiated tropical zones in the east and south and a more semi-arid climate in the northwest. Its population of 4.6 million is concentrated in the large central valley where the capital is situated. There are many small agricultural towns in areas characterised by both commercial and subsistence farming. Many disasters are seismic in nature and these tend to receive more attention. However, frequent, small-scale losses are regularly ascribed to flooding and landslides. Drought can affect portions of the country with limited or no access to irrigation. Recently, heavy rainfall and inadequate infrastructure and drainage have led to serious losses of bridges and roads.

Costa Rica has a long history of dealing with seismic risk. The destruction of the old capital, Cartago, by an earthquake in 1910 marked the start of a long process of seismic risk awareness, mitigation and prevention. Strict building codes were introduced in a collaborative project involving engineers in US universities. These have been mostly adhered to in the more populous regions, with more informal housing in less accessible areas and those inhabited by marginalised population groups. In 2012 the magnitude 7+ earthquake in the south of the Guanacaste Peninsula led to one death and building damage but no collapses.

Displacement risk in Costa Rica consists largely of seismic events that either destroy buildings directly or trigger landslides. These are exacerbated by deforestation and soil saturation. The 2009 Cinchona earthquake led not only to substantial seismic damage but also extensive landslides that together necessitated relocating almost the entire community of Cinchona, a process that has taken several years.

Another source of displacement risk involves increasing flood hazard levels. These result largely from unsustainable upstream development or agricultural practices Much displacement induced by more frequently recurring flood events happens slowly as increasing impact levels eventually drive families out. Groups informally settle (or re-settle) in hazardous flood areas as their only affordable option to be close enough to livelihood options, thus creating a recurring problem of informal development and loss.

4.2.2 Results

Costa Rica's average estimated displacement of about 6,500 people per year, and slightly more than 1,400 displaced per one million inhabitants per year, suggests that the country manages its risks fairly well considering the large level of exposure to seismic risk and relatively high vulnerability to flood and landslides.

Costa Rica's scores place it in the lowest 30 per cent of the ten studied countries in terms of displacement risk, both absolute and relative. This is impressive, considering

Figure #4.2.1: Disaster and climate change induced displacement estimates

Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Costa Rica	4,860,000	7,166	8	1,474	8	Low

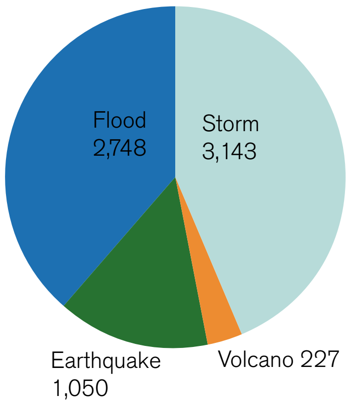
Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
Costa Rica	27.85	6.50	7.43	2.44	0.32	5,431	1,118

it has by far the highest relative multi-hazard exposure level of any of the studied countries. This would be considered a good sign of adequate measures for reducing vulnerability and increasing resilience. Furthermore, displacement amplitude is considered low since Costa Rica has one of the highest income per capita levels in the region and a diverse array of economic opportunities allows for re-integration within reasonable proximity of the previous home.

In relationship to climate change, changes to underlying averages and extremes are expected to produce changes in intensity and duration of hydro-meteorological events. This is set to increase exposure to events such as floods and landslides which Costa Rica is less well prepared to handle. Recovery from such events is difficult due, for example, to lost access to markets for agricultural products when bridges are destroyed.

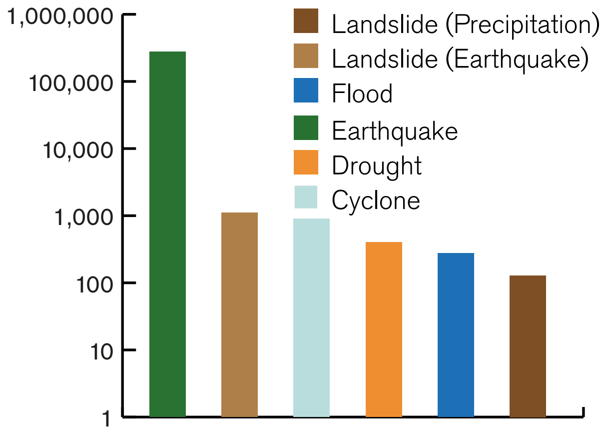
Figure #4.2.2:
Annual displacement estimates per hazard



4.2.3 Key Data

Costa Rica's population exposure is, in relative terms, the highest of any country in the study. This is largely due to the almost pervasive earthquake risk. Other hazards also have reasonably high exposure levels, including landslides, cyclones, droughts and floods. In absolute terms, the total human exposure level is in the middle range of the studied nations.

Figure #4.2.3: Relative Hazard Exposure (per million inhabitants).

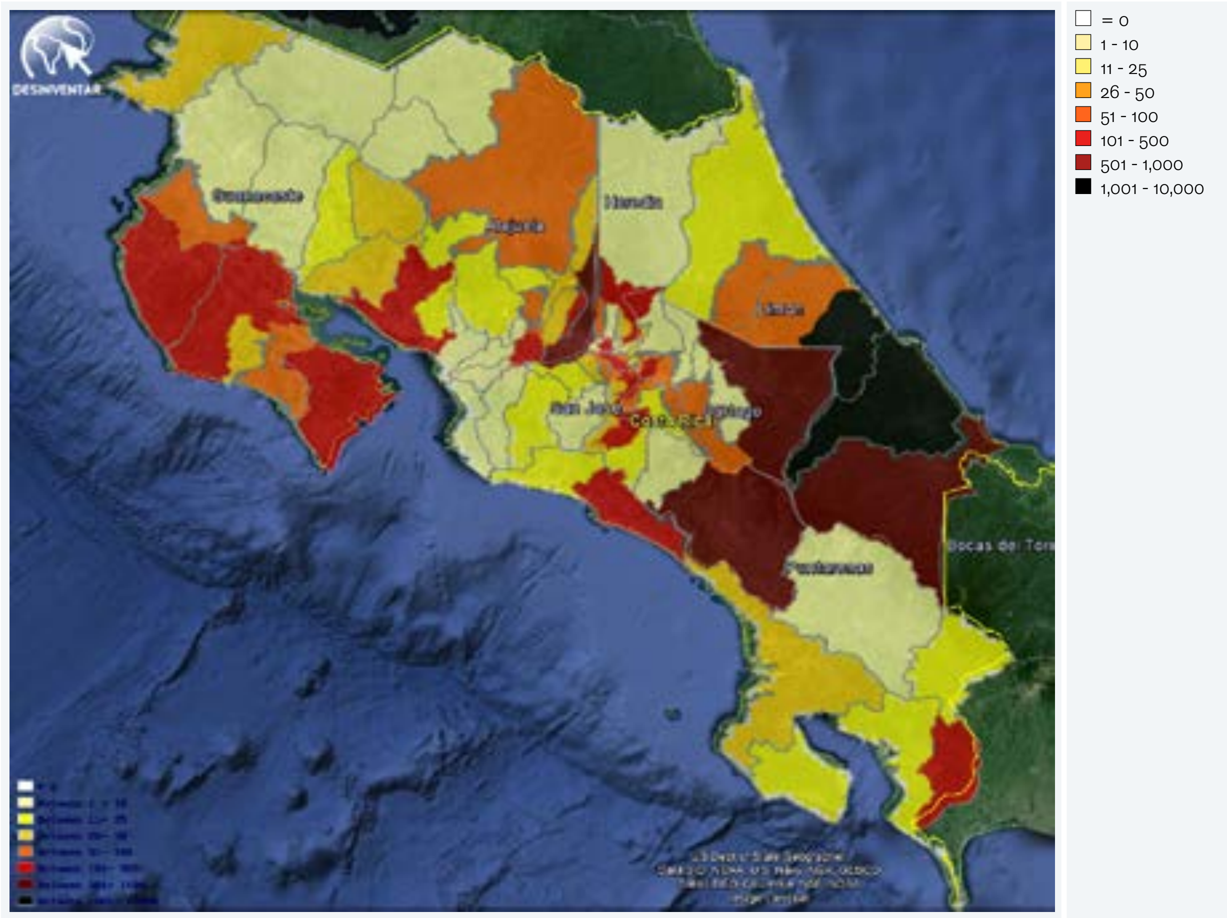


Source: UNEP GRID Model, 2011

The sub-national analysis of homes destroyed demonstrates the wide range of loss levels throughout the country. Some of the more remote and least developed areas have suffered the greatest aggregate losses over the 43 year DesInventar sample. Many of the losses are from large-scale intensive events, but many others accrue over time with repeated losses leading to regular erosion of livelihoods that inevitably lead to migration/displacement.

EM-DAT data for Costa Rica includes homeless figures tracked especially for larger events with deaths or other substantial effects. Overall homeless averages for both earthquake and hydro-meteorological events together add up to slightly over a thousand people a year. Landslide risk, a frequent source of displacement, is not well represented in EM-DAT due to the threshold levels that are used to register events. This makes it hard to quantify the risk level associated with these typically more micro-scale events in a delimited affected area.

Figure #4.2.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.2.5: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Costa Rica	Earthquake	41 yrs	439	3,533	3.0
	Flood	41 yrs	759	13,196	3.2
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	5	0.2
	Storm	41 yrs	159	22,203	2.3
	Volcano	41 yrs	0	1,718	0.0
Costa Rica Total		41 yrs	1,357	40,655	8.8

Source EM-DAT disaster loss database

4.3 Dominican Republic

4.3.1 Displacement Risk Configuration

Located on the eastern two thirds of the island of Hispaniola in the central Caribbean, the Dominican Republic is exposed to substantial earthquake, drought, flooding and hurricane risks that all contribute to displacement risk. Its population of slightly over ten million is subject to higher earthquake risk than is modelled for neighbouring Haiti, although during the sample period of 1970-2010 there were no significant earthquakes. The country has a large total exposure, especially to hydro-meteorological hazards. Hurricane Georges demonstrated this in 1998, leaving around 185,000 homeless and knocking out electricity and water supplies throughout the country for months. The combination of heavy winds and rainfall led to widespread rain-based landslides as well as river and storm surge flooding, overwhelming much of the country's response capacity.

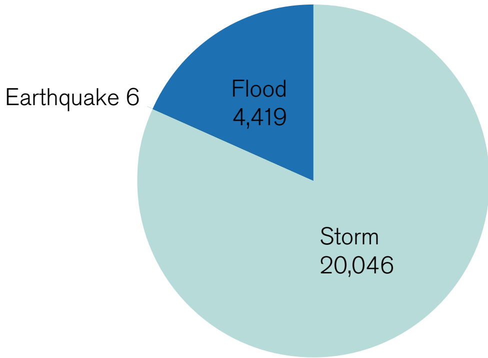
As is the case with other countries in the region, there is growing concern about displacement risk stemming from flood conditions triggered by hydroelectric dams. This risk was highlighted by experience in Tabasco, Mexico where substantial flooding was primarily due to poor planning and management of dam facilities, leading to destructive release of water in order to protect hydroelectric facilities.

4.3.2 Results

With average annual displacement estimated around 25,000 people, and a relative estimated displacement of almost 2,500 people per million inhabitants, the Dominican Republic scores in the high-medium range of displacement risk among the ten studied countries.

The Dominican Republic shares Haiti, a similar set of underlying hazard configurations that could lead to displacement risk. Its exposure levels are the third highest of the ten studied countries in both absolute and relative terms, placing it higher on the charts than Haiti in both of these categories. However, once average loss data and other variables are taken into consideration, its overall human displacement risk comes in several rungs lower than that of its neighbour: results indicate that the Dominican Republic averages a third of the displacement rate of Haiti in both absolute and relative magnitude.

Figure #4.3.2: Annual displacement estimates per hazard.



4.3.3 Key Data

UNEP's exposure model indicated relatively equal levels of earthquake, drought and cyclone risk, with substantially lower landslide exposure. Due to its large population the relative numbers add up, significantly creating a reasonably high annual displacement average.

Figure #4.3.1: Disaster and climate change induced displacement estimates

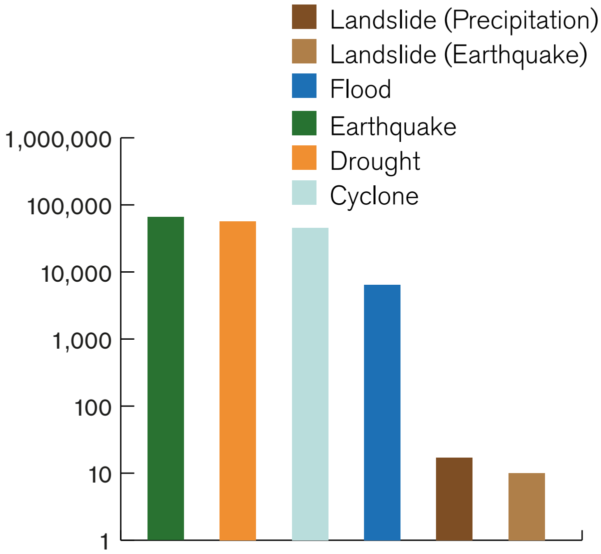
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Dominican Republic	10,291,000	24,543	4	2,385	6	Medium

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnera-bility	Resi-lience	Risk Confi-guration	Risk Configuration (Normalised)	Historic Absolute Displace-ment	Historic Relative Displacement (per 1M)
Dominican Republic	17.46	5.25	6.14	1.49	0.17	20,915	2,032

Figure #4.3.3: Relative Hazard Exposure (per million inhabitants)

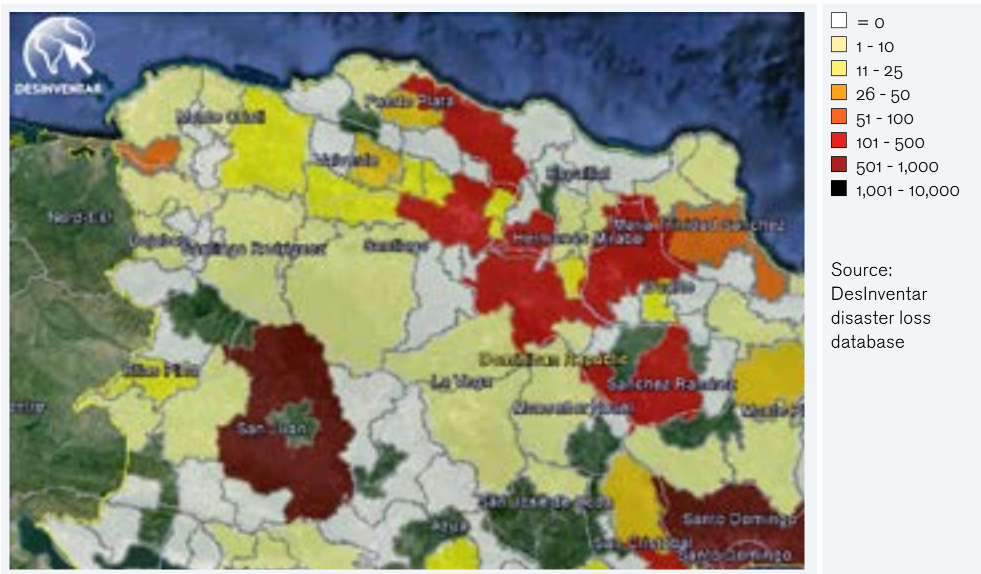


Source: UNEP GRID Model, 2011

Viewing loss data for homes via DesInventar, we find that most housing destruction has been concentrated in a few provinces, including the capital and surrounding, high-population areas. Several other provinces in the northern central region, plus San Juan, have also registered significant housing loss.

The Dominican Republic's home loss figures in EM-DAT are concentrated under just storm-related losses, although impacts as well as mortality levels from flooding events would indicate that the average annual homeless figure for floods may be significantly under-represented. Earthquake-related displacement averages have been several orders of magnitude less than the two primary hazard types. However, the possiblity of a substantial event, especially combined with a pattern of high rain levels, could lead to rather substantial displacement given the right combination of factors.

Figure #4.3.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.3.5: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Dominican Republic	Earthquake	41 yrs	0	49	0.1
	Flood	41 yrs	75	36,810	20.4
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	0	0.0
	Storm	41 yrs	11,524	55,597	49.1
	Volcano	41 yrs	0	0	0.0
Dominican Republic Total		41 yrs	11,600	92,456	69.6

Source EM-DAT disaster loss database

4.4 El Salvador

4.4.1 Displacement Risk Configuration

El Salvador, located entirely on the Pacific, is the most densely populated country in Central America, with over six million inhabitants in a country of roughly 21,000 square kilometres. It is exposed to several disaster displacement configurations. Due to high population densities there are more at-risk areas than in countries with lower pressures on land. El Salvador only emerged from a sustained period of civil war in 1992, although subsequent economic progress has been relatively robust by regional standards.

El Salvador has been regularly hit by earthquakes that lead to human displacement, with the 1986 event resulting in approximately 100,000 homeless. The January- February 2001 earthquakes led to extensive damage to housing stock, both from the direct effects well as large indirect losses from resultant landslides. The 2005 eruption of the Santa Ana volcano also demonstrates the ongoing risk from other geophysical hazards.

El Salvador is also at a relatively higher displacement risk level in regard to hydro-meteorological hazard, especially rain and drought related conditions which are often tied to the effects of the El Niño Southern Oscillation (ENSO) which can bring unseasonably sustained periods of either dry or wet weather. 2001 saw a severe period of drought that destroyed a large part of the country's agricultural produce. 2005 saw severe rains that caused extensive displacement due to flooding and landslides. In the Lempa Valley mismanagement of dam facilities in the upper basin led to the destructive release of flood-level waters into the lower basin. These types of problems are expected to continue increasing displacement risk in the future.

4.4.2 Results

Average total displacement is estimated at almost 17,000 people per year, which translates into a relative level of about 2,700 people per million. The hazard variables work together to yield a substantial overall exposure, which, together with historic loss patterns, place El Salvador in the middle of the rankings for the ten countries reviewed. Due to its high population density, substantial exposure level and multi-hazard configuration, El Salvador has a reasonably high intrinsic risk configuration. Relative displacement figures are around the average for the ten country sample.

Figure #4.4.2: Annual displacement estimates per hazard

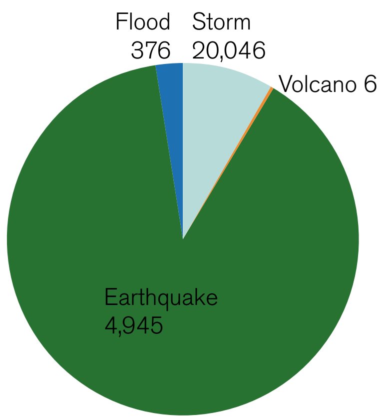


Figure #4.4.1: Disaster and climate change induced displacement estimates

Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
El Salvador	6,326,000	16,791	6	2,654	4	Medium

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
El Salvador	20.58	7.33	6.32	2.39	0.31	12,800	2,023

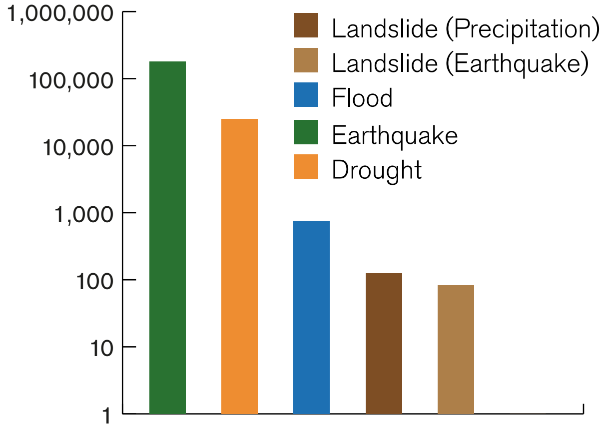
4.4.3 Key Data

Earthquake, flood, drought and landslide risk are found throughout many parts of the country, with a large number of multi-hazard contexts. High aggregate exposure levels are due to a combination of high population density, rural land use patterns and vulnerable livelihood conditions.

El Salvador's DesInventar database contains a relatively large set of loss data. Housing loss patterns demonstrate high levels of loss throughout many of the country's departments and municipalities, with substantial losses recorded in at least several dozen municipalities. The heaviest displacement figures are in western and south-central regions.

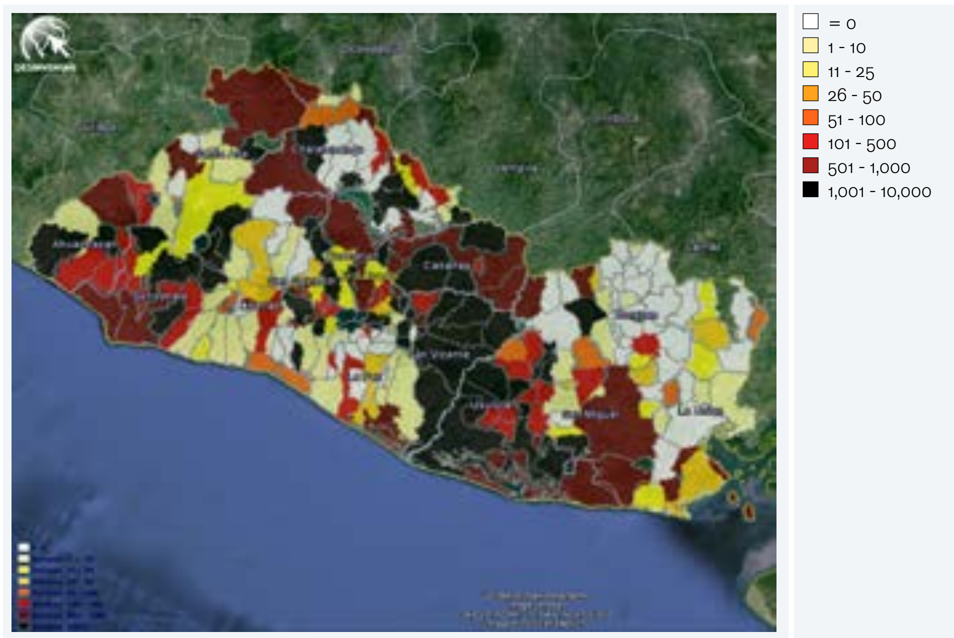
EM-DAT figures for El Salvador are predominantly related to seismic risk but flood and storm related losses provide an increasingly significant portion of the total. Homeless figures for floods appear not to be regularly reported in this dataset. Many of these losses often accrue to smaller, more widespread events below the lower threshold criteria for the database.

Figure #4.4.3: Relative Hazard Exposure (per million inhabitants)



Source: UNEP GRID Model, 2011

Figure #4.4.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.4.5: EM-DAT Homeless figures 1970-2010.

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
El Salvador	Earthquake	41 yrs	6,159	51,943	55.6
	Flood	41 yrs	0	2,716	15.7
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	0	1.1
	Storm	41 yrs	483	5,945	20.8
	Volcano	41 yrs	0	49	0.0
El Salvador Total		41 yrs	6,641	60,652	93.2

Source EM-DAT disaster loss database

4.5 Guatemala

4.5.1 Displacement Risk Configuration

Guatemala's approximately 15.5 million inhabitants occupy a total area of just under 110,000 square kilometres bordering both the Pacific and Caribbean coasts. Hazard configurations consist of a substantial seismic risk, particularly in southern regions, and hydro-meteorological exposure to storm- and cyclone-related flooding and landslides. Guatemala is well acquainted with the notion of displacement: the capital has twice been moved due to disaster in the past several hundred years: in 1541 due to mud flows and in 1973 due to an earthquake.

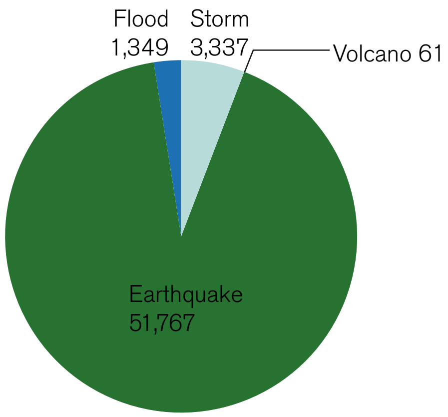
Recurrent political instability from 1944 to 1996 was characterised by rapid changes of government which contributed to high vulnerability with prolonged consequences for the nation. The impact of the 1976 earthquake was exacerbated by turmoil, contributing to an extremely high death and displacement toll, especially among poor and marginal social groups.

Climate change brings with it increased hazard and exposure risk. Exposure to drought (such as that which affected upwards of 2.5 million people in 2009) and storms (such as those that affected about half a million people in both 2005 and 2010) attest to Guatemala's high exposure levels to climate-sensitive hazards. The effects of ENSO are already triggering extensive losses, with effects expected to be amplified as climactic averages change.

4.5.2 Results

The large total population, high vulnerability and low resilience place it among the highest in terms of both absolute and relative displacement figures. The displacement model estimates annual displacement at around 55,000 per year and relative displacement around 3,700 per million inhabitants. This places it in the top third of the ten reviewed countries in terms of both absolute and relative risk.

Figure #4.5.2:
Annual displacement estimates per hazard.



4.5.3 Key Data

Exposure data for Guatemala is largely composed of earthquake exposure, with totals for all hydro-meteorological event exposure levels two orders of magnitude below that of the exposure to earthquake hazard. These exposure numbers might under-represent total hydro-meteorological exposure, as the effects of Hurricanes Mitch and Stan would seem to indicate.

DesInventar's mapping of homes destroyed per municipalities points to several concentrations comprised of

Figure #4.5.1: Disaster and climate change induced displacement estimates

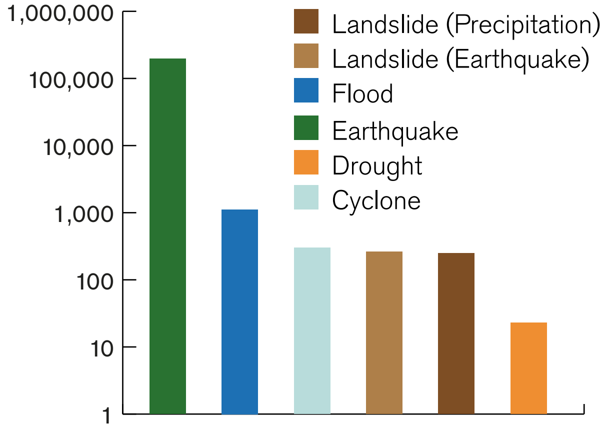
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Guatemala	15,419,000	56,587	3	3,670	2	High

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
Guatemala	19.77	7.00	5.25	2.64	0.35	41,916	2,718

Figure #4.5.3: Relative Hazard Exposure (per million inhabitants)

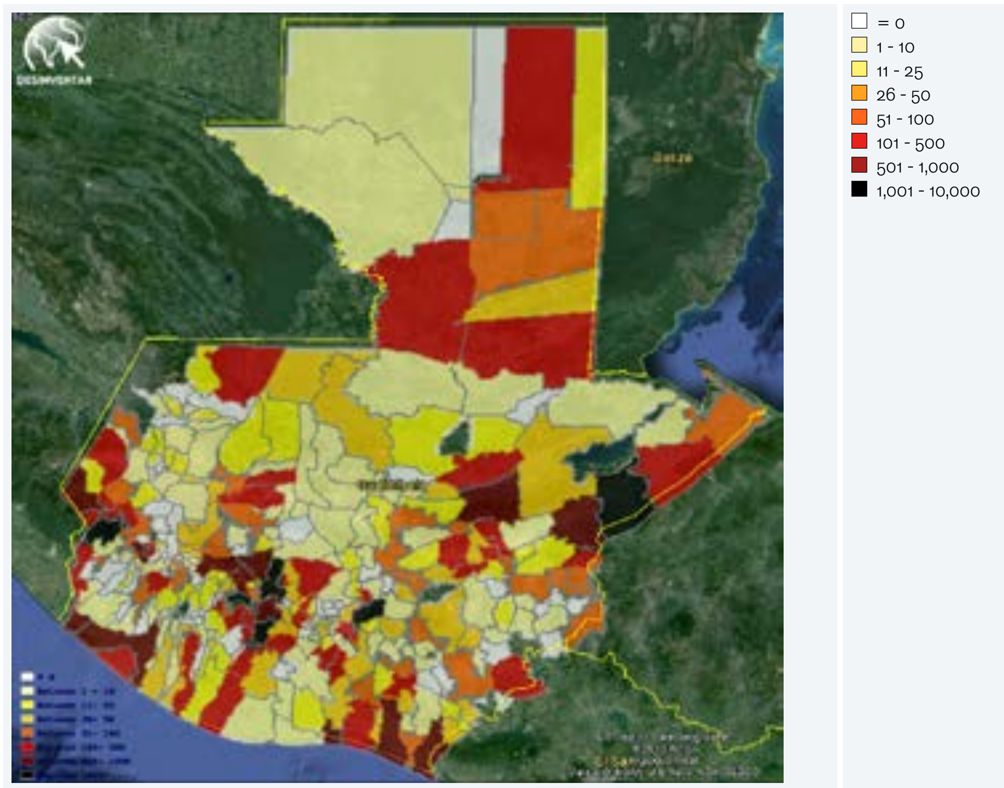


Source: UNEP GRID Model, 2011

higher density population areas in the central southern region or more lightly populated areas in the north that are more exposed to hydro-meteorological hazards from the Caribbean.

EM-DAT records a substantial number of homeless due to earthquake risk, with an average annual homeless count of around 28,000, along with a substantial death toll of over 500 per year. Storm data in general would appear not to contain any homeless figures and flood related data indicate very low homeless rates, both of which would appear to be significantly under-reported. Due to EM-DAT's threshold it is probable that a good percentage of the losses that would be ascribed to landslides are not reported in the dataset.

Figure #4.5.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.5.5: EM-DAT Homeless figures 1970-2010.

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Guatemala	Earthquake	41 yrs	28,563	92,211	562.1
	Flood	41 yrs	104	8,741	20.7
	Mass movement - dry	41 yrs	24	50	1.4
	Mass movement - wet	41 yrs	11	66	5.8
	Storm	41 yrs	0	24,206	51.2
	Volcano	41 yrs	0	450	0.0
Guatemala Total		41 yrs	28,703	125,724	641.2

Source EM-DAT disaster loss database

4.6 Haiti

4.6.1 Displacement Risk Configuration

Haiti, located on the western third of the island of Hispaniola in the central Caribbean, experienced an extremely large displacement-inducing disaster with the devastating 2010 earthquake that affected almost half of the country's population. In addition, other earthquakes, storms and drought have each affected over a million people in recent decades.

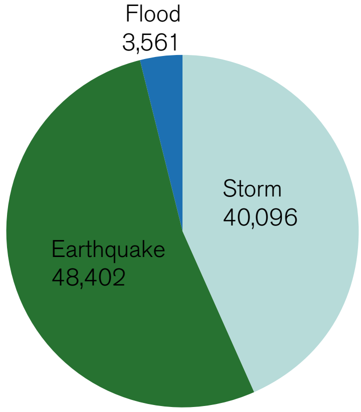
With slightly over ten million inhabitants, historically high vulnerability and low resilience levels, and substantial exposure from cyclone (wind, storm surge and river flooding) and seismic hazards, Haiti has demonstrated historically high patterns of disaster loss and displacement.

Climate change-related displacement is expected to increase due to the expected changes in averages and extremes for storm and drought hazards. Countries such as Haiti with historically low levels of good governance often find it difficult to effectively mitigate or adapt to these changes, thus leading to increased future displacement risk.

4.6.2 Results

The disaster displacement index ranked Haiti in first place in both absolute and relative terms among the ten countries. With average annual displacement figures of approximately 92,000 people and relative displacement figures of around 9,000 people per million Haiti's modelled displacement risk exceeded Mexico's, a nation with over ten times more people. These numbers are heavily based on historic loss figures over the past forty years. Events with large return periods, such as the 2010 earthquake, necessarily skew the results. No adjustment has yet been made for this source of bias in the results.

Figure #4.6.2: Annual displacement estimates per hazard.



4.6.3 Key Data

Exposure figures for Haiti rank drought, cyclone and flood as the most substantial hazards, with earthquake exposure at a significantly lower level than, for example, the neighbouring Dominican Republic. This multi-hazard exposure has led to frequently recurring hazard levels, triggering substantial losses on several occasions in recent decades. High vulnerability levels often mean that many events for which other countries in the region are prepared to handle cause substantial losses in Haiti. This configuration of exposure, vulnerability and hazard can lead to progressive erosion of livelihoods, which eventually translates into either displacement or migration.

Figure #4.6.1: Disaster and climate change induced displacement estimates

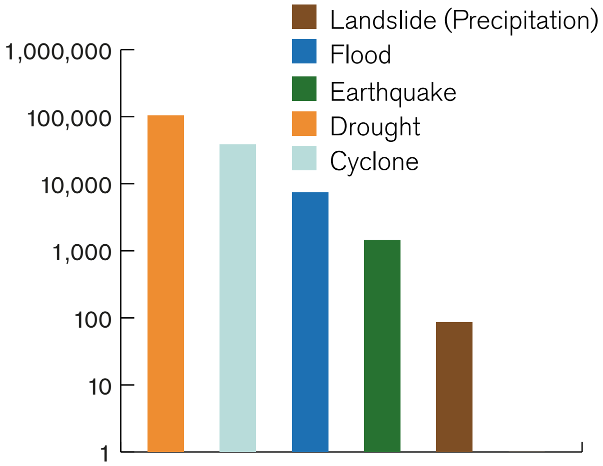
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Haiti	10,261,000	92,042	1	8,970	1	Very high

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
Haiti	15.11	5.50	3.93	2.11	0.27	72,512	7,067

Figure #4.6.3: Relative Hazard Exposure (per million inhabitants)

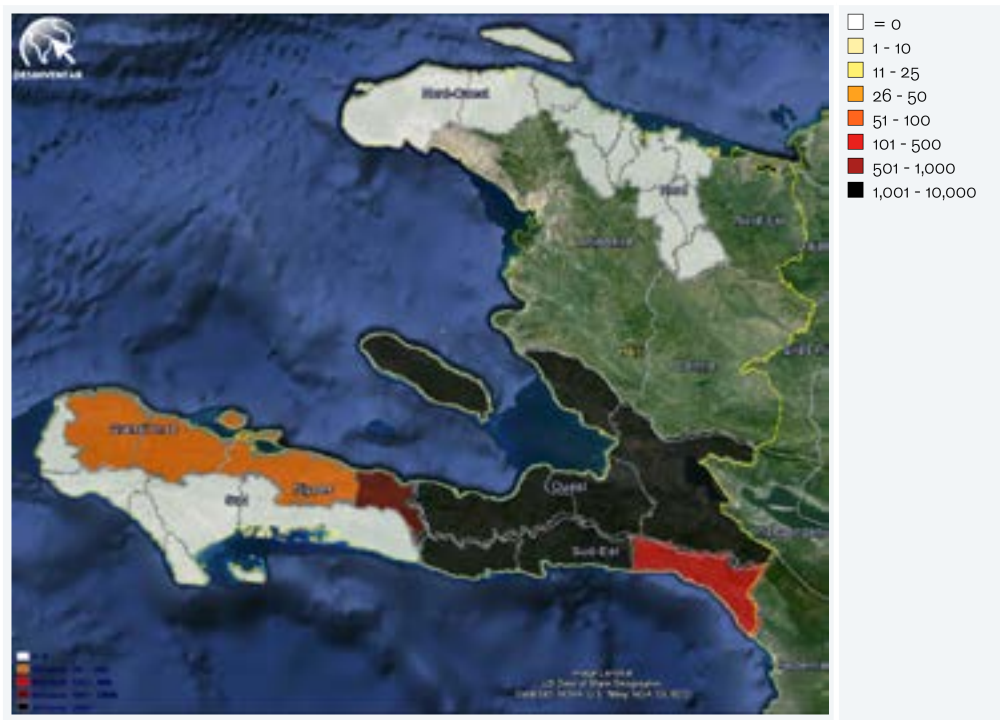


Source: UNEP GRID Model, 2011

DesInventar data for Haiti is limited to the 2010 earthquake event, and thus is of limited use in a sub-national analysis of displacement risk.

EM-DAT's loss data for Haiti places historic homeless figures on about a par between earthquake- and storm-related losses, with a large amount of flood-related losses as well. Impact figures are also in line with homeless figures. Average earthquake mortality is much higher for earthquake hazard than hydro-meteorological events.

Figure #4.6.4: DesInventar Homes Destroyed 2010



Source: DesInventar disaster loss database

Figure #4.6.5: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Haiti	Earthquake	41 yrs	24,390	82,927	5,428.5
	Flood	41 yrs	1,286	14,381	80.1
	Mass movement - dry	41 yrs	0	0	0
	Mass movement - wet	41 yrs	24	0	0.0
	Storm	41 yrs	22,909	85,316	130.5
	Volcano	41 yrs	0	0	0.0
Haiti Total		41 yrs	48,610	182,624	5,639.1

Source EM-DAT disaster loss database

4.7 Honduras

4.7.1 Displacement Risk Configuration

Located between Guatemala and Nicaragua, with part of its western border along El Salvador, Honduras sits in the middle of the transition zone between the more seismically unstable southern part of Central America and the more storm-prone northern region. Its approximately eight million inhabitants occupy an area of over 110,000 square kilometres, consisting of varied geographic and climate types, from high plateaus to tropical coasts.

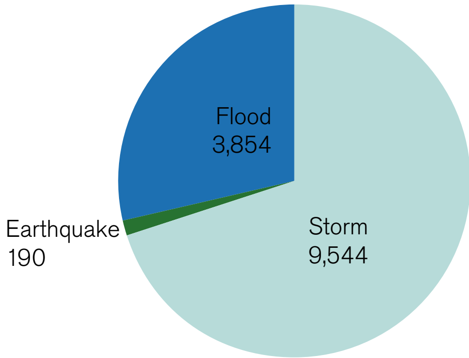
A significant area of the country lies on the Caribbean, resulting in substantial exposure to hydro-meteorological events such as Hurricane Mitch which affected over two million people in Honduras alone. The populous central region is also susceptible to considerable earthquake hazard, although the most recent damaging earthquake, in 2009, struck the northern region, causing destruction of a few homes. Drought has affected the south and there has been flooding in northern and central areas. Over a million landslides were associated with Mitch, many due to lack of vegetation on hillsides

Climate change-related displacement risk is expected to be significant in Honduras due to the combined effect of ENSO-influenced hurricanes.

4.7.2 Results

Disaster-induced human displacement in Honduras is expected to average slightly fewer than 18,000 per year in absolute terms and around 1,700 per million people in relative terms. Those displacement figures place Honduras significantly below the average and between all of its neighbours. This could be due to this initial model's reliance on homeless figures in EM-DAT, which has disproportionately low homeless counts relative to its average impact levels for several of the covered hazard types.

Figure #4.7.2: Annual displacement estimates per hazard.



4.7.3 Key Data

Exposure data for Honduras ascribes about half of the exposure to seismic hazard, the remainder to hydro-meteorological hazards including drought, cyclone, flood and landslide.

DesInventar's database of disaster losses concentrates most of the homeless figures around the north-western corner and along the Caribbean coast.

Figure #4.7.1: Disaster and climate change induced displacement estimates

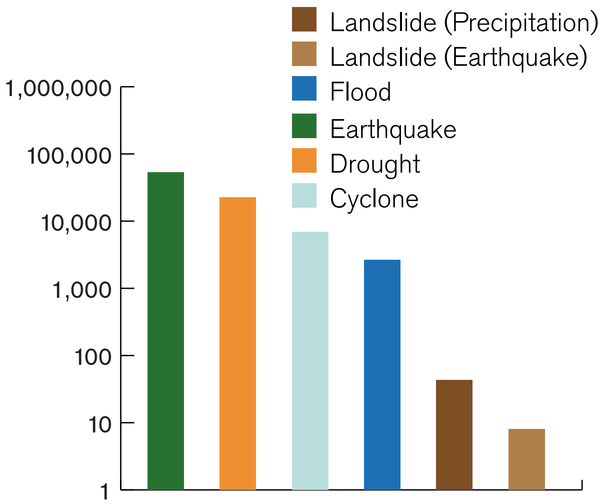
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Honduras	8,075,000	13,714	7	1,698	7	High

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnera-bility	Resi-lience	Risk Confi-guration	Risk Configuration (Normalised)	Historic Absolute Displace-ment	Historic Relative Displacement (per 1M)
Honduras	8.50	7.00	5.70	1.04	0.10	12,422	1,538

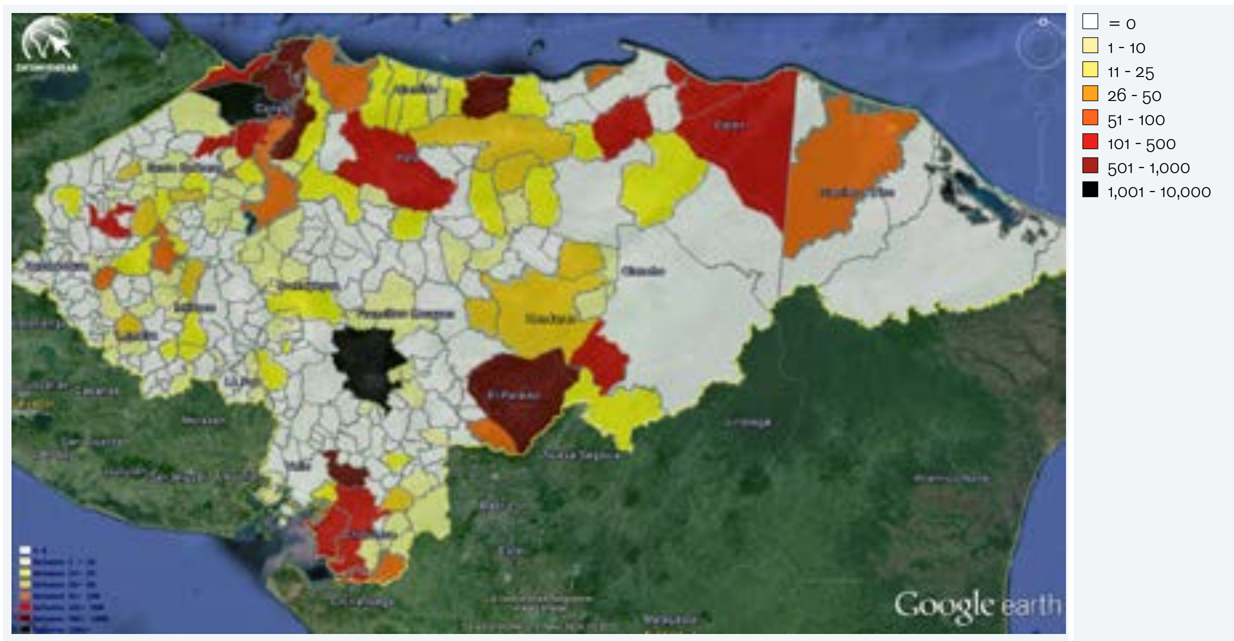
Figure #4.7.3: Relative Hazard Exposure (per million inhabitants).



Source: UNEP GRID Model, 2011)

EM-DAT loss figures for Honduras average around 100,000 people affected and 650 people killed per year, mainly from hydro-meteorological events (storms, floods and landslides). Annual homeless figures average much lower values than would be expected considering the high loss levels indicated by impact and mortality figures. This makes an accurate estimate of displacement risk challenging.

Figure #4.7.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.7.5: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Honduras	Earthquake	41 yrs	45	1,274	0.2
	Flood	41 yrs	643	28,388	21.8
	Mass movement - dry	41 yrs	0	0	0.2
	Mass movement - wet	41 yrs	0	0	68.3
	Storm	41 yrs	994	71,246	557.2
	Volcano	41 yrs	0	0	0.0
Honduras Total		41 yrs	1,683	100,908	647.7

Source EM-DAT disaster loss database

4.8 Mexico

4.8.1 Displacement Risk Configuration

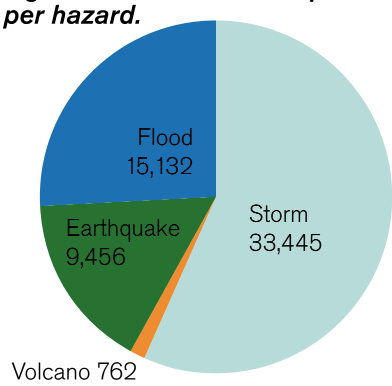
Mexico, by a factor of approximately ten the largest country in the sample, has a complex set of disaster risks that regularly lead to human displacement – the full description of which is beyond the scope of this paper. With around 116 million inhabitants, significant portions of coastline on both the Pacific and on the Caribbean, and a total mass area of almost two million square kilometres, Mexico provides a unique challenge to assessing displacement risk.

Mexico's history with natural disasters involves frequent cyclones on both coasts together with several destructive earthquakes. At least nine events in the past thirty years have affected over 500,000 people, the greatest number as a result of the 1985 earthquake. In the past 15 years eight storm or flood events have each averaged close to one million people affected. Common disasters include substantial drought in the north and landslides virtually everywhere. Furthermore, sea-level rise and climate change impacts are predicted to be extensive.

4.8.2 Results

Disaster-induced displacement averages for Mexico were estimated at slightly over 58,000 per year. These figures translated to around 500 displaced per million, the second lowest score after Panama. Future iterations of the displacement risk model should factor into account other relevant variables to insure that the relative values for Mexico are realistic. Exposure, vulnerability and resilience scores would tend to indicate higher loss figures than the model arrives at.

Figure #4.8.2: Annual displacement estimates per hazard.



4.8.3 Key Data

Mexico's top hazard exposure is to drought, followed by earthquake, cyclone, flood and landslide hazard. Due to the large and varied nature of the country, many specific configurations of exposure are found, including a significant number of multi-hazard configurations. Due to the highly centralised nature of Mexican decision making and emergency response, outlying, and often highly exposed, areas often receive less attention in terms of prevention and mitigation.

Due to its size two DesInventar maps showing the spatial distribution of housing losses to all hazard types are here provided. The first, showing losses at the level of Mexico's states, clearly show the effect of cyclones on house destruction, with highest loss areas corresponding to the areas most exposed to cyclone risk on each of the coasts. The second, showing losses at the municipal level, indicates a much higher inconsistency in losses. Many municipalities have no housing loss numbers with

Figure #4.8.1: Disaster and climate change induced displacement estimates

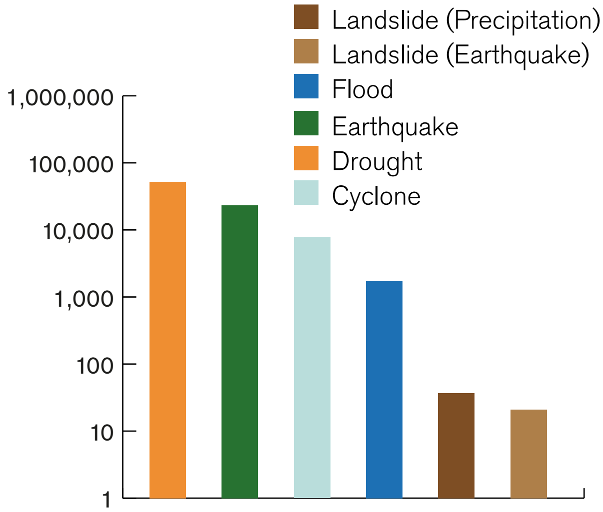
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Mexico	119,321,000	58,526	2	490	9	Low

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnera-bility	Resi-lience	Risk Confi-guration	Risk Configuration (Normalised)	Historic Absolute Displace-ment	Historic Relative Displacement (per 1M)
Mexico	8.49	5.50	6.42	0.73	0.06	55,473	465

Figure #4.8.3: Relative Hazard Exposure (per million inhabitants).

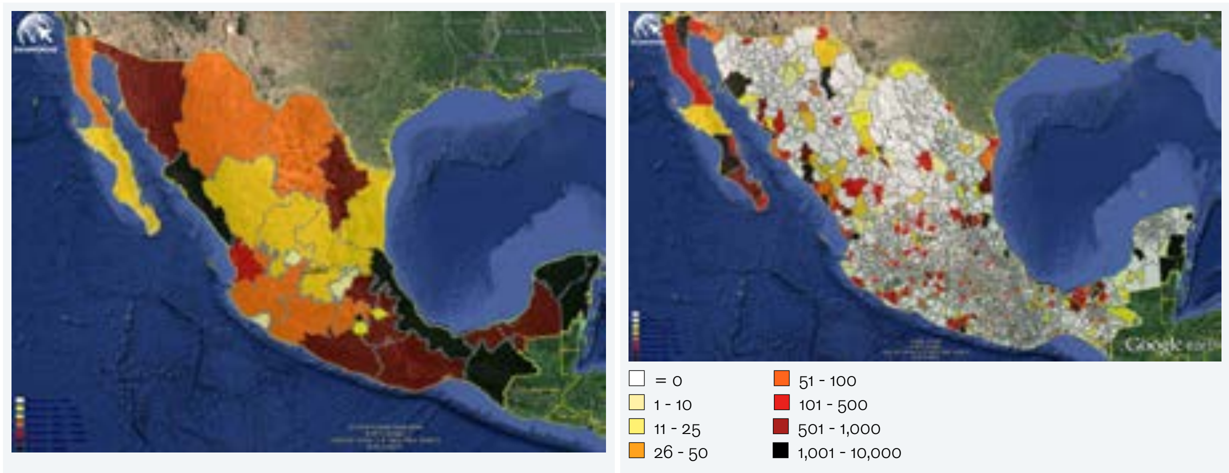


Source: UNEP GRID Model, 2011

much higher losses in some larger ones or those directly impacted by cyclones during the sample period. The highly contained nature of losses within groups of one or a few municipalities, and the ability for people to temporarily displace to nearby locations without crossing national borders, helps explain why disaster-induced displacement in Mexico is considered to most often be internal in nature.

EM-DAT figures for Mexico are reasonably extensive, with average homeless figures coming primarily from hydro-meteorological events (around 20,000 per year due to storms and floods) and a smaller fraction related to earthquakes (around 3,000 per annum).

Figure #4.8.4: DesInventar Homes Destroyed 1970-2012



Source: DesInventar disaster loss database

Figure #4.8.5: EM-DAT Homeless figures 1970-2010. (Source EM-DAT disaster loss database)

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Mexico	Earthquake	41 yrs	2,738	59,317	250.2
	Flood	41 yrs	4,049	101,769	49.8
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	3	5	3.5
	Storm	41 yrs	15,323	161,638	65.2
	Volcano	41 yrs	366	3,498	2.9
Mexico Total		41 yrs	22,479	326,227	371.6

4.9 Nicaragua

4.9.1 Displacement Risk Configuration

Nicaragua is located between Honduras and Costa Rica, with extensive coasts on both the Pacific and Caribbean oceans. With an area of around 130,000 square kilometres it has a population of just over six million. Principal hazards in terms of historic impact levels are earthquakes, storms, floods, droughts and volcanoes. Tsunamis experienced in the early 2000s were reportedly more than ten metres high. In recent decades political unrest and insecurity have contributed to high vulnerability and low resilience levels throughout the country.

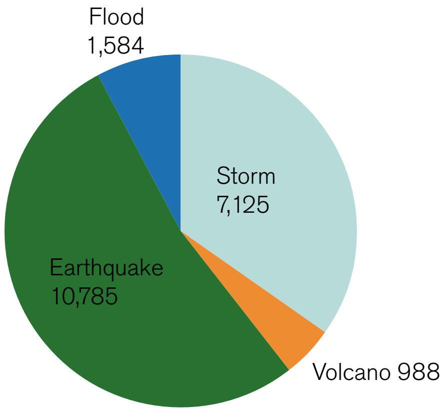
Nicaragua has a long history of disaster-induced displacement. The capital, Managua, was largely destroyed by a 1972 earthquake that left approximately 8,000 people dead, over a quarter of a million homeless and displaced around two thirds of the city's one million residents. Patterns of displacement from this event are still evident today as many of those displaced resettled a significant distance from the historic city limits in barrios centred around available water sources, places where earthquake displacees camped after losing their homes.

Nicaragua is also subject to substantial risk from storms and flooding as Hurricane Mitch demonstrated, together with Hurricane Joan in 1988. Although Mitch never entered Nicaragua, heavy rainfalls caused extensive problems leaving over half a million homeless and displacing several hundred thousand people. Joan struck the Caribbean coast, virtually destroying the city of Bluefields.

4.9.2. Results

Disaster induced displacement estimates for Nicaragua were around 20,000 people per year in absolute terms, or around 3,400 out of every million inhabitants. These figures placed Nicaragua as one of the highest in terms of relative levels of displacement risk among the ten reviewed countries. Slightly more than half of this displacement risk can be attributed to seismic risk, with storms and foods accounting for just under the other half. Volcano-driven displacement is also responsible for a small percentage of displacement risk.

Figure #4.9.2: Annual displacement estimates per hazard.



4.9.3 Key Data

Hazard exposure modelling suggests that earthquakes are the largest source of exposure in Nicaragua, with drought following a distant second. Cyclone hazards, together with flooding and landslide hazards, also contribute to exposure although to a lesser extent according to GRID's model.

Figure #4.9.1: Disaster and climate change induced displacement estimates

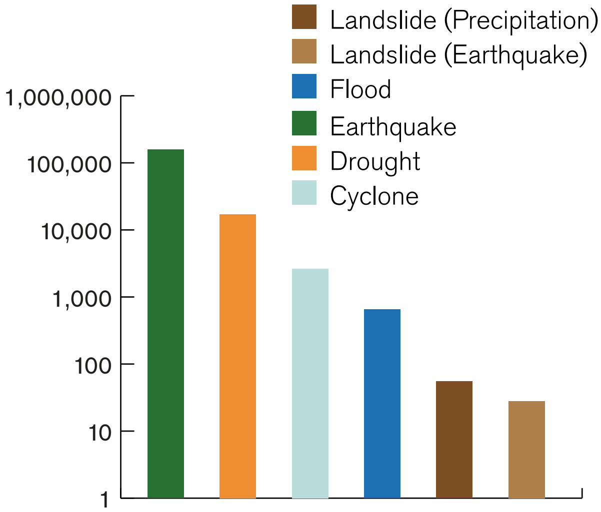
Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Nicaragua	6,066,000	20,555	5	3,389	3	High

Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
Nicaragua	17.79	6.25	5.72	1.95	0.24	16,533	2,725

Figure #4.9.3: Relative Hazard Exposure (per million inhabitants)



Source: UNEP GRID Model, 2011

Due to technical difficulties with Nicaragua's DesInventar dataset, it was not possible to produce a sub-national map of homes destroyed. The table in figure 6.9.3, above, provides numbers for housing destruction between 1992 and 2011 and demonstrates the large number of houses destroyed, together with a large number of houses damaged. Nicaragua's EM-DAT averages indicate around 7,500 homeless per year due to earthquake, with almost 2,000 per year due to hydro-meteorological hazards. Landslide figures, as with most other countries in the region, are very sparse. Again this is probably due to EM-DAT threshold levels.

Figure #4.9.3: DesInventar homes destroyed & other relevant totals, 1992-2011

Department	Fichas	Affected	Homes affected	Homes destroyed
Chinandega	14	1 385	117	4 575
RAAN	10	34 801	2 985	3 970
RAAS	17	8 396	1 457	3 159
Managua	56	5 360	780	2 161
Jinotega	12	6 480	95	966
Madriz	7	4 260	657	774
Nueva Segovia	12	1 141	192	637
Masaya	7	12 775	2 555	613
Estelí	5	0	53	371
Granada	8	1 580	286	287
Matagalpa	15	8 685	1 762	199
León	13	114	79	51
Rivas	4	1 515	33	43
Boaco	3	573	0	29
Chontales	1	496	110	13
Carazo	2	0	0	3
Río San Juan	1	0	0	1
TOTAL	187	87 561	11 161	17 852

Source: Nicaragua DesInventar disaster loss database

Figure #4.9.4: EM-DAT Homeless figures 1970-

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Nicaragua	Earthquake	41 yrs	7,455	9,944	248.4
	Flood	41 yrs	247	10,278	3.0
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	140	0.7
	Storm	41 yrs	1,648	40,024	95.6
	Volcano	41 yrs	15	7,822	0.0
Nicaragua Total		41 yrs	9,364	68,208	347.8

Source EM-DAT disaster loss database

4.10 Panama

4.10.1 Displacement Risk Configuration

At the southern end of Central America, Panama has a population of 3.8 million, concentrated mainly around the central regions, where both of the largest livelihood generators, Panama City and the Panama Canal, are located. Panama has a unique combination of low overall hazard levels, reasonably high resilience scores and historically low displacement numbers which make disaster displacement risk relatively low in most of the country.

More recently development-related problems with, for example, inadequate storm water management have led to flooding in metropolitan areas. Earthquake risk in the border regions with Costa Rica, in David and Panama City could lead to significant displacement. Panama sits on three intersecting plates and is considered to have substantial seismic risk. Panama City was seriously affected by an earthquake in the late 19th century.

4.10.2 Results

Panama's average annual displacement, in absolute terms, is estimated to be around 1,000 people per year. Its relative displacement of less than 300 people per million places it lowest in the ten-country sample. Around a quarter of Panama's displacement risk stems from seismic risk, while the vast majority stems from flooding events. Panama's figures are unique in the region as no other country in the study had such substantial a percentage of displacement risk associated with flooding alone.

4.10.3 Key Data

Panama's exposure is made up primarily of earthquake hazard, with smaller amounts of drought, flood and landslide exposure.

Figure #4.10.2: Annual displacement estimates per hazard

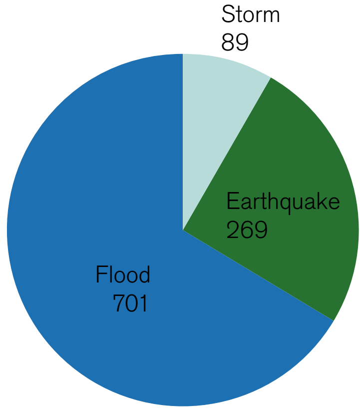
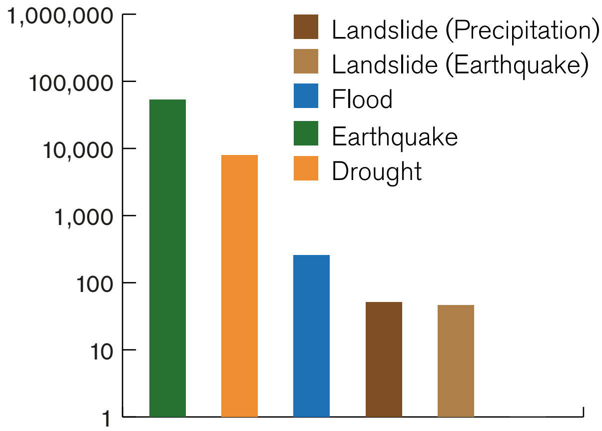


Figure #4.10.3: Relative Hazard Exposure (per 1 million inhabitants).



Source: UNEP GRID Model, 2011

Figure #4.10.1: Disaster and climate change induced displacement estimates

Disaster displacement estimates

		Magnitude		Magnitude		Amplitude
Country	Population	ABSOLUTE – 2014-2018 Average Annual Displacement (Country total)	Rank	RELATIVE – 2014-2018 Average Annual Displacement (per million inhabitants)	Rank	Qualitative Displacement Amplitude
Panama	3,864,000	1,059	9	274	10	Low

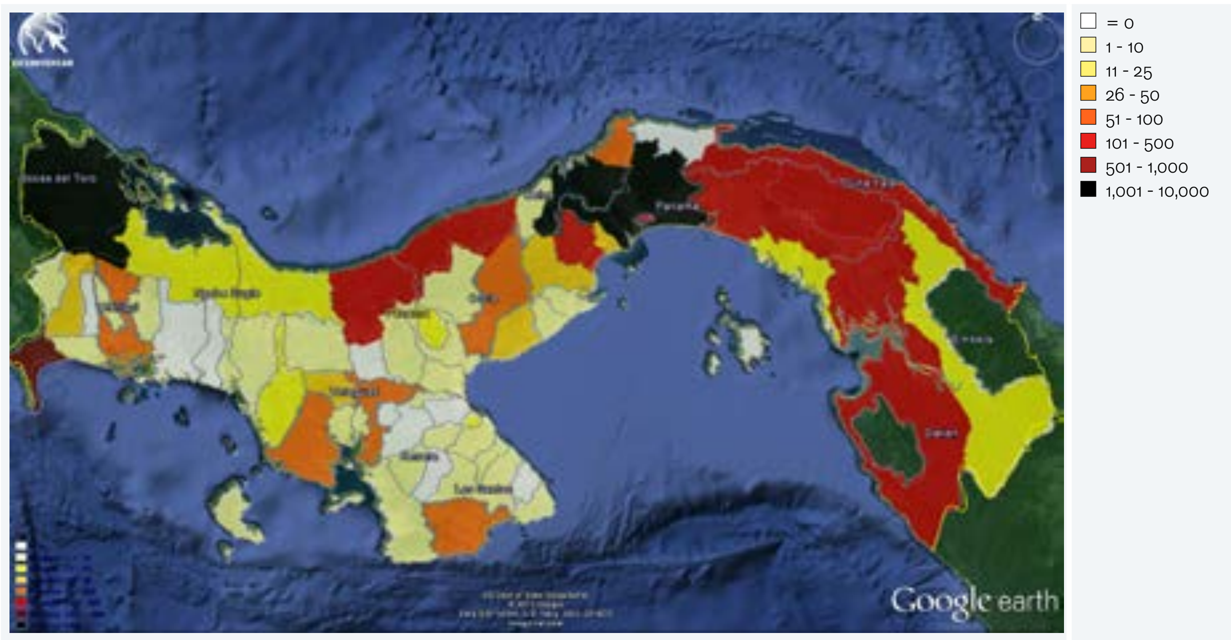
Disaster displacement estimate components

	DDI Absolute Magnitude					Historic Displacement	
Country	Total Relative Physical Exposure (per 100)	Vulnerability	Resilience	Risk Configuration	Risk Configuration (Normalised)	Historic Absolute Displacement	Historic Relative Displacement (per 1M)
Panama	6.11	7.00	6.15	0.70	0.05	1,009	261

DesInventar's Panama database is one of the most extensive and thorough datasets maintained of the ten countries reviewed. Substantial numbers, in terms of houses destroyed, have been compiled for several parts of the country, particularly the most populated central region and most areas bordering the Caribbean.

Panama's EM-DAT entries average slightly fewer than 500 homeless per year over the 41 year sample. Its flood-related 'number of homeless persons' figures would appear to be lower than expected, possibly due to mis- or under- reporting of figures for this hazard type by the agency used for primary source data in Panama. In terms of number of people affected, floods were by far the highest source of hazard, with much lower averages for earthquake- and storm-related losses.

Figure #4.10.3: DesInventar Homes Destroyed 1970-2012



Source: Panama DesInventar disaster loss database

Figure #4.10.4: EM-DAT Homeless figures 1970-2010

Country	Disaster Type	Sample period (1970-2010)	Annual Average Homeless	Annual Average Affected	Annual Average Deaths
Panama	Earthquake	41 yrs	228	280	0.8
	Flood	41 yrs	182	4,814	4.2
	Mass movement - dry	41 yrs	0	0	0.0
	Mass movement - wet	41 yrs	0	140	0.0
	Storm	41 yrs	49	347	1.1
	Volcano	41 yrs	0	0	0.0
Panama Total		41 yrs	459	5,442	6.1

Source EM-DAT disaster loss database

5 Bibliography

Brenes, A. 2013. *Inventario de herramientas para el análisis del riesgo de desastre y la promoción de acciones de adaptación al cambio climático.* Unpublished report for Banco Interamericano de Desarrollo (BID)

Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDERNAC). 2010. *Informe base de daños y pérdidas de eventos hidrometeorologicos.*

Centro Nacional de Registros de la República de El Salvador (CNR). (2003). *Análisis de Riesgo por Inundaciones y Deslizamientos en la Microcuenca del Arenal de Montserrat.* http://archivo.elfaro.net/secciones/Noticias/20070604/informe.pdf

Cohen, R. and Bradley, M. 2010. Disasters and Displacement: Gaps in Protection. *Journal of International Humanitarian Legal Studies*, v.1 2010. http://www.brookings.edu/research/articles/2010/11/16-disasters-and-displacement-cohen

Cooper, M.D. 2012. *Migration and Disaster-Induced Displacement: European Policy, Practice, and Perspective.* Centre for Global Development. http://works.bepress.com/michael_d_cooper/2/

Development Assistance Research Associates (DARA). 2012. *Indicator of Conditions and Capacities for Risk Reduction* (IRR). http://daraint.org/wp-content/uploads/2010/10/RRI.pdf

Dirección General de Ordenamiento y Desarrollo Territorial (DGODT), Republica Dominicana. 2012. *Avances y Desafíos en la Gestión de Riesgo de Desastres en República Dominicana.* http://economia.gob.do/eWeb/Archivos/Libros/Indicadores_de_Gestion_de_Riesgos.pdf

Economic Commission for Latin America and the Caribbean (*ECLAC).(2003. Handbook for Estimating the Socio-economic and Environmental Effects of Disasters.* http://www.proventionconsortium.org/toolkit.htm

Hoshour, K. and Kalafut, J. 2010. *A Growing Global Crisis: Development-Induced Displacement and Resettlement.* International Accountability Project, August 2010. http://www.accountabilityproject.org/downloads/KateHoshourPaper.pdf

Instituto Dominicano de Desarrollo Integral (IDDI) and US Agency for International Development (USAID). 2012. *Critical Points regarding Vulnerability to climate change and variability in the Dominican Republic.*

Internal Displacement Monitoring Centre (IDMC). 2011. *Displacement due to natural hazard-induced disasters: Global Estimates for 2009 and 2010.* IDMC. http://www.internal-displacement.org/publications/natural-disasters-2009-2010

IDMC and the UN Office for the Coordination of Humanitarian Affairs (OCHA). 2009. *Monitoring disaster displacement in the context of climate change.* IDMC. http://www.internal-displacement.org/8025708F004CFA06/%28httpPublications%29/451D224B41C04246C12576390031FF63?OpenDocument

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 Intergovernmental Panel on Climate Change* [Field, C.B. et al. (eds.)]. Cambridge University Press. http://ipcc-wg2.gov/SREX/

Inter Press Service (IPS). 2012. *Climate Refugees – Today's New Reality.* http://www.ipsnews.net/2012/06/climate-refugees-todays-new-reality/

Inter Press Service (IPS). 2012. *Number of IDP's on the Rise Due to Climate Change.* http://www.ipsnews.net/2012/10/number-of-idps-on-the-rise-due-to-climate-change/

Kälin, W. and Schrepfer, N. 2012. *Protecting People Crossing Borders in the Context of Climate Change: Normative Gaps and Possible Approaches.* UNHCR Legal and Protection Policy Research Series. http://www.refworld.org/docid/4f38a9422.html

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://www.ehs.unu.edu/article/read/changing-climate-moving-people-framing-migration-displacement

Kolmannskog, V. and Trebbi, L. 2010. Climate change, natural disasters and displacement - a multi-track approach to filling the protection gaps. *International Review of the Red Cross*, v.92, No.879, Sept 2010. http://www.icrc.org/eng/resources/documents/article/review-2010/irrc-879-kolmannskog-trebbi.htm

McAdam, J. 2011. *Climate Change Displacement and International Law: Complementary Protection Standards.* UNHCR Legal and Protection Policy Research Series. http://www.unhcr.org/4dff16e99.pdf

Norwegian Refugee Council (NRC). 2011. *Nansen Principles- Climate Change and Displacement in the 21st Century.* http://www.nrc.no/?did=9569923

Pacific Islands Applied Geoscience Commission (SOPAC), Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI). 2011. *Risk Assessment*

Methodology. http://pcrafi.sopac.org/documents/16

Robinson, W.C. 2003. *Risks and Rights: The Causes, Consequences, and Challenges of Development-Induced Displacement*. The Brookings Institution-SAIS Project on Internal Displacement http://www.brookings.edu/fp/projects/idp/articles/didreport.pdf

Secretaría de Planificación y Programación de la Presidencia de la República de *Guatemala*. 2012. *Análisis de Riesgo en Proyectos de Inversión Pública.*

Terminski, B. 2013. *Development-Induced Displacement and Resettlement: Theoretical Frameworks and Current Challenges*. University of Geneva. http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/8833/Bogumil%20Terminski,%20development-Induced%20Displacement%20and%20Resettlement.%20Theoretical%20frameworks%20and%20current%20challenges.pdf?sequence=1

Thomas, A., Rendon, R. 2010. *Confronting Climate Displacement: Learning from Pakistan's Floods.* Refugees International. http://www.alnap.org/resource/6077

United Nations Environment Programme (UNEP). 2013. Global Resource Information Database (GRID). PREVIEW Global Risk Model. http://preview.grid.unep.ch.

United Nations Environment Programme (UNEP). 2011. GRID Physical Exposure Data. "*Physical exposition to tropical cyclone of Saffir-Simpson category 5 1970-2009", "Physical exposure to earthquakes of MMI categories higher than 9 1973-2007"* "*Physical exposition to flood*", "*Physical exposition to lanslides triggered by earthquakes", "Physical exposition to landslides triggered by precipitations"," Physical exposition to droughts events 1980-2001"* http://preview.grid.unep.ch

United Nations Office for Disaster Risk Reduction (UNISDR). 2005. Hyogo Framework For Action 2005 – 2015: Building the Resilience of Nations and Communities to Disasters. UNISDR, Geneva.

UNISDR. 2009. Terminology on Disaster Risk Reduction. http://www.unisdr.org/we/inform/publications/1037

United Nations Office for Disaster Risk Reduction (UNISDR). 2013. *Global Assessment Report (GAR) 2013 From Shared Risk to Shared Value: The Business Case for Disaster Risk Reduction*. http://www.unisdr.org/we/inform/publications/33013

Wilches- Chaux, G. 1988. *La Vulnerabilidad Global* in Maskrey, Andrew. (ed) *Los desastres no son Naturales*. LA RED. Tercer Mundo Editores. http://www.desenredando.org/public/libros/1993/ldnsn/LosDesastresNoSonNaturales-1.0.0.pdf

Wilches Chaux, G. 1998. *Auge, Caída y Levantada de Felipe Pinillo, Mecánico y Soldador o Yo Voy Correr el Riesgo: Guía de La Red para la Gestión Local del Riesgo.* La Red. IT Perú, Quito.

World Bank. 2011. Worldwide Governance Indicators (WGI). http://info.worldbank.org/governance/wgi/index.aspx#home

World Bank, Global Facility for Disaster Reduction and Recovery GFDDR (2012). *Metodología de Elaboración del Índice de Riesgo Municipal.*

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[28]; UNISDR (2013) Global Assessment Report[29]; IPCC (2012) SREX[30] and the Hyogo Framework for Action (2005).[31]

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.

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)

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 'conse-*

quences.' 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)

Notes

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

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

3. See http://www.unisdr.org/we/inform/gar

4. See http://www.internal-displacement.org/publications

5. See http://www.nanseninitiative.org/

6. IDMC (2013) Global Estimates 2012. p.6

7. Due to the difficulty of estimating drought-related displacement using existing methodologies, IDMC is employing 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 will be published in early 2014.

8. A more thorough glossary is included in Appendix I.

9. Adapted from Intergovernmental Panel on Climate Change (IPCC), 2012. *Managing the Risks of Extreme Events and disasters to Advance Climate Change Adaptation, Special Report of the Intergovernmental Panel on Climate Change*, Cambridge: Cambridge University Press, p.557. http://ipcc-wg2.gov/SREX/

10. UNISDR, 2009. *UNISDR Terminology on Disaster Risk Reduction*. Geneva: UN Office for Disaster Risk Reduction. http://www.unisdr.org/files/7817_UNISDR TerminologyEnglish.pdf

11. UNISDR, 2013. Glossary of Key Terms. In *Global Assessment Report on Disaster Risk Reduction 2013 From Shared Risk to Shared Value: the Business Case for Disaster Risk Reduction*. Geneva: UNISDR. http:// www.preventionweb.net/english/hyogo/gar/2013/ en/home/index.html

12. United Nations, 1998. Guiding Principles on Internal Displacement. Geneva: United Nations.

13. 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 Warner, K., Afif, T.,Kälin, W., Leckie, S., Ferris,B., Martin, S. and Wrathall, D. (eds.)]. Bonn, Germany: United Nations University Institute for Environment and Human Security (UNU-EHS). http://www.ehs.unu.edu/article/read/changing-climate-moving-people-framing-migration-displacement

14. By convolution we here mean that each variable in the equation in Figure 2 may be expressed by a function (rather than say, a constant value). The relationship between each of these in turn may be expressed by another function obtained by integration that explains their relationship.

15. The term 'fat tailed distribution' is commonly used to describe the shape of a loss frequency curve where events on the end 'tails' of the distributions (that is, very low recurrence) are actually more probable than previously expected and/or related to more losses than previously expected.

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

17. 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://www.brookings.edu/research/reports/2011/01/06-operational-guidelines-nd). Also, Cernea's Impoverishment Risks and Reconstruction approach analyses forced resettlement in the context of 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: World Bank.

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

19. United Nations International Strategy for Disaster Reduction (UNISDR), 2005. *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Geneva: UNISDR. http://

www.unisdr.org/we/inform/publications/1037. 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. A post-2015 agreement is currently being prepared for adoption at the Third UN Conference on Disaster Risk Reduction scheduled to take place in Sendai, Japan in 2015.

20. Internal Displacement Monitoring Centre (IDMC) and Norwegian Refugee Council, 2013. *Global Estimates 2012: People displaced by disasters*. Geneva, IDMC. http://internal-displacement.org/publications/global-estimates-2012

21. Susman, P., O'Keefe, P. and Wisner,B. 1983. Global disasters, a radical interpretation. In *Interpretations of Calamity* [Ken Hewitt (ed.)]. Boston: Allen and Unwin.

22. 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).

23. EM-DAT: The OFDA/CRED International Disaster Database – www.EM-DAT.be – Université catholique de Louvain, Belgium.

24. DesInventar stands loosely for 'Disaster Inventory' in Spanish and is principally a methodology and tool for setting up and administering disaster loss databases at a national level. These databases are each administered independently and help track "daily disasters of small and medium impact." Datasets and mapping tools are available at http://www.desinventar.org.

25. This paper used a 41-year period from 1970-2010 from EM-DAT and as close to a 40-year period from DesInventar databases as the data would allow.

26. For the displacement estimates produced in this paper, we used the principal international database for disaster losses, EM-DAT. It uses a threshold of ten fatalities, 100 people affected or a call for international aid. Generally, number of persons killed and number of persons affected values seem to take precedence over homeless figures whose entries can be less consistent. Future iterations of the model seek to integrate DesInventar databases – which contain much more granular loss data on many more events. These databases are maintained by each participating country, with the ability to apply the methodology for the database as each country sees fit. Since some countries report more detailed figures, and/or utilise lower thresholds than others, developing comparisons between countries is very challenging.

27. Development Assistance Research Associates (DARA). 2012. *Indicator of Conditions and Capacities for Risk Reduction* (IRR). http://daraint.org/wp-content/uploads/2010/10/RRI.p

28. See: http://www.preventionweb.net/english/professional/publications/v.php?id=7817&utm_source=pw_search&utm_medium=search&utm_campaign=search

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

30. See: http://ipcc-wg2.gov/SREX/

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

About IDMC

The Internal Displacement Monitoring Centre (IDMC) is a world leader in the monitoring and analysis of the causes, effects and responses to internal displacement. For the millions worldwide forced to flee within their own country as a consequence of conflict, generalised violence, human rights violations, and natural hazards, IDMC advocates for better responses to internally displaced people, while promoting respect for their human rights.

IDMC is part of the Norwegian Refugee Council (NRC).

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