THE NANSEN INITIATIVE
DISASTER-INDUCED CROSS-BORDER DISPLACEMENT

CLIMATE INDUCED MIGRATION AND DISPLACEMENT IN MESOAMERICA

DISCUSSION PAPER

Report prepared by Fanny Delavelle
London School of Economics and Sciences Po Paris

DISASTERS
CLIMATE CHANGE AND
DISPLACEMENT
EVIDENCE FOR ACTION

PARTNERS

NRC NORWEGIAN REFUGEE COUNCIL

iDMC internal displacement monitoring centre

UNHCR The UN Refugee Agency

ACKNOWLEDGEMENTS

Alex de Sherbinin of the Center for International Earth Science Information Network (CIESIN), The Earth Institute at Columbia University, served as my advisor. I also benefited from advice and comments by Susana Adamo at CIESIN and by Hannah Entwisle Chapuisat at the Nansen Initiative Secretariat.

Center for International Earth Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

The project is funded by the European Union with the support of Norway and Switzerland

NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Foreign Affairs FDFA

CONTENTS

1. INTRODUCTION

As environmental degradation induced by natural disasters has become more frequent in the last decades, the impact of environmental changes on migration has created new, unprecedented challenges. Compared with other natural disasters such as earthquakes and tsunamis, climate-related events caused the most displacement in 2010, forcing 38 million people to move (IDMC, 2012).

Migration is a strategy used to adjust to changing environments (Haque, 2010). Most scholars acknowledge a spectrum between voluntary and involuntary movement, given multiple factors influencing movement (Hugo, 1996). In this article, we consider that in general environmental migration refers to a primarily voluntary movement in which the decision-making process is subjected to various factors – including non-environmental ones-, while displacement is largely forced or involuntary, with environmental constraints acting as primary factors[1]. In turn, planned reallocations can be either forced or voluntary depending on the circumstances. Human mobility can be precipitated by both sudden disasters such as hurricanes and slow onset events such as desertification. Sudden events, sometimes called emerging disasters, typically capture media attention and demand quick response from governments and non-governmental actors. Such disasters often displace large populations immediately after they occur (Foresight, 2011). Although in most cases displaced people wish to return home as soon as possible, quick return is sometimes not possible, and sudden events can induce long-term displacement. In 2010, disasters displaced more than 42 million persons globally, and such events are expected to grow in frequency and intensity with climate change (Gemenne, 2010). Slow onset events, or ongoing crises, are not given as much attention by the media, despite significant impacts on livelihoods and migration decision making. Analyzing such patterns will be crucial to the development of adaptation policies to respond to future climate change impacts. Indeed, in many cases, migration is used as an adaptation strategy in response to slowly deteriorating local conditions (National Intelligence Council, 2009). While slow onset events generally induce migration rather than displacement, and thereby relatively voluntary movement, they may with time reach a crisis point, thus turning into disasters, and inducing movement that can be placed closer to the "involuntary" or "forced" end of the spectrum. The increasing environmental degradation associated with the crisis phase may also be caused by the cumulative effects of multiple slow-onset disasters that gradually renders an area uninhabitable (The Nansen Initiative, 2013).

Although climate change is a global phenomena, its impacts will be locally differentiated. Mesoamerica's greenhouse gas emissions will in all likelihood continue to be a very small fraction of global emissions, but its geographic characteristics make it one of the regions most vulnerable to climate change impacts (Barcena, Prado et al., 2010).

This article adopts the framework of the Foresight report on Global Environmental Change and Migration (2011) and applies it to Mesoamerica. Drawing from the main conclusions of the Foresight report, we argue in Part II that environmental change has impacted and will continue to impact migration flows, particularly by influencing economic, political and social drivers that are potential migration triggers by themselves. This means that environmental migration cannot be understood in isolation from other social, political, demographic and economic drivers (see Figure 1), and that the complex-

[1] It is worth mentioning that there is currently no internationally agreed definition of environmental migration, limiting both legal and empirical efforts to analyse environmental migration.

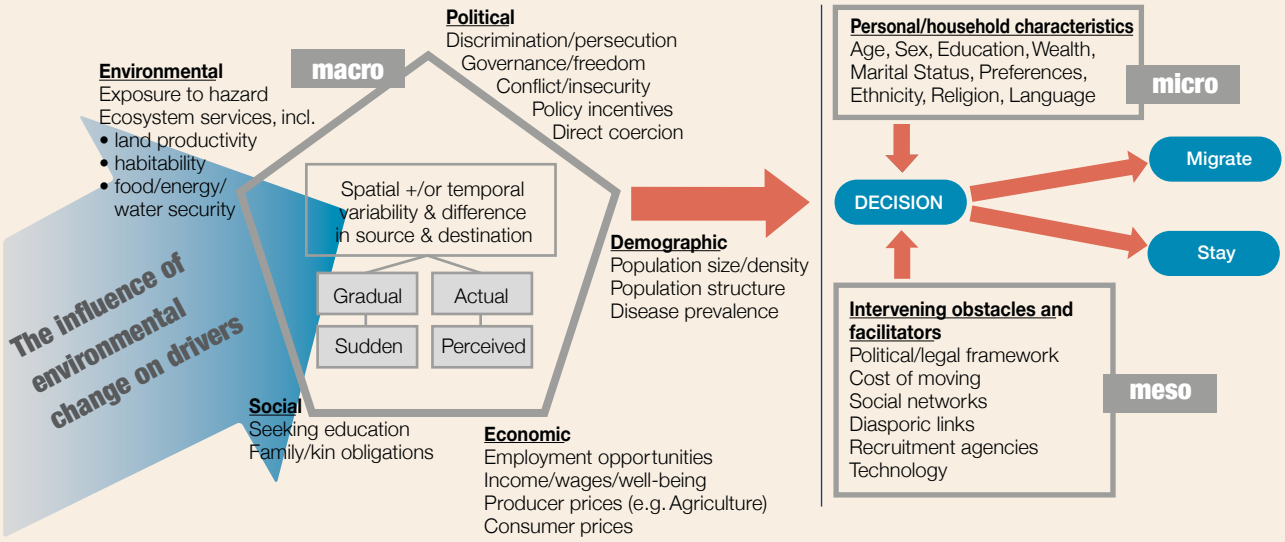


Figure 1: Foresight Environmental Migration Framework

ity of the interactions between these factors make it difficult to identify individuals that are solely motivated to migrate by environmental factors (Foresight, 2011). In order to assess the influence of environmental drivers on migration flows in Mesoamerica, we identify in Part III the trends affecting the region's climate and their likely future evolution. Section IV also stems from the conclusions of the Foresight report, building on Part III's analysis of the region's climate vulnerabilities to stress how Mesoamerica's economic, social and political vulnerabilities aggravate the impact of natural disasters. Finally Section V assesses past and present migration patterns in the region, analyzing the most powerful migration drivers, and considering their connection with environmental factors as well as their influence on the decision to migrate. Section V also illustrates the Foresight report's argument that the impact of environmental changes on migration flows will increase in the next decade, specifically by forcing changes in livelihoods and by challenging the efficiency of traditional responses.

Through this description of the past and predicted future impacts of climate variations on mobility dynamics in Central America, we hope to highlight the necessity for states as well as local communities to build strategies and policies to improve disaster risk reduction, preparedness and adaptation.

Figure 2. Map of Mesoamerica

2. ENVIRONMENTAL MIGRATION

2.1 UNDERSTANDING ENVIRONMENTAL MIGRATION

Understanding the current patterns of environmental migration in Central America today and their relation to vulnerability allows an informed analysis of the potential future impacts of climate change on the present dynamics. According to the IPCC, climate change will increase the frequency of sudden onset natural disasters as well as slow onset environmental changes that impact human migration and displacements (IPCC, 2007). Some areas of the world might actually "benefit" from climate change as the new environmental conditions will be more advantageous for their economy, thereby attracting migrants. This is expected to be the case for the Arctic, as climate change is likely to open new shipping routes, and engender new resource-based activities (McLeman and Hunter, 2010; Wrathall, 2013). However, most other regions, including Central America, will be negatively affected as climate change will hinder their economic activities. If adaptation and capacity building projects are not put into place, massive displacements of population should be expected, in some cases leading to the progressive abandonment of villages (Foresight, 2011).

Environmental changes influence migration patterns as they either directly (through destruction of crops or housing) or indirectly (through decreases in the country's GDP) affect the livelihoods of populations in both rural and urban areas (Ho and Milan, 2012). Environmental variables can act both as push factors (e.g., in the case of natural disasters like hurricanes and in the case of human-induced degradation such as land-degradation) and as pull factors (e.g., attraction of fertile farmland). In the case of Guatemala, which is analyzed in Section IV, push factors such as land fragmentation and degradation push farmers from the highlands, while available land served as pull factors to attract migration towards the Petén (Bilsborrow, 2002).

Migration induced by environmental changes is usually considered as a type of forced mobility, as the push factors are typically stronger than the pull factors. Hugo (1996) suggested that the various types of environmental mobility should be placed on a continuum from forced to voluntary mobility. Refugee-like situations where households have little control over the events and the process, and are highly vulnerable, would thereby be differentiated from scenarios where the migrant has larger control over the timing, type and destination and are not as vulnerable (ECOSOC, 2011). It is not easy to decide when the tipping point is reached; that is, when does the accumulation of factors turns a voluntary decision into a forced one? Another issue is to identify the type of situations when the environmental factor reaches such a point that migration will be permanent. Slow-onset coastal erosion from sea level rise and storm surge is an example of an irreversible change that over time may result in migration (Boncour, 2008).

Furthermore, environmental factors are usually intertwined with a large array of other socioeconomic and political motivations, and migrants usually do not move only because of environmental changes, but because of the accumulation of various factors, with environmental ones acting as multipliers (Foresight, 2011). Estimating the number of future "environmental migrants" is therefore a difficult task as it depends on the predicted magnitude of environmental changes compared to other push and pull factors (National Intelligence Council,

A Mayan woman walks across a dry corn field in the remote town of Guayabo, Guatemala. (Source: Infosur Hoy, 2009)

2009). Most of the time, the environmental factors are linked to economic and social ones, and environmental migrants are usually also economic migrants (ECOSOC, 2011). It can also be argued that in the case of rural to urban migration, most economic migration is also environmental: in many cases, environmental degradation (e.g., declining yields or parcelization of small holdings owing to population growth) leads to declining livelihoods, precipitating a decision to move in the search for more stable or remunerative occupations elsewhere (Bilsborrow, 2002).

While the intensity or frequency of natural disasters will have some impact on migration, it must be emphasized that likely migration flows are also a function of regional social vulnerability (National Intelligence Council, 2009). Developing countries are the most vulnerable to environmentally induced migration, due to specific social, political and infrastructural sensitivities which we will explore in Section IV. This means that vulnerability can be lowered through appropriate adaptation programs (Landa, Magaña and others, 2008), as a country develops its infrastructure, reduces social vulnerabilities and improves its political structure.

2.2 ENVIRONMENTAL MIGRATION AS A RISK MANAGEMENT STRATEGY

In rural regions of Central America, as droughts and rainfall variability lead to lower incomes and farming productivity, migration is often used as a risk management strategy to mitigate the impacts of variability in household consumption and revenues related to rain-dependent agriculture (Foresight, 2011).

This process of risk management relates to the "agricultural squeeze", coined by Norman Myers in 1993, who referred to Mexicans resorting to migration in response to poor agricultural outputs provoked by land degradation. According to this theory, the decision to migrate is usually taken by households who do not have a reliable and sufficient source of income (Myers, 1993). Particularly, farmers who are repeatedly affected by natural disasters that wipe out their entire production, and don't benefit from a suitable disaster risk management system (e.g., crop insurance) are more likely to consider migration as an adaptation strategy than those affected by smaller, less frequent disasters. While destruction of housing structures is the primary reason for initial displacement following a natural disaster, subsequent permanent migration is usually induced by labor market dimensions (eg the loss of commercial land) (Foresight, 2011). Indeed, loss of agricultural land is an important driver in the decision to migrate permanently (National

Intelligence Council, 2009). In 1979 for instance, after a tropical cyclone hit the Dominican Republic, the decision by households to migrate depended more on crop type than on the damage suffered by the community; those who engaged in multi-cropping over an seasonal cycle were less likely to migrate than those whose crops were harvest annually (Verner, 2010).

Similarly, in the dry land area of Tlaxaca State, Mexico, where households depend on rain-fed agriculture, changes in rainfall periods have increased uncertainty and provoked a decrease in crop yield and revenues. As a result, seasonal migration is widely used in the area as a source of livelihood diversification, enabling workers to gain money while not leaving their villages permanently (Warner et al., 2009, EACH-FOR 2009 Mexico Case Study Report). On the other hand, in Cacahoatan, in the state of Chiapas, Mexico, the future income expectations of farmers are much gloomier. In 2007, the municipal director for rural development of Cacahoatan estimated that about 30% of yearly coffee production is destroyed by natural disasters, particularly droughts. As a result, about 50% farmers' sons have migrated to the USA (Saldana-Zorilla, 2008). These examples show that if relatively short droughts evolve into longer dry spells, or a trend towards desertification, farmers living in areas that currently rely on rain fed agriculture are likely to abandon the regions permanently unless proper irrigation systems are set up (Milan and Ruano, 2013).

When migration is used as a risk management system, the type of disaster affecting the region will greatly influence the migration process (Foresight, 2011). In the last decades, food insecurity induced by droughts and floods tended to last for relatively short and predictable periods, so populations were more likely to migrate seasonally rather than permanently (Ho and Milan, 2012). However, as the impacts of climate change become stronger, migration flows are likely to increase in both distance and duration, especially if most Central American countries do not take the necessary steps to adapt and recover from slow-onset and sudden disasters (National Intelligence Council, 2009). In the case of slow-onset disasters such as land degradation, natural processes act as amplifiers of already precarious conditions, further decreasing economic and social opportunities, and thereby forcing households to find other revenue options. Due to the gradual character of the environmental change it is most likely that only one member of the family – usually young adult males – will undertake labor circular migration alone at first, following pre-established routes, and will support his family financially through remittances (ECOSOC, 2011). The economic costs of land degradation in Central America are a strong incentive for a member of a household to migrate to the USA (Leighton and Notini, 1994). This international pattern of migration is likely to grow in the coming decades as the impacts of climate change increase.

On the other hand, in the case of sudden environmental disasters such as a hurricane, where the household's entire source of revenue is wiped away, the whole household will usually move to another, typically closer location. In this type of situation, natural disasters on their own are enough of a trigger to provoke migration, and poverty and social vulnerability amplify their impact (Ho and Milan, 2012).

In this part, we have shown that environmental migration is often used as a risk management strategy to decrease the impacts of disasters on income. The level of income however does not necessarily directly influence the decision to migrate. Indeed, the links between wealth and environmental migration are still unclear, various papers reporting opposite effects of income on migration (McLeman and Smit, 2006; Frey and Singer 2006). For instance, while we might expect wealthier households to migrate in the case of repetitive disasters, it is actually expected that land owners are in many cases less likely to migrate than renters, as they have more to lose (Mc Leman and Smit, 2006). Similarly, although it can be argued that subsistence farmers are the most likely to migrate as a response to natural disasters, since they lack access to alternative sources of income, many of those farmers don't actually have the economic means to migrate, and are therefore caught in a "poverty trap", relying mostly on community solidarity for survival (Girot, 2003, Milan and Ruano, 2013). Such "trapped populations" were a major focus of the Foresight Project on Environmental Migration (Black et al. 2011). Furthermore, initial differences in vulnerability to the natural disaster – related to socio-economic and demographic factors – gradually disappear as a maximum level is attained in terms of water and food availability and as coping strategies aside from migration fail (Meze-Hausken, 2000).

3. PAST AND PREDICTED CLIMATE CHANGE IN MESOAMERICA

In order to understand the patterns of environmental migration in Central America, it is first necessary to analyze the evolution of climate variables in the region. It is important to underline that regional information deficiencies makes it difficult to obtain a full assessment of the impact of recent climate changes on the economies and populations of the region. There are large gaps in data, deficiencies in methodologies as well as instruments to monitor information and track events at the local, national and regional levels (National Intelligence Council, 2009). Heterogeneities across countries is also an issue. Although endeavors are being made to increase data quality and availability, this lack of rigorous analysis of past climate trends and extremes means that governments don't always have the information they need to address current and future adaptation. Most research on this topic has been undertaken discipline by discipline, sector by sector, an issue that hinders climate change analysis in most developing countries. The lack of systematic analysis should be resolved by increasing integrated research on the various sectors impacted by climate change (Foresight, 2011).

3.1 SLOW-ONSET CHANGES

3.1.1 Temperature increase

According to past climate observations, the mean annual temperature in Central America increased by approximately 1°C in the region in the past decades and is expected to continue increasing in the next decades (IPCC, 2007). Scenarios of medium-low emissions without mitigation actions – corresponding to the business-as-usual plan in which the current trend is sustained- predict that annual temperatures will increase by 0.5 °C by 2020, compared to the 1980-2000 average. By the year 2030, temperatures would have increased by 1.3°C-1.5°C on average, when compared to the same baseline – results that correspond to the IPCC's global estimations (Foresight, 2011).

3.1.2 Precipitation changes

In and of themselves, temperature increases will mean that evapotranspiration will increase, which will have impacts on soil moisture availability for crop growth and runoff, limiting the types of viable agricultural crops and extending drought periods (National Intelligence Council, 2009). On top of this, precipitation levels are projected to fall, although the projections for future precipitation are still quite tentative and vary significantly among models. In the same scenario of medium-low emissions (B2 scenario of the IPCC), rainfall could decrease by 17% in Nicaragua, and 12% in Honduras, by 2100 (see Table 2). Using more pessimistic estimations according to the A2 scenario of the IPCC,

Table 1: Average temperature change in Central America, scenario B2, 1980-2000 to 2100 (in degrees Celsius)
(Source: Barcena, Prado et al., 2010).

Country	2020	2030	2050	2070	2100
Costa Rica	0.53	0.83	1.23	1.77	2.40
Belize	0.57	0.90	1.33	2.00	2.40
El Salvador	0.53	0.97	1.40	1.97	2.63
Guatemala	0.57	1.00	1.43	2.10	2.67
Honduras	0.50	0.90	1.40	1.93	2.53
Nicaragua	0.57	0.90	1.37	1.80	2.43
Panama	0.50	0.80	1.23	1.70	2.20
Central America	**0.53**	**0.90**	**1.33**	**1.87**	**2.50**

Table 2: Annual mean precipitation change, scenario B2, three model average, 1980-2000 to 2100 (in percentages)
(Source: Barcena, Prado et al., 2010).

Country	2020	2030	2050	2070	2100
Costa Rica	-0.73	-8.43	-3.08	-1.43	-10.40
Belize	3.67	-3.93	-7.88	-10.43	-12.60
El Salvador	5.40	-3.53	-2.44	0.43	-11.03
Guatemala	3.30	-0.60	-0.10	-3.33	-7.23
Honduras	6.17	-4.47	-7.18	-6.50	-12.27
Nicaragua	5.30	-6.57	-7.31	-6.17	-17.43
Panama	4.37	-2.67	-2.36	-3.10	-2.90
Central America	**3.90**	**-4.30**	**-4.33**	**-4.37**	**-10.53**

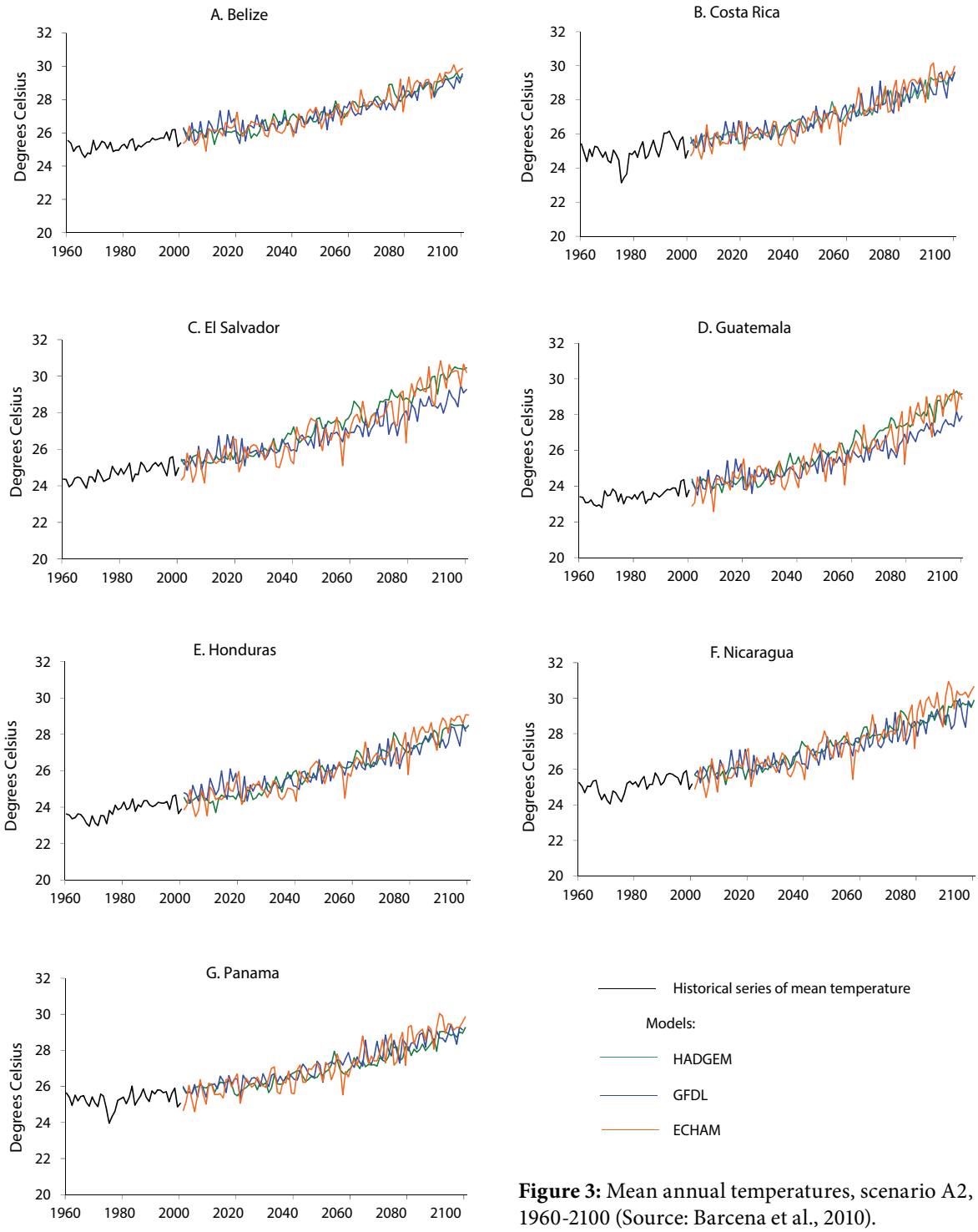


Figure 3: Mean annual temperatures, scenario A2, 1960-2100 (Source: Barcena et al., 2010).

Table 3: Annual mean precipitation change, scenario A2, three model average, 1980-2000 to 2100 (in percentages)
(Source: Barcena, Prado et al., 2010).

Country	2020	2030	2050	2070	2100
Costa Rica	1.77	3.87	-12.47	-14.83	-26.53
Belize	-3.47	-0.13	-15.23	-16.93	-30.17
El Salvador	-2.67	-0.63	-15.23	-15.73	-31.27
Guatemala	-1.53	-1.33	-12.73	-14.17	-26.80
Honduras	-2.20	4.17	-15.70	-17.43	-32.03
Nicaragua	-0.60	4.87	-17.93	-17.73	-34.87
Panama	1.53	1.97	-7.97	-9.93	-17.53
Central America	**-1.03**	**1.83**	**-13.87**	**-15.27**	**-28.43**

precipitation reductions could reach 35% and 32% in those countries, respectively (See Table 3) (IPCC, 2007). However, up to the present, no sustained decrease in annual precipitation levels has been observed in the region, underscoring the uncertainties. Although they were slightly lower in El Salvador, Guatemala and Honduras in the last three decades compared to 1950-1979, they actually slightly increased in Belize and Panama (IPCC, 2007). It is expected that the region will not be uniformly affected by decreases in precipitation levels. A number of estimates for instance predict lower rainfall levels on the Atlantic coast, and higher ones on the Pacific, with elevated regions being particularly affected by increases in rainfall, possibly leading to more frequent landslides (Foresight, 2011).

The El Niño Southern Oscillation phenomenon (ENSO) is the main cause of climate variability in this region characterized by its high inter and intra-annual and geographic variability (NOAA, 2013). El Nino is characterized by warmer than usual ocean temperatures in the Equatorial Pacific, while La Nina is associated with unusually cold ocean temperatures. ENSO has important impacts on weather around the world, and most particularly in Central America. The increase in extreme natural disasters in the region in the last thirty years is related to the intensification of ENSO events, most notably the disasters of 1982-83 and 1997-98 (Threnberth and Stepaniak, 2001). ENSO usually affects the region every four to seven years, from July to December, leading to large reductions in precipitation. A moderate ENSO event can reduce precipitation by > 80% in July and August (UNDP, 2013). ENSO cycles strengthened by climate change could contribute to increases in rainfall in some areas and extended droughts in others. The Pacific coast should for instance receive more rainfall whereas the Atlantic coast will face a reduction in precipitation (Barcena, Prado et al., 2010). Today, the region typically faces a short dry period from late July to early August, and a tropical storm and hurricanes season from June 1st to November 30th. This situation could change dramatically in the next few decades, with longer, more intense drought periods in the summer, and stronger, more frequent hurricanes in the autumn, thereby increasing the region's already high climate variability (National Intelligence Report, 2009). Reports have highlighted the link between cold ENSO years and hurricane frequency in the region, it is estimated that there is more than 3:1 ratio of hurricane landfalls per season between cold and warm ENSO events (Targatlione et al., 2003).

3.1.3 Consequences on water distribution

This irregular distribution of rainfall would aggravate the already uneven distribution of water between countries and between regions within each nation. Although Central America is considered to be in a relatively well-off situation regarding water availability, with approximately 23,000 cubic meters per inhabitant (the threshold of 1,700 m^3/person/year is considered to mark conditions of water stress (Falkenmark and Lindh, 1976)), the distribution of water across the region is highly uneven and varies annually, geographically and seasonally, inducing severe water scarcity in certain areas and time periods. The Caribbean coast for instance has a relatively high level of precipitation all year long whereas the Pacific coast is often subjected to dry spells of over five months (World Bank, 2009). In such areas, water flows in rivers are limited to the rainy season, causing rural inhabitants to be left without ready access to water for over six months in a row (Barcena, Prado et al., 2010). Droughts, in addition to hurricanes, are the most widespread disaster type in Central America, with almost no area in the region that hasn't been affected in the last three decades. The Dry Corridor, a region on the Pacific side that runs from Guatemala to Costa Rica, including the northern half of Mexico (Magrin et al., 2007), has experienced ENSO-related droughts causing extensive damage – a pattern that is likely to intensify in the near future considering current climate change predictions (UNEP/UNDP/EIRD/World Bank, 2010). In 2004-05 for instance, a severe drought affected the departments of Gracias a Dios and Francisco Morazan, Honduras, in July, provoking a 20% decline in maize production in which more than 30,000 households lost all or part of their subsistence crops (FAO, 2004). This same region had already been affected by the major droughts induced by the ENSO phenomenon in 1997-1998 (Olson, Alvarez et al., 2001), affecting water availability.

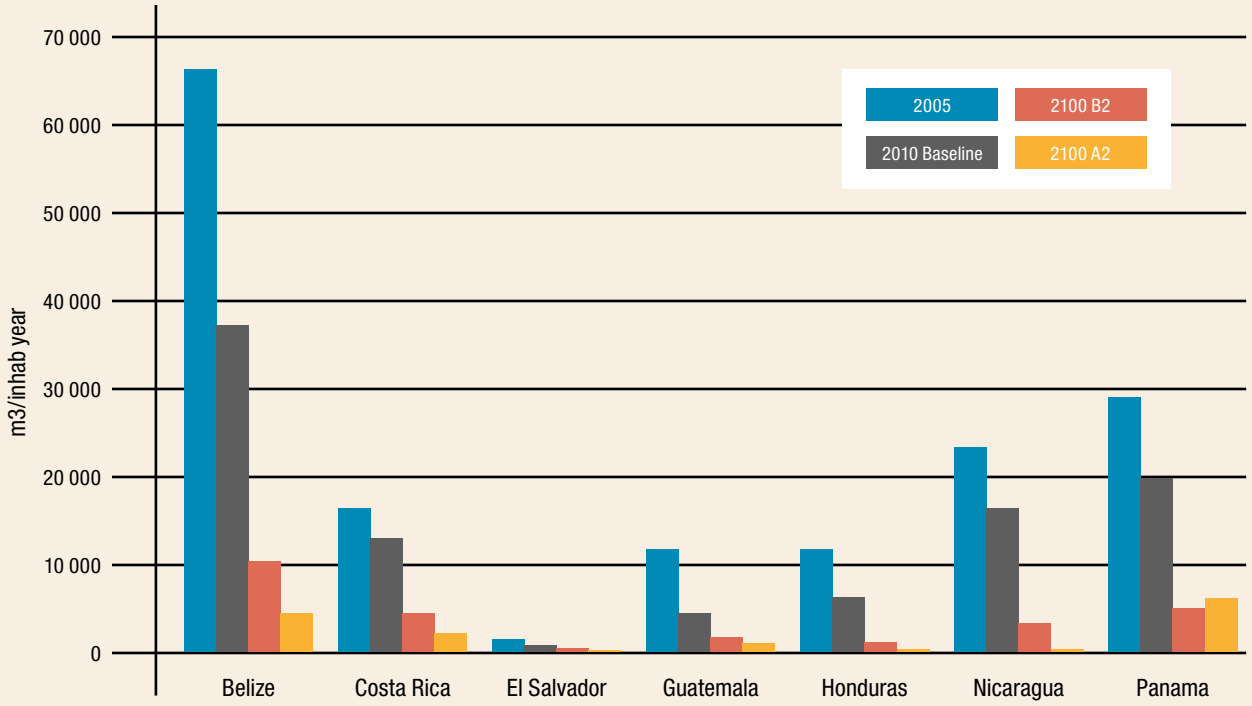


Figure 4: Water per capita availability in 2005, as well as with baseline scenario B2 and A2 to 2100 (in cubic meter per capita per year) (Source: Barcena, Prado et al., 2010).

3.1.4 Interactions between water supply and demand

Given its importance for the region's economic activities, water availability is a central issue for Central America. About 12% of the Central American population doesn't have access to improved drinking water today (about 61.7 million persons), the large majority living in rural areas (WSS INFO data, 2013). Although these figures are more related to development concerns than to absolute quantities of available water, they will be aggravated by climate change in the next decades: the number of Central Americans without access to improved drinking water is expected to increase to 79-178 million by 2050 (Arnell, 2004) if no adaptation measure if taken (IPCC, 2007).[2] Estimates show that water availability could remain stable until 2030, when levels would start to fall drastically (Barcena, Prado et al., 2010). When taking into account the increases in water demand due to demographic changes as well as the expected decrease in water supply, it is estimated that the regional intensity of water use would reach 140% in a scenario of moderate climate change (meaning that the water demand would be much higher than water supply), well above the 20% international threshold of "water stress". El Salvador is expected to be the most affected country, with Honduras and Nicaragua following closely (IPCC, 2007).

Even without climate change, the fact that the region's population is growing by 1.6% per year (PRB, 2012) will increase water demand in the next decades. It is important to note that 75% of the region's population relies on ground water for its water supply, particularly in the most important urban agglomerations on the Pacific coast (Losilla and others, 2001). The aquifers of Costa Rica's Central Valley and of Managua in Nicaragua for instance provide water for 50% of the population. However, a number of aquifers on the Pacific coast of Guatemala, Honduras and El Salvador have shown increased levels of salinity since 2005, and are in parallel facing water quality issues caused by untreated sewage water and runoff of agrochemicals (Barcena, Prado et al., 2010). The situation could be largely improved through public policies to renovate and expand the largely uncontrolled drinking water and sewage systems in the rapidly growing cities as well as in marginal areas (UNEP/CCAD, 2005). In Nicaragua for instance, important improvements in terms of water sanitation have recently been achieved through the construction of improved sewage systems in 180 rural communities in this area, decreasing regional water stress (World Bank, 2013).

Water availability for agriculture is of particular concern, as it typically constitutes over 75-90% of water demand (FAO, 2012). Building sustainable irrigation plans in the region will be crucial in the next decades to

[2] These estimations do not include the percentage of households that may migrate from water-stressed areas.

avoid increases in water stress in the agricultural sector, leading to reductions in production, and thereby affecting the region's economies (Milan and Ruano, 2013). Certain agricultural zones will be particularly affected by water stress for irrigation, including the Motagua Valley and Pacific slopes of Guatemala, eastern and western regions of El Salvador, the central valley and Pacific region of Costa Rica, the northern, central and western inter-mountain regions of Honduras and in the peninsula of Azuero in Panama. Inappropriate agricultural practices such as deforestation and excessive use of chemical fertilizers will further deteriorate surface and groundwater in terms of volume and quality, as demonstrated by the current state of the Matalgapa amd Jinoteca areas in Nicaragua (IPCC, 2007)[3].

Increased water scarcity is a potential cause for future conflict in the region where "hydro politics" is already a large dimension of intra-regional relations (German Advisory Council on Global Environmental Change, 2007). An example of potential hostilities that could emerge concerns the Rio Lempa, a crucial provider of drinking water end hydroelectric power for El Salvador, and which flows along the border between Honduras and Guatemala (Girot, 2003). Partly as a result of deforestation, the quantity of available water in the river has decreased by over 60% between 1985 and 1993. (Ordóñez et al., 1999).

3.2 EXTREME WEATHER EVENTS

3.2.1 Mesoamerica's vulnerability to natural disasters

Between 1930 and 2008, Central American countries have been affected by over 240 recorded extreme natural disasters, with floods, mudslides, storms and landslides accounting for over 80% of the total (CRED, 2012). The most affected country has been Honduras, with 54 natural disasters. An increase in the frequency of climate-related disasters such as droughts and landslides caused by floods has been noted since the 1970s, and especially from 1990 to 2008, an observation that could validate fears that climate change will increase natural disaster risk[4] (Anemüller, Monreal and Bals, 2006). The vulnerability of Central America to natural disasters was highlighted by the Germanwatch organization in its Global Climate Risk Index of 177 countries, which calculated that Honduras is the most affected by extreme natural events (considering absolute and proportional numbers of deaths, total losses in dollars and total losses as a proportion of GDP from 1998 to 2007), followed by Nicaragua ranking third, Guatemala eleventh and El Salvador thirtieth (Harmelling and Eckstein, 2012).

Hurricanes and storms typically cause the largest damages, and although they are more intense on the Atlantic side in countries like El Salvador, Guatemala, Costa Rica and Belize, their impact is often felt throughout the region (CRED, 2009). Although the IPCC's Fourth Report in 2007 (Hegerl et al., 2007) highlighted that there is no clear evidence that the increased frequency of storms is associated with climate change, it did underline that some observations indicate – with some uncertainty – that climate change influences the intensity of such disasters. Indeed, as concentrations of greenhouse gases increase in the atmosphere, the intensity of hurricanes is expected to grow. A warmer atmosphere containing more water vapor and warmer oceans may favor the process of storm and hurricane formation, through a more intense hydrological cycle. The main studies on this topic estimate that hurricanes will grow in intensity by 4% to 12% by 2100 (IPCC, 2007).

Floods remain the most frequent disaster, as their frequency has been multiplied by two in the past twenty years in comparison to the 1970-89 levels. A study by Oxfam-UK estimated that 15.4 million people in Central America are exposed to flood risks (Ordóñez, 1999). Panama, Costa Rica and Honduras have been the most affected by floods (Barcena, Prado et al., 2010).

3.2.2 Repetitive natural disasters

While Central America has been affected by over 240 major environmental disasters from 1930 to 2008, it is crucial to mention the large number of natural disasters that have taken place on a smaller scale, but whose repetitive impacts have had important consequences on households (Barcena, Prado et al., 2010). These types of smaller events deserve further attention as they have for the moment been under-studied and are mostly invisible in the media (World Bank, 2012). Their cumulative impacts have engendered a vicious cycle in which communities are unable to adapt efficiently, as they barely have had time to recover from a past disaster when the next one strikes (Beson and Clay, 2004).

Measures of economic losses have mostly been measured for major natural disasters, at the expense of smaller but repetitive ones. Although their impact is not significant at the aggregate level, they have the potential to induce changes in livelihoods, because of their cumulative impact over time (Charveriat, 2000). Only 9% of the disasters registered in Panama, Costa Rica, Guatemala and El Salvador have been large scale, while smaller scale natural events caused three in four human deaths from natural disasters in Costa Rica and El Salvador and accounted for over 55% of the affected households (Barcena, Prado et al., 2010). Such disasters have been increasing in frequency in the past decade, and have expanded geographically, adding to the general risk (Beson and Clay, 2004).

---

[3] See Part IV C. for a detailed analysis of the importance of the agricultural sector.

[4] Note that changes in definitions, reporting and methods used by CRED since the 1980s mean that trends in natural disasters are somewhat uncertain.

4. MESOAMERICA'S VULNERABILITY TO EXTREMES

The previous section described the high degree of exposure to climate extremes, but this is only part of the overall picture. The region's particular vulnerability to such environmental hazards stems from a history of cumulative and intertwined cyclical, anthropogenic and natural factors, including large-scale structural factors (e.g. population growth, fast urbanization and deforestation) as well as local drivers such as limited access to resources, weak local institutions and local inequalities. These vulnerabilities tend to cumulate, worsening the impacts of climate events (Girot, 2003).

4.1 DEMOGRAPHIC GROWTH

Latin America's demographic characteristics make it quite vulnerable to natural disasters. In the last five decades, the Central American population has grown rapidly. The region's population quadrupled from 11 million in 1950, to 44 million in 2012. This demographic growth has led to increased inequalities in access to land and resources, and thereby in economic and social vulnerability (Girot, 2003). For instance, smaller farms tend to be located in less fertile areas or in zones prone to landslides, notably in highlands and on steep terrains. This induced a pattern of environmental degradation and soil erosion through which farmers over-exploited their farming areas before moving to other, often even less fertile zones, and repeating the process of deforestation and soil erosion (Foresight, 2011).

This is the case in many regions of Mexico, as a result of the historic ejido system, adopted after the Mexican revolution in the early 1910s. This system aimed at redistributing land property actually contributed to the agricultural expansion and grazing of marginal lands throughout the twentieth century (Jones and Ward, 1998). In 1992, an amendment to the Constitution that allowed land owners to sell or rent their land didn't stop this pattern of marginalization through resettlement, as commercial land owners bought plots from poor rural households, thereby forcing them to move into even more marginalized lands, repeating the process of degradation (Colunga, Rivera, 2011).

Beyond rural settlements, urban areas are also increasingly vulnerable, partly due to this intense demographic growth (National Intelligence Council, 2009). Nicaragua's population was predominantly rural a few decades ago, whereas over 65% of Nicaraguans lived in urban centers in the early 2000s. All countries in Central America have undergone a similar process, with over half of the total population living in cities, including one fifth in cities over 100,000 inhabitants (Proyecto Estado de la Nación, 1999).

Both national and local authorities have generally mismanaged this urban growth. In the 1990s, this could be explained partly by the desire to limit public spending on social programs, in order to reduce national debts as mandated by international lending organizations (Girot, 2003). In the last decade however, the mismanagement of urban growth was mainly caused by the inefficiency of programs that were set in place, lack of government funding, as well as corruption within the government at all levels (Tarmann, 2002). These factors resulted in increased levels of economic and social vulnerability in both rural and urban areas, with uncontrolled urban expansions and the growth of marginal settlements into highly vulnerable (especially flood-prone) areas (Girot, 2003). In 2001, one in three households in urban areas were living in slums, while proportions in Nicaragua, El Salvador and Panama were closer to two-thirds. The situation is deteriorating in many parts of the region as appropriate programs are not put into place – the slum prevalence in Honduras for instance increased from 24 to 35% from 1990 to 2005 (ECOSOC, 2011).

Demographic growth has also induced an increase in demand for scarce resources, further aggravating the region's vulnerability to natural disasters. Indeed, further agricultural lands and forests were degraded for agricultural purposes, and the expansion of resource extraction was encouraged (EACH-FOR, 2009). Such environmental modifications have direct impacts on the vulnerability to natural disasters. For example, mangroves on the coast which used to act as buffers from hurricanes and floods are now increasingly threatened, being deforested to expand urban centers, shrimp cultures and tourist infrastructures (Girot, 2003), and large areas of virgin forest are being replaced by oil palm plantations in Honduras (Wrathall, in press). In Guatemala, it is estimated that 73,000 hectares of forest, including mangroves, are deforested every year, causing a loss of over 26,500 hectares of mangrove in the last six decades. The main cause of mangrove deforestation is the expansion of shrimp aquaculture and tourist infrastructures. Although these initiatives have been promoted for their contributions to economic development, deforestation has increased the risk of landslides and the vulnerability to storms (Valladares, 2009).

CASE STUDY: MEXICO

Mexico will be largely affected by climate change in the coming decades. Environmental degradation is already an issue in Mexico. It is estimated that 85% of Mexican territory is affected by soil erosion, including 17% considered as totally eroded and 31% in a state of accelerated erosion (EACH-FOR, 2009). Mexico is greatly vulnerable to environmental disasters linked to the ENSO, particularly in its southern states of Puebla, Guerrero, Veracruz and Hidalgo (Aguilar and Vicarelli, 2011). Along with temperature increases in the North, rainfall is expected to decrease by 15% in central regions. The hydrological cycle will be more intense, leading to more frequent storms during the rainy season and longer droughts during the dry season –these projections have already been observed in the country over the last 5 years. Droughts and disasters will continue impacting agricultural production, further strengthening inequalities.

It is important to note that about 87% of desertification in Mexico is estimated to be caused by anthropogenic factors, while 13% is provoked by climate change (Leighton Schwartz and Notini, 1994). Similarly, 80% of soil fertility losses are estimated to be related to the inadequate use of the land (CONAZA, 1994), notably as inadequate irrigation practices worsen the desertification process through water logging and salinization. Thereby, the situation could be transformed through the adoption of sustainable measures to protect lands and forests in order to ensure the stability of production in the coming decades. The same remarks can be made regarding water consumption. About 75% of Mexico's water is used by the agricultural sector, with over 55% of it wasted, and households use 14% of the water, with an estimated waste of 43% due to leaks and excessive use. The rises in temperatures and decreases in rainfall will lead to water availability losses of 5% by 2020 and 15% by 2050. The North and Central regions will be most severely affected, as well as the Pacific-Central region (National Intelligence Council, 2009).

EACH-FOR studies (2009) have shown that Chiapas (South Mexico) is also a desertified state highly vulnerable to the impacts of climate change, because of the combination of deforestation, erosion as well as poverty and social inequalities (Warner, Ehrhart, de Sherbinin et al., 2009). The area is regularly affected by tropical storms such as Hurricane Mitch (1998) and Stan (2005) which had devastating consequences on the local populations. It has been observed that the impacts of storms have actually worsened in the last decades as a result of human-induced environmental degradation such as deforestation and soil degradation. It is for instance estimated that 76% of Chiapas' forest coverage is degraded. In the coastal region of Soconusco and the mountainous region of Sierra, such increases in vulnerability have led to stronger and more frequent severe socio-economic damages following heavy rainfalls (EACH-FOR, 2009). The case of Chiapas is also interesting when considering the impact of environmental degradation on migration. Indeed, EACH-FOR studies (2009) have shown that in the municipalities of Huixtla, Motozintla and Tapachula, the severe damage caused by hurricanes Mitch and Stan accelerated the decision of many households to migrate, as their sources of livelihood had been destroyed.

A decrease in water availability and increase in the frequency of droughts may strengthen Mexico-U.S. migration flows, through the consequences on agricultural productivity in the origin areas. A recent article estimated that for every 10% decrease in crop yields, emigration from Mexico to the U.S. may increase by 2% (Feng et al., 2010). However, while climate changes in Mexico have the potential to increase the pressure to migrate, it will simultaneously reduce the means to do so. Additionally, climate change current destination areas in the U.S. may reduce labor needs in commercial farming and thereby slow-down immigration (Adamo and de Sherbinin forthcoming). Rural to urban domestic migration may also result from such future environmental degradation. Saldaña-Zorilla (2007) for instance pointed out that losses from natural disasters usually exceed rural coping capacities of Mexican farmers, and in cases when state support for rural areas is insufficient, rural producers typically migrate to urban centers, usually settling down in urban areas vulnerable to natural disasters.

Figure 5: Lower Lempa Valley, El Salvador (Source: Google Maps)

4.2 A HISTORY OF VIOLENT CONFLICT

Another important historic factor that aggravated Latin America's vulnerability to environmental disasters is the violent conflicts that affected the country in the second part of the twentieth century. Every country in Central America was directly or indirectly affected by conflicts in the 1980s (Lehoucq, 2012). Approximately 150,000 internationally displaced persons sought refuge in neighboring nations like Costa Rica, Belize and Honduras (Girot, 2003). Even after the conflicts ended in Nicaragua, Guatemala and El Salvador, tensions remain relating to the voluntary and planned repatriation, relocation and integration of displaced persons in their country of origin, as well as to the fate of the 400,000 internally displaced persons. The return of these populations has increased disaster risk, as a large part has resettled in highly vulnerable, marginal areas, and faced national politics of exclusion against specific groups, for instance former opponents to the current regimes (Bate, 2004). This was the case in the Lower Lempa Valley of El Salvador (Figure 5), as well as in the Retalhuleu of Guatemala, where socially vulnerable populations that had been displaced by the wars resettled in flood-prone regions. These two cases were particularly difficult as the resettled populations were very heterogeneous, with persons from various ethnic social and geographic origins, thereby complicating the process of community building which is crucial to the development of efficient adaptation and coping programs (Girot, 2003).

Furthermore, it should be mentioned that part of the resettled populations in these regions had little experience in agriculture, having fought in the nation's war most of their adult life (Bate, 2004), and were therefore ill-prepared to engage in sustainable agriculture. On the contrary, they usually engaged in predatory uses of natural resources, increasing the deforestation rates and the soil erosion (Nietschmann, 1995).

The Lower Lempa Valley represents an area of about 880 square kilometers that is recurrently damaged by floods, landslides and droughts. As resettled populations had little experience in agriculture, and/or had been forcibly displaced by conflicts, so had little resources, the poverty rates in this area have been high for the last decades (Bate, 2004). The area's vulnerability to natural disasters has further contributed to the communities' marginalization, as most households in the region are engaged in subsistence farming (Alonso, 2012). Since 1998 however, local communities have called for increased risk reduction programs from the country's government, and a new strategy has been put into place in coordination with the Inter-American Development Bank (Lavell, 2008).

Beyond the massive displacements, the civil wars also institutionalized a migration trend that had up until that time been mostly confined to professionals, skilled farmers and domestic labor: migration to the North, mainly to the United States but also to Belize, Mexico, Costa Rica, and Canada (Gzesh, 2006). This new pattern was partly

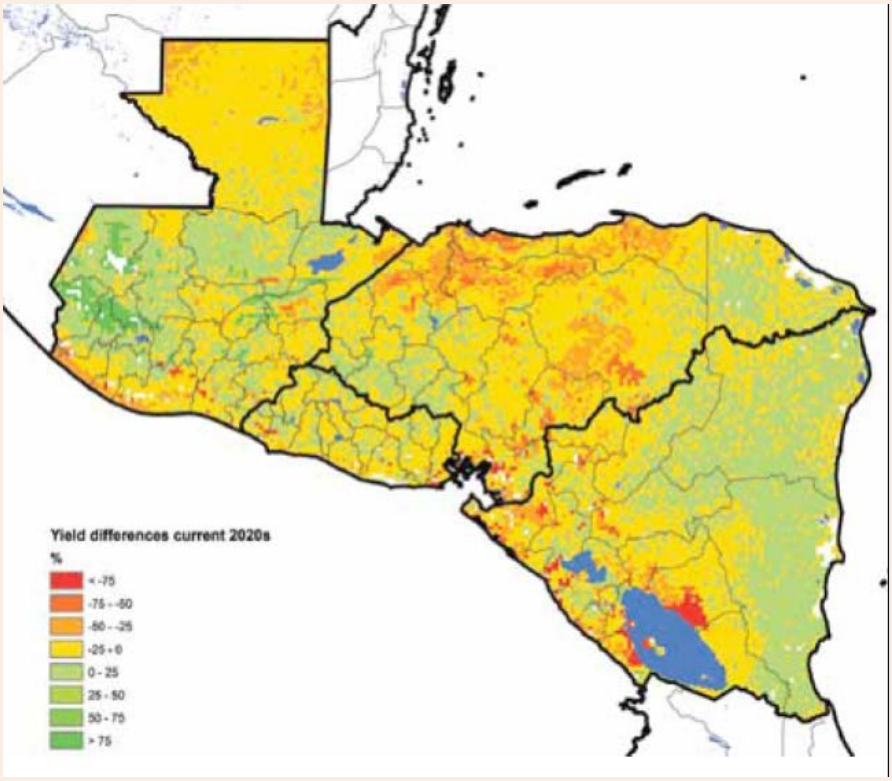


Figure 6: Predicted differences in maize yields for 2020 under good soil scenarios (Source: CRS, 2012)

caused by the fact that internal migration was becoming increasingly dangerous and not necessarily beneficial in economic terms. The increased migration of low-skilled farmers from the agrarian communities changed the composition and intensity of flows[5] (Girot, 2003).

4.3 THE IMPORTANCE OF THE AGRICULTURAL SECTOR

As mentioned in part III, a particular vulnerability of Central America lies with the importance of the agricultural sector for its economy. It currently constitutes about 18% of Central America's GDP – including agro-industry –, and will be one of the sectors most harmed by climate change in the coming decades. Production has already begun to grow more slowly in the past decades, as the ENSO phenomenon has provoked lower rainfall levels around the Pacific coast, where much of the commercial agriculture takes place, leading to delays in the start of the rainy season and to longer summers with more intense isolation (National Intelligence Council, 2009). Such impacts of climate variability, associated with low capital investments and natural disasters have had destabilizing impacts on hydrological balances, have increased the soil erosion in some areas and directly affected the yield of crops in certain regions (Foresight, 2011). Pessimistic predictions estimate that the average bean yields for the region could for instance decline from over 0.7 to fewer than 0.1 tons per hectare by the end of the century, and similar projections have been observed for other major crops and livestock (Figures 6 and 7) (Warner et al., 2012). It is for instance estimated that 30 to 50% of lands currently highly or moderately suitable for coffee production in Central America will be unsuitable by 2050, leading to large decreases in yields, exports, and economic growth (Keller, et al. 2011).

Taking onto account that a large proportion of farmers are small scale producers with limited resources and relatively low yields who consume most of their production, the consequences of a warming of the atmosphere by even only 1 °C and 2°C would have disastrous impacts throughout Central American countries, endangering food security of a significant part of the population (Foresight, 2011). The poorest producers are likely to be most affected by the impacts of climate change, having no other source of income to rely on (EACH-FOR, 2009). Indeed, a Ricardian type analysis has shown that global warming would induce a reduction of income from property values in most of the region, affecting mostly rural populations with the lowest income

[5] The 1990 US census estimated that over a million Central Americans migrated to the U.S. in the 1980s, although most of them were not legally accepted (US Census, 1990)

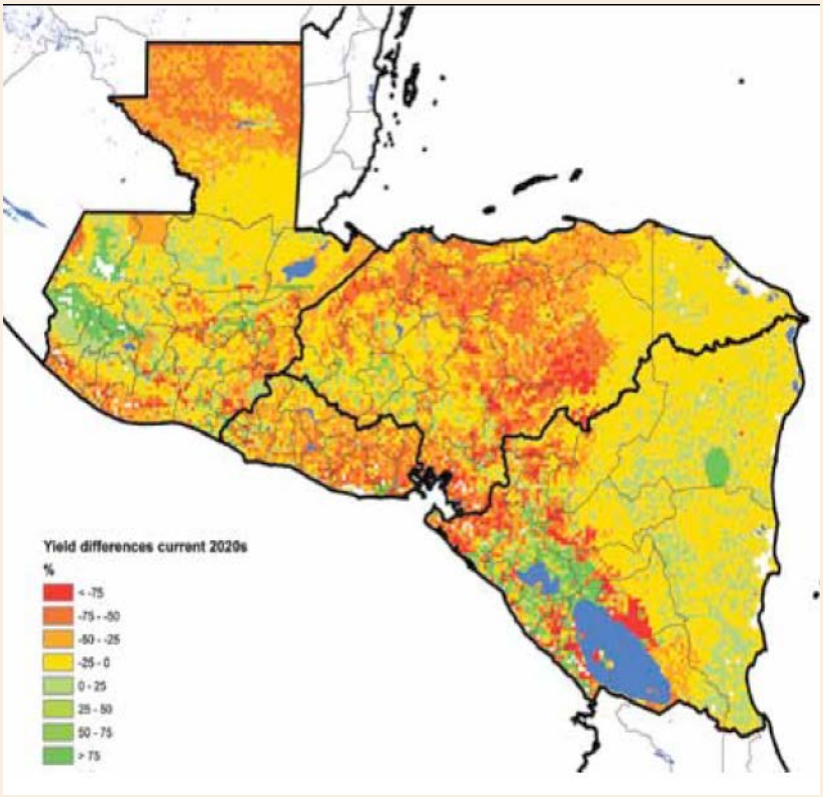


Figure 7: Predicted differences in maize yields in 2020 under bad soil scenario (Source: CRS, 2012)

deciles, and leading to significant losses in the nations GDP if no adaptation measures are adopted, as higher food prices would decrease purchasing power both in rural and urban areas – depending on the options for compensatory imports (Ramírez, Ordaz and Mora, 2009). A recent study underscored that soil quality will significantly influence crop production in a scenario of climate change (CRS, 2012). However, 75% of farming currently takes place on degraded soils in Central America, and smallholder farmers are the most likely to be located on poor soils. The study thereby highlights that such farmers will be affected by considerably greater losses than their richer counterparts situated on fertile soils. For example, in El Salvador, while climate change will cause virtually no losses on fertile soils (Figure 6), it will provoke losses of about 30% in maize production on poor soils (Figure 7).

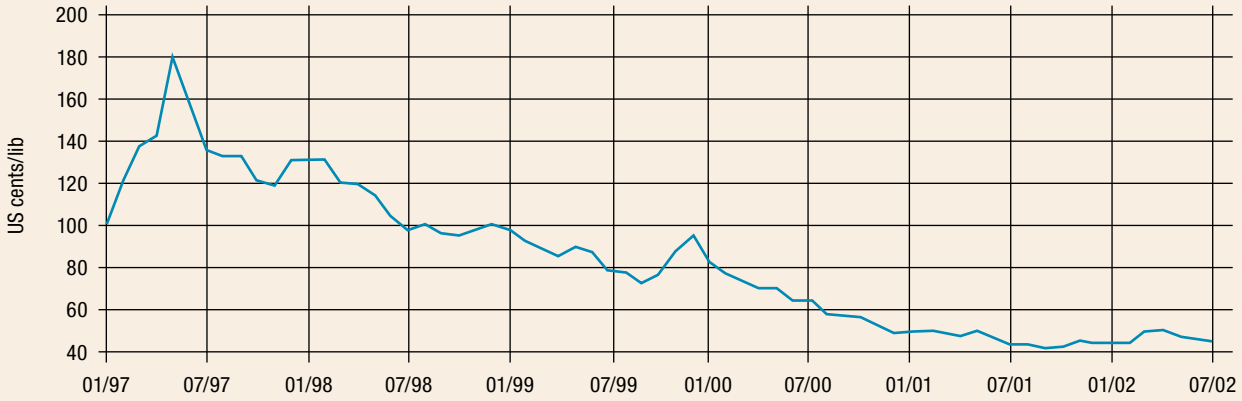
Surveys have already highlighted the pessimistic future predictions of farmers regarding their livelihoods. Research by Warner et al. (2012) found that 68% of households interviewed for a survey said that rainfall variability affected their food production, and indicated serious concerns regarding their community's future and the long term viability of their farming systems.

CASE STUDY:
COFFEE AND CLIMATE VARIABILITY

Coffee is one of the primary cash crops produced in Central America. Although revenue diversification is considered as one of the answers to low commodity prices, finding other options that have equal advantages as cash crops like coffee is very hard (FAO, 2013). In the absence of such diversification, farmers are either forced to grow illegal drugs or to migrate (The Economist, 2001). Most subsistence farmers don't have the training, the technical apparatus, resources or market access to make other income options generate a significant economic improvement.

Farm workers are particularly vulnerable actors. In the late 1990s-early 2000s, coffee producers were affected by a global coffee crisis, as illustrated by Figure 8 below (Osorio, 2002), partly as a result of the dissolution of the International Coffee Agreement in 1998 and of vast increases in coffee production in Vietnam (Eakin et al., 2005).

During the first two crop cycles after the start of the coffee crisis, the World Bank highlighted that permanent employment in coffee cultivation in Central America decreased by 50%, and seasonal employment by 20%, with a loss of revenues of about $140 million for coffee cultivation workers in the region (Varangis et al, 2003). The impacts of the coffee crisis were further exacerbated by the years of droughts in Central America which reached crisis levels in 2001 (Eakin et al., 2005). Farm workers are affected by most of the market risks as reducing the labor force is the cheapest way to cut costs for landowners, and as they lack political representation.



ICO composite indicator price (green coffee): Monthly averages, January 1997 – July 2002

However, some regions have taken steps to prevent such disasters. Veracruz is the second coffee producing state in Mexico, and number four in terms of indigenous population. It is also the state with the smallest farm size average in the country (small-scale coffee producers in Mexico grow about 40% of the total coffee production of the country, the rest being produced by large-scale farms). Veracruz is also one of the poorest regions of Mexico, with high marginalization rates. The Huatusco sub region is particularly interesting, as its land is 29% mountainous, 28% hilly, 8% with ravines and steep cliffs, and 17% with valleys, and as the large majority of its population is moderately or highly marginalized (Bacon, 2008). A study made in the region showed that coffee farmers developed production strategies according to their socio-economic situation as well as to their geographical location. While farmers in less marginalized social conditions and in relatively fertile areas were able to diversify their production with other cash crops such as sugarcane and banana (and sometimes livestock), the most economically disadvantaged living in spatially marginalized areas were forced to continue farming for subsistence. Other factors related to the region's history and power-struggle also played a role in the relationship between farmers, the environment, and poverty (EACH-FOR, 2009). This example highlights that production strategies can differ widely within one region depending on the economic and social representation of each group (Bacon, 2008). For instance, in Coatepec, Veracruz (Mexico), farmers who are part of an agricultural organization (usually the Consejo Regional de Café de Coatepec) are more likely to have recently benefitted from technical assistance and/or credit from formal sources than their counterparts who don't pertain in any organization, thereby increasing their capacity to change their crop mix (Eakin, 2005).

Although coffee farmers are typically used to variability in market conditions, and have adapted to such risks in various way (particularly through diversification of crops and income and other livelihood changes), the most recent process of global integration which took place in the 1990s and 2000s has however created unprecedented challenges for small-scale farmers (Eakin, 2005). Indeed, the coffee crisis was much more than a market downturn, it represented a shift in global and domestic production and consumption, with prices becoming more volatile and profits increasingly captured by the actors at the end of the commodity chain (Ponte, 2002). Small-scale coffee producers are thereby faced with the challenge to move beyond their usual strategies to cope with temporary downturns, and to design adaptation plans in response to the new structural order. Such adaptation may induce the adoption of new production methods, further income diversification, migration or even the abandonment of coffee production (The Economist, 2001).

5. OVERVIEW OF PAST AND CURRENT MIGRATION PATTERNS IN MESOAMERICA

Analyzing the various migration flows in Mesoamerica is crucial to understand environmental migration in the region. Indeed, as previously mentioned, the decision to migrate is induced by a cumulation of intertwined factors, making it it in many cases difficult to separate one migration flow from another. In order to assess the weight of environmental factors in the decision to migrate, it is thereby necessary to analyze the influence of other migration triggers.

5.1 OVERALL MIGRATION PATTERNS IN MESOAMERICA

In the first decades of the 20th century, Central American countries were centers of immigration, attracting migrants from Europe, the Middle East and parts of Asia. The situation has however changed in the last five decades, and the region is now a net source of emigration, as we can see on Figure 8. Between 2000 and 2010, the net number of migrants in Central America was of -6,777,000, a sharp increase from the -2,579,000 rate from 1970 to 1980 (ECOSOC, 2009). Although Graph 1 shows that Guatemala and El Salvador have quite high rates of emigration, Mexico remained the country most affected by emigration from 1950 to 2010. Its net migration rate from 1970-1980 was of -1,778,000; and it increased steeply throughout the last decades, reaching a net migration rate of -5,132,000 from 2000 to 2010 (ECOSOC, 2009). In this part we will analyze the processes and particular patterns of migration that characterize the region, acknowledging the heterogeneity of the flows and assessing how environmental migration fits into this new picture (Durand, 2009).

Central America has been a crossroads of diverse flows of rural-to-urban, intraregional, and interregional migration for decades, and has even become a transit route for South American migrants going north towards the United States since the 1980s (Maguid, 1999). These migration patterns have had a heterogeneous impact in the region, and it is therefore interesting to study the different flows in more detail. Areas of emigration have for instance not been impacted in the same way as regions of immigration. Countries like Nicaragua that were affected by civil conflict in the 1980s witnessed higher emigration rates in comparison to the more peaceful states of Costa Rica (Mahler and Ugrina, 2006). In the same way, the most violent regions in each nation have been subjected to higher emigration and displacement flows than the others (Lehoucq, 2012).

Migration drivers vary widely depending on the area and the person considered, although the most frequently cited include factors related to the labor market, land and housing, social welfare, political rights and the environment (pollution, population density etc.) (Perch-Nielson, et al. 2008), acting both as push and pull factors. Previous migration can also be considered as a key driver – the phenomenon of chain migration through which past migration by relatives makes it easier for households to migrate to the same region of destination (McFalls 2003).

5.1.1 Domestic migration

One of the first consequences of the demographic boom in Central America in the twentieth century was the growth of major cities, through processes of rural-urban migration as well as migration from smaller cities or towns (Lehoucq, 2012). The main motivation for rural to urban migration was the decline of work opportunities in rural regions, as agricultural growth has been quite weak in comparison to other sectors (Maguid, 1999). Another related explanation of rural-urban migration

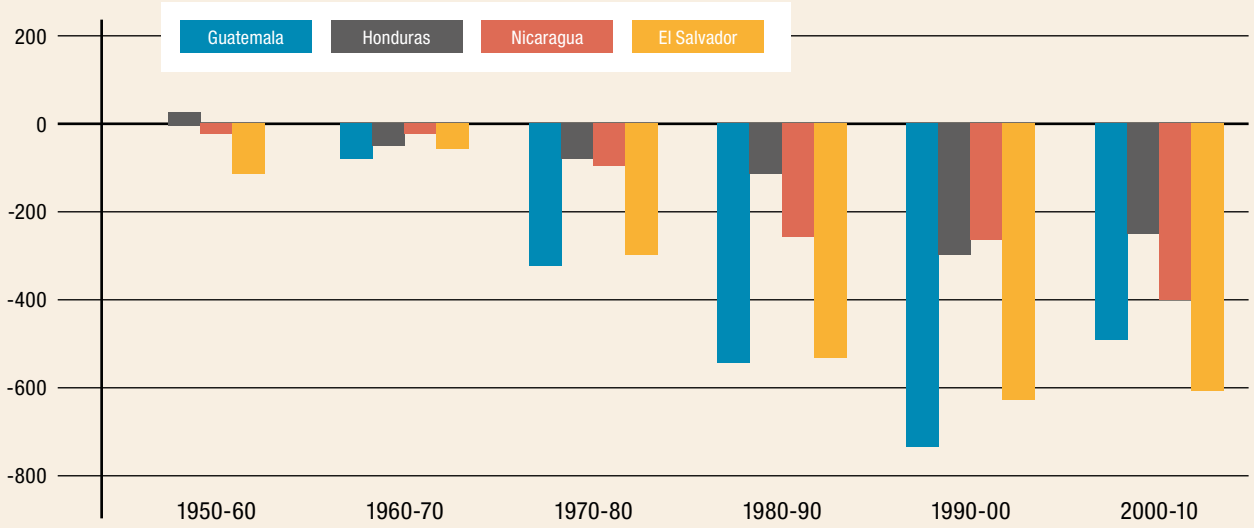


Figure 7: Net number of migrants, 1950-2010 (Designed by report's authors, with data from the UN ECOSOC, Population Division, 2009)

growth is the process of environmental degradation, with deforestation and contamination of soils and water among others provoking decreases in production, inducing farmers to migrate, either to other rural urban areas. This induces a "cumulative causation" cycle linking rural poverty, deforestation and land degradation (Bilsborrow, 2002), or to cities (Mahler and Ugrina, 2006).

This is the case in Guatemala, where the combination of farming-land fragmentation and the lack of alternative sources of income induced large flows of migration from rural areas, generally to Guatemala City and the Peten (Guatemala's only agricultural frontier) (Bilsborrow, 2002). As a result, deforestation rates in the Department of Petén have increased dramatically as shown in the image below. The causes are multiple, including high population density and conflict in the highlands, together with freely available, albeit low quality, land for agriculture (Foucart, 2011). Even protected natural and archeological sites are being affected (mostly because of forest fires resulting from land cover change), and the National System for Prevention and Control of Forest Fires estimated that over 600,000 hectares of forest have been lost in the last decade because of incursions (UNEP, 2009).

Although each country's primate city provides the best educational, work and health opportunities, they were unable to handle the influx, as mentioned in Part IV. The result is many irregular settlements and shanty towns, as well as increased traffic and pollution. Another important impact was the disappearance of a large number of small rural or periphery towns, as local populations migrated to larger urban centers. The example of Mexico is particularly telling, as 76.9% of municipalities in the semi-arid state of Durango experienced negative growth from 1990-2000 (Durand, 2009). Similarly, Ursula Oswald Spring (2006) highlighted in a study that desertification and environmental deterioration along with reductions in governmental support and growing production costs have induced large-scale migration from rural areas in Mexico. Migration between urban regions was actually predominant in most Central American countries in the past decade, with the exception of Nicaragua where most migration was rural to urban (ECOSOC, 2011).

5.1.2 Intra-regional migration

Two main patterns of intra-regional migration can be analyzed: temporal migrations of short distance across borders and longer term migrations of larger distances.

Short term border migration is typically linked to agricultural harvests, notably of coffee, sugar cane and tobacco. Two classic examples are the ones of Nicaraguan farmers and the Ngöbe indigenous populations of Panama going to grow coffee in Costa Rica (Rosero, 2002), as well as the Guatemalans harvesting coffee and fruits in Chiapas, Mexico (Pena Pina et al., 2000). Cross-border migration over small distances can in some circumstances be easy for indigenous groups whose ethnic territories rest along the sides of a border, as they don't face the usual integration and adaptation challenges. This is the case for the Mayans of Guatemala and Mexico for instance (Durand and Massey, 2010). Often, migrants from a certain region will migrate to the same area of destination, forming communities of short-term workers, and rarely integrating the local population, often leading to tensions between the local community and the migrants, especially during economic downturns (Foresight, 2011).

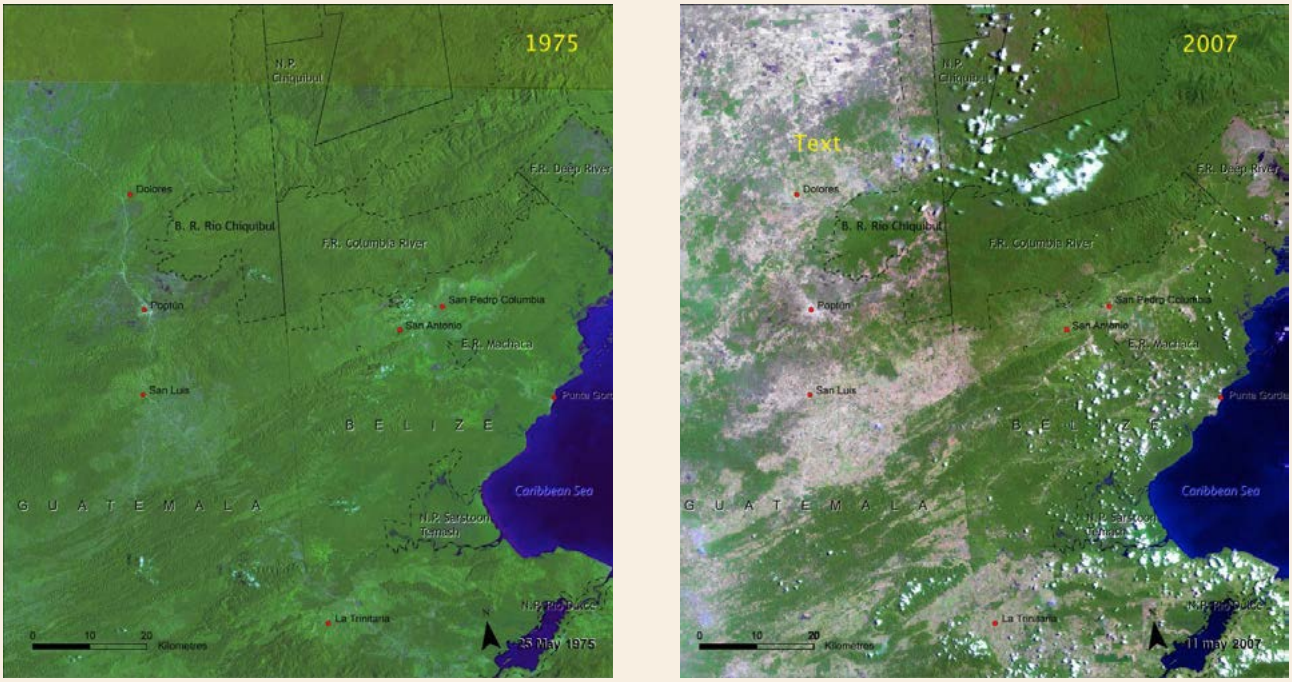


Figure 10: Satellite images show the high landscape change between 1975 and 2007 on the Guatemala-Belize border. (Source: UNEP, 2009 (provided by NASA)).

Intra-regional migration to cities can take place over short and long terms, but has a more permanent character than border migration, as destination places tend to be further from the migrant's origin. Two groups of migrants can be distinguished in this type of migration flows: middle class migrants with professional qualifications and the larger group of migrant workers and farmers. This second group is of particular interest to this paper, as it is likely to be most affected by climate change and environmental disasters due to their socio-economic vulnerabilities (Durand, 2009). Intra-regional migration is thereby closely related to economic changes. It will fluctuate according to the boom or bust of certain sectors such as construction and services, which are both typical sectors for migrant workers (Maguid, 1999). Construction industries often actually employ teams from the same country of origin, to enable the smooth exchange of information about increases and/or decreases in economic activity and thereby ensure that their workforce needs are fulfilled (Durand, 2009).

Despite the liberalization of migration through regional economic integration, e.g. CARICOM and other Central American free trade agreements- intra-regional migration remains quite a limited process in Central America, significant in a little number of countries only, like Costa Rica where Nicaraguans accounted for 7% of the total population (Rosero, 2002). Similarly, in Belize in 2010, immigrants made up 15% of the total population. In contrast, most of the other Central American countries were rather emigration centers. In Honduras for instance, international migrants constitutes only 0.3% of the total population (UN ECOSOC, 2009). Although Nicaraguans have a history of migration to Costa Rica for agricultural purposes, the flows have intensified in the last four decades, following the 1972 earthquake, and the ongoing violence in the 1970s and 1980s. Nowadays, Nicaraguan immigrants tend to settle in cities rather than rural areas, and the proportion of female Nicaraguan migrants is on par with men, mostly because of an increased demand for domestics (Durand, 2009). A relative decrease in Nicaraguan immigration to Costa Rica has however been observed in the last decade, partly because of improvements in the Nicaraguan economy while opportunities in Costa Rica declined, but also due to a growing anti-Nicaraguan feeling which has led the government to introduce more restrictive laws for migrants (Mahler and Ugrina, 2006).

5.1.3 Migration in transit

In transit migration is a relatively new phenomenon in Central America which is linked to the increased migration to the U.S. through the border with Mexico (EACH-FOR, 2009). In 2005, Mexico's National Migration Institute indicated that 94% of the almost 241,000 persons who were detained or apprehended because they entered the country illegally were originally from El Salvador, Guatemala and Honduras. In contrast, it reported that only slightly over 40,000 Central Americans were living legally in Mexico in 2000. These statistics underline that the percentage of persons from Central America in transit through Mexico is five times as high as the percentage of those residing there – and the numbers don't even include the migrants who successfully crossed the US border (Durand, 2009). A decrease of in-transit migration has however been not-

ed since 2005 – a pattern that can be observed through the reduction of deported Central Americans in Mexico and in the US. In 2008, fewer than 95,000 illegal migrants were detained in Mexico, and between 2005 and 2007, the number of migrants from Honduras and El Salvador decreased by almost 50%. This trend can be explained by various factors. Firstly, work opportunities in many sectors have been stagnating since 2005, a pattern that was exacerbated by the 2008 economic crisis in the U.S. (EACH-FOR, 2009). Second, additional migration restrictions were introduced by Central American countries in recent years, including border controls, in response to growing hostility towards undocumented migrants in those countries. Finally, some countries such as El Salvador, Guatemala and Honduras already have a large number of their citizens living abroad (as high as 14% of El Salvador's population in 2000) (Solimano, 2008). Although the focus is usually put on Mexico as the primary transit country, it is important to underline that other Central American nations are also transit nations, especially Guatemala, as migrants from other countries in the region as well as from Latin America go North on their way to the U.S. (Durand, 2009).

5.1.4 Migration and gender

In order to understand the migration processes in Central America, it is also important to consider the specific individual characteristics of the migrants, that will influence the decision making process. Gender is a particularly interesting aspect to analyze in the case of Central American migration, as the links between migration and gender differ depending on the country. For instance while migration decisions in Mexico are usually taken my men with few consultations from women (who typically come afterwards through family reunification) (Cerrutti and Massey 2001; Aysa and Massey 2004), such decisions are mainly made by women with little or no input from men in the Dominican Republic, usually for economic purposes (Massey, Fischer, and Capoferro 2006).

However, some patterns can be outlined: young, single or recently-married adults are the most likely to migrate, and women tend to accompany their spouse more often than men. Migration flows are often gender-specific, for instance women usually outnumber men in urban migration flows, as a result of the increasing role of women in industrial production and to the evolutions in the division of labor (Bilsborrow, 2001).

5.2 ENVIRONMENTAL FACTORS AND THE DECISION TO MIGRATE

As discussed in Section IV, environmental factors have played some role, albeit an indeterminate one, in contributing to migration in Mesoamerica. De Sherbinin et al. (2012) estimated net migration by ecosystem for the last three decades of the 20th century in a global study, and their research found that drylands and mountainous regions have typically been regions of greatest net negative migration (net migration represents in-migration minus out-migration), and that areas near coasts and large water bodies have seen net influxes of migrants. Results for Central America suggest that a net of 8m people left mountain areas in the region during this period (1970-2000), another 10m left drylands, and 3m left forested areas (as defined by circa 2000 forest extents).[6] The only area of net in-migration was inland waters, which received approximately 2m people (net), most likely because of migration to the area around lake Managua and Nicaragua, where the capital of Nicaragua is located.

As we can see from Table 4, Central America is vulnerable to most of the expected impacts of climate change, as its population is spread across regions with high and low altitudes, coastal areas and zones already susceptible to droughts and precipitation events (McLeman and Hunter, 2010).

The third column in the table describes the general types of population displacements or migrations that may be associated with the types of exposures in the regions given in the first two columns. These associations are derived from analogous cases described in the article. Since it is impossible to predict with high confidence how climate change will impact population movements, researchers often use analogous events from the past to anticipate likely future migration patterns

When environmental factors are at play, the migration decisions rely on an often complex hierarchical process: they increasingly depend on the entire household rather than one member only, and are influenced by local community-contextual factors (such as community cohesion or the presence of migrants from the community in the destination area), which may be themselves affected by provincial and national policies, and the latter by international variables (Foresight, 2011). The example of coffee producers in Central America is a good illustration: their living standard depends on the price given for their products by intermediaries, which vary according to national taxes, potential subsidies and export policies related to coffee as well as inputs used in its production, and to international supply and demand (IPCC, 2007). In this picture, environmental factors usually either affect revenues at the household level (for instance due to a

[6] Ecosystems are not mutually exclusive, so net migration may add up to more than the regional total of -12.2m.

Table 4: Expected Impacts of Anthropogenic Climate Change and Potential Associations with Future Population Displacements/Migration (Source: Adapted from McLeman and Hunter, 2010)

Expected Change (from IPCC 2007)	Regions to be Affected (from IPCC 2007)	Associations with Population Displacement/Migration
Increases in annual average river runoff and water availability	High latitudes and some wet tropical areas	Risk of flood displacements in riverine settlements
Decreases in annual average river runoff and water availability	Mid-latitudes and dry tropics	Increased frequency of water scarcity and drought-related population movements; emergence of new areas prone to such events
Increased extent of areas affected by droughts	Regions already susceptible to drought	Increased frequency of water scarcity and drought-related population movements
More intense precipitation events	Will vary by region	Risk of flood displacements in riverine and low-lying coastal settlements
Increasing number of plant and animal species at risk of extinction; increased potential for significant ecosystem disturbances	Globally	Out-migration from settlements dependent on small range of resources

decrease in the quantity of land available due to household expansions) or at the community level (such as soil degradation after a flood) (Bilsborrow, 2002).

The case of small-scale coffee producers in Honduras is particularly telling (Tucker et al., 2010). Honduras became the second largest coffee producer in the region in 2000. The municipality of La Campa in Western Honduras benefits from favorable conditions for the growth of coffee beans, with elevations of 900 to 1800 meters, and annual rainfall average of about 13000mm. The area is characterized by a relatively high poverty and marginalization rate (the population does not have electricity or proper sanitation), and a relatively high rate of migration: 27% of households reported in 2003 that one of their household members had migrated in the first part of the 2000s. It is interesting to analyze how different factors were combined to lead to the migration decision. Producers in La Campa have been affected by both the international coffee crisis from 1999 to 2003, and experienced unusually extreme weather conditions during the same period, notably with hurricane Mitch.

During a survey conducted in the area in 2003, it appeared that the majority (two third) of the population was more concerned about the risks posed by illness in the family than by declining coffee prices (56.8%). Concern for extreme weather events only came in third place, for two main reasons. Firstly, farmers in the region are already used to climate variability, and have most often developed diversification strategies to avoid devastating revenue losses. About 73% of Honduran farmers in the area have already changed their area under cultivation, usually by expanding coffee or maize fields (the availability of land is an important factor, as it enabled farmers to expand and diversify their production without sacrificing their existing cropping areas through land use changes). Second, it is likely that the unpredictable impacts of climate variability may make it seem as less of a risk to individuals, as they usually do not affect the entire region simultaneously (unlike market shocks). Also, it is important to note that the survey took place in the middle of the coffee price crisis, which might have influenced the population's choice of primary concern. In La Campa, although the choice of coffee producers to migrate depended on a large array of factors, the coffee crisis was thereby the predominant motivation, and migration was mostly considered as a temporary coping strategy, and not as a long-standing or recurrent part of household revenue. This perception explains why most migrants moved to nearby cities for temporary jobs, and did not leave for the USA.

Furthermore, in addition to the household, national and international level factors that weighted in on the decision to migrate, community-level factors have also played a key role. Indeed, it appeared that Honduran farmers participated very actively in local farmer organizations. Through this social network, they were able to access more information on adaptation possibilities including new crops, credit assistance as well as migration routes.

This example highlights the linkages between the various factors, making it difficult to predict migration choices. The factors described are furthermore in no way comprehensive. They for instance don't take into account the experience of households in dealing with

such situations. For example, the farmers in La Campa were actually planting more coffee crops during the coffee crisis than before, as they were preparing for prices to bounce back, as they had after previous crises (Tucker et al., 2010).

There are of course exceptions to this pattern, for instance in the case of natural disasters like Hurricane Mitch that displaced populations regardless of other factors (although socio-economic conditions did play a role by increasing vulnerability to such events, and therefore the degree of damage) (ECOSOC, 2011).

Analyses of environmental migration patterns are thus complicated by the complexity of the decision-making process of each household. The difficulty is increased by the fact that individuals moving in the context of natural hazards typically join the broader migration flows in the region. The existence of such mixed-migration flows makes identification and data collection even more complicated, especially as many "environmental" migrants may have the incentive to describe themselves as "economic" or "humanitarian" migrants in order to benefit from the advantages (in terms of statute, treatment at the border and so on) of these other categories. This poses challenges to states balancing security considerations with more permissive immigration measures, even temporary humanitarian protection measures, as identification and categorisation possibilities are limited both by the diversity of environmental migration drivers as well as by such mixed migration flows. Beyond this identification issue, the inclusion of environmental migrants within mixed flows typically provides an incentive to choose similar channels of migration as other migrants. As the Latin American region does not provide sufficient structures or official channels to facilitate safe migration processes for most migrants, this means that environmental migrants are often forced to use irregular channels that place them at the same risks as other migrants, in terms of trafficking, violence, and illegal entry with possible deportation, among others (The Nansen Initiative, 2013). Abuses, including sexual and gender-based violence, are a great risk for migrants and displaced persons moving through Central America and Mexico. Youth gangs ("maras") in Mexico and Guatemala are typically known for preying on irregular migrants. The lack of appropriate structures and channels for migrants often forces the latter to resort to smugglers that are known to take unnecessary risks in order to avoid law enforcement authorities, for instance abandoning their "clients" in the desert or the sea, or squeezing them so tightly in vehicles that they die of suffocation (UNHCR, 2009).

Table 5: Humanitarian and economic losses from hurricanes In Central America, 1961-2001
(Source: CEPREDENAC, 2002; Government of Belize National Emergency Management Organization, 2002).

Month and year	Event	Extent/region and countries affected	Dead	Wounded	Displaced	Economic losses (in US$)
October 1961	Hurricane Hattie	Belize and Northern Guatemala	275			150,000,000
September 1969	Hurricane Francelia	Guatemala, Belize, El Salvador E and SE Honduras	296	248	18,200	35,6000,000
September 1971	Hurricane Edith	Nicaragua, Honduran Mosquitia	35		2,800	2,968,000,000
September 1974	Hurricane Fifi	Honduras, Belize	8,000 (all in Honduras)		670,000	3,478,000,000
September 1978	Hurricane Greta	Honduran and Nicaraguan Mosquitia, Eastern Guatemala and Belize			2,000	
October 1988	Hurricane Joan	Nicaragua, indirect effects in Costa Rica and Panama	156	182	427,000	460,000,000
July 1996	Hurricane Cesar	Costa Rica and Nicaragua	49	50	681,367	53,000,000
October 1998	Hurricane Mitch	All seven countries in the Central America Region, hardest hit Honduras and Nicaragua	9,977	13,440	1,981,912	6,009,000,000
October 2000	Hurricane Keith	Belize	8			250,000,000
October 2001	Hurricane Iris	Belize and Guatemala	20			220,000,000
Total	**10**		**18,816**	**13,920**	**3,783,279**	**13,623,600,000**

5.3 ENVIRONMENTAL MIGRATION AND HURRICANES

As we can observe in Table 5, Central America is recurrently affected by hurricanes. The damage inflicted by hurricanes is both a cause and consequence of the region's vulnerability. Indeed, the recurrence of hurricanes further exacerbates the region's previously analyzed vulnerabilities (caused by years of civil conflicts as well as inadequate land use, that created large groups of highly vulnerable households living on marginal and hazardous lands both in rural and urban areas). Although we can see that most storms did not have as damaging an impact as Hurricane Mitch, their cumulative consequences make it more difficult to successfully implement development programs (EACH-FOR, 2009).

An interesting exception to the overall vulnerability of Central American countries to natural sudden disasters is Belize, a country that was not directly affected by civil conflicts in the second half of the twentieth century and where processes of environmental degradation are not as strong. Although Belize was affected by hurricane Mitch in 1998, the authorities managed to set up a system of evacuation of one third of its citizens living in highly vulnerable regions before it hit the country. Partly as a result of this governmental preparedness and lower inherent vulnerability, no deaths were reported in the country (McLeman and Hunter, 2010).

CASE STUDY:
HURRICANE MITCH, OCTOBER 1998

Hurricane Mitch is regarded as the last century's worst disaster in Central America in terms of intensity and scale of impact. It was so intense that it delivered in only one week almost the yearly average of rainfall in Central America, causing over 20,000 deaths, destroying hundreds of thousands of houses, flooding farming areas, contaminating water supplies and forcing the displacement of two million persons (McLeman and Hunter, 2010). The storm remained off the coast of Honduras for four days, growing to a Category 5 hurricane, before it made landfall on the North coast of Honduras on October 28th as a tropical storm (NOAA, 1998). In contrast with the usual northern-bound hurricanes, Mitch headed South, passing over Tegucigalpa, the capital of Honduras, and stalling five days over the country before moving to El Salvador. This unusual path means that the hurricane passed over regions that were ill-prepared for hurricanes, such as Southwestern Honduras (IADB, 2000). Regions in Northwestern Honduras received almost 1,600mm in only 10 days, the equivalent of over a year of average rainfall, resulting in massive landslides and floods. Nicaragua and El Salvador were also severely affected – an estimated 2,000 villagers for instance died in a single mudslide in the region of Chinandega in Nicaragua (McLeman and Hunter, 2010). Guatemala was relatively less affected by the storm, although many poor neighborhoods in hazardous deforested areas around Guatemala City were destroyed by floods and mudslides caused by heavy rainfall (Girot, 2003). It is estimated that 80% of Central America is vulnerable to landslides caused by precipitation, a percentage that is likely to grow as a result of deforestation. El Salvador is the most vulnerable country with only 10% of forest land, but as deforestation rates continue to grow, states like Guatemala and Honduras will also be increasingly exposed (UNEP/UNDP/EIRD/World Bank, 2010).

The large majority of populations affected by the hurricane were from the poorest social groups, partly because of land policies and income inequalities that led to marginalization in both urban and rural areas, leaving them with no other option but to settle on hazardous areas like steep lands, river canyons and flood-prone plains (Wisner, 2001). Rural settlers then often proceeded to cut down protective forests to grow subsistence crops, thereby aggravating land exposure to erosion and run-off. The vulnerability to natural disasters of the already most socio-economically disadvantaged was thereby increased, and most of the 18,000 people killed by floods and landslides induced by Mitch belonged to such social groups (IADB, 2000). The hurricane's infrastructural damage was also considerable, with about 300,000 persons left homeless, a further two million having to leave their houses to find shelters, and a large amount of sewage systems severely affected, leading to unsanitary conditions and spread of diseases in the storm's aftermath (Girot, 2003). However, analyses of migration trends in Honduras before and after Hurricane Mitch have shown that while the poorest populations were the most affected, changes in land tenure and support have made them less vulnerable to subsequent natural disasters in the late 2000s, and thereby less likely to be displaced. This example underscores that government programs to ensure access to ecosystem services is crucial to mitigate the impacts of environmental risks on migration flows (Foresight, 2011).

Hurricane Mitch's impacts sustained for a number of years, particularly through the damage it caused to subsistence crop and livestock production – costs reaching as high as USD 155 million for this sector only in Honduras-. Not only were crops and livestock completely lost, but the soil of already low-fertility farming lands was washed away, or covered by sterile sediments (IADB, 2000). The short term consequences of the storm and the lack of services and recovery programs were thereby aggravated by longer term economic impacts, with the livelihoods of entire population being wiped away (Girot, 2003). Over a year after the hurricane, tens of thousands of households remained displaced in the country. Beyond internal displacement, the hurricane also triggered international migration responses: immigration from Honduras was multiplied by three after Mitch hit the country – a pattern that was also observed in other Central American countries such as Nicaragua (where out migration increased by 40%). Another indication of the rise in international migration post-hurricane Mitch is the increase by over 60% of apprehensions of migrants from Central America (excluding Mexico) at the U.S. border in the few months after the hurricane. (McLeman and Hunter, 2010)

CASE STUDY: GOVERNMENT INTERVENTION: RELOCATION AFTER A NATURAL DISASTER, A CASE STUDY OF THE SANTIAGO ATITLAN REGION IN GUATEMALA, FOLLOWING HURRICANE STAN

Tropical Storm Stan hit Guatemala on October 5th, 2005, forcing the government to declare a state of public emergency. The hurricane's economic damage and losses amounted to 3.4% of the country's 2004 GDP, particularly affecting lower income households and small-scale farmers (who endured 59% of the losses). The storm was especially harmful in terms of housing shortages, as it destroyed 17,000 houses, increasing the prior shortage of 1.2 million homes. To recover successfully from the storm, the President launched an inter-agency program of "Reconstruction with Transformation", aimed at resettling around 7,400 families (50,000 persons) in 80 new settlements across 15 departments. The government focused on community participation, in order to respond appropriately to local needs (Correa, 2011).

The communities in the districts of Tzanchaj and Panajab, in the municipality of Santiago Atitlan, were one of the at-risk populations that participated in the resettlement process. The two districts are predominantly rural, with agriculture and craftwork as the primary sources of revenue. The districts were also characterized by their high poverty rates, and the fact that the majority of the population belonged to the Tzutujil ethnic group. The district was flooded with a million cubic meters of water and sediments in only 8 minutes on the day of the hurricane, causing the deaths of 600 individuals, and destroying 205 homes. Local communities had to organize their own rescue and survival plans in the five first days after the storm, as the heavy rain prevented the government to send aid by airplane, and as roads were unusable because of landslides. A military troop was sent to act as a rescue team, but had to withdraw after being rejected by the local communities, due to a distrust of the army ever since villagers were killed by soldiers in 1990 (Correa, 2011).

This first reaction by the government highlights that short term recovery and rescue measures had not been curtailed to local needs by the regional and national governments, who were largely unprepared in the face of such a disaster. Five days after the storm, humanitarian assistance was able to access the district, and the National Fund for Peace was chosen as the coordinating organization during a town meeting (Correa, 2011).

An initial resettlement program was designed through the building of 28 shelters on land donated by the Catholic Church. However, this resettlement response had been set up in emergency and without proper planning, and the authorities soon realized that the area was actually hazardous and vulnerable to landslides – as were the sites on which the communities had been previously living, which underlines the lack of preparedness prior to Stan. Consultations were then held with the 230 households that had already resettled in this region, and a consensus was reached on the necessity to find new sports in a safer area. This first, inadequately planned resettlement project highlights the importance of prior planning and consultation with local authorities, in order to reduce the length and cost of the process as well as the disturbances to local households. The efforts of the authorities to consult the local communities in order to reach an optimal and consensual resolution to the matter however has to be underlined, as it avoided any conflict of interest and contributed to the success of the second initiative.

The resettlement process was indeed redirected to a safer area, offering lodging to families affected by the storm as well as households living in at-risk zones for a total number of 915 households, thereby acting both as a reactive measure to storm Stan as well as a preventive measure for future disasters, highlighting that resettlement should be used as a tool for prevention, not just a response to disasters. The urban and housing structures were designed according to the community's traditions, and local representatives were included in most of the Commissions created by the central institutions to operate the resettlement process, including the Land Procurement and the Housing Design Commissions.

Although the consultations with the local population increased the immediate difficulty of the resettlement process (particularly since many members of the community only spoke the local dialect and rejected any plan to be resettled outside of the region for historical reasons (Fortuny, 2008)), it did ensure the success of the initiative in the middle term. The lots were for instance designed to accommodate a house, a zone for poultry, a traditional steam bath house, a yard to grow vegetables and fruits and an area to dry the laundry, corresponding to local needs. Furthermore, the consultations enabled to create a town structure that would improve the livelihood of villagers by taking advantage of local traditions to increase their income, through the building of stalls and spaces for the sale of locally made goods, as well as a restaurant area to attract tourists to this rich cultural destination. This inclusion of local communities was also crucial to re-building the trust towards the national government, which had been lost after the killings of 1990, in order to optimize the reconstruction process. It did however complicate the land search, as the only safe area that was found in the region consisted in small plots of land that had been occupied by owners for generations without formal legal titles, making it impossible for the Reconstruction Commission to formally buy them. A specific land acquisition program therefore had to be created, in order to ensure the respect of the rights of the current owners as well as of the resettled populations. New legal titles were created for the land and

houses, to ensure that they belonged to the entire family – and not only to the head of the household, and that they could not be sold for a period of 18 years. The purchasing and legalization of the lots lasted eight months, and cost over USD 1 million dollars – the total cost of the reconstruction project in Santiago Atitlan was of USD 10.7 million, and of USD 92.7 million for the 19 municipalities in the Solola region. These costs were partly funded by the government (USD 3.56 million), but the largest part were provided by UNDP as well as other international organizations (Correa, 2011).

Despite the success of this resettlement project in many regards, it is important to highlight certain drawbacks of the project which should be improved in the case of future resettlements in the region. First of all, the improper planning of the first settlements wasted time and funds, and the final resettlement took so long to be fully organized that a large number of households had to wait over three years before they could resettle in the safe area. In the meantime, most of them lived in precarious conditions in the mudslide area, having to evacuate frequently due to heavy rain. Furthermore, many villagers reported that the houses in the safe area were not given freely by the government, but that households had to either save money to pay for the labor force building their own houses, as well as for the building materials – a quasi-impossible task for the low-income households whose main sources of revenue had been washed away by Stan (Stein, 2009). Furthermore, while opening the new settlement to families in high-risk areas that hadn't been affected by Stan was a good measure of prevention, it provoked –and quite rightly so- an increase of tensions and anger towards the government from the families that had been strongly affected and were living in the mudslide camps. Furthermore, the Chuk'muk was built quite far from the economic center of the region, forcing inhabitants had to spend more money on transport, and making it more difficult for children to attend their school –while education is crucial to decreasing risk-vulnerability (Stein, 2009) (illiterate villagers are for instance more likely to believe that landslides were an act of god, while those who had gone to school knew that they were partly caused by deforestation (Fortuny, 2008)).

Finally, the resettlement projects partially destroyed the community spirit of the population, mainly because the precarious conditions in which households had to live in the mudslide camp led to an increase in alcohol consumption, crime and domestic violence, leading to a deterioration of the social link (Stein, 2009).

6. CONCLUSION

Central America is undergoing a period of rapid change. Its population has more than tripled since 1960, its urban centers are growing fast, and often in an uncontrolled way, inequalities are steadily increasing (three out of five Central Americans are poor) (PRB, 2012). It is usually during such times of fast change that disasters occur. Transformations in the use of land, deforestation and soil erosion among other processes compound social vulnerabilities to aggravate the impacts of natural disasters. It can be argued that disasters are man-created, through bad policy decisions (Foresight, 2011).

Indeed, a hurricane of the same intensity will have different impacts depending on the region it hits: a strong disaster in a developing country might only cause light damages in a developed one (Girot, 2003). This sort of work makes up a portion of the work package on loss and damage under the UN Framework Convention on Climate Change (see Warner et al. 2012).

Although sudden disasters cause the most visible damage, slow-onset events need to be studied further. Analyzing the thresholds in inequalities, demography and environmental transformation beyond which changes in the availability of major resources are irreversible should be the object of further research, as it is a question that will become increasingly crucial in the coming decades, especially when looking at the link between resource scarcity and conflict (Girot, 2003).

Most responses to displacement and migration are currently ad hoc, inducing the presence of a judicial gap in terms of protection and assistance. Central American governments need to adopt a proactive, integral and inter-sectorial approach at the international, domestic and local levels to prevent and mitigate the impacts of both sudden on slow-onset disasters. They should make the most of the region's integration system. The regional response to climate change, coordinated by the national Ministers of the Environment and the Central American Council on the Environment and Development (CCAD) was put in a prominent position in 2008 following the decision by the Presidents of the Central American Integration System to prepare a Regional Strategy on Climate Change (ERCC). Cooperation on the design and implementation of national policies would increase the efficiency of adaptation programs, and cooperation would enable Mesoamerican countries to identify a common agenda to defend during international negotiations on climate change (Barcena, Prado et al., 2010). Given the multiple causality of environmental mobility, action is needed on multiple fronts to try to prevent displacement, support adaptive migration, and find durable solutions for those displaced.

Governments at all levels need to go past the usually reactive response, and accept to prepare for environmental change in a context of uncertainty (IPCC, 2007). In other words, adaptation programs should be improved, in particular in regards to risk management and prevention processes. Strengthening the resilience of communities at risk will require cooperation with communities and local governments, in order to ensure the development of measures that are efficient and sustainable in the long term. The elaboration of a participative diagnostic containing socio-cultural aspects would be particularly useful. At the international level, such a process would be enhanced by the harmonisation of definitions and concepts in regards to environmental migrant, in parallel to a strengthening of bilateral and regional plans to identify efficient risk-management strategies and decrease the vulnerability of communities. This could be achieved through the "Sistema de Integracion Centroamericana". Although return and reintegration often remain the best options, in cases when populations are highly vulnerable to natural disasters, relocation and/or migration should not be considered as a failure of adaptation, but as a means of adaptation itself.

The structures and channels used by displaced individuals and migrants also need to be strengthened and made more secure. Governments at all levels should increase their populations' awareness of their role in disaster prevention, involve communities in projects, and ensure that displaced households and migrants have information on all the range of options -return, resettlement and so on- during their decision-making process (Landa, Magaña and Neri, 2008). Human rights protection at borders should be enhanced, with a particular focus on women, children and indigenous communities, through proper access to humanitarian assistance, as well as consular services. Governments should also commit to the promotion and harmonisation of the use of humanitarian visas for individuals displaced by disasters, as well as the insurance that durable solutions are available after the visas expire.

In conclusion, governments should focus on three major objectives: preventing displacement, supporting adaptive migration, and finding durable solutions for those displaced. Such aims require action at multiple levels of governance, and on multiple fronts, including immigration policies, human rights law and disaster risk management, among others. The conclusions of the Nansen Initiative Central American Consultation in December 2013 were very promising, as government representatives worked cooperatively and showed their willingness to find solutions on most fronts (Nansen Initiative, 2013). Translating these preliminary commitments into efficient practices will be a challenge in the coming years. Governments should however not loose sight of the overwhelming social, economic and political benefits of such measures, in both the short and long term.

7. BIBLIOGRAPHY

Adamo, S.B., and A. de Sherbinin. (forthcoming). "Migration and Environmental Change in North America (USA and Canada)". In: E. Piguet (ed.), People on the Move in a Changing Climate. Dordrecht NL: Springer Science.

Adamo, S.B., and A. de Sherbinin. 2011. The Impact of Climate Change on the Spatial Distribution of Populations and Migration. Chapter in: Proceedings of the Expert Group Meeting on Migration, New York: United Nations Population Division. Available at http://goo.gl/lVbTws

Aguilar A., Vicarelli M. (2011), El Nino and Mexican children: Medium-term effects of early-life weather shocks on cognitive and health outcomes, Technical report, Harvard and Yale University.

Alonso C. (2012). Adaptation to climate change in El Salvador, We Adapt Project.

Anemüller, S; Monreal S.; and Bals, C. (2006), Global Climate Risk Index 2006. Weather-Related Loss Events and their Impacts on Countries in 2004 and in a Long-Term Comparison, German Watch [Online: http://www.germanwatch.org/klak/cri06.pdf].

Arnell, N.W., (2004). Climate change and global water resources: SRES scenarios emissions and socio-economic scenarios. Global Environ. Chang., 14, 31-52.

Aysa, M., Massey D. (2004). Wives left behind: The labor market behavior of women in migrant communities. In Crossing the border. Research from the Mexican Migration Project, ed. Jorge Durand and Douglas S. Massey, 172-90. New York, NY: Russell Sage Foundation.

Bacon, C.M., Mendez V.E., Gliessman S.R., Goodman D., Fox J.A. (2008), Confronting the Coffee Crisis: Fair Trade, Sustainable Livelihoods and Ecosystems in Mexico and Central America, MIT Press, USA.

Barcena, A.; Prado A. et al. (2010).The economics of climate change in Central America. Economic Commission for Latin America and the Caribbean (ECLAC).

Bate P. (2004). Q bigger development bang. IDB América, Magazine of the Inter-American Development Bank.

Benson C., Clay, E.J. (2004). Understanding the economic and financial impacts of natural disasters, Disaster Risk Management Series No 4, World Bank.

Bilsborrow, R.E. (2001). Gender, Migration and Development: World Monitoring Report, 2001. New York: United Nations Population Division; 2001b. Chapter VI. Gender, Migration and Development; pp. 146-160.

Bilsborrow R.E. (2002), Migration, Population Change and the rural environment, Environmental Change & Security Project Report, Issue No.8, The Woodrow Wilson Center

Black R., Bennett S.R.G., Thomas S.M. and Beddington J.R. (2011). Migration as adaptation. Nature 478:447-9.

Boncour P. (2008). Environment, Forced Migration and Social Vulnerability: Identifying Problems and Challenges. Keynote address delivered on October 9-11 2008 in Bonn Germany, Environment, Forced Migration and Social Vulnerability. [Online transcript: http://goo.gl/YbfKGR]

British Red Cross (1999). Hurricane Mitch Agricultural Support Programme: Rebuilding Rural Livelihoods: A comparative analysis of effects of cash assistance on the recovery of rural livelihoods. London: ESA Consultores.

Catholic Relief Services (2012). Tortillas on the roaster Summary Report, Central American maize-bean systems and the changing climate.

Cerrutti, Marcela, and Douglas S. Massey . 2001. On the auspices of female migration between Mexico and the United States. Demography 38:187-200.

Centre for Research on the Epidemiology of Disasters (CRED) (2012). Emergency events database EM-DAT: the international disaster database. [Online: http://www.emdat.be].

Charveriat, C. (2000). Natural disasters in Latin America and the Caribbean: an overview of risk. Inter-American Development Bank, Research Department, Working paper #434, October 2000.

Colunga M., Rivera F. (2011), The state of environmental migration, IDDRI/ IOM.

CONAZA (1994). Plan de Acción para Combatir la Desertificación en Mexico (PACD-Mexico). Saltillo, Coahuila: Comisión Nacional de Zonas Áridas.

Correa E. (2011). Preventive Resettlement of Populations at Risk of Disaster Experiences from Latin America, The World Bank, Washington DC, 2011.

de Sherbinin, A., M. Levy, S.B. Adamo, K. MacManus, G. Yetman, V. Mara, L. Razafindrazay, B. Goodrich, T. Srebotnjak, C. Aichele, and L. Pistolesi. 2012. Migration and Risk: Net Migration in Marginal Ecosystems and Hazardous Areas. Environmental Research Letters. 7 045602. http://dx.doi.org/10.1088/1748-9326/7/4/045602.

Durand J. (2009), Processes of Migration in Latin America and the Caribbean (1950-2008), Human Development Research Paper 2009/24, UNDP.

Durand, Jorge and Massey Douglas (2010), New World Orders: Continuities and Changes in Latin American Migration, Philadelphia, Annals of the American Academy of Political and Social Science, 2010 July 1; 630(1): 20-52

EACH-FOR (2009). Environmental factors in Mexican migration: the cases of Chiapas and Tlaxcala, Environmental Change and forced migration scenarios, Mexico Case Study Report.

Eakin, Hallie; Tucker, Catherine; and Castellanos, Edwin (2005). Responding to the coffee crisis: A pilot study of farmers' adaptations in Mexico, Guatemala and Honduras. The Geographical Journal. 172: 156-171.

Economist, The (2001). Drowning in cheap coffee. The Americas, September 27th 2001.

Falkenmark and Lindh 1976, quoted in UNEP/WMO. [/climate/ipcc_tar/wg2/180.htm "Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability"], UNEP.

FAO (2013). Severe coffee leaf rust infection in Central American countries, GIEWS Update.

Feng, S., Krueger, A. B., & Oppenheimer, M. (2010). Linkages among climate change, crop yields and Mexico–US cross-border migration. Proceedings of the National Academy of Sciences, 107(32), 14257-14262.

Findlay A.M. (2011). Migrant destinations in an era of environmental change. Global Environmental Change 21 (Suppl. 1) S50-8.

Food and Agriculture Organization/ Global Information and Early Warning System (2004). Foodcrops and shortages, Honduras. [Online: http://goo.gl/mhlsjB]

Food and Agriculture Organization (2012). Aquastat, Information system on Water and Agriculture. [Online: http://goo.gl/iiLByp].

Foresight: Migration and Global Environmental Change (2011). Final Project Report, The Government Office for Science, London.

Fortuny L (2008). Memory and death: study of the social organization in the community of Panajab, Santiago Atitlan, Solola, Guatemala, after the devastation of Hurricane Stan. 28th Annual Conference of the International Association for Impact Assessment, 4-10 May 2008, Perth Convention Exhibition Centre, Perth, Australia (www.iaia.org).

Foucart S. (2011). A race for land is destroying the Guatemalan rainforest, The Guardian Weekly, Tuesday 12th July 2011 (Online at: http://goo.gl/J18Def).

Frey, W. H. and Singer A. (2006). Katrina and Rita Impacts on Gulf Coast Populations: First Census Findings, The Brookings Institution Metropolitan Policy Program, Special Analysis in Metropolitan Policy.

Gemenne, F. (2010). The state of environmental migration 2010, IDDRI/ IOM.

Girot P.O. (2003). Overview B: Environmental degradation and Regional Vulnerability: Lessons From Hurricane Mitch, International Institute for Sustainable Development (IISD).

Gzesh S. (2006). Central Americans and asylum policy in the Reagan era. Migration Information Source.

Haque S. (2010). The state of environmental migration 2010. IDDRI/IOM.

Harmelling S., Eckstein D. (2012). Global Climate Risk Index 2013, GermanWatch.

Hegerl G.C. (2007). IPCC Fourth Report

Ho R. and Milan A. (2012). Where the rain Falls project. Case study: Peru, results from Huancayo Province, Junin Region. Report No. 5. Bonn: United Nations University Institute for Environment and Human Security (UNU-EHS).

Hugo, G (1996) Environmental concerns and international migration. International Migration Review 30(1): 105-31.

IADB (2000). Central America after hurricane Mitch: the challenge of turning a disaster into an opportunity.

InfoSur Hoy (2009). Drought ravages Central America, October 22nd, 2009. [Online: http://goo.gl/FnF0p7].

Internal Displacement Monitoring Center (2012). Internal Displacement Global Overview 2011: People internally displaced by conflict and violence, April 2012.

IPCC Fourth Assessment Report: Climate Change (2007). [Online: http://goo.gl/AA6grc].

Jones G.A., Ward P.M. (1998), Privatizing the commons: reforming the ejido and urban development in Mexico. Blackwell Publishers Ltd, MA, USA.

Keller M., Echeverria D., Parry J. (2011), Review of Current and Planned Adaptation Action: Central America and Mexico, Adaptation Partnership, International Institute for Sustainable Development.

Landa R., Magaña V. and Neri C. (2008). Agua y clima: elementos para la adaptación al cambio climático, Mexico City., Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). Universidad Naciona Autónoma de México. Centro de Ciencias de la Atmósfera.

Lavell A. (2008), Relationships between Local and Community Disaster Risk Management & Poverty Reduction: A Preliminary Exploration. A Contribution to the 2009 ISDR Global Assessment Report on Disaster Risk Reduction.

Lehoucq F. (2012). The politics of modern Central America: civil war, democratization and underdevelopment. Cambridge University Press.

Leighton Schwartz, M. and J. Notini (1994). Desertification and Migration: Mexico and the United States. U.S. Commission on Immigration Reform. San Francisco, California, Natural Heritage Institute:1-64.

Losilla, Marcelino and others (2001), Los acuíferos volcánicos y el desarrollo sostenible en América Central, San José, Costa Rica. University of Costa Rica.

Magrin, G., C. Gay García, D. Cruz Choque, J.C. Giménez, A.R. Moreno, G.J. Nagy, C. Nobre & A. Villamizar (2007). Latin America. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.), Cambridge University Press, Cambridge, U.K., 581-615

Maguid, A. M. 1999. "Los esfuerzos de las poblaciones: las migraciones en Centroamérica," in Estado de la Región en desarrollo humano sostenible, pp. 359-384. San José, Costa Rica: Editorama, S.A.

Mahler S.J., Ugrina D. (2006), Central America: Crossroads of the Americas, Migration Information Source, April 2006 [Online: http://goo.gl/E4ahjt].

McFalls JA Jr (2003) Population: a lively introduction. Population Bulletin 58:1-40.

McLeman, R. and Smit B. (2006). Migration as an adaptation to climate change. Climatic Change, 76(1-2), 31-53.

McLeman, R.A.; Hunter L.M. (2010), Migration in the context of vulnerability and adaptation to climate change: insights from analogues, Wiley Interdisciplinary Reviews: Climate Change, Volume 1, Issue 3, pages 450-461, May/June 2010.

Meze-Hausken E. (2000). Migration caused by climate change: how vulnerable are people in dryland areas? Mitigation Adaptayion Strategy Global Change 5:379-406.

Milan A.; Ruano S. (2013). Rainfall variability, food insecurity and migration in Cabricán, Guatemala. Milan, A. and S. Ruano (2013) Rainfall variability, food insecurity and migration in Cabricán, Guatemala. Climate and Development, in press..

Myers, N. 1993. Mexico, Ultimate Security: The Environmental Basis of Political Stability. New York: W.W. Norton.

Nansen Initiative, The (2013). Background paper: Disasters and Cross-Border Displacement in Central America: Emerging Needs, New Responses. Nansen Initiative Central American Regional Consultation San Jose, Costa Rica, 2-4 December 2013

Nansen Initiative, The (2013). Desastres y desplazamiento transfronterizo en América Central: necesidades emergentes, nuevas respuestas. Conclusiones de la Consulta Regional de la Iniciativa Nansen, 2-4 December 2014.

National Intelligence Council (2009), Mexico, the Caribbean, and Central America: The Impact of Climate Change to 2030, A commissioned Research Report.

Nietschmann, Bernard. 1995. Conservación, autodeterminación y el Area Protegida Costa Miskita, Nicaragua, Mesoamérica, 16 (29), june 1995, pp.1-57.

NOAA (1998). Mitch: the deadliest Atlantic hurricane since 1780. Climate Monitoring, Climate of 1998, Atlantic Hurricanes.

NOAA (2013). El Nino Theme Page. [Online: http://goo.gl/xWxXk5]

Olson R.S., Alvarez R.A., Baird B.P., Estrada A., Gawronski V.T., Sarmiento Prieto J.P. (2001). The storms of '98: Hurricanes Georges and Mitch, Impacts, Institutions Response, and Disaster Politics in Three Countries. Special Publication 38, Natural Hazards Research and Applications Information Center, Institute of Behavioral Sciences University of Colorado.

Osorio, N. (2002). The global coffee crisis, a threat to sustainable development. International Coffee Organization.

Oswald Spring, Ú. (2006). El papel de la mujer en la megalópolis y los suburbios marginales. Seguridad humana, de género y ambiental con ordenamiento territorial, cooperación, desarrollo y gestación de resiliencia como respuestas políticas ante el cambio climático y la desertificación. Paper presented at the Simposio Internacional sobre Deser tificación y Migración, Almería/Spain, 25.-27.10.2006.

Ordóñez, A., M. Trujillo and Rafael Hernández (1999). Mapeo y Riesgo de Vulnerabilidad en Centroamérica y México: Estudio de la Capacidad para Trabajar en Situaciones de Emergencias, Managua: OXFAM.

Pena Pina J., Salvatierra Izaba E.B., Velasco G.M., Zuñiga López R.E. (2000), Determinantes Socioeconómicos de la migración laboral: el caso de los indígenas mames de la Sierra Madre de Chiapas, México, Papeles de Población, vol. 6, núm. 23, enero-marzo, 2000, Universidad Autónoma del Estado de México, México.

Perch-Nielson S., Battig M.B. and Imboden D. (2008), Exploring the link between climate change and migration, Climatic Change (2008) 91:375-393.

Ponte S. (2002). The 'latte revolution'? Regulation, markets and consumption in the global coffee chain. World Development, 30 1099-122.

Population Reference Bureau (2012). World Population Data Sheet 2012 [Online: http://goo.gl/JshU8]

Proyecto Estado de la Región (1999), Informe Estado de la Región en Desarrollo Humano Sostenible, San José: PNUD/CUE.

Ramírez D., Ordaz, J. and Mora, J. (2009), "Istmo centroamericano: Efectos del Cambio Climático Sobre la Agricultura" ("Central American Isthmus: Effects of Climate Change on Agriculture") CEPAL, CCAD, DFID.

Rosero-Bixby, L. (2002). Estimaciones y proyecciones de población por distrito y otras áreas geográficas: Costa Rica 1970-2015. San José, Costa Rica : Centro Centroamericano de Población, Instituto Nacional de Estadística y Censos (INEC).

Saldaña-Zorrilla, S.O. 2007. "Socioeconomic vulnerability to natural disasters in Mexico: rural poor, trade and public response", Estudios y Perspectivas 92, UNO/CEPAL Disaster Evaluation Unit, Mexico City: United Nations Publication.

Saldana-Zorilla S.O. (2008). Stakeholders' views in reducing rural vulnerability to natural disasters in Southern Mexico: Hazard exposure and coping and adaptive capacity, Global Environmental Change 18 (2008) 583-597.

Solimano A. (2008). Migraciones internacionales en América Latina. México, FCE.

Stein, S.S. (2009). Health at the margins: distress and illness after the 2005 mudslide in Santiago Atitlan, Guatemala. Department of Anthropology, university of Pennsylvania.

Tarmann A. (2002). Easing urban poverty key to economic growth in Central America. Population Reference Bureau.

Tartaglione, C. A., S. R. Smith, et al. (2003). "ENSO Impact on Hurricane Landfall Probabilities for the Caribbean." Journal of Climate 16(17): 2925-2931.

Trenberth, Kevin E. and David P. Stepaniak (2001), "Indices of El Niño evolution," Journal of Climate, n° 14.

Tucker C.M., Eakin H., Castellanos E.J. (2010). Perceptions of risk and adaptation: Coffee producers, market shocks, and extreme weather in Central America and Mexico, Science Direct, Volume 20, Issue 1, February 2010, Pages 23-32.

United Nations, Department of Economic and Social Affairs, Population Division (2009). World Population Prospects: the 2008 Revision, CD-ROM Edition.

United Nations Development Programme (UNDP) (2013). Climate Risk Management for Smallholder

Agriculture in Honduras. New York, NY, UNDP, Bureau for Crisis Prevention and Recovery (BCPR).

UNEP (United Nations Environment Programme)/ CCAD (Comisión Centroamericana de Ambiente y Desarrollo) (2005), GEO Centroamérica: perspectivas del medio ambiente 2004, Mexico City.

UNEP (2009), Frontier between Guatemala and Belize, [Online: www.cathalac.org/lac_atlas/index.php?option=com_content&view=article&id=37:frontier-between-guatemala-and-belize&catid=1:casos&Itemid=5)

UNEP/UNDP/EIRD/World Bank (2010), "The PREVIEW global risk data platform," [on line] http://preview.grid.unep.ch/index.php

Valladares D. (2009), Guatemala: Relentless Devastation of Mangroves, Inter Press Service News Agency, Guatemala City, July 16 2009.

US Census (1990) [Online: http://goo.gl/R1qqNR].

Varangis P., Siegel P., Giovannucci D., and Lewin B. (2003), Dealing with the coffee crisis in Central America, Wolrd Bank Policy Research Working Paper, 2993.

Verner D. (2010). Reducing poverty, protecting livelihoods and building assets in a changing climate. The World Bank, Washington DC, 2010.

Warner K., Ehrhart C., de Sherbinin A., Adamo S., Chai – Onn T. (2009), In Search of Shelter

Mapping the Effects of Climate Change on Human Migration and Displacement, [Online: http://www.ehs.unu.edu/file/get/4170].

Warner K., Afifi T., Henry K., Rawe T., Smith C., De Sherbinin A. (2012), Where the rain falls: climate change, food and livelihood security, and migration. Global Policy Report, UNU-EHS/ Care.

Warner, K., K. van der Geest, S. Kreft, S. Huq, S. Harmeling, K. Koesters, and A. de Sherbinin. 2012. Evidence from the Frontlines of Climate Change: Loss and Damage to Communities Despite Coping and Adaptation. Bonn, Germany: United Nations University.

WBGU (German Advisory Council on Global Environmental Change) (2007). Climate Change as Security Risk, Berlin.

Wisner, B. (2001). Risk and the neoliberal state: why post-Mitch lessons didn't reduce El Salvador's earthquake losses. Environmental Studies Program, Oberlin College, USA. 2001 Sep;25(3):251-68.

World Bank (2009) World Development Indicators Database [on line: http://data.worldbank.org/indicator]

World Bank / GFDRR (2012). Disaster Risk Management in Central America: GFDRR Country Notes.

World Bank (2013). In Nicaragua, rural communities obtain visible results in access to water and sanitation. [Online: http://goo.gl/QusR2W].

Wrathall, D. (2013). Migration and resettlement amidst social-ecological regime shift: the Garífuna of Northern Honduras. Workshop on developing a research agenda for climate change and resettlement, Columbia University, 21 February 2013.

Wrathall D., A. Mildam & J. Jenkins. (in press) Between the hammer of climate change and the anvil of mitigation: African Palm production, deforestation and flooding on the North Coast of Honduras.

WSS Info data (2013). (Online: http://www.wssinfo.org/data-estimates)

DISASTERS
CLIMATE CHANGE AND
DISPLACEMENT

EVIDENCE FOR ACTION

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

1 › **increase the understanding** of States and relevant actors in the international community about displacement related to disasters and climate change;

2 › **equip them to plan for and manage** internal relocations of populations in a protection sensitive manner; and

3 › **provide States and other relevant actors tools and guidance** to protect persons who cross international borders owing to disasters, including those linked to climate change.

THE NANSEN INITIATIVE
DISASTER-INDUCED CROSS-BORDER DISPLACEMENT

Nansen Initiative Secretariat
International Environment House 2
7-9, Chemin de Balexert, 1219 Chatelaine, Geneva, Switzerland
Phone: +41 22 917 8205
info@nanseninitiative.org
www.nanseninitiative.org