The Potential Influence of Climate Change on Migratory Behaviour – A Study of Drought, Hurricanes and Migration in Mexico

DPhil

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Statement

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:……

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Summary

This thesis develops a conceptual and methodological approach to understanding how future climate change is likely to affect migration, and then applies this approach to explore the likely effects of climate change on different migration flows in and from Mexico. Scientific and policy interest in the climate change-migration nexus has been growing over the last decade, yet empirical results remain inconclusive. Existing approaches are often conceptually and methodologically unconvincing as they assume a linear relationship between climate change and migration, or try to separate climate stressors from other factors involved in migration decisions. Furthermore, most current research into the climate-migration nexus has focused on a relatively simple framing of localised environmental pressures forcing people to migrate. In contrast, this thesis acknowledges the complexity of migration and suggests that climate change is likely to affect factors involved in migration decisions at the local and the global level. It develops a more realistic understanding of the potential effect of climate change on migration by examining the impact of the local and global consequences of climate change on livelihood stressors and other factors involved in migration decisions.

This thesis adopts a qualitative and comparative approach to illustrate this concept, based on fieldwork in Zacatecas and Veracruz, two Mexican states with different migration profiles and different local climate stressors. It analyses the factors involved in migration decisions, which include livelihood stressors but also networks, recruiters and individual agency. A risk matrix is then developed to explore the climate sensitivity of the various factors that influence internal and international migration flows. It analyses the extent to which each factor is likely to be affected by climate change in combination with the relevance of this factor for the migration decision-making process. This approach allows identifying those factors that, affected by future climate change, have the highest potential to impact on existing migration patterns. It also allows a comparison between different migration flows. Results suggest that climate change is likely to have moderate effects on migration, mainly on internal rural flows. Alarmist predictions of large numbers of ‘climate change refugees’ are thus inappropriate and policies should instead focus on the factors projected to impact most on migration under scenarios of future climate change. Policies should also aim at mitigating the negative effects of climate change on people’s livelihoods and at protecting migrants and non-migrants.

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Glossary of Acronyms

- ASEAN: Association of Southeast Asian Nations
- AU: African Union
- CCEMA: Climate Change, Environment and Migration Alliance
- CIESAS: Centro de Investigaciones y Estudios Superiores en Antropología Social
- COLEF: Colegio de la Frontera Norte
- CONAPO: Consejo Nacional de Población
- COP15: 15th Conference of the Parties - UN Climate Change Conference 2009
- COP16: 16th Conference of the Parties - UN Climate Change Conference 2010
- DFID: Department for International Development (UK)
- EACH-FOR: Environmental Change and Forced Migration Scenarios
- ECOWAS: Economic Community of West African States
- EU: European Union
- IASC: Inter-Agency Standing Committee
- INAMI: Instituto Nacional de Migración
- INEGI: Instituto Nacional de Estadística, Geografía e Informática
- IOM: International Organisation for Migration
- IPCC: Intergovernmental Panel on Climate Change
- LDCs: Least Developed Countries
- MMP: Mexican Migration Project
- MPPACC: Model of Private Proactive Adaptation to Climate Change
- NAFTA: North American Free Trade Agreement
- NAPA: National Adaptation Programmes for Action
- NELM: New Economics of Labour Migration
- NGO: Non-Governmental Organisation
- OAS: Organisation of American States
- OCHA: Office for the Coordination of Humanitarian Affairs
- OECD: Organisation for Economic Co-operation and Development
- PRSP: Poverty Reduction Strategy Papers
- PVCC: Programa Veracruzano ante el Cambio Climático
- SAGARPA: Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación
- SLA: Sustainable Livelihood Approach
- SRE: Secretaría de Relaciones Exteriores
- STPS: Secretaría del Trabajo y Previsión Social
- UN: United Nations
- UNEP: United Nations Environment Programme
- UNFCCC: United Nations Framework Convention on Climate Change
- UNHCR: United Nations High Commissioner for Refugees
- UNU: United Nations University
- USA: United States of America
- WMO: World Meteorological Organisation

Chapter 1: Introduction - The nexus between climate change and migration

The nexus between climate change and migration is little understood despite the interest in the subject among scientists, policy makers and the media. Existing literature is often concerned with attempts to categorize and quantify climate-related migration, while only few publications so far tried to understand the nature of and the elements involved in climate change-migration linkages. Conceptual and methodological approaches to studying the potential effects of climate change on migration are often based on simplistic assumptions, ignoring the complexity of climate change and migration and of their potential relationship.

This thesis seeks both to fill this gap, and to move beyond simplistic assumptions by grappling head-on with the complexity of migration-climate change linkages. It does so through the development of a conceptual model to address these complex linkages; and then through the application of this model to two regions of Mexico that are heavily affected by migration, and are predicted to be severely impacted by climate change. This introductory chapter starts with a brief overview of the existing literature on the projected effects of climate change on migration, which mostly seeks to estimate numbers of people likely to become displaced by the consequences of future climate change. The first part of the chapter also analyses the negative connotations of migration as a response to climate change. In much of the literature, migration is considered a failure to adapt, and the view of migration as an adaptation strategy is only slowly emerging. The section goes on to argue that the key issues impeding a more nuanced understanding of the nexus between climate change and migration are the focus on categorizations and definitions, the inadequacy of the theoretical approach, as well as the lack of empirical evidence.

The second section of this introduction highlights two recent major assessments into the relationship between the environment and migration, the Environmental Change and Forced Migration Scenarios (EACH-FOR) project and the Foresight project on migration and global environmental change. An important contribution of both assessments is that they explore the potential effects of environmental

change on migration in a global context and within the framework of a large research project. In contrast, most previous case studies analysed the effects of one specific environmental stressor on local migration patterns in one region of the world.

The last part of the chapter introduces the contribution of this thesis to answering the question how climate change is likely to affect migration. In response to the lack of a convincing conceptual and methodological approach for studying the relationship between climate change and migration, this thesis develops such an approach. This approach is illustrated with empirical data from Mexico, based on long-term fieldwork in four rural communities in the Mexican states of Zacatecas and Veracruz. The last section of this chapter also provides an overview of the content of the following chapters of this thesis.

1.1 Projected effects of climate change on migration

Climate change and migration are two topics of long-standing policy interest, and concern about the nexus between the two phenomena has been growing in recent years. Despite this policy interest, there is little sound evidence so far about the likely future effects of climate change on migration. Research into climate change and migration needs to tackle the complexity of climate change, as well as the complexity of the role that migration might play as an adaptation strategy to the consequences of climate change. Although there have recently been signs of a more nuanced understanding of climate-change migration linkages and an acknowledgement of their complexity (Tacoli 2010, Hunter 2005), most policy publications still assume a linear and positive relationship between climate change and migration (Action Aid International 2007, Christian Aid 2007, Conisbee and Simms 2003).

In particular, potential migration associated with climate change is generally perceived as the negative consequence of a failure to adapt to changing precipitation and temperature patterns and extreme events. These perceptions

about the climate change-migration nexus are related to fears of exponentially growing numbers of people displaced by climate change, and to the implicit assumption that all climate related migration will be international and dominated by moves from poor to economically more developed countries. In contrast, the following paragraphs highlight the complexity of climate change and of adaptation measures, and demonstrate why prevalent assumptions about future mass migration triggered by climate change are not solid. The last part of this section analyses the key issues related to research into the climate change-migration nexus, including the focus on definitions and categorisations, the inadequacy of the existing theoretical approach as well as the lack of systematic empirical evidence.

1.1.1 Climate change and climate change adaptation

Climate change and migration are two widely debated and highly complex phenomena. An analysis of their relationship needs to consider various sources of uncertainty, related to predicted future climate change, to its impacts on people's livelihoods, and to people's responses to climatic stressors. The uncertainty in climate change predictions is caused by the chaotic nature of the atmosphere, different outcomes of different climate change models, and the unknown scale of future mitigation efforts, leading to different emission scenarios (Black et al. 2011). The potentially abrupt occurrence of tipping points, thresholds at which whole ecosystems might suddenly collapse, adds an element of uncertainty to scenarios of future climate change (Foresight 2011a). Nevertheless, the 2007 IPCC report, which provides the most recent comprehensive assessment of observed and predicted climate change, suggests that it is highly likely that climate change will lead to changing precipitation and temperature patterns and to changes to the frequency and severity of extreme climatic events (Parry et al. 2007). As a consequence, some already dry regions might become drier and the probability of the occurrence of droughts might increase in these regions. Elsewhere, precipitation might increase in total volume and intensity, leading to higher flood risks. Yet, rising temperatures might improve climatic conditions in high latitude

regions, and in some parts of Europe and Northern America agriculture might become more productive under future climate change (Solomon et al. 2007).

The question how future climate change is likely to impact on people's livelihoods thus depends to a large extent on the local effects of climate change on existing climatic conditions in different regions of the world. However, climate change might also entail negative consequences felt at the global level, for instance an increase in commodity prices (Brown and Funk 2008, Lobell et al. 2008). Yet, the impacts of climate change on people's livelihoods also depend on people's vulnerability and adaptive capacity to shocks and stresses. The Sustainable Livelihood Approach (SLA) provides a useful framework for analysing how people respond to external climatic and non-climatic livelihood stressors. The SLA suggests that people make use of a combination of available assets to mitigate the effects of livelihood stressors (DFID 2000). The impact of the consequences of climate change on people's livelihoods thus depends to a large extent on the availability of assets to affected people and the way how they make use of these assets and of potential livelihood strategies.

Migration might or might not be one livelihood strategy among others that people affected by climatic stressors choose to make use of. Furthermore, many factors play into migration decisions (Kritz et al. 1992, Castles and Miller 1993, Boyle et al. 1998), and in most cases it is unlikely that people's migration decisions are only based on climatic stressors. Much also depends on the form of migration. For instance, seasonal short-distance moves have been a response to drought in the Sahel for centuries (Rain 1999). Other forms of migration, particularly long-distance international moves, might not be feasible options for everybody as they require access to financial resources and to networks. Furthermore, climate change is predicted to most seriously affect poor people (Parry et al. 2007, Yamin et al. 2005). Thus climate change might even deprive more people from the option of choosing migration as a livelihood strategy, because a growing number of people might not be able to afford migration anymore.

1.1.2 Assumed migration increase caused by climate change

Despite the potential of migration as an adaptation strategy in response to the consequences of climate change, migration is still most often considered a failure to adapt to climate change (Tacoli 2009). The potential role of migration as a livelihood strategy is thus ignored in much of the climate change-migration literature. Also ignored is the fact that climate change might limit people's potential to make use of migration as a livelihood strategy, because a growing number of people might become unable to afford migration as a consequence of future climate change. Instead, the established discourse on climate change and migration claims that climate change will cause the displacement of millions of people.

The 2006 Stern Review on the Economics of Climate Change suggested that climate change might force millions of people worldwide to migrate. It uses language that stresses the negative undertone of migration as a consequence of climate change and refers to a "risk of displacement or migration" for a large number of people worldwide (Stern 2006:111). Although the report does not put forward an exact number of potential climate change migrants, it reports that 200 million people worldwide live in flood prone coastal areas alone. Furthermore, Stern (2006) argues that frequently cited estimates of 200 million future 'climate change refugees' are based on "conservative assumptions".

Several other organisations (Christian Aid 2007, Greenpeace 2007, Environmental Justice Foundation 2008) have published policy papers after the Stern Review, equally claiming that climate change will force large numbers of people to migrate. All of these publications conceptualise migration as a failure to adapt to climate change, or as the Stern Review puts it "a last-resort adaptation for individuals, but one that could be very costly to them and the world" (Stern 2006:111). Fears of large numbers of climate change migrants have since then dominated the policy discourse, at the expense of calls for better protection of poor people affected by climate stressors and migrants in general.

1.1.3 Key issues

One of the key issues which hinders a profound understanding of the nexus between climate change and migration is the focus on categorizations and definitions for people expected to migrate because of climate change (Dun and Gemenne 2008). These categorizations and definitions are needed to produce estimates of projected numbers of climate-related migrants, and to establish a protection scheme for so-called 'climate change refugees'. However, although some form of legal protection of people displaced by climate change might be desirable or even necessary at some point in the future, the focus on a protection regime for climate migrants runs the risk of excluding migrants who become displaced on other grounds, as well as people affected by climate change who are unable to migrate. Next to this practical concern, there are theoretical arguments against the establishment of a separate protection scheme for people displaced by climate change and against the categorization of 'climate change refugees' itself.

These arguments include the inherent difficulty in finding a convincing definition of 'climate change refugees' or 'climate change migrants' in order to distinguish them from other migrants or refugees. Despite various attempts, a concrete definition of this group of migrants does not yet exist. This difficulty is linked to the lack of a convincing conceptual and methodological approach, which is another theoretical argument that speaks against a protection scheme for 'climate migrants'. Existing approaches, which either assume a linear relationship between climate change and migration or try to separate climate stressors from other factors involved in migration decisions, seem to be inadequate. The latter approach is more convincing than the former because it acknowledges the multi-causality of migration and the complexity of climate change adaptation strategies. Nevertheless, this approach does not acknowledge that climate change is likely to not only have direct local effects on people's livelihoods and on agricultural output but also in an indirect manner on employment opportunities and global commodity prices.

Because of the various direct and indirect impacts, as well as the local and the global effects of climate change, attempts to separate climate change from other elements involved in migration decisions so far have not captured the complete picture of the relationship between climate change and migration. A number of recent case studies, which have concentrated on the effects of one specific climate stressor on migration, have provided useful insights into the current situation at specific places and allowed some projections of future scenarios. Yet, so far these studies did not offer a holistic understanding of the effects of climate change on people's livelihoods and of the role that migration might play as a response to climatic and non-climatic stressors. Therefore, existing empirical results are far from being conclusive enough to permit general statements about the current and potential future effects of climate change on migration. Nevertheless, existing empirical evidence confirms the above theoretical considerations that the relationship between climate change and migration is complex and highly context specific.

1.2 Contribution of recent major assessments

As a response to the increasing policy interest and to the lack of theoretical and empirical knowledge, two major research projects into the relationship between environmental change or climate change and migration have emerged during the last four years. The Environmental Change and Forced Migration Scenarios project (EACH-FOR) aimed to systematically generate worldwide empirical evidence from case studies set in areas, in which environmental stressors and the potential for migration were identified. In contrast, the UK Foresight project on migration and global environmental change focussed on regions of policy interest for the UK and to a lesser extent for global policies. Apart from a few case studies, the latter study was mainly based on expert consultations and reviews drawing on existing information. The aim of the Foresight project was to conceptualise environment-migration linkages and to forecast potential future developments.

1.2.1 Environmental Change and Forced Migration Scenarios (EACH-FOR)

The two-year research project on Environmental Change and Forced Migration Scenarios (EACH-FOR)[1] was co-financed by the 6th Framework Programme of the European Commission and run between 2007 and 2009. As opposed to existing single case studies into the relationship between the environment and migration, EACH-FOR investigated the effects of different environmental stressors on migration in different parts of the world in one project. Some 23 case studies were carried out worldwide, using qualitative as well as quantitative research methods. The project aimed to contribute to the understanding of the role that environmental factors play in forced migration and to build plausible future scenarios regarding forced migration under future environmental change, including climate change.

The synthesis report of the project admits that due to time and financial constraints only preliminary conclusions can be drawn from the research results (Jäger et al. 2009). Nevertheless, one of the project's major contributions was that it raised awareness of the complexity of the two phenomena environmental change and migration and of their relationship. It contributed to the growing interest in the environmental change-migration nexus at scientific events and in the media[2]. The main results of the EACH-FOR project can be summarised in three points. 1) Migration decisions are complex and environmental change might be one out of many factors to affect them; 2) Environmental change is likely to increase the pressure on people to migrate or to alter existing migration patterns; and 3) People can only migrate when they have access to financial resources and networks (Jäger et al. 2009). The presented case studies show more nuanced and sometimes contradictory results, which will be analysed in detail in chapter 2.

[1] http://www.each-for.eu/index.php?module=main
[2] http://www.each-for.eu/index.php?module=ef_media

1.2.2 Foresight project on migration and global environmental change

The Foresight project on migration and global environmental change[3] is a project in the portfolio of the Foresight Programme of the UK Government Office for Science within the Department for Business, Innovation and Skills. It started in October 2009 and the project report is due to be launched in the autumn of 2011. The general aim of the Foresight Programme is to assess the likely future developments of issues of major concern for UK and global policies. The Foresight project on migration and global environmental change, therefore, concentrates on regions and ecosystems, in which the impacts of environmental change on migration are expected to be of highest importance for policymakers in the UK and worldwide. These focus areas are dryland margins, low elevation coastal zones and small island states, and mountainous regions. A workshop was organised in each of these focus areas, as well as in the Mediterranean, bringing together experts and stakeholders from the region. The reports of these workshops are a major part of the project's outcome and will be published together with the final project report in late 2011. The workshop reports and the project report where not available yet at the time of completion of this thesis.

1.3 Contribution of this thesis

This thesis aims to contribute to a better understanding of the nexus between climate change and migration, using the example of Mexico. It develops a conceptual and methodological approach, which acknowledges that climate change is likely to affect people's livelihoods in several ways, and that its consequences will manifest at the local and the global level. It argues that people are likely to respond to livelihood stressors worsened by climate change in different ways and that migration might or might not be one of their chosen strategies. Furthermore, the approach acknowledges the multi-causality of migration, and argues that many elements play into migration decisions so that in most cases it seems unlikely that people migrate only because of climate stressors. The thesis also provides long-term field evidence from Mexico to illustrate this conceptual and

[3] http://www.bis.gov.uk/foresight/our-work/projects/current-projects/global-migration

methodological approach. This empirical evidence is based on fieldwork in Zacatecas and Veracruz, two Mexican states with different migration patterns and different climatic conditions.

Empirical fieldwork is based on two sets of guiding research questions. First, it was concerned to explore the elements involved in migration decisions in rural communities in Mexico. This includes the questions why some people migrate while others stay in their home community, what forms of migration can be found in rural Mexico, and why some forms of migration are more common in a specific village context than others. Thus, fieldwork sought to explore how households, under different economic, social, and cultural circumstances, choose the most appropriate form of migration, or choose other livelihood strategies instead of migration.

It is argued that only once the above questions have been answered can we go on to explore the likely effects of the global and local consequences of climate change on these observed migration flows. This includes understanding of the differences and similarities regarding different migration flows, and of the elements involved in different migration decisions at the sending and destination areas, under scenarios of future climate change. The fieldwork conducted shows in particular a number of alternative livelihood strategies that were observed in the village communities, and analyses the circumstances under which people have access to these livelihood strategies and consider them appropriate responses to livelihood stressors.

1.3.1 A new conceptual and methodological approach

It is argued in this thesis that existing approaches to studying the link between climate change and migration are conceptually and methodologically flawed and unconvincing. In particular, many papers published over the last decade have been guided by the assumption of a direct, very strong, linear and positive relationship between climate change and migration (Tacoli 2009). In contrast, this thesis argues that the academic and policy debate needs to be informed by an understanding of

the complexity of the relationship between climate change and migration. Chapter 3 develops an alternative conceptual model that takes the complexity of both migration decisions and the consequences of future climate change into account. The chapter shows that the theoretical debate and existing empirical research so far have been based on two distinct approaches, which either conceptualise climate change as a single cause of migration or as one driver of migration amongst many others.

While the assumption of a linear link between climate change and migration is conceptually flawed, the conceptualisation of climate stressors as one migration driver amongst many others is consistent with the idea accepted in migration research, that migration is a multi-causal phenomenon. Chapter 3 shows that elements of the Sustainable Livelihood Approach (SLA) and the New Economics of Labour Migration (NELM) can be used to illustrate that 1) migration has different drivers, and that 2) perceived livelihood stressors, which can be identified as migration drivers, also drive different responses. Furthermore, chapter 3 integrates migration theories that acknowledge the importance of networks and institutions and the effect of cumulative causation to explain why some people migrate and others stay in their home communities. The chapter thus argues that factors influencing migration decisions can be found at the macro, the meso, and the micro level and that all these factors need to be considered when analysing the potential impact of climate stressors on migration. Thus, the conceptualisation of migration decisions as a complex as opposed to a linear process is supported in this thesis.

Nevertheless, chapter 3 also argues that the conceptualisation of climate change as one factor among many others affecting migration decisions is not sufficient for a holistic understanding of the climate change-migration nexus. While this approach acknowledges the complexity of migration processes, it does not consider the complexity of the potential consequences of climate change. These consequences will not only translate into local environmental stressors that might directly affect migration decisions but they are likely to also indirectly affect

migration decisions in several ways. The local and global consequences of climate change might, for example, affect job opportunities in sending and destination areas. These consequences might in turn affect the functioning of institutions at the meso level, such as recruiters of workers and migrant networks, as well as the individual perception of migration as a desirable endeavour. To take these considerations into account, climate change is conceptualised as affecting the elements involved in migration decisions at the macro, the meso, and the micro level, although some elements are likely to be more climate sensitive than others.

The methodological approach presented in chapter 4 builds on this conceptualisation. It consists of two parts, first identifying and analysing the elements involved in different forms of migration decisions, and second testing these factors involved in migration decisions for their sensitivity to climate change. Based on the conceptualisation that climate change is likely to affect migration decisions in many ways, a qualitative approach was chosen to illustrate how and to what extent climate change is likely to affect each element involved in migration decisions. Qualitative data for the first part of the methodological approach were collected in a total of four rural communities in the Mexican states of Zacatecas and Veracruz between January 2008 and March 2009. Fieldwork consisted of about 50 semi-structured interviews in each community, participant observation, life histories, and interviews with people who know the communities in their function as teachers, doctors, nurses, or researchers. Empirical research in the communities was completed by visits to local libraries and archives, meetings with Mexican researchers working on themes related to migration or climate change, and by local climate and population statistics. After returning from fieldwork, interviews and field reports were analysed and categories of factors affecting migration decisions on the macro, the meso and the micro level were constructed.

The second part of the methodological approach consists of testing the factors involved in migration decisions, as identified during fieldwork, for their sensitivity to climate change. To this end, the principle of a risk matrix, as presented in chapter

4.3, is used. A risk matrix measures the probability that a specific event is likely to occur in combination with the impact that this event is expected to have. Accordingly, for the purpose of the analysis of the climate sensitivity of factors involved in migration decisions, a matrix including two axes with possible values on a scale from 1-5 each is constructed. The first axis measures to what extent each element involved in migration decisions is likely to be affected by climate change. The second axis measures how relevant this factor is in the migration decision-making process. The product of the two scores for each specific element involved in migration decisions indicates the extent to which the effects of climate change on this element will in turn affect migration decisions. Factors involved in migration decisions that are at the same time highly sensitive to climate change and of high importance in the decision-making process for or against migration can be expected to contribute most to potential changes to existing migration patterns caused by climate change. Possible scores range from 1-5 for each axis, allowing product scores between 1 and 25. Calculating the product of the two scores for each factor involved in the migration decision-making process, allows identifying those factors that, affected by future climate change, have the highest potential to change existing migration patterns. Performing this process for different forms of migration allows a comparison between the potentially different climate sensitivity of each migration flow in rural Mexico.

1.3.2 Long term field evidence from Mexico

To be able to present a true-to-life picture of the heterogeneous migration profiles, a careful selection of the research setting is crucial. Chapter 4 justifies the choice of Mexico, and the particular states of Zacatecas and Veracruz, as the research setting. While the classic migration states (such as Zacatecas, Durango and Michoacán) in the centre-west of the country have been sending international migrants for generations, international migration only emerged in the 1990s in the southern and south eastern states. Internal migration is a common phenomenon in many parts of the country. Furthermore, different local climate stressors such as droughts, floods and hurricanes can be found within one country, often

simultaneously, so that their potentially different effects on migration decisions can be analysed. Zacatecas and Veracruz were selected as the two Mexican states in which fieldwork took place because they show distinct migrations patterns and are impacted by different climate stressors. While droughts are very common in Zacatecas, Veracruz has been hit several times by severe floods and hurricanes in recent years. Zacatecas and Veracruz thus allow an analysis of different migration flows and also an analysis of the effects of different local climate stressors on people's livelihoods. Furthermore, in each region two rural communities, again with different migration and environmental characteristics, were selected to consider as many potential local characteristics as possible.

Chapter 5 briefly introduces the regions and the communities in which fieldwork took place. This short and mainly descriptive chapter stresses the diversity of the different regions of Mexico but also the differences and similarities of rural communities within each state of Zacatecas and Veracruz. The chapter starts with a brief presentation of geographic, demographic, economic and environmental data for each of the two states. Then, the four researched communities Laguna Seca and El Tigre in Zacatecas, and Cascajal del Río and Nuevo Renacimiento in Veracruz are presented. In addition to demographic and economic data for each community, the major climatic stressors that affected people's livelihoods in the past are summarised for each community. The purpose of this short chapter is to prepare the context for the three chapters 6, 7 and 8, in which the empirical results of this thesis are presented.

Chapter 6 is concerned with the history of migration, current migration patterns and the underlying drivers of migration in Mexico and more specifically in Zacatecas and in Veracruz. After presenting explanations for migration in Mexico found in the literature, the chapter turns to the underlying drivers of migration that were identified during fieldwork. These drivers are decreasing employment opportunities, a decreasing income-price ratio, the fact that subsistence agriculture and foraging have become more difficult, and increased desires as a consequence of cultural

change. The last section of the chapter is concerned with the extent to which these drivers actually lead to migration as opposed to other responses. Livelihood strategies such as micro-businesses, credits, selling land or livestock, and waiting for external aid are alternatives to migration. This means that the potential drivers of migration that are analysed in chapter 6, do not necessarily lead to migration.

Chapter 7 analyses under what conditions the livelihood stressors at the macro level presented in chapter 6 transform into drivers of migration. This chapter stresses that migration has many different forms and that the four different migration flows that were observed in the communities, in which fieldwork was conducted, are illegal international migration, legal international migration, internal migration to rural destinations, and internal migration to urban destinations. Furthermore, migration can be temporary or permanent and can involve single family members or whole families. The chapter presents the factors that influence the choice of the preferred form of migration and the decision to migrate or not to migrate at all. Determinant factors on the meso level are access to networks or recruiters. Crucial factors at the micro level related to human agency are perceptions of the usefulness of different forms of migration as a livelihood strategy, perceptions of the ability to succeed in the destination area, the willingness to leave the community and the degree to which this is accepted by family members and fellow village dwellers, and the access to the necessary financial resources.

Chapter 8 analyses the sensitivity of these factors involved in different migration decisions and of the alternative livelihood strategies identified in chapter 7. The chapter starts with an analysis of the climate sensitivity of subsistence agriculture, including a critical analysis of existing assessments of the projected effects of climate change on agricultural productivity. The fact that these assessments use rainfall as a proxy for agricultural productivity is criticised because agricultural output also depends on a variety of other factors. Most important of all, these studies ignore the influence of human agency on the decision to stop or to continue

farming. Rather, they are conceptualised around the idea that climate change will gradually decrease yield output, mainly in developing countries, thereby assuming that farmers will continue farming under all circumstances. However, high costs of farming in relation to low market prices for agricultural produce in combination with uncertain yield outputs due to uncertain climatic conditions have already caused many farmers to stop farming in the researched communities in Zacatecas and Veracruz. Instead they need to rely to a large extent on alternative livelihood strategies, which makes them dependent on external sources of income and decreases their household income.

The second part of the chapter is concerned with the analysis of the climate sensitivity of commercial farming. It shows that uncertain climatic conditions in combination with decreasing revenues for agricultural produce might lead to two different responses of commercial farmers. First, they might switch to more robust crops, which provide lower but more secure revenues and demand less labour. This would entail a decrease in employment opportunities in commercial agriculture. Second, they might diversify their produce and switch to more expensive and labour intensive crops in order to achieve a higher benefit. This, to the contrary, would entail an increase in employment opportunities in commercial agriculture. Thus, the same consequences of climate change in the same region can have opposite effects on farming and employment opportunities, depending on the experiences and perceptions of farmers and landowners.

The third part of chapter 8 analyses the climate sensitivity of the different migration flows, based on empirical data gathered during fieldwork in the four communities in Zacatecas and Veracruz. It shows that internal and international migration are likely to become affected by climate change in different ways. While worsening local climate stressors have the potential to increase the volume of internal migration, they seem to have little effect on international migration. All forms of migration from rural Mexico are likely to become affected by a decrease of people's purchasing power as a consequence of rising commodity prices in response to

climate change. This might put pressure on people to migrate. Yet, climate change can also be expected to decrease people's access to money, as it is likely to decrease the availability of employment opportunities in Zacatecas and Veracruz. Furthermore, decreasing employment opportunities at the village level lead to decreasing options of access to informal credits on the household level, because the number of families that could provide credits is likewise decreasing. As international migration is an expensive endeavour, it is likely that fewer families will be able to afford international migration. The nexus between climate change and migration thus shows many aspects of complexity. The following chapter analyses the existing evidence on the relationship between the environment or the climate and migration.

Chapter 2: Environment, climate change and migration: existing evidence

This chapter analyses existing evidence on the nexus between climate change and migration. It starts with an overview of the 'environmental refugee' debate in the 1990s, and argues that many elements in this debate provided the intellectual basis for the current scientific and policy interest in potential linkages between climate change and migration. The second part of the chapter then moves on to the current debate about the nexus between climate change and migration. It analyses three policy areas, where the relevance of this nexus is currently discussed: climate change, migration and development; climate change, migration and conflict; and international climate protection mechanisms. The third part of the chapter discusses existing empirical studies concerned with the potential impacts of droughts, tropical cyclones and floods on migration.

2.1 The 'environmental refugee' debate

The potential effects of environmental change on migration have been explored theoretically for almost four decades. The concept 'environmental refugee', was first introduced by Lester Brown of the Worldwatch Institute in the 1970s (Saunders 2000), and became more widely known by the work of El-Hinnawi (1985) of the United Nations Environment Programme (UNEP). Another decade later Norman Myers and Jennifer Kent (1995) provided estimates of numbers of expected 'environmental refugees' that are still quoted some 15 years later. They suggested that there were at least 25 million environmental refugees at the time the text was written, which they expected to double by 2010. However, the most widely cited quote refers to environmental stressors, which "could eventually cause as many as 200 million people to be put at risk of displacement" (Myers and Kent 1995:1).

Other scholars have also made the claim that the numbers of 'environmental refugees' will be immense in their own work. Jodi Jacobsen (1988 as quoted in Lonergan and Swain 1998) concluded that, "environmental refugees have become the single largest class of displaced persons in the world" (Lonergan and Swain

1998:5). John Cairns even expressed fears that all human beings might become 'environmental refugees' one day:

> "When countries capable of absorbing environmental refugees are at or beyond their carrying capacity, every individual on the planet becomes a potential environmental refugee with no place to go" (Cairns 2002:34).

The debate about a possible nexus between environmental degradation and migration was mainly led by environmental scientists and ecologists (IOM/RPG 1992, see Myers and Kent 1995, Lonergan and Swain 1998, Unruh 2004, Myers 2005). Their major focus of interest was the search for current and future numbers of people displaced by environmental problems, while there was hardly any interest in understanding the context of this nexus.

2.1.1 Methodological and conceptual issues

The concept 'environmental refugee' and the estimates of numbers of people who are expected to become displaced or migrate due to environmental problems were challenged by other scholars (McGregor 1993, Suhrke 1994, Kibreab 1997, Black 1998, 2001) for being over-simplistic and methodologically and conceptionally flawed. Most indications of the numbers of expected 'environmental refugees' were based on population estimates in the regions affected by environmental problems, as reliable statistics rarely exist in many of these areas. Although environmental stressors often most seriously affect poor people, within a community and on the global level (Parry et al. 2007, Yamin et al. 2005), it is generally not the poorest people who migrate overseas because international migration is an expensive endeavour that demands resources for the journey and for the crossing of borders (Castles 2000, De Haan 2000, Skeldon 2002)[4]. It is thus difficult to imagine that people who lost their land and all their other resources will manage to embark on a journey to Europe or to North America.

[4] Most authors acknowledge that in exceptional cases, the poorest might become displaced because of environmental catastrophes or wars. However, they are not specific about the destinations of these people.

Furthermore, the reasoning behind the term ‘environmental refugee’ suggests that the consequences of environmental change will make people’s living conditions unbearable, forcing them to leave their homes. Yet, there is a general consensus that migration is a very complex phenomenon which cannot be explained by one single reason alone but by a multitude of economic, social, and cultural factors that influence migratory behaviour (Kritz et al. 1992, Castles and Miller 1993, Boyle et al. 1998, Wood 2001).

This shows that the nexus between environmental stressors and migration is not linear and not necessarily positive because different forms of migration have to be considered. It is feasible that people become displaced by or migrate after an extreme environmental event, most likely over short distances. Yet, it is also feasible that material losses after an extreme event render people poorer and therefore deprive them from the possibility of making use of migration as a livelihood strategy, especially over large distances and across borders.

2.1.2 Definitional and legal issues

One of the central themes in the context of the 'environmental refugee' debate was the call for legal protection for people displaced by environmental change. Therefore, there was the need for a definition of ‘environmental refugees’, on which this legal protection framework would be based. Attempts to define ‘environmental refugees’ were numerous but not conclusive (Black 2001). Furthermore, most attempts to define ‘environmental refugees’ were flawed. An example containing two contestable elements is the one by the World Foundation for Environment and Development and the Norwegian Refugee Council (Trolldalen et al. 1992, quoted in Swain 1996):

> “First, it should refer to persons who are coerced or forced to leave their homes for environmental reasons that threaten their lives. Secondly, it should be limited to persons who have crossed an international border (that is, persons who are outside their country of nationality or origin)” (Swain 1996:965).

The weakness of the first part of the definition is linked to the problem of how environmental reasons can be separated from other motives for migration. The claim that the classification should be “limited to persons who have crossed an international border” in the second part of the definition fulfils part of the 1951 Geneva Convention on Refugees. Yet, it contradicts Myers’ concept of including everybody who has become displaced for environmental reasons, regardless of the destination. Thus, the numbers of people who are likely to become displaced for environmental reasons and cross an international border – and therefore comply with the definition – are likely to be much smaller than the 200 million estimated by Myers.

The lack of a clear definition and theoretical framework for the concept ‘environmental refugee’ has been identified as a major hindrance to the construction of a legal protective mechanism for this group of people (Lonergan and Swain 1998, Flintan 2001). Partly in response, Hugo (1996) suggests using the concept of ‘environmental migrant’ instead. Although he disputes the term ‘environmental refugee’, he acknowledges that environmental change is a factor that drives involuntary migration and should be recognised academically and politically as such. He argues that “conceptualizing environmentally induced migration as a subset of forced migration draws attention to the neglect of this type of movement by researchers and policymakers alike” (Hugo 1996:110-1). Lee (1994) also distinguished between the terms ‘environmental refugee’ and ‘environmental migrant’. However, she provided no further explanation of the difference between the two concepts. One argument put forward against the use of the term ‘environmental refugee’ is that the 1951 Geneva Convention defines ‘refugees’ as people who are outside the country of their nationality “owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion“ (UNHCR 2006:16). Therefore, Black (2001) criticises “that although environmental degradation and catastrophe may be important factors in the decision to migrate, and issues of concern in their own right, their conceptualisation as a primary cause of forced

displacement is unhelpful and unsound intellectually, and unnecessary in practical terms" (Black 2001:2). Kibreab (1997) points out that states are not obliged to provide asylum to people who have become displaced for environmental reasons.

2.2 The climate change-migration nexus

The debate about 'environmental refugees' in the 1990s thus did not produce any results in the form of conclusive empirical evidence, a convincing research design, a clear definition, or any form of legal protection for people displaced by environmental change. From the second half of the first decade of the 21st century onwards, the focus of the debate shifted more and more from the potential nexus between environmental degradation and migration to the potential nexus between climate change and migration. Yet, one of the major areas of concern was still the search for definitions and numbers, with the aim of establishing a legal protection scheme for people expected to become displaced by climate change.

2.2.1 Definitions and legal protection

Potentially as a consequence of the criticism of the 'environmental refugee' concept as analysed above, more recent attempts to define people displaced by environmental or climate change, use the terms 'environmental migrant' or 'climate change migrant'. In 2008, the International Organisation for Migration (IOM) proposed a definition of 'environmental migrants':

> "Environmental migrants are persons or groups of persons who, for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to have to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their territory or abroad"(http://www.iom.int/jahia/Jahia/definitional-issues).

Despite this partial shift of nomenclature, claims for the need to change the 1951 Geneva Convention on Refugees and to include legal refugee status for people who have become displaced due to the degradation of their natural environment or because of climate change were still numerous at the end of the 2000s. It was argued that changes to the legal framework of refugee policies have become

necessary because of the changing needs of people. Among others, the Global Governance Project (Biermann and Boas 2008), Population Action International (2008), the United Nations University Institute for Environment and Human Security (Renaud et al. 2007), Christian Aid (2007, 2006), Greenpeace (Jakobeit and Methmann 2007), and the New Economics Foundation (Conisbee and Simms 2003) have included this concern into their agenda.

Williams (2008) discusses the feasibility of installing a protective mechanism for people displaced by climate change. She finds that changing the Refugee Convention and including environmental stressors as reasons for becoming classified as a refugee is not an option because of the UNHCR's opposition to mixing the two categories of refugees and environmentally displaced people, and because of the expected resistance of the international community towards the implementation of this approach. Analysing 45 interviews she conducted with ambassadors and senior diplomats of different United Nations Institutions, McNamara (2007) concludes that "policy absence on environmental refugees is an outcome of debates and discourses by various actors and agencies at the United Nations". While it seems correct that the UNHCR has opposed use of the term 'environmental refugees', other UN agencies such as UNEP have nonetheless used it (ex. El-Hinnawi 1985, UNEP 2007). Nevertheless, a global binding protection scheme for people displaced by environmental change does not seem to be a feasible option. Williams (2008) argues that the installation of such a scheme would imply that all states accepted climate change as a fact and were willing to take the responsibility for it, which will most likely not be the case. In a Research Brief based on the outcomes of the 2nd Expert Workshop on Climate Change, Environment, and Migration, Stal and Warner (2009) stress that the attempt to include climate or environmental stressors into global protection schemes is often convincing intellectually, yet that such efforts are doomed to fail at the practical level because of the authority of the nation states, which are unlikely to adopt measures contradicting their own interests.

Williams (2008) argues further that, while the Guiding Principles on Internal Displacement offer more room to include environmental reasons for displacement, protection of environmentally displaced people in this framework would only be possible as long as they do not cross an international border. This concern might not be of too much practical importance, as it can be regarded as highly likely that most environmentally displaced persons will not cross an international border in the first place. Next to this practical issue, Williams puts forward an ethical concern about including environmentally displaced people into the Guiding Principles on Internal Displacement: “There still remains a need for such individuals to be recognized and protected based on their own intrinsic value and circumstances rather than being manipulated and engineered into a pre-existing framework designed for other purposes” (Williams 2008:513). She suggests that regional protection schemes, coordinated by the EU, the AU, the OAS, and ASEAN, or by smaller regional entities, under the auspices of the UNFCCC would be the most feasible approach.

In a background paper for the 2010 World Migration Report, Martin (2010) approaches the question about legal protection schemes for people who migrate for environmental reason by looking at existing policies at the state level. She mentions that the temporary protection scheme, which was established in the USA in 1990, includes environmental aspects. This scheme grants temporary protection to those people who are already in the USA when their home country is affected by an ongoing violent conflict, an environmental disaster, or any other form of temporary extreme situation. The definition of environmental disasters include “an earthquake, flood, drought, epidemic, or other environmental disaster in the state resulting in a substantial, but temporary, disruption of living conditions in the area affected” (Martin 2010:8). Yet, Martin (2010) argues that the potential of the scheme as a protective mechanism for people affected by climate stressors is very limited because of its temporary nature, and because of the fact that it only applies to persons who are already in the USA at the time of the disaster. Canada, Switzerland, and the United Kingdom suspend deportations to countries after an

environmental disaster and applied this principle to nationals affected by the 2004 Tsunami. Finland and Sweden are the only countries who included environmentally displaced people into their immigration policies (Martin 2010). In 2006, the Stern Review on the Economics of Climate Change suggested that negotiations were underway to establish an agreement between New Zealand and Tuvalu, in which New Zealand would agree to receive 'climate change refugees' from the island. This claim was echoed in the media although the New Zealand Ministry of Foreign Affairs and Trade clarified on its website[5] that no such agreement exists. Thus so far, claims for policy agreements that protect people displaced by environmental stressors have not been successful, even in the form of soft laws and non-binding agreements, which were suggested by Stal and Warner (2009) as a more feasible alternative to a legally binding approach.

2.2.2 The focus on numbers

Many policy papers published in the second half of the 2000s follow the arguments put forward in the 'environmental refugee' debate, sometimes simply replacing 'environmental change' by 'climate change'. The dominating discourse is the claim that climate change will induce the displacement of large numbers of people worldwide. Estimates of the numbers of expected 'climate change refugees' draw on figures put forward by Myers and Kent (1995) in the context of the 'environmental refugee' debate presented above, despite the criticism of the concept and the predicted numbers of environmentally displaced persons. These figures of up to 200 million climate change refugees in the coming thirty years are quoted in a report written on behalf of Greenpeace Germany (Jakobeit and Methmann 2007). According to the Stern Review on the Economics of Climate Change (2006), they are only based on "conservative assumptions". The report goes on to argue that "climate change will lead to hundreds of millions more people without sufficient water or food to survive and/or threatened by dangerous floods and increased disease" (Stern 2006). Accordingly, a report for the British organisation Christian Aid (2007) states in the introduction that one billion climate

[5] http://www.mfat.govt.nz/Foreign-Relations/Pacific/NZ-Tuvalu-immigration.php

change refugees should be expected by 2050. However, later on in the report the authors admit that as not enough research has been carried out so far, there are no recent, authoritative, global figures on the number of people who could be displaced from their homes by climate change. Nonetheless, the report calls for immediate action to protect those who might become displaced by climate change, and stresses the need for attention to those displaced within their own countries using case studies from Colombia, Burma and Mali (Christian Aid 2007).

Contradictory statements can also be found in a report by Warner et al. (2009). In the first paragraphs of the Executive Summary, the authors claim that forced migration will be and already is a negative but unavoidable consequence of climate change, especially in developing countries, which in turn entails negative consequences for development and human security. Yet, the case studies show a more nuanced picture of the climate change-migration nexus. These case studies were part of the EACH-FOR project, and include examples from Asia, Central America, Western Africa, the deltas of the Ganges, the Mekong, and the Nile, as well as the low lying islands of Tuvalu and the Maldives. For instance, a case study of Mexico shows that some people affected by climate change might be too poor to migrate, whilst a case study in the Sahel shows that migration is a well-established livelihood strategy to diversify income. Thus the link between climate change related environmental stressors and migration turns out to be complex and case specific and far from evident as the first part of the report suggests.

A 2008 report by the Environmental Justice Foundation starts with the statement that “climate change is set to create millions of environmental refugees” (EJF 2008:2), again referring to Myers and Kent’s estimates of 200 million. Yet, unlike most other reports, the authors distinguish between 150 million ‘climate change refugees’ and 50 million people to be displaced by non-climate related environmental problems. The authors admit that the majority of these people are likely to become internally displaced but nevertheless, they use the term ‘climate change refugees’ without any further explanation. In general, the report holds an

alarmist view, presenting selective evidence. It refers to the most recent Fourth Assessment Report of the IPCC (2007) for information about the physical science related to climate change. However, it quotes the First IPCC Assessment Report (1990) about the nexus between climate change and migration: “The gravest effects of climate change may be those on human migration” (EJF 2008:4), ignoring the more cautious reference to a “potential for population migration” due to climate change, mentioned in the 2007 IPCC Assessment Report.

2.3 Policy areas focused on climate change-migration linkages

The previous section showed that policy reports about the nexus between climate change and migration have continued to produce alarming numbers of ‘climate change refugees’, despite methodological, conceptual and legal flaws, which mirror those identified and expressed more than a decade ago. Brown’s (2008) call for “better predictions” of the number of people whose migration decisions will, to a larger or smaller extent, be influenced by future climate change might be justified in this context. Yet, attempts to construct these numbers, summarized in the previous sections, suggest that reliable predictions at a global level are difficult if not impossible to obtain because climate change-migration linkages seem to be very complex and context-specific. Therefore, better understanding the elements that are involved in the climate change-migration nexus seems to be important to move the policy debate away from the image of a linear relationship between environmental stressors and population displacement. Even if alarming numbers are still being produced, there are signs of such an advance in understanding of the nuances of climate change-migration linkages in recent policy reports concerned with the nexus between climate change, migration, and development; climate change, migration, and conflict as well as with migration in the context of international climate protection mechanisms, which will be analysed in the next sections. A shift towards a more profound understanding of climate change-migration linkages could be especially useful in the context of development policies, which should aim at supporting those displaced, but also those who might be forced to stay because of the consequences of climate change.

2.3.1 Climate change, migration, and development

Christian Aid claims in two reports (2006, 2007) that research into the link between changing climate and migration should be conducted within the realm of development studies. According to these reports, climate change might foil the efforts of development assistance, as water and other resources will become even scarcer. Another policy paper by Action Aid International (2007) focuses on flooding in African cities, which are presented as major destinations for internal migrants because of the degradation of rural livelihoods by droughts and floods. One of the major arguments of the report is that climate change poses a double threat to sending and receiving areas for migrants within Africa. On the one hand, flooding in African cities might worsen as a consequence of climate change; whilst on the other hand, because climate change is projected to increase the risk of droughts and floods in rural areas, more people are likely to migrate to the same cities. The report calls for a pro-poor integrative policy approach while criticizing the current lack of policy preparedness (Action Aid International 2007). Yet, it remains unclear what such pro-poor policies with respect to climate change and migration should look like.

The underlying idea of the concept of ‘climate change refugees’, which is repeated in policy papers, such as the ones discussed above, suggests that the consequences of climate change impoverish people so that these have no choice but to leave. Migrants are thus conceptualized as victims of climate change rather than actors who make use of migration to diversify their income in times of environmental hardship. According to Heine and Petersen (2008), migration is generally perceived as “adaptation failure” among policy-makers. The authors start their article by saying that “adaptation focuses on reducing [poor people’s] vulnerability and thereby preventing both displacement and conflicts over scarce resources” (Heine and Petersen 2008:48). Implicitly, they thus make the important distinction between ‘displacement’, which should be avoided, and ‘temporary migration’, which can be an adaptation strategy. Stal and Warner (2009) explicitly say that in some cases, voluntary migration can be an adaptive strategy in

responsive to environmental stressors, while in other cases forced displacement as a consequence of environmental issues is a sign of a failure to adapt. This view is also expressed in a report on disaster risk reduction, climate change adaption, and environmental migration by the IOM (2010). Heine and Petersen (2008) argue that, therefore, development cooperation should aim at integrating migration into adaptation policies rather than trying to limit it.

Laczko and Aghazarm (2009) regret that there are too few studies concerned with showing “how migration can be a coping or adaptation strategy or how migration can relieve pressure on environmentally degraded areas” (Laczko and Aghazarm 2009:10). They cite the 2010 World Development Report on climate change and development issued by the World Bank, in which the authors fear that this negative image of climate change-related migration might entail policies that try to restrict migration in cases where migration might be the only option for those affected by climate stressors. Even in situations in which migration is not the only option but a livelihood strategy among others, policies aiming at restricting climate-induced migration are likely to harm people affected by climate change instead of supporting them and the livelihood strategies they are making use of.

Yet, such studies are beginning to emerge. In one of the first articles to conceptualise migration as an adaptation strategy to climate stressors, McLeman and Smit (2006) develop a conceptual model that shows under what circumstances communities affected by climate stressors might use migration as a livelihood strategy to reduce vulnerability. Similarly, Tacoli (2009) considers a change in perceptions of the role of migration in the context of climate change as very important for understanding policy needs. She argues that successful policies need to support adaptation to climate change and that migration as an income diversification strategy is likely to reduce vulnerability to climate and non-climate related risks. Often migration is still considered a failure of existing livelihood systems and, therefore, policy makers tend to prioritize solutions that restrict migration and decrease the number of migrants. In contrast, Tacoli (2009) argues

that there should be a shift away from seeing migration as problematic to conceiving it as part of the solution to climate related problems. In some cases, the potential of migration as an adaptation strategy has already been acknowledged. The 2010 IOM Human Migration Report mentions that migration might be “one of several adaptation strategies in the face of natural disasters” (IOM 2010:3), the frequency and intensity of which is likely to be exacerbated by climate change. Furthermore, the potential of migration as a proactive strategy to adapt to changing environmental conditions, rather than as a reaction to disasters that already occurred, should be taken into account (Bardsley and Hugo 2010).

Yet, so far, policy makers in many cases do not conceptualize migration as an adaption strategy to climate change. The UNFCCC database on local coping strategies[6] does not include any form of migration, not even under the category which lists different livelihood diversification strategies. Meanwhile, whilst in the National Adaptation Programmes for Action (NAPAs) of some countries, the potential of migration for being part of the solution to climate related stressors has been acknowledged, few if any NAPAs have to date developed concrete policy formulations based on these observations (Sward and Codjoe 2011, forthcoming).

NAPAs[7] are strategic processes designed to identify policy priorities to respond to the consequences of climate change in Least Developed Countries (LDCs). By February 2011, the UNFCCC Secretariat had received NAPAs from 45 countries. Martin (2009) analysed the 38 NAPAs that existed at the time when her paper was written. She found that many countries are aware that climate change is likely to affect migration patterns. Again, in many cases, migration is an anticipated negative consequence of loss of habitats and livelihoods, caused by the effects of climate change. In turn, adaptive measures need to “reduce migration pressures and allow people to remain in their original settlements” (Martin 2009:364).

[6] http://maindb.unfccc.int/public/adaptation
[7] http://unfccc.int/national_reports/napa/items/2719.php

A systematic analysis of the 45 existing NAPA's in February 2011 by the author shows that migration is mentioned in four contexts: 1) Migration/displacement as a negative consequence of climate change (29 countries); 2) Migration as a traditional and/or positive adaptation strategy for people (13 countries); 3) Migration/resettlement as a new or planned adaptation strategy for governments (13 countries); and 4) Migration causing environmental and other problems (7 countries). Several countries mention migration in different contexts, and nine countries even see migration as a negative consequence of climate change and as a positive adaptation strategy at the same time. These countries are Bangladesh, Burkina Faso, Burundi, Comores, Ethiopia, Guinea-Bissau, Lesotho, Madagascar, and Sao Tome and Principe. The NAPA for Yemen mentions that migration from areas affected by climate stressors has slowed down because of new job opportunities generated as a result of an adaptation project. Mali is the only country that mentions that climate change might be a more serious threat to those who cannot migrate than to those who have got access to migration as a livelihood strategy. Contrary to western policy-making discourses, which are implicitly mainly concerned with effects of climate change on international migration, most NAPAs mention only internal migration or displacement, or do not specify the form of migration at all. Only Mali also considers migration to neighbouring ECOWAS countries and to Western countries as an increasingly used adaptation strategy in response to droughts. Similarly, middle-income countries such as China, India, and Mexico, in their National Action Plans on Climate Change hardly consider migration (Martin 2009).

In contrast to the NAPAs, Poverty Reduction Strategy Papers (PRSPs) only marginally mention the nexus between environmental or climate stressors and migration. Out of 59 countries that had produced a PRSP until August 2009, only those of the Maldives (2008) and Tajikistan (2002) considered the need for resettlement policies from areas affected by environmental stressors (Black and Sward 2009).

2.3.2 Climate change, migration, and conflict

Another aspect that has received some attention in policy papers is the nexus between climate change, migration, and conflict. Christian Aid (2007) suggests that climate change might lead to violent conflicts over the ownership of resources, which in turn could cause the further displacement of a large number of people (Christian Aid 2007). Meanwhile, the United Nations Environment Programme identifies environmental factors as “one of three major causes of displacement in Sudan” (UNEP 2007:104). The neo-Malthusian argument that environmental problems and scarcity of resources cause conflict, particularly in less developed countries, is stressed by Reuveny (2007), and like the environmental refugee debate cited earlier, also has links back to literature that was published in the 1990s (Homer-Dixon 1991, 1994).

While Reuveny acknowledges that increasing conflict over resources might cause migration, his main argument is that migration entails conflict at the destination areas caused by competition about resources, ethnic tensions, and general distrust between migrants and residents. Yet, he mitigates his argument by saying that migration must not necessarily lead to conflict but can also be beneficial for receiving areas by providing additional workforce. Also, governments can play an important role in assisting migrants to integrate into society. Nevertheless, he presents historical evidence for his argument that migration leads to conflict in migrant receiving areas. This evidence includes violence towards migrants from the Great Plains in California in the 1930s, tensions between Bangladeshi internal migrants and residents leading to an insurgency in the 1980s, as well as violence between migrants from Bangladesh and residents in India, also in the 1980s. Furthermore, he argues that environmental migrants from El Salvador in Honduras caused a war between the two countries. Reuveny goes on to argue that these conflicts occur in migrant receiving areas if migration decisions are linked to environmental problems or not. Yet, he fears that climate change is likely to increase the scope and the speed of migration flows, forcing many people to migrate quickly. This in turn would affect receiving areas as they would be unable

to cope with the increased number of migrants in a short time, especially in less developed countries where people rely on the environment for their livelihoods (Reuveny 2007).

However, Raleigh and Urdal (2007) argue that the assumption that environmental stressors generally lead to conflict is not supported by empirical evidence, which also questions the above link between the environment, conflict, and migration. As opposed to Reuveny's (2007) analysis, which uses historical examples based on aggregate date at the state level, Raleigh and Urdal base their conclusions on data at the local level, considering geographic rather than political units of analysis. They acknowledge that their statistical analysis found some influence of demographic and environmental factors on conflict risk, but they argue that these effects are outweighed by economic and political factors. They summarise that "While population growth and density are associated with increased risks [of violent conflict], the effects of land degradation and water scarcity are weak, negligible or insignificant" (Raleigh and Urdal 2007:674).

A recent report published by the International Peace Academy also argues that the relationship between climate change and conflict on its own is weak, but that mass migration can be seen as the linking element (Gleditsch et al. 2007). The authors present two different scenarios: 1) environmental stress in the sending area leads to migration and then conflict in the receiving area, and 2) environmental stress leads to conflict in the sending area, migration, and again conflict in the receiving area (Gleditsch et al. 2007). In a report for the Norwegian Refugee Council, Kolmannskog (2008) stresses the role of environmental conflict in forced migration. He estimates that environmental conflicts over scarce resources caused by sudden events such as floods and hurricanes but also by the degradation of water resources can be a reason for forced migration. Yet, the potential for environmental conflicts should be seen in the context of historical, social, and political factors. On the other hand, migration followed by a competition of local residents and migrants over scarce resources, may in itself trigger violent conflicts at transit or destination

areas. Yet, as McLeman (2011) stresses, conflict can arise over a lack of resources (scarcity–conflict scenario) but also over an abundance of resources (abundance–competition scenario). In the latter scenario, violent conflicts emerge because geographically concentrated resources, such as diamonds or oil, enable those who have access to them to control others who do not have access. Fairhead (2004) argues that in Africa at least, the latter have historically been far more significant than the former.

In another paper by Kolmannskog (2009) for the UNHCR, the author uses case studies in Somalia and Burundi, two countries which are or were recently involved in armed conflict and civil war, to illustrate the different ways in which climate change, conflict, and migration can be linked. In Somalia, drought, population growth and concentration in some areas of the country in combination with civil war caused disruptions to the traditional migratory patterns of pastoralists, who are the majority of the population. As a consequence, people were forced to stay in areas, where they could not maintain their herds. Many of them lost their animals and subsequently migrated to the big cities to join the urban poor. Yet in Burundi, where the majority of the population are farmers, major problems arise out of droughts in combination with land scarcity and subsequent violent conflicts over land. While migration historically is an adaptation strategy in Burundi, many people have become too poor to migrate and do not have a place to go to. Thus, the relationship between climate stressors, conflict, and migration is complex and policy responses are therefore likely to be difficult to conceptualise. Yet, as McLeman (2011) stresses, policy responses have the potential to play an important role in preventing climatic stressors from translating into motives for violent conflict.

2.3.3 Migration and international climate protection mechanisms

As the previous sections showed, the link between climate change, migration, and development and the link between climate change, migration, and conflict are important areas of policy interest. As the summarized policy papers show, this interest has emerged in organisations interested in diverse issues including

environment, development, human security, human rights, and migration. Most recently the international climate change community has become interested in including migration into their agenda. In 2009, the Inter-Agency Standing Committee (IASC) published two reports. The first one was a compilation of points to be integrated into the successor-agreement to the Kyoto Protocol and was considered at the COP15 meeting in Copenhagen in December 2009. The report suggested that more research into the nature of climate change related moves was needed as well as more research into the humanitarian consequences of climate change in general. Furthermore, it stressed that migration can be an undesirable consequence of climate change but also an adaptation strategy and that this should be recognised in international policies. In this context, the report argued that there is also a need for national adaptation plans to go beyond what is said in existing NAPAs. The second report stressed that the nexus between climate change and migration is non-linear but that nonetheless a relationship exists. Therefore, policies should 1) consider alternative protection schemes for displaced people who do not fall under the 1951 Refugee Convention; 2) continue the policy dialogue about the nexus between climate change and migration; 3) ensure cohesion between existing policies in the field of mitigation, adaptation, humanitarian responses, and development; and 4) include forced displacement into existing risk management and adaptation schemes, also in all NAPAs.

McLeman (2011) argues that reducing the potential for population displacement as a consequence of climate change is to a large extent linked to general efforts of agreeing on international agreements to decrease GHG emissions. Yet, he says that these efforts are currently stalled as a consequence of the non-conclusive and sometimes contradictory statements issued after the Climate Change Summit in Cancun. Furthermore, he observes a decreasing interest in climate change policies among governments and the general public due to the errors that were found in the 2007 IPCC Assessment Report and because of the shift in policy priorities after the 2008 financial crisis (McLeman 2011). However, considerations of migration as an aspect that might be linked to climate change have recently been increasing. While

the Kyoto Protocol (UNFCCC 1998) only contained a paragraph about the need for climate change adaptation and did not mention migration, the follow up document of COP16, which took place in Cancun, Mexico in December 2010, acknowledges migration as an adaptation strategy in its 'Cancun Adaptation Framework'. The report of the Ad Hoc Working Group on long-term Cooperative Action under the Convention (UNFCCC 2010), which includes this framework, gives advice on how member states could enhance climate change adaptation. One of the suggestions proposes "measures to enhance understanding, coordination, and cooperation with regard to climate change induced displacement, migration, and planned relocation, where appropriate, at national, regional, and international levels" (UNFCCC 2010:3). The involvement of migration into international climate change negotiations was a contribution by several organizations concerned with migration issues, such as the IOM, the UNHCR, the UNU, and OCHA (Stal and Warner 2009). These organizations are operating under the name of the Climate Change, Environment and Migration Alliance (CCEMA)[8], which organized side events during COP15 in Copenhagen, Denmark and during COP16 in Cancun, Mexico.

2.4 Empirical studies into the environment/climate change-migration nexus

The previous sections demonstrated that conceptual and policy interest in the environment and migration is long-standing and has surged in recent years. This section suggests that the growing theoretical and policy interest in the nexus between environmental or climate-related stressors has not been followed at the same pace by empirical research into this relationship. Nevertheless, the amount of empirical studies into environment-migration linkages has also been growing to some extent over recent years. Although such studies are not conclusive, results so far reinforce the point that the link between climate change and migration is very complex, and different forms of migration will likely be influenced in different ways by climatic stressors.

[8] See: http://www.ccema-portal.org

One conclusion from these empirical studies is that there seems to be a difference between the effects of slow onset and sudden impact environmental stressors on migratory behaviour. For example, Halliday (2006) found in a panel study for El Salvador that migration into the USA increased after agricultural shocks such as the loss of harvest and livestock, whereas US migration decreased after a major earthquake in 2001. Obviously, earthquakes are not a consequence of climate change, and the loss of harvest or livestock is not necessarily linked to a lack of rainfall. However, what is interesting here is the distinction between a relatively slow onset event, such as the loss of a harvest over the agricultural cycle, and a sudden disaster that destroys many people's livelihoods within a few minutes, and their opposed effects on international migration flows. Thus, it is conceivable that climate change, which is likely to cause slow onset as well as sudden impact environmental stressors, will affect migratory behaviour in different ways.

Currently, three major environmental stressors, the effects of which are likely to be exacerbated by climate change, can be observed: droughts, hurricanes, and floods. Two more, sea level rise and the melting of glaciers, have also been cited as likely to affect migration. They are not considered here as their effect is not currently measurable. While low lying island states such as Tuvalu are the most prominent example for populations at risk for climate change related displacement (Gemenne 2010a), Mortreux and Barnett (2009) challenge this assumption by analysing people's perceptions of climate stressors. They conclude that climate change is not perceived as a threat to people's livelihoods and less as a driver of migration in Tuvalu. The effects of melting glaciers on migration are equally contested. Some cases of forced migration due to melting ice in Alaska have been analysed by Bronen (2008). On the other hand McLeman (2011) states that melting ice has not yet been a reason for migration out of the arctic, on the contrary melting ice might attract migrants from the south to the north as passing by ship through ice-free water becomes easier, and natural resources might become accessible as a consequence of the melting ice. Thus, the following sections are limited to analysing the effects of droughts, hurricanes, and floods on migration, respectively.

2.4.1 Drought and migration

Beyond the historical and archaeological literature, which is not covered here, one of the best-known historical examples, in which environmental stress was followed by large migration movements is the Dust Bowl in the USA in the 1930s. After a series of droughts and dust storms as a consequence of soil erosion, many farmers in the Great Plains, mainly in the state of Oklahoma, lost their harvests and livelihoods. Large numbers went in search of work to California and other regions in the USA. However, although environmental stress was certainly one of the most important reasons for these moves, migration from this region had already started before the droughts occurred as a consequence of the overall economic and financial problems in the USA at the end of the 1920s. Furthermore, those who migrated were likely to have pre-existing social connections in California, and possessed the required agricultural skills to find work at the destination. Also, they often did not possess any farmland or lost it for financial reasons, so that the bonds to their land were not that strong anymore (McLeman 2006).

The most prominent contemporary example of the link between drought and migration is the Sahel, where the majority of studies into the relationship between environmental stressors and migration are set. The historical importance of migration as one strategy to adapt to environmental problems in this region should be acknowledged. Rain (1999) and Brown (2007) illustrate the seasonal process of migrating to nearby agglomerations during times of environmental hardship, which among the people in the Sahel is known as “eating the dry season”. Also, the seasonal migration of pastoralists traditionally reflects differences in the timing of the rainy season as a consequence of climatic variability (Primavera 2005).

One of the first studies to formally examine the relationship between drought and migration in the Sahel is Findley’s (1994) research into migration from rural Mali during the 1983-1985 drought. She found that long-distance migration – notably of male household members – to France decreased. This can be explained by the fact that food scarcity leading to increased prices forced people to spend more

money on their basic needs. Therefore, they could not afford to invest in migration any more. At the same time, short-distance migration to larger agglomerations increased because women and children left in search of work to contribute to household incomes. In addition, this strategy reduced the number of persons in a household and thus the amount of food needed.

Under the comparable circumstances of the 1980s drought in the Sahel, Ezra and Kiros (2001) analysed rural out-migration in the drought prone areas of Ethiopia. Almost 80% of the people moved to other rural areas. The authors do not specify if these moves involved border crossings or not, but it is not likely that long distances were covered as the destination of a long distance move is usually a bigger agglomeration. Contrary to their expectations, Ezra and Kiros found that the percentage of people who indicated reasons for moving that might be related to drought[9] was very low. Most migration was caused by family formation after marriage. A multilevel analysis of their survey data, however, revealed that, next to age and gender, the availability of food at the community level was identified as a major factor that determined out-migration.

Haug (2002) welcomes the classification of pastoralists in northern Sudan, whose livelihoods became affected by the mid-1980s drought, as 'environmental refugees'. Nevertheless, she acknowledges that:

> "At the same time, mobility and different kinds of migration have always been part of the Hawaweer's livelihood strategy. In addition, not all the Hawaweer perceived the situation as forced. Some people chose to stay behind. Among these, some were in a situation where migration was impossible because they did not have access to the necessary number of animals needed for migration. For them, the reason for staying was not because they chose to but because they were forced to" (Haug 2002:76).

Haug thus stresses that the consequences drought has upon livelihood decisions, including migration, largely depend on the socioeconomic situation of the people

[9] These reasons are 'drought', 'shortage of land' and 'to look for work'.

concerned. Accordingly, Meze-Hausken (2004) points out that vulnerability to drought alone does not cause migration. In her study in northern Ethiopia, in which she surveyed more than 100 farmers, she found that “people in marginal regions have developed a great variety of adaptation mechanisms, which strengthen their ability to cope with both, slow climatic changes and extreme climatic events” (Meze-Hausken 2004:abstract).

Henry et al. (2004) investigated the effect of changing rainfall patterns on migration in Burkina Faso using event history analysis. They found no relationship between changing rainfall patterns and migration in general when they did not distinguish between different types of migration by destination and duration. Individual characteristics of people, such as level of education, type of activity involved in, and belonging to a particular ethnic group seemed to be the deciding factors for migration. Once split up between different types of migration, the study reveals that people living in areas with scarce rainfall are much more likely to engage in short distance moves than people living in other regions. However, the number of migrants does not increase after periods of minimum rainfall in the dryer regions. The fundamental conclusion that the authors draw from their findings is that: “long-term migrations seem to be less related to environmental conditions than short-term moves...” (Henry et al. 2004:455).

These results are partially confirmed by Gray and Mueller’s (forthcoming) research into the effects of environmental stressors on migration in Ethiopia using event history analysis based on longitudinal household data. They found that drought increases male mobility, especially among the landless poor moving in search of work. On the other hand, mobility of women decreases, which the authors link to the fact that during times of drought followed by financial hardship, no resources are available for marriage or the formation of new households. Gray and Mueller (forthcoming) conclude that, under certain circumstances drought increases mobility but that ability to migrate remains selective, also in the context of environmental pressure on people’s livelihoods.

Bassett and Turner (2007) challenge the common assumption that Fulbe herders in the Sudano-Sahelian zone are migrating with their herds to the south to escape increasing periods of drought in the north. Instead, they show that two new forms of migration have developed among the Fulbe as a consequence of droughts. Many Fulbe had to sell their livestock and went to the south as labour migrants. Moving south with their livestock would have been difficult because most of them do not possess any social networks that would protect their cattle from being stolen. For the same reason, others refrained from moving south with their cattle in one single move to stay there. Instead, they developed a strategy of gradually moving south by extending their grazing areas bit by bit. This enabled them to create networks of friendships and create the protection they needed to move with their cattle. As the examples in the Sahel have shown, drought can either increase or decrease migration, but it can also create new forms of migration that were uncommon among a group of people before.

The EACH-FOR project funded by the EU is one of the largest efforts to collect empirical evidence on climate change and migration in recent decades, involving 23 case studies. It included three case studies in Africa about drought and migration, which show to some extent contradictory results. Afifi (2009) summarises the result of his study in Niger: “it is obvious that environmental degradation does have a considerable impact on migration patterns in Niger“ (Afifi 2009:25). Bleibaum (2009) in her Senegal study also concludes that most of the migrants she interviewed were forced to migrate because of environmental conditions, poverty, and the lack of institutional support. Van der Geest (2009), on the other hand, comes to a more complex conclusion for his study in Ghana. He investigated the drivers of north-south migration within the country and found that in the interviews most of the migrants actually mentioned adverse environmental conditions as a cause of their migration decision. However, an analysis of macro level data showed that during the droughts in the Sahel during the 1970s and 1980s, fewer people moved south and more migrants returned from the south to the north of the country. Yet, the same study shows that “migration propensities are

higher in districts with more scarcity of natural resources, especially in those with low annual rainfall, and with higher rural population densities that results [sic!] in farmland scarcity" (Jäger et al. 2009:47).

Another EACH-FOR study for Spain shows how the economic situation of a region is more important for its migratory situation than its actual environmental conditions. The region around Almería became one of the major migrant sending areas in Spain in the 1960s, as a consequence of increasing droughts, and in combination with the poverty and economic underdevelopment of the region. However, due to capital investment, EU subsidies, the development of technologies to overcome the problems of water shortage, and the access to new markets for the produce, Almería transformed from a migrant sending to a migrant receiving region (Fermin 2009).

Two studies into the relationship between decreasing precipitation and international migration in Mexico produced contradictory results. Research by Munshi (2003) found a negative relationship between rainfall and migration in south west Mexico because more people move to the USA when a decrease in rainfall endangers their harvests. However, an analysis of migration and precipitation data in Zacatecas and Durango showed a positive relationship between rainfall and migration in the two states, suggesting that the number of US migrants decreases in times of dryer weather (Kniveton et al. 2008).

2.4.2 Tropical cyclones and migration

The effects of cyclones on migration also seem to depend on the socio-economic context before and after the disaster. Paul (2005) investigated the effects of a tornado on migratory behaviour in two village communities in north-central Bangladesh. He used an approach that combined secondary data on household statistics with the results of a survey he conducted himself and some interviews with local officials and NGOs. The major finding of his study is that the 2004 tornado in the region did not cause higher rates of out-migration in the affected

villages. His conclusion is thus, that there was no link between the tornado and migratory behaviour at all. Paul argues that almost no outmigration occurred because of the efficiency of disaster aid.

An earlier study by Smith and McCarty (1996) looked into the demographic consequences of Hurricane Andrew that hit parts of Florida in 1994. Smith and McCarty surveyed inhabitants of south and north Dade County and asked first about their own, but also about their neighbours' reactions to the hurricane. They found that people who lived in the wealthier southern part of the county migrated in much larger numbers than people who lived in the northern, poorer part. The question of whether this was caused by the fact that the south was more severely affected or by the distribution of wealth in the population is left unanswered in the study. In general, Smith and McCarty conclude that: "many of the moves caused by Hurricane Andrew were short-lived, others lasted for many months, and some were permanent" (Smith and McCarty 1996:274).

Some studies investigating the consequences of hurricane Katrina that hit parts of the US states of Alabama, Mississippi, and Louisiana, and destroyed the city of New Orleans in 2005 have been conducted. They are mostly concerned with changes in the demographic patterns after the hurricane and the nature of return migration (Elliott and Pais 2006, Falk et al. 2006, Landry et al. 2007), while few studies analyse outmigration patterns after the hurricane. Landry et al. (2007:2) only state that following the evacuation order "in New Orleans, 70,000 people remained, some by choice, but most without means of escape". It seems that it was mainly the poorer black residents of the city who were unable to leave (Landry et al. 2007). Gemenne (2010b) criticises this simplistic victimisation of the poor and the black residents of New Orleans, which was mainly transferred by the media. He suggests that the impact of hurricane Katrina should instead be analysed in the context of the social vulnerability of the population of New Orleans, which already existed before the disaster. He stresses the social inequality between the different areas but also between the social segments of the city and points out that some

segments were more affected by the hurricane than others. The most affected parts of the population were also those in which many people could not evacuate, and those who did leave, were disadvantaged when they wanted to return and rebuild their part of the city. The characteristics of these disadvantaged population segments are: “poor, black, female, old, renters, and in poor medical condition” (Gemenne 2010b:29). Yet, Gemenne (2010b) also points out that whether people owned a car and had friends or relatives to stay with outside of the city determined if people were able to evacuate. This private evacuation usually worked quite well, while those who depended on transportation and shelter provided by the government were often left behind.

The EACH-FOR project also included some research into the effects of hurricanes on migration. Alscher's (2009a) study on the island of Hispaniola showed the importance of economic and political differences for the vulnerability of people. He says that for example hurricane Jeanne in 2004 caused 3,000 deaths in Haiti but only 19 in the Dominican Republic. In the Mexican state of Chiapas, one of the poorest states of the country, Alscher (2009b) identified hurricanes as a trigger for outmigration because they are aggravating the existing agricultural problems.

2.4.3 Floods and Migration

Although, in policy papers and in the media, the effects of floods on outmigration from low lying deltas are often quoted as the most obvious climate stressor that might displace people, empirical evidence on this relationship is scarce. The EACH-FOR project included studies on floods and migration in Bangladesh, Vietnam, Tajikistan, Mozambique, Argentina, and Ecuador, which are considered in this section.

In a study in Bangladesh, Poncelet (2009) stresses that many people depend on the river for their livelihoods and that, consequently, they have learned how to live with floods. This echoes what was said in studies about droughts in the Sahel. Nevertheless, Poncelet (2009) argues that climate change is exacerbating the

frequency and intensity of floods. One of her most important findings is that migration patterns related to floods are complex and that people who suffer from the same livelihood stressors make use of migration as a coping strategy in different ways, which are not specified in the report. Second, while migration by most people is considered the most important livelihood strategy after a flood, some people cannot migrate because they lack the necessary resources, others who migrate struggle to find employment at their destinations, so that migration projects are not always considered successful (Poncelet 2009).

In Vietnam, Dun (2009) analysed the effects of floods on migration. She explains that regular flooding of the Mekong delta provides its inhabitants with fertile land, so that 40% of Vietnam's cultivated land is concentrated in this area, known as the rice bowl. Yet, variations in flood levels and the annual distribution of floods have become problematic for people living in the delta region. Dun (2009) found several forms of migration as a response to this increased variability in flooding patterns. Some people migrate during the flooding season and return when it is over. However, successive events of strong and destructive flooding can force rice farmers who depend on their land for their livelihoods to permanently abandon their farmland. In addition, the resettlement of people from vulnerable zones has become part of the government's flood management strategy (Dun 2009).

In a third case study, Stal (2009) undertook research into the effects of floods, tropical cyclones, and droughts on migration in Mozambique. He found that two tropical cyclones in 2000 and 2007 did not displace many people because the majority of the affected population managed to rebuild their houses after the storm. Yet, floods in the Zambezi River Valley displaced a large number of people because they destroyed not only peoples' houses but also their farmland and therefore deprived them from their major means of livelihood. As a consequence, local movement away from the river valley is becoming more and more permanent, while migration to cities or international migration cannot be observed on a large scale yet (Stal 2009).

In their studies in Argentina (Álvarez Gila et al. 2009a) and Ecuador, (Álvarez Gila et al. 2009b) showed different results regarding the effects of floods on migration in each country. In Argentina they identified economic reasons as the most important drivers of migration and did not find a relationship between environmental stressors and migratory behaviour for both international and internal moves. Only short distance moves were to a certain extent affected by the environment (Álvarez Gila et al. 2009a). However, in Ecuador, they found that migration is an important coping strategy after environmental stressors such as floods occurred. Most importantly, however, they show that the El Niño event of 1997-1998 which brought about larger and more harmful floods in the coastal regions, in addition to an economic and financial crisis in the region, entailed new migration flows from Ecuador to Europe, mainly to Spain (Álvarez Gila et al. 2009b).

While floods are often associated with low lying deltas or river valleys, floods in mountain regions can also be an important environmental stressor as Khakimov and Mahmadbekov (2009) found in Tajikistan. Yet, they conclude that environmental stressors in that region are not a driver of migration at the moment (Khakimov and Mahmadbekov 2009). Finally, outside the context of the EACH-FOR project, Hoermann et al. (2010), in a study on labour migration and remittances in the Hindu Kush-Himalaya region, found that droughts and floods equally impact on agricultural food security, which is a major element in migration decisions.

2.5 Chapter conclusion

This chapter has provided an overview of policy debates and empirical results regarding the nexus between environmental and climate related stressors and migration. It shows that the scientific and policy interest in the subject has grown and shifted from an interest in linkages between environmental degradation and migration to an interest in linkages between climate change and migration. Many policy papers are still concerned with finding a protective mechanism for people displaced by climate stressors and with predictions of numbers. The role of

migration in the context of climate change and conflict in general is perceived negatively. Nonetheless, there is growing acknowledgement of the rising role of migration as an adaptation strategy rather than a failure to adapt. As evidence by the Cancun Adaptation Framework[10] has suggested, there is a need to include migration in considerations about development policies under future climate change. There also remains some controversy about the importance of linkages between the environment, migration and conflict. Meanwhile, all studies agree that historical, social, and political factors are important elements, which determine if and to what extent migration related to environmental stressors leads to conflicts or not.

Yet, despite this growing policy interest, there remain no reliable estimates of the number of people who are likely to become displaced because of climate change. This causes dissent about the circumstances under which climate change is expected to impact on migration. It remains unclear to what extent factors such as poverty, scarcity of natural resources, and violent conflicts influence the nexus between environmental stressors and migration. Much more empirical evidence is therefore needed. Idean Salehyan summarises the issue: “The link between climate change and migration has [...] suffered from a lack of systematic evidence in support of sweeping claims” (Salehyan 2005:2).

As the last part of the chapter showed, empirical evidence so far is also scarce. The results are highly context-specific and show that the link between climate change and migration is complex and not linear and that neither climate shocks and stresses nor migration are uniform phenomena. Meanwhile, although the foci and the research designs of existing empirical studies vary, two general results can be identified so far. First, climate stressors seem to cause an increase in the number of people who engage in short-term rural to rural types of migration. On the other hand, they seem not to affect, or even decrease international, long-distance moves. Second, the conceptualisation of vulnerable people as helpless victims

[10] http://unfccc.int/adaptation/cancun_adaptation_framework/items/5852.php

who have to flee the consequences of climate stressors seems to be false. Depending on their socioeconomic position, people might have the choice between a variety of coping strategies, including migration. Yet, other people might be too poor to migrate at all, meaning that migration is as unlikely to be a way of escaping their situation as any other strategy. Thus some people might be forced to migrate while others might be forced to stay as a consequence of climate change.

The most important limitation of most of the empirical studies so far is that, as they only analyse the effect of one type of environmental stressor on migration, they do not provide the basis for any comparison between different types of environmental shocks or stresses. Furthermore, most existing research is concerned with the effects of current environmental problems on migration, which can only to some extent be used as a proxy for the effects of future climate change on migration. Yet, policy interest in climate change-migration linkages as opposed to environment-migration linkages is growing. Therefore, alternative methodological approaches are needed to design empirical research that responds to current policy needs. The next chapter will introduce some ideas about how these approaches might be designed and it will discuss the most appropriate conceptual approach to answering the research questions of this thesis.

Chapter 3: A new conceptual approach to climate change and migration

The previous chapter illustrated the scientific and policy interest in climate change-migration linkages, which demands more empirical evidence to answer the question how climate change is likely to affect migration in the future. This chapter argues that the lack of a convincing conceptual and methodological approach for this kind of empirical research is a major impediment to obtaining empirical results suited to inform policies. Existing approaches fail to acknowledge the complexity of all factors involved in the climate change-migration nexus. This chapter starts with an analysis of the complexity of different manifestations of climate change and its effects on people's livelihoods. The second part of the chapter analyses the complexity of migration decisions, focusing on the multi-causality of migration, acknowledged in different migration theories and approaches explaining migratory behaviour. The third part of the chapter argues that migration might be one among many responses to external shocks and stresses, and that household's decision-making processes in the context of risk are influenced by a variety of factors. Finally, the chapter develops an alternative conceptual approach for studying climate change-migration linkages, based on the argument that climate change as well as people's migration decisions and responses to risk are complex and context-specific processes.

3.1 The complexity of climate change

As the previous chapter showed, a growing amount of recent publications to various extents acknowledge the complexity of the nexus between climate change and migration. Yet, research into the subject so far failed to consider the complexity of climate change and most empirical studies used some form of a local weather extreme as a proxy for climate change. However, research using a present or past local climate stressor as a proxy for future climate change ignores the difference between climatic variability and climate change, as well as the fact that the consequences of climate change are likely to occur at the global and at the local level. Furthermore, research into the social consequences of climate change, including its effects on migratory behaviour, needs to take the uncertainty of

climate change predictions and of predictions of people's future behaviour in response to changing climatic conditions into account.

3.1.1 Climate variability and climate change

The United Nations Framework Convention on Climate Change defines 'climate change' as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC 1992:3). A similar but more concrete definition of climate change in the Working Group II Report of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) also stresses that climate change refers to changes to the mean or to the variability patterns of the state of the climate, which persist over an extended period of time, mainly decades or longer. These changes need to be identifiable by statistical tests (Solomon et al. 2007) or as the World Meteorological Organisation (WMO) write about climate change[11]: "In statistical terminology, the curve of the frequency distribution representing the probability of specific meteorological events occurring is changed".

Furthermore, the IPCC report distinguishes between internal processes and external forcings causing changes to the climate. Atmospheric (internal) processes cause a natural variability of the climate system, including variations in temperature, precipitation, but also extreme events. In contrast, external phenomena include natural disturbances, such as changes to solar radiation and volcanism, but also anthropogenic impacts leading to long term changes of the climate system (Solomon et al. 2007).

The distinction between natural climate variability and climate change is important for researching its impact on migration. Natural climate variability, caused by

[11] http://www.wmo.int/pages/prog/wcp/ccl/faqs.html

atmospheric processes and natural external phenomena, has affected migration patterns for generations. One of the well-known examples is the seasonal labour migration in the Sahel during or after droughts (Rain 1999). McLeman and Hunter (2010) argue that research into this kind of historical and present patterns of climate-migration linkages can be helpful for predicting the effects of future climate change on migration patterns. Yet, they also acknowledge the limitations to this approach:

> "While the specific details of the case examples [...] may not capture the full range of possible manifestations of anthropogenic climate change to come, we are nonetheless able to identify from them some general dimensions of environmental migration that are useful when considering how migration decisions and processes unfold in response to conditions and events that may become more common or widespread as a result of anthropogenic climate change in coming decades" (McLeman and Hunter 2010:454).

Historical and present examples can provide some insights into the future effects of climate change on migration, when trying to predict people's response to different types of climate related shocks and stresses, such as droughts, hurricanes or floods. Yet, predicted effects of climate change are complex and not limited to simple increases of the intensity and frequency of already existing climate stressors. Historic examples that parallel these complex consequences of expected future climate change do not exist. Therefore, climate change might or might not lead to completely new impacts on existing migration patterns, which cannot be predicted by only using analogues to past events.

3.1.2 Key elements of climate change relevant to human migration

The consequences of climate change are thus predicted to be complex and to go beyond worsening local weather conditions. Nevertheless, part of the impact of climate change on future migration patterns is likely to be caused by the direct consequences of climate change such as changing temperature patterns, sea level rise, changing precipitation patterns, and extreme weather events. The 2011 Final Project Report of the Foresight Project on International Dimensions of Climate Change summarises these predicted changes, which are presented in table 3.1.

Table 3.1: Key elements of climate change

Temperature	• Up to about 2040, mean global temperatures are projected to increase by approximately 1.3-1.7°C across the world (relative to the 1981-1999 global average) under the three scenarios[12]. • All regions are expected to experience an increase in extreme high temperature events. • By 2080, mean global temperatures are projected to be around 3.5°C higher than the 1981-1999 average for the medium emissions scenario, and around 1.5°C for the aggressive mitigation scenario.
Sea level rise	• Significant increases in sea level are expected in many coastal areas by the 2040s. • By 2100, average sea level may rise by 0.23-0.43m under the medium emissions scenario. • There will be regional variation in sea level rise.
Precipitation	• Less precipitation in parts of the Amazon region, southern Africa and Southeast Asia, and more in the high latitudes of Northern America, Europe and Central and North Asia is projected by the 2040s. • By the 2040s, in some regions, annual mean precipitation could be 500 mm more or less than today.
Extreme weather events (floods, droughts, storms)	• By 2100, under the medium emissions scenario, the Amazon region and equatorial West Africa may be almost constantly under moderate drought conditions, and frequent droughts may occur in the western Mediterranean. • Severe tropical cyclones may become more intense in the future with stronger winds and heavier rainfall.

Source: Foresight International Dimensions of Climate Change Final Project Report (2011)

The 2007 IPCC report projected continuing increases of the global mean surface air temperature (SAT) for the 21st century. For the first part of the 21st century,

[12] The Foresight International Dimensions of Climate Change Final Project Report (2011) refers to three different emission scenarios: high emissions, medium emissions and aggressive mitigation.

existing models roughly agree on the rate of warming, expecting an average warming of 0.64°C to 0.69°C for the time period from 2011 to 2030 compared to the time period from 1980 to 1999. By mid-century, the magnitude of the projected warming rate depends to a large extent on the scenario, varying between expected temperature increases of 1.3°C to 1.8°C, while by the late 21st century differences between the scenarios become even larger (Solomon et al. 2007). A more recent report by the Pew Center (2009) analyses evidence on expected temperature increases published after the 2007 IPCC report. It summarises that due to higher than expected emission levels at the beginning of the 21st century, expected global SAT temperatures for the end of the 21st century are likely to be much higher than the projected temperatures by the same model based on more conservative emission levels. One climate model showed more than twice as much warming using the corrected emission level resulting in an expected temperature increase of 5.2°C compared to 2.4°C until the end of the 21st century (Pew Center 2009). Geographical patterns of global warming show that temperature increases are projected to be highest over land and at high northern latitudes and lower over the southern oceans and over the North Atlantic. Furthermore, the report considers it as highly likely that heat waves will be more intense, more frequent, and longer lasting, while cold episodes are projected to decrease significantly, including decreases of frost days (Solomon et al. 2007). In an updated review of developments since the 2007 IPCC report, Good et al. (2010) specify that extreme daily maximum and minimum temperatures have increased by 1°C to 3°C since 1950, depending on the region. They also indicate that anthropogenic effects have doubled the risk of summers as warm as in the year 2003 and that “by the 2040s summers over southern England could be at least as warm as 2003 on average 50% of the time” (Good et al. 2010:13).

On a global scale, sea levels were projected to rise by 20 cm to 60 cm until the end of the 21st century, according to the 2007 IPCC report (Solomon et al. 2007). More recent studies, however, indicate that the potential for a much higher rise between 0.5 and 2 metres exists, which might to a large extent be caused by the melting of

the Greenland and Antarctic land ice sheets (Pew Center 2009). Yet, other studies conclude that there is a low probability of sea level rise significantly higher than one metre occurring, while this possibility cannot be completely ruled out (Good et al. 2010). Furthermore, there is a potential for abrupt large-scale sea level rise, potentially caused by the collapse of the West Antarctic Ice Sheet. Also, more recent studies found that the sea level is likely to rise higher at the Atlantic and Pacific coasts of the USA than in other parts of the world (Pew Center 2009).

The 2007 IPCC report projected increases in precipitation in high latitudes as well as in tropical regions, and decreases in precipitation in subtropical regions, which in many cases would mean that it might rain less in already dry areas, while it might rain more in currently wet areas (Solomon et al. 2007). Recent research suggests that precipitation reductions in dry areas of the world are likely to be irreversible. It indicates that, for example, a reduction in rainfall of 15-20% is projected for the south-western United States, which would make the region dryer than it was during the ‘Dust Bowl’ in the 1930s (Good et al. 2010).

These predicted changes to temperature and precipitation patterns also increase the risk of more frequent and more severe droughts caused by a decline in average rainfall in already dry regions. Additionally, according to the 2007 IPCC report, the annual distribution of rainfall is likely to change so that increasingly long periods of time without rainfall might be interrupted by heavy rainfalls during a short time of the year (Solomon et al. 2007). On the other hand, more and heavier rainfall, as predicted for other areas of the world, might lead to an increased risk of floods. Human-caused increases of sea surface temperatures are projected to cause more intense hurricanes (Good et al. 2010), while evidence about changes to the frequency of hurricanes is less clear (Solomon et al. 2007).

3.1.3 Global and local climate effects

The predicted key elements of climate change shown in the previous section, although projected to occur on a global scale, manifest at the local level where they

are perceived as shocks or stresses to people's livelihoods. They are likely to affect people in different ways, directly or by destroying key assets of crucial importance for their livelihoods. Fast onset disasters, such as floods and tropical cyclones, as well as slow onset changes, such as sea level rise, constitute a direct threat to people's lives and destroy their houses, their belongings and their farmland, on which many people rely for their subsistence. Drought, as opposed to floods, hurricanes and sea level rise, only impacts on a part of people's livelihoods, mainly by destroying crops and by killing cattle and other farm animals. As Section 2.4 showed, empirical studies exist into the effects of both the fast onset climate stressors, such as floods and tropical storms, and relatively slow onset climate stressors such as droughts. This existing research is concerned with the direct and indirect local effects of these climate stressors, often using crop failures as a proxy for the disaster itself.

Although these studies allow insights into the relationship between local environmental problems and migration, they can only to some extent be used to predict the impact of future climate change on migration. Climate change is likely to have severe impacts on people's local livelihoods but also on global structures and systems, changes to which might also negatively affect the livelihoods of many people. It is likely that climate change will affect global food production and therefore basic commodity and food prices (Foresight 2011a). Recent research constructs a more pessimistic scenario than the 2007 IPCC report regarding the decline of crop productivity and finds that the effect of CO_2 enrichment is likely to be smaller than projected in earlier studies (Good et al. 2010). It is also conceivable that energy and water prices, or even the availability of water and energy in certain areas of the world, might be negatively affected by climate change. These global and indirect effects of climate change are predicted to affect people's livelihoods and should therefore be considered when studying linkages between climate change and migration.

Most case studies into the relationship between climate change and migration in a geographical region look at that area in isolation and do not consider that the destination areas of migrants might also become affected by climate change. One sector, in which many migrants usually work, is commercial agriculture, which is highly susceptible to climate change, also in migrant receiving areas. The consequences of climate change might force landowners to stop farming or switch to alternative crops or production methods, which might affect the need for migrant labour. It is uncertain if workers, who might be made redundant as a consequence, will find employment in other sectors, or will be able to move to other destinations or not. A decline in the need for migrant workers is particularly conceivable in regions dominated by commercial agriculture, such as California, where many migrants from Mexico but also from Central America go. As a consequence, areas in the world, which are currently receiving many migrant workers, might cease to be attractive destinations for migrants in the future. Another potential effect might be that areas projected to become more attractive for farming due to changing temperature and precipitation patterns or a higher CO_2 concentration in the atmosphere might become new destinations for future migrants. Yet, the question if new migrant destinations might open up as a consequence of climate change highly depends on the accessibility of these regions for migrants, i.e. favourable migration policies, access to recruiters and emerging networks. Furthermore, climate change is likely to affect most current migrant sending regions to some extent, so that common destinations might become saturated in the case that climate stressors stimulate outmigration from many of these areas.

3.1.4 Uncertainty of climate predictions

In addition to the general level of uncertainty regarding predictions of the future, approaches aiming to predict the future relationship between climate change and migration should take uncertainties regarding climate change scenarios as well as uncertainties regarding the effects of climate change on migration into account. The uncertainty of predicted climate change scenarios has been widely acknowledged (Kniveton et al. 2009). It is linked to three different sources, the

internal natural climate variability, different climate change outcomes due to different scenarios about the level of future emissions, and different climate change models which do not present the same results for all areas of projected future climate change (Foresight 2011a). Furthermore, so-called tipping points, critical thresholds at which major elements of the earth system might collapse, bear the danger of abrupt changes, the consequences of which are unpredictable. Examples for these tipping points include the melting of the Greenland Ice Sheet, the Atlantic thermohaline circulation as well as the Amazon forest dieback (Foresight 2011).

In addition to the uncertainty of the physical consequences of climate change, there is a high level of uncertainty regarding the question of how people will react under scenarios of changing climatic conditions. For instance, although dry weather conditions might stimulate certain forms of migration in the Sahel, this does not mean that less rainfall will stimulate even more migration. Patterns might remain the same, destinations might change, or migration flows in general might increase or decrease (Tacoli 2010, Black et al. 2011).

3.2 Migration theories and multi-causality

The projected consequences of climate change can thus be expected to manifest at the global and at the local level and are likely to impact directly and indirectly on people's livelihoods. Furthermore, climate predictions have to be considered highly uncertain for various reasons. This complexity of climate change, therefore, needs to be taken into account when studying the relationship between climate change and migration. The idea that migration decisions are complex processes is supported by the number of different theories and approaches trying to explain migration. Mainly in the second half of the 20th century, various migration theories were developed, which seek the causes of migration at the macro, the micro or the meso level. The following paragraphs analyse the different explanations for migration put forward in these theories, based on an overview of migration theories by Massey et al. (1993).

3.2.1 Key theories of migration

One of the best-known migration theories is the macro theory of neoclassical economics. It argues that migration is caused by geographic differences in the supply and demand of labour. Workers from poor and low-wage countries are attracted by higher wages in capital-rich countries, which are in need of labour. As a consequence, the supply of labour in poor countries will decrease, which is expected to cause wages to rise in these countries. At the same time, the supply of labour in rich countries will increase and wages are expected to fall as a consequence. According to the neoclassical economics theory, labour migration will continue until an equilibrium in the supply and demand of labour will be reached. As opposed to this macro theory, which seeks the causes for migration at the state level, the micro theory of neoclassical economics argues that migration is a consequence of individual rational actors trying to maximise their income. According to this theory, prospective migrants calculate the net benefits of migration by taking into account its advantages, such as higher wages and more jobs, as well as its disadvantages, such as the material costs for the journey as well as the psychological costs related to the migrant's need to adapt to a new environment (Massey et al. 1993).

Unlike the neoclassical economics theories, which understand migration decisions as individual processes, the new economics of labour migration theory conceptualises migration decisions as collective decisions by families or households. According to this approach, the purpose of migration is not only the maximisation of individual profit, but more importantly, the spreading of the risk that a household will be unable to generate sufficient income. These considerations are particularly important in societies in which insurance systems and social security and welfare programmes by the government do not exist or are not accessible for all (Stark and Bloom 1985).

Two migration theories, the dual labour market theory and the world systems theory concentrate on explanations for migration linked to the demand for labour in

modern capitalist and industrialised societies. The dual labour market theory argues that migration is not caused by push factors in migrant sending regions but by pull factors, mainly the need for foreign workers in migrant receiving countries. The world systems theory argues that companies from capitalist societies, using peripheral non-capitalist societies as sources for labour, land, raw materials, and as new consumer markets, created disruptions in these societies, which were leading to migration (Massey et al. 1993).

Other theoretical approaches stress that migration is facilitated by migrants' access to networks in destination areas and to institutions, which facilitate the legal or illegal crossing of borders. Furthermore, it has been recognised that migration processes change societies in sending areas as they are often affecting the distribution of income and other forms of capital as well as the organisation, and social meaning of work. These changes in turn most often facilitate the migration decisions of future migrants. This process is referred to as the cumulative causation of migration (Massey et al. 1993).

Thus, a number of approaches try to explain migration from different perspectives, which are sometimes complimentary (Massey et al. 1993) but also often contradictory (Bakewell 2010). So far, no successful attempts to integrate these approaches into one universal theory were made. This lack of a universal theory explaining migration decisions has been considered a significant problem because researchers often need to combine different theoretical approaches to fit their research designs into a theoretical framework. Yet, doubts about the feasibility of constructing such a universal migration theory, given the complexity of migration and the various approaches trying to explain it, have also been expressed (Bakewell 2010).

Bakewell (2010) stresses that the most important divide between migration theories is the distinction between explanations at the macro or structural level and explanations at the micro level or related to human agency. Some approaches also

try to combine explanations at the two levels, based on Giddens' structuration theory, which stressed the importance of both the aggregate and the individual level for understanding social processes, including migration (Bakewell 2010). Meanwhile, Faist (1997) stressed the importance of the meso level and of including migration networks and institutions into migration theories.

3.2.2 The relative importance of the environment as a cause of migration

None of the existing migration theories explicitly acknowledges the potential role that the environment might play in migration decisions. This is potentially linked to the fact that contemporary migration theories in fact are theories explaining international migration (King and Skeldon 2010). Yet as chapter 2.4 showed, environmental stressors affect, if at all, internal migration to a much larger extent than international migration. However, the fact that environmental stressors are not mentioned as causes for migration does not mean that they do not have some effect on the economic factors at the micro or the macro level, which some migration theories acknowledge as causes for migration. Nevertheless, migration research so far did not show much concern for climate change or any kind of environmental problem as a cause for migration. While each migration theory seeks to explain migration processes differently and stresses different aspects of its causality, one of the major common aspects of these theories is the multi-causality of migration, which has been acknowledged for decades within the field of migration research (Kritz et al. 1992, Castles and Miller 1993, Boyle et al. 1998). Existing migration theories thus oppose the idea of a strong and linear relationship between environmental or climate change and migration because they do not explicitly include the environment as a cause for migration and they stress the multi-causality of migration decisions.

Existing migration theories thus do not acknowledge the environment as a cause of migration, while as chapter 2.4 showed, the volume of empirical research into the nexus between a specific environmental stressor and migration is growing. Most of these studies conclude that this relationship is determined by many other social,

economic and cultural factors and that it is highly context-specific. It is, therefore, difficult if not impossible to deduct a generalised global pattern of the impacts of climate stressors on migration, based on empirical case studies in different parts of the world.

Additionally, Tacoli (2011) considers the “high level of uncertainty regarding the locally-specific impacts of climate change and the lack of comprehensive data on migration” (Tacoli 2011:5) two important obstacles to research into climate change-migration linkages. She presents empirical evidence into the relationship between environmental change and migration from a comparative case study in different regions of Bolivia, Senegal and Tanzania. The research compared the effects of different slow-onset environmental stressors, such as drought, soil erosion and salinization, but also deforestation and land use change on migration under different social and cultural contexts. One of the findings of the research is that, in line with the results of the case studies summarised in chapter 2.4, migration should not be considered in isolation from other factors in the broader context of people's livelihoods. Tacoli (2011) thus concludes that migration should be understood as a livelihood strategy and a way of diversifying sources of household income under the increasing impact of climate change on natural resources. In line with this conceptualisation of climate change as a risk, and migration as one possible response, this chapter now turns to an analysis of household decision-making in the context of risk.

3.3 Explaining household decision-making in the context of risk

Migration is one potential response out of many others to environmental shocks and stresses. People affected by environmental stressors often make use of a combination of livelihood strategies in response, which might or might not include some form of migration. The question how households respond to risks is thus just as complex as the question how they take migration decisions. The Sustainable Livelihood Approach (SLA) and the New Economics of Labour Migration (NELM) might be useful tools for the understanding of causal linkages between climate

stressors and migration (Kniveton et al. 2008). The conceptual underpinning of this thesis is informed by many ideas developed in the context of SLA and NELM. The thesis is not completely based on these frameworks and, therefore, does not follow the requirements of SLA as a methodological approach. Nevertheless, given the importance of SLA and NELM for the conceptual framework to be developed in this chapter, the following sections turn to a brief review of the SLA and NELM.

3.3.1 The Sustainable Livelihoods Approach (SLA)

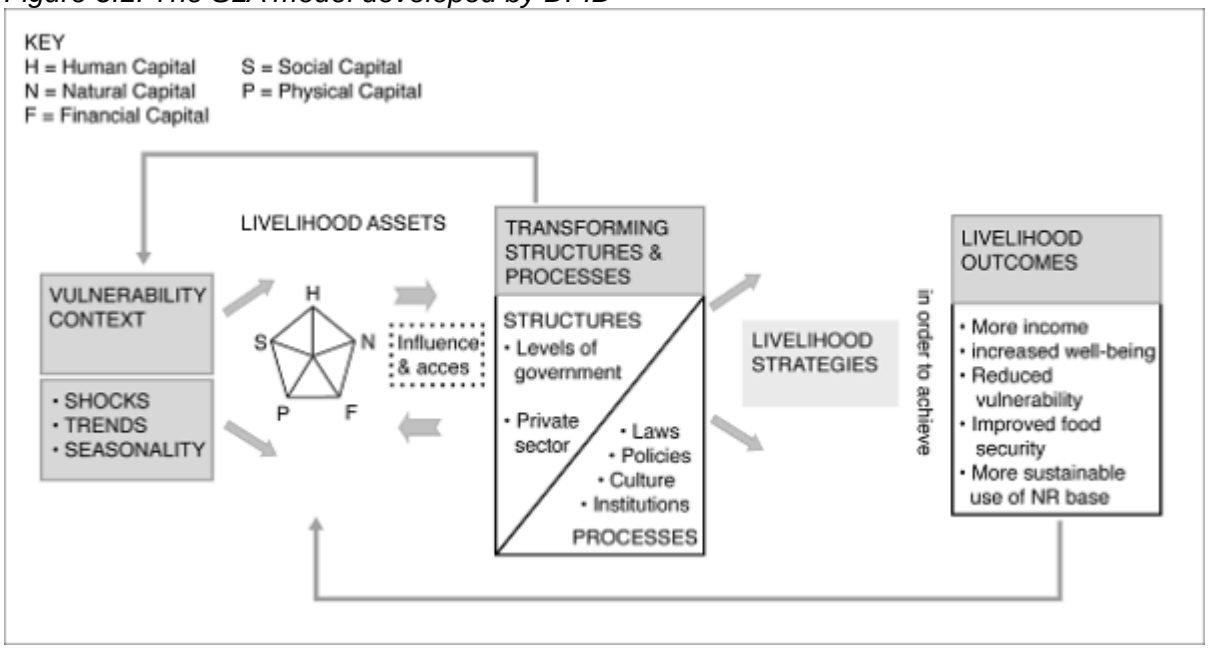
The SLA is a research framework that has been designed in the context of development studies. It builds upon the idea that people take decisions and act with the aim of maintaining a socially and environmentally sustainable livelihood (DFID 2000). According to Chambers and Conway (1992), “a livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend, and has net beneficial effects on other livelihoods” (Chambers and Conway 1992:iii). A socially sustainable environment can “cope with and recover from stresses and shocks, and provide for future generations” (Chambers and Conway 1992:iii).

Different forms of the Sustainable Livelihoods Approach have been developed and implemented by a variety of research institutes and donor agencies since the late 1990s (Brocklesby and Fisher 2003), so that different forms of the concept exist (Hussein 2002). The initial purpose of the SLA was to understand people’s livelihoods so that development assistance could be tailored according to their individual needs. The underlying idea is that families possess a variety of natural, physical, financial, human, and social assets, which are all used to maintain a family’s livelihood. If one of the assets suffers a loss, it can be compensated for by falling back on the other available assets in the so-called asset-pentagon. External influences in the form of policies and institutions are also taken into account (DFID 2000). The SLA is also concerned with the question of how vulnerable livelihoods are to shocks, trends, and seasonal developments and what kinds of coping strategies are used by people in the case of one of these events (Carney 1998).

This approach was for example applied in a study by Ziervogel and Calder (2003), in which they assessed the impact of climate variability on adaptive capacity in Lesotho.

In 2000, DFID published the DFID Sustainable Livelihoods Guidance Sheets, in which the Sustainable Livelihood Framework was presented and explained. The following paragraphs are based on information provided in these guidance sheets. The model of the SLA, as presented by DFID and shown in figure 3.1, is constructed around the asset pentagon, which includes human, natural, financial, social, and physical capital.

Figure 3.1: The SLA model developed by DFID



Source: DFID 2000

The approach suggests that people make use of different combinations of these assets to maintain their livelihoods under precarious conditions. According to the SLA, people act in the vulnerability context. They are confronted by different kinds of external shocks, which might be related to environmental disruption, violent conflicts, diseases, or economic crises. People's livelihoods are also affected by the seasonality of production, employment, and prices, as well as by demographic, economic, political, and technological trends on the local and the global level.

The combination of different forms of accessible capital in the asset pentagon is conceived of as a constantly changing entity depending on the vulnerability context described above and on transforming structures and processes. The structures and processes caused by changes to the existing governmental and institutional context can create assets, e.g. by means of investment in basic infrastructure. They can also regulate access, e.g. by means of ownership or access rights, and they can influence the rate of asset accumulation, most importantly of financial capital, by tax policies. In this context of vulnerability, and affected by changes to external structures and processes, people strive to make use of their assets in such a way that they achieve the best possible livelihood outcome. Access to a variety of assets is therefore crucial as it provides more options to combine and switch between different livelihood strategies, and therefore increases the likelihood of achieving better and more stable livelihood outcomes (DFID 2000).

One of the main strengths of the approach is its holistic view of the various strategies people adopt to maintain their livelihoods. Yet, one of the practical disadvantages of the approach is that investigating people's livelihoods is a very time-consuming endeavour. It requires an in-depth understanding of the people and their habits, and therefore requires a qualitative approach. Furthermore, the Sustainable Livelihood Approach has been criticised on a number of conceptual grounds. One of the major arguments is that it neglects inequalities of power at the community level and within families. The SLA is based on the assumption that households are conflict-free unities and that all household decisions are based on consensus between its members. However, inter-generational and gendered conflicts and inequalities of power are common within many households (Waddington 2003). It has been suggested that the analysis of the influence of institutions should be broadened to include community and family structures (Toner 2002). This change would shift the meaning of a household from a homogenous unit to a structured and complex entity.

Furthermore, the SLA assumes that people have access to all the knowledge they need to make informed and strategic decisions to optimise their livelihood outcomes, which is most likely not the case. The concept of the SLA is also based on the prerequisite that people always act rationally towards the achievement of their maximum economic benefit. Yet, decision making processes are likely to be also influenced by emotions, cultural norms and the belief in altruism. Next to the criticism of the conceptual simplification of household structures and dynamics and of decision making processes, the SLA has also been criticised for some methodological difficulties. One of the major challenges of the SLA framework is how to compare and measure different forms of assets. Different forms of assets seem to be linked to each other and the possession of one kind of assets might entail the access to others. For example, social capital is likely to facilitate or hinder access to other forms of assets (Toner 2002).

Despite this criticism, the Sustainable Livelihood Approach is a useful tool that can contribute to the development of a conceptual framework and research design for studies into the nexus between climate change and migration. It suggests that people respond to external shocks and stresses by making use of different assets. This idea is crucial for the development of the conceptual framework of this thesis because this perspective supports the idea of non-linearity in the climate-migration context. Under the situation of climatic stress, people can choose from a variety of responses, or make use of a combination of responses, and migration, in its different forms, might or might not be one of these strategies. Furthermore, the SLA acknowledges that people's livelihoods are affected by a variety of external shocks that can be related to climatic stressors but are also caused by factors that have nothing or very little to do with a changing climate. The recognition of different livelihood stressors affecting people's livelihoods again supports the conceptualisation of the non-linearity of climate-migration linkages. These two arguments supporting the perspective of the non-linearity of the nexus between climate change and migration are linked to the migration theory of the New Economics of Labour Migration, to which this chapter now turns.

3.3.2 The New Economics of Labour Migration (NELM)

The theory of the New Economics of Labour Migration (NELM) was introduced by Oded Stark and David Bloom in 1985. It was developed in response to neo-classical migration theories, which claim that individuals decide to migrate in order to maximise their income. NELM can be interpreted either as a criticism or as an improvement of neo-classical theories. The two approaches have in common that they conceive of migrants as rational agents who try to increase their financial situation (Arango 2000). The difference between them is that the New Economics of Labour Migration approach assumes that "[m]igration decisions are often made jointly by the migrant and by some group of nonmigrants" (Stark and Bloom 1985:175). It is usually assumed that these groups are families and that remittances are a way of improving the household income. Migration is thus not a strategy used to maximise individual income but a means to diversify sources of household income. The risk that household income will decline is spread, as financial resources are generated by different forms of activities such as local employment, agriculture, and migration (Arango 2000). Massey et al. (1993) compare the function of these risk-minimising strategies in developing countries to systems of insurance or social welfare in the developed world. If local markets fail for some reasons, some family members can compensate these losses by providing money they earned in systems that are not linked to the local market (Massey et al. 1993). Boyle et al. (1998) summarise the features of the New Economics of Labour Migration:

> "For this school, migration can be interpreted as being guided by a family-based risk-reduction strategy rather than as an individual income-maximising action" (Boyle et al.1998:74).

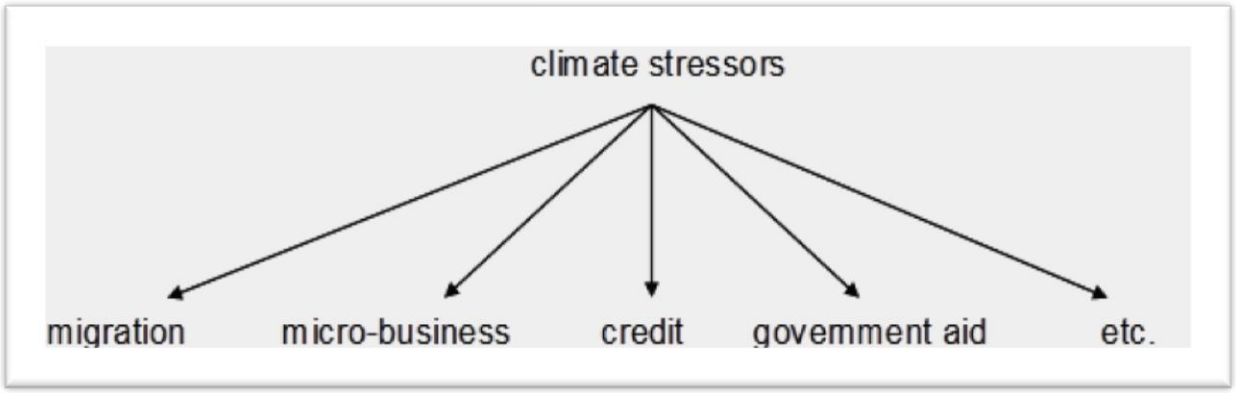
The New Economics of Labour Migration challenged the former understanding of economic migration theories that claimed that wage differentials between countries are the trigger for migration, and that people will continue to migrate until the gaps between wages in sending and receiving countries will be closed.

NELM has been criticised on the other hand for searching the reasons for migration only in the source areas. Most migration decisions, however, also include considerations of the situation in the destination area, as Piore already argued in 1979 in the context of the Dual Labour Market migration theory (Massey et al. 1993). Furthermore, migration decisions need to take obstacles such as border protection policies as well as lack of resources needed for the journey into account. Originally, NELM had been tailored to societies in which migration is an established livelihood strategy. Developed in a Mexican village in the 1980s, it takes the specific situation of this place and point of time into account. It might therefore not be applicable to societies in which migration is not that common, in which whole families migrate, or in which migrants decide to leave their families for individual reasons (Arango 2000). Like the Sustainable Livelihoods Approach, NELM is based on the assumption of a consensual household, and therefore neglects conflicts and power inequalities at the household level (Faist 1997). Furthermore, NELM is a micro-level decision model, which is like the SLA based on the assumption of a rational actor (Massey et al. 1993) and assumes that migration decisions are always taken by well-informed families seeking to optimise their economic situation.

3.3.3 Contributions and limitations of SLA and NELM

Despite the shortcomings of the two approaches, the main ideas of the New Economics of Labour Migration theory, in combination with the Sustainable Livelihood Approach, form the basis of the conceptual approach of this thesis. Section 3.3.1 stressed that one of the important arguments of the SLA is that people respond to external shocks and stresses by making use of different assets. Thus they rely on a variety of responses to climatic stressors. As this section shows, this idea is supported by a major argument put forward in the context of NELM. NELM is based on the idea that migration should be conceptualised as one source of household income among others. Internal or international migration and local income generating activities are not mutually exclusive but complementary livelihood strategies of different household members (Massey et al. 1993).

Figure 3.2: Different potential responses to climate stressors

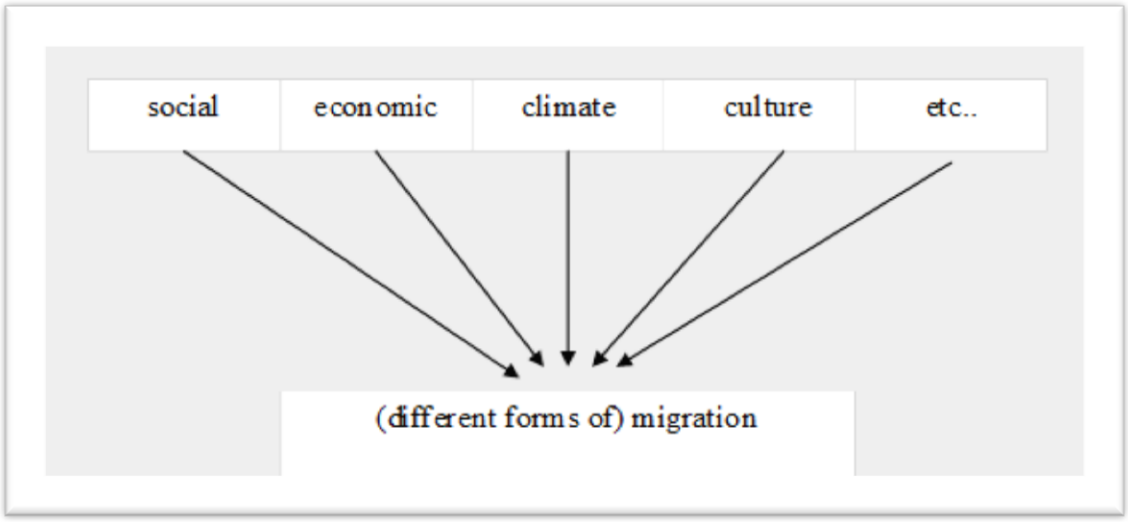


Source: author

Thus migration can be used by households to spread the risk of having no income in case that one of the other income generating activities of household members experiences difficulties. Similar to the SLA, NELM thus suggests that families tend to rely on different sources of income to minimise potential risks. If climatic stressors can be considered as constituting a risk to a family's livelihood, both SLA and NELM suggest that families or other social units use migration as one strategy among others in response to the risk of climate stressors. Figure 3.2 shows how migration can be conceptualised as one potential response to climate stressors.

Another underlying idea of the SLA is that livelihoods are subject to various types of internal and external shocks and stresses. Climate related shocks and stresses are affecting people in combination with economic, social, cultural and other stressors. Different forms of migration are potential responses to these different kinds of shocks and stresses. While NELM limits the reasons for migration to economic drivers, it acknowledges the multiple sources of risks, which might negatively affect a household's income stability. Figure 3.3 depicts different forms of migration as a potential response to different livelihood stressors.

Figure 3.3: Migration as a potential response to different livelihood stressors



Source: author

The two diagrams above thus single out and illustrate two important aspects of the climate change-migration nexus. First climatic stressors are likely to lead to a variety of different responses, potentially including migration. Second, different forms of migration can be caused by different livelihood stressors and aspects affecting people's livelihoods. These livelihood stressors might include climate related stressors among many others. This illustrates that the conceptualisation of a linear relationship between climate change and migration is wrong because of the multiple responses to climate related stressors and because of the multi-causality of migration.

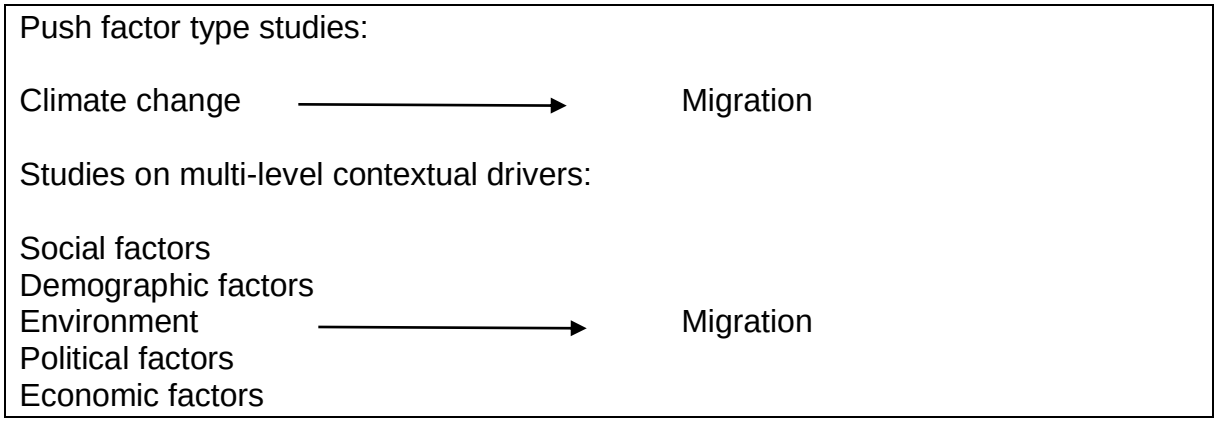
The previous sections showed that SLA and NELM are useful tools to explain why gradual climate change is unlikely to entail unprecedented migration flows. Yet, the relationship between climate change and migration is more complex than the previous sections outlined and goes beyond the aspects that SLA and NELM can explain. The conceptual approach of this thesis acknowledges that factors influencing migration decisions can be found at the macro, the meso, and the micro level, and that they interact with each other. While neo-classical migration theories and also NELM focus on the macro or the micro level, more recent approaches

such as network theories and the theory of cumulative causation are concerned with the important effects of structures and institutions at the meso level on migration decisions (Faist 1997). Kandel and Massey (2002) showed by using the case of Mexico how people's perceptions of migration as a normal part of adult life or even a rite of passage for transition into adulthood affects people's livelihoods. Migration has thus a long history in many parts of the world and has in many cases become an important and institutionalised part in people's lives. This argument counters the often implicit assumption that most migration flows caused or affected by climate change are new.

3.4 An alternative conceptual approach

This chapter so far has demonstrated the importance of taking the complexity of climate change, migration decisions, as well as different responses to risk into account when studying the nexus between climate change and migration. In this section, a new conceptual approach is developed, based on the main arguments presented in the previous sections. Existing studies, while sometimes partially acknowledging the complexity of migration decisions and of the relationship between climate change and migration, in most cases fail to acknowledge the complexity of people's responses to risk related to climate stressors and the complexity of climate change. Jónsson (2010) divides the conceptual frameworks of these existing empirical studies into 'push factor type studies' and studies on 'multi-level contextual drivers', as shown in figure 3.4. In Jónsson's terminology, 'push factor type studies' assume a strong direct, linear and positive link between environmental or climate stressors and migration. The conceptual framework of these studies is based on neo-Malthusianism and on a push-pull framework of migration, which ignores influences on the meso- and on the macro-level (Jónsson 2010). In contrast, studies on 'multi-level contextual drivers' acknowledge the complexity of the relationship between the environment and migration. They are conceptualised around migration theories such as the New Economics of Labour Migration (NELM) and around sustainable livelihood approaches (SLA). They are also often informed by social constructionism and political ecology (Jónsson 2010).

Figure 3.4: Conceptual approaches to the environment-migration nexus



Source: author, adapted from Jónsson (2010)

Section 3.2.1 showed that different migration theories explain decisions for or against migration by factors at the micro, meso, and macro level. It is thus unlikely that migration will be caused by climate change alone, and the multi-causality of migration should be acknowledged. Furthermore, migration has different forms as migrants, alone or with their families, move over short or long distances, internally and internationally, legally and undocumented, and to rural or urban destinations. As, for example, international, long-distance migration seems to require more resources than internal migration over a short distance, it is also likely that the factors which influence decisions for different forms of migration are not the same. Thus, push factor type studies, which, as shown in figure 3.4, depict climate change as a single reason for migration, are conceptually unconvincing.

Studies on multi-level contextual drivers acknowledge the complexity of migration and argue that environmental or climate stressors might affect migration decisions in combination with social, demographic, political, economic and other factors. While this approach is more convincing than the approach that ignores the multi-causality of migration, it also does not capture all the elements involved in the potential relationship between climate change and migration. Section 3.3 in this chapter showed that the decisions households take when faced by shocks or stresses are as complex as migration decisions. Just as environmental or climate

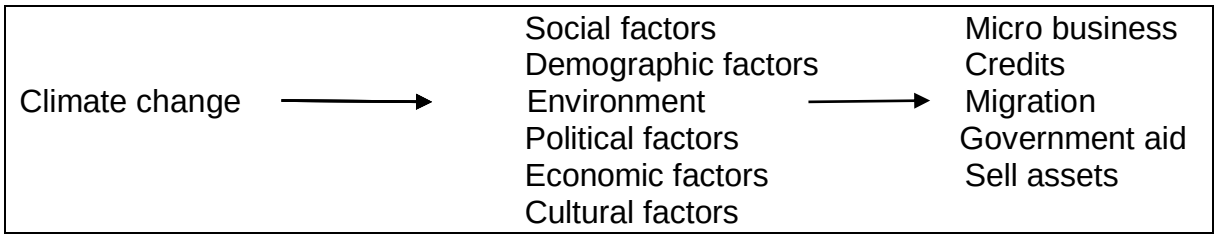
stressors are not the only driver of migration, migration, in turn, is not the only response to external stressors. Households facing stressors to their livelihoods can often choose between various responses and different forms of migration might be one potential response among many others. Sustainable Livelihood Approaches and the New Economics of Labour Migration suggest that households spread the risk of loss of income by making use of various adaptation strategies at the same time. A conceptual approach, which tries to explain the nexus between climatic stressors and migration, thus needs to acknowledge the multi-causality of migration as well as the multiple potential responses to different livelihood stressors.

Section 3.1 stressed the complexity of climate change and the uncertainty of predictions of future climate change. It showed that climate change can be expected to affect people's livelihoods directly and indirectly at the local and at the global level. While, for example, changing precipitation and temperature patterns at the local level are likely to affect agricultural output and the livelihoods of people who depend on farming, climate change at the global level might increase global food prices and most severely affect the livelihoods of poor people worldwide. Furthermore, climate change might render some rural destinations unattractive for migrants if it affects the agricultural productivity of these areas and the need for migrant workers decreases as a consequence. Yet, most existing empirical research into the nexus between the climate and migration simply uses some form of a local environmental stressor as a proxy for climate change and does not consider the potential indirect and global effects of climate change on people's livelihoods. Most existing research also ignores the fact that climate change is likely to affect – in various ways and to different extents – the many factors involved in migration decisions.

An alternative approach to studying climate-migration linkages thus needs to take into account the complexity of migration decisions and of people's responses to livelihood stressors. Furthermore, it should acknowledge that most elements

involved in migration decisions are likely to be sensitive to the consequences of climate change. The conceptual approach, on which the research presented in this thesis is based, therefore suggests that a mix of various social, demographic, environmental, political, economic and cultural factors triggers a mix of different responses, potentially including different forms of migration. In turn, these factors involved in migration decisions and in decisions for alternative responses are likely to be affected by climate change. Figure 3.5 presents a simplified scheme of this conceptual model.

Figure 3.5: Conceptual model acknowledging the complexity of climate change impacts on migration decisions



Source: author

It has to be acknowledged that interlinkages between different livelihoods stressors and between different responses are likely to exist, which the diagram does not capture. Several livelihood stressors might affect people at the same time and people might make use of a combination of different responses. Furthermore, the diagram does not show that also individual preferences and experiences are involved in decisions for or against migration. Nevertheless, the diagram shows the main contribution of this alternative conceptual approach for studying the nexus between climate change and migration. It underlines that the relationship between climate change and migration is not linear and not necessarily positive. It also shows that climate change is not one element, which can be separated out of many other drivers of migration. In contrast, it shows that climate change is likely to affect stressors to people's livelihoods, which might lead to migration as well as to other responses.

3.5 Chapter conclusion

This chapter argued that existing conceptual approaches for studying the relationship between climate change and migration do not completely acknowledge the complexity of climate change, migration decisions, and people's responses to risks. Therefore, an alternative conceptual approach is needed, which was also developed in this chapter.

The first part of the chapter showed that climate change is very complex and that predictions of the consequences of future climate change are very uncertain. Furthermore, the predicted future effects of climate change can be expected to manifest at the global and at the local level and will be likely to directly and indirectly affect people's livelihoods. Therefore, the use of local climate phenomena, such as droughts or floods, as a proxy for future climate change is conceptionally unconvincing. The second part of the chapter argued that migration decisions, for different forms of migration, are also complex and include many elements at the macro, the meso and the micro level. This multi-causality of migration, which is acknowledged in many different migration theories and in approaches, which try to explain migration, shows that the relationship between climate change and migration is likely not to be linear and not necessarily positive. The third part of the chapter showed that different forms of migration are only one potential response to people's livelihood stressors, depending on people's access to assets and on individual decision-making processes in the context of risk.

The last section of this chapter developed an alternative conceptual approach, based on the idea that climate change can be expected to affect social, demographic, environmental, political, economic, and cultural factors involved in migration decisions. Yet, these factors might also drive responses other than migration, such as micro-businesses, credits, selling assets or relying on external aid. The next chapter shows how this conceptual approach translates into the methodological approach of this thesis.

Chapter 4: Methodological approach, choice of research setting and research methods

The previous chapter developed the conceptual approach, on which this thesis is based. This chapter presents the methodology, the research settings and the research methods, which were chosen to illustrate this conceptual approach by analysing the case of Mexico. Consistent with the logic behind the conceptualisation of the research presented in this thesis, the methodological approach of this research consists of two steps; 1) understanding the nature of migration flows in Mexico as well as alternative livelihood strategies, and 2) understanding the climate sensitivity of all factors involved in decisions to migrate at the local and the global level. Therefore, in a first step, the factors involved in different migration decisions as well as the decisions in favour of alternative livelihood strategies are identified. Then, in a second step, these factors and the alternative livelihood strategies are analysed and tested for their climate sensitivity.

The first part of the research is therefore concerned with answering the following set of research questions:

- What are the elements involved in migration decisions in rural communities in Mexico?
- Why do some people migrate while others stay in their home community?
- What are the different forms of migration that can be observed in rural Mexico, and what are the reasons why some forms of migration are more common in a specific village context than others?
- How do households choose the most appropriate form of migration for their prospective migrant household member?
- What are alternative livelihood strategies and under what circumstances are they made use of?

Empirical data answering these questions are analysed and categorised, leading to a conceptual model of all elements involved in decisions for or against different forms of migration or for or against alternative livelihood strategies.

The second part of the research is concerned with analysing the climate sensitivity of the elements in this conceptual model. It answers the following set of research questions:

- What are the likely effects of the global and local consequences of climate change on the observed migration flows?
- What are the differences and the similarities regarding different migration flows?
- How will the elements involved in different migration decisions at the sending areas, at the destination areas and livelihood strategies that might be used as an alternative to migration likely be affected by the consequences of local and global climate change?
- Which elements are likely to be most severely affected by future climate change?
- What are the policy implications of the results?

4.1 The methodological approach

As the analysis of empirical research into the climate change-migration nexus in chapter 2 showed, many existing studies seem to be methodologically flawed. Methodological approaches usually start by analysing the climatic stressors and their effects on people's migratory behaviour. Qualitative studies try to gain insights into the questions of how different groups of people respond to different kinds of climate-related shocks and stresses and to what extent different forms of migration are part of these responses. Qualitative work also often concentrates on understanding people's perceptions of climate-migration linkages (Jäger et al. 2009). Quantitative studies, on the other hand, try to establish a statistical relationship between an extreme climatic event and changes to the number of outmigrants before and after that event. Often, correlations between precipitation levels and the number of outmigrants are established (Munshi 2003, Kniveton et al. 2008). Alternative approaches analyse the usefulness of conceptual models in discovering climate change-migration linkages (Perch-Nielsen 2006) or suggest agent based modelling (Kniveton et al. 2008, Smith et al. 2008).

All of these approaches provide some valuable insights but results on the climate change-migration nexus are not conclusive yet. It is likely that one of the reasons for this lack of conclusive results is that existing studies try to isolate climate

stressors as one factor among many other factors that influence migratory behaviour. This is a methodological problem, which both qualitative and quantitative studies face. Chapter 3 argued that conceptualising climate change as a factor that can be isolated from migration decisions does not do justice to the complexity of climate change. Therefore, research designs need to overcome this methodological problem by conceptualising climate change as a complex phenomenon affecting the global and local factors involved in different migration flows.

4.1.1 A qualitative methodology

Qualitative approaches are better suited than quantitative approaches to explain complex relationships and contexts. Yet, as Flick (1998) stresses, results of qualitative approaches are often less considered by policy makers or society as a whole, because of a lack of generalizability of findings and less standardized research methods. Similarly, the results of this thesis are not generalizable in a quantitative sense. The thesis does not make an attempt to quantify results and therefore does not provide estimates of numbers of people expected to migrate because of future climate change. Instead, it seeks to generate new knowledge by which the policy and public debate might be informed in two ways. It presents a conceptual and methodological approach, which might influence the way of thinking about the nature of the relationship between climate change and migrations. Furthermore, it uses a qualitative methodology to illustrate this approach for the case of Mexico. This methodological tool can also be applied in different geographical contexts.

A qualitative approach is used to generate profound knowledge about the character of existing migration patterns in Mexico and about the question of how these patterns of different migration flows are likely to change under future climate change. To understand how migration decision-making functions, all elements involved in migration decisions, including livelihood stressors at the macro level but also people's involvement in networks at the meso level as well as their decision

making processes at the micro level, are considered in this analysis. To understand how migration processes are likely to be affected by future climate change, all potential consequences of climate change at the global and the local level need to be considered, and the effects they might have on different migration decisions must be judged. This means that different kinds of knowledge are needed, including empirical data, histories, statistics, secondary data, and predictive climate models and assessments. The generation of this knowledge requires different tools and methods. The concept of 'bricolage' as found in qualitative research allows this mix of different strategies, tools, techniques, and research methods as well as the use of all available empirical materials to generate the knowledge that is needed to answer a specific research question (Denzin and Lincoln 2011).

Another important feature of qualitative research is the fact that it allows integrating and stressing the perspective of the people concerned by the studied phenomenon. Denzin and Lincoln (2011:3) stress that "…qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them". To ensure an in-depths understanding from an emic perspective, the research design is built around a holistic approach, involving many different aspects of people's livelihoods. The research also seeks to understand people's perceptions of livelihood stressors and of the usefulness of different forms of migration as a response. Bryman (1988) defines qualitative research as "...an approach to the study of the social world which seeks to describe and analyse the culture and behaviour of humans and their groups from the point of view of those being studied" (Bryman 1988:46). Understanding decisions for or against different forms of migration from the perspective of the people concerned permits insights into their perceptions and reasoning. Qualitative fieldwork is conducted to gather data about the elements involved in migration decisions because people's perceptions and opinions play an important role.

4.1.2 A comparative methodology

Another important element of the research design is that it acknowledges that climate change-migration linkages are likely to be heterogeneous due to local or regional characteristics, for different migration flows, and under the condition of different local climatic stressors. In order to illustrate the differences and similarities caused by this heterogeneity, instead of focusing on one single case alone and doing an ethnography in one village community, a comparative approach was chosen. Bryman (1988) puts forward three strategies that can avoid the danger of research results turning out to be idiosyncratic: 1) study more than one case, 2) involve more than one researcher, and 3) select a typical or a 'deviant' case. Making use of the second strategy is not feasible because of the nature of this DPhil project. A priori knowledge about the characteristics of villages in different parts of Mexico is not available, which means that the third option cannot be chosen either. Choosing more than one case, however, is considered a feasible option, which is adopted in this thesis.

Lamnek (2005) stresses the importance of choosing the right cases in comparative research. Therefore, before starting fieldwork, two regions in Mexico with different migration patterns and affected by different local climate stressors were selected. One classic migration state suffering from drought, Zacatecas, and one state in which international migration is more recent and which is suffering from floods and hurricanes, Veracruz, were selected. Once this choice was made based on secondary data, both regions were visited and local researchers were asked for help in choosing the most appropriate communities for fieldwork. Again, to avoid idiosyncrasies as much as possible, two communities were selected in each of the two states. It has to be acknowledged that the choice of the research setting has been limited to rural communities because the effect of local climate stressors was considered to be likely more visible in rural than in urban areas. Nonetheless, cities are likely to suffer the consequences of climate change, and migration to and from urban areas is also likely to be affected by these consequences. Yet, in the context of this study, choosing another selection criterion or variable and selecting more

cases would have gone beyond what one single researcher in one study can do and might have affected the quality of the research as a whole.

A total of four communities in Mexico, two in Zacatecas and two in Veracruz, were thus selected. Empirical research started in January 2008 in Zacatecas. Each time after three to four weeks the village was alternated until the end of fieldwork in Zacatecas in July 2008. Furthermore, short visits to other communities in Zacatecas were made during the time of the fieldwork. This strategy enables a better understanding of the factors that play into the relationship between climate variability and migration, because some of these factors might be found on the state level, others in both communities, some might exist in certain groups in both communities and some might be characteristic of one community and not found in the other. Alternating research between the two communities can therefore help to distinguish between features that are particular to one community, features that are particular for a group of people that share certain characteristics, and features that seem to be more universal in the region. This strategy also helps to understand behaviour in one community by comparing it to what other people do in a similar setting. This reduces the danger of bias and therefore increases the external validity of the study. After a break from fieldwork, in which a first analysis of the empirical data collected in Zacatecas was made, the second phase of fieldwork in Veracruz started in September 2008 and lasted until March 2009. Fieldwork in Veracruz followed the same strategy as fieldwork in Zacatecas, with alternating stays of three to four weeks in the researched communities as well as additional short visits to other communities in the state of Veracruz. After making a case for a qualitative and a comparative approach, the following section explains in detail why Mexico, the two regions in Mexico and the two village communities in each region were selected as research setting.

4.2 The choice of the research setting: Mexico

As chapter 2.4 showed, most empirical research into the nexus between environmental stressors and migration is set in the Sahel and concerned with the effects of droughts on migration. Another example of interest for the effects of climate stressors on migration is the relationship between migration and floods in low lying areas and river deltas such as the coastal regions of Bangladesh. While these studies provide valuable results, they do not allow for a comparison between the effects of different environmental stressors on migration because of socio-economic, political, and cultural differences in different countries. Mexico is an interesting research setting because different environmental stressors can be found in one country.

Droughts mainly occur in the northern and central part of Mexico, while the coastal regions and especially the southern and south-eastern states of Tabasco, Veracruz, Chiapas, and Oaxaca are prone to floods and hurricanes. Furthermore, different migration patterns can be observed in Mexico. While the classic migration states in the centre-west of the country have been sending international migrants for generations, international migration only emerged in the 1990s in the southern and south-eastern states. Furthermore, seasonal internal migration as well as international labour migration to the USA is a common phenomenon in many parts of the country[13]. Mexico thus offers the opportunity to observe the direct effects of different climate stressors on different forms of migration within one country. Although, especially in a country of the size of Mexico, the socio-economic, cultural, and political conditions vary from region to region, they are likely to be more similar between the different Mexican states than between different countries.

As mentioned above, fieldwork was conducted in the two states of Zacatecas and Veracruz. These regions with different migration histories and patterns, which are suffering from different climate stressors, were chosen to allow a broader insight into the various climate and non-climate related stressors affecting people's

[13] A more detailed analysis of these different migration patterns can be found in chapter 5.

livelihoods, different livelihood strategies, as well as different migration decision-making processes. Two communities in each region were selected to reduce the risk of idiosyncrasies and to follow the comparative approach presented above.

4.2.1 Zacatecas

Zacatecas was selected as one of the research settings because of its long history of international migration, and because drought is an important stressor to many people's livelihoods in the state. The state of Zacatecas lies in the centre-north region of Mexico, with the state capital Zacatecas situated 500 km to the north of Mexico City and 1,400 km south of the border between the state of Sonora and the USA, which many migrants from Zacatecas cross. Zacatecas is surrounded by the states of Jalisco, Aguascalientes, San Luis Potosí, Coahuila, and Durango.

Figure 4.1: The state of Zacatecas in Mexico

Source: INEGI

The population of Zacatecas rose from 1.35 million inhabitants in 2000 (INEGI 2000) to 1.5 million in 2010, of which a bit less than 10% live in the state capital of

the same name (INEGI 2010). Yet, with 20 inhabitants per km^2 it remains one of the less densely populated states of Mexico, compared to the national average of 57 inhabitants per km^2 (INEGI 2010). As the low population density suggests, the state is dominated by rural areas and small villages, which are politically divided into 58 municipalities.

In the 2010 Mexican census[14], 5.8% of the economically active population of Zacatecas indicated that they were unemployed. While this rate of structural unemployment is relatively moderate, seasonal fluctuations in the need for day labourers should be considered. In 2006, about 29% of the economically active population was employed in the primary sector (INEGI 2007), which is high above the national average of 16% and 13% in 2000 and 2010, respectively (INEGI 2010). Due to the average altitude of 2,100 metres above sea level, and the related periods of frost and low temperatures, agriculture is not possible between October and February. Therefore, many people do not have work during these months and the lack of secure and permanent employment opportunities is one of the major livelihood stressors, mainly among the rural population in Zacatecas.

While the choice of the state as a research setting was based on information found in the literature, the selection of the two researched village communities was based on visits to different parts of Zacatecas. These visits showed that the state is not homogeneous as far as both the degree of the impact of drought and migration rates are concerned, which is unsurprising given the size of the state with a north-south extension of about 500 km.

The north of the state is considerably poorer and the climate is dryer than in the rest of the state. As a consequence, fewer people can afford to migrate internationally, and internal migration is the dominant form of migration. Yet, while the municipality of Mazapil in the extreme north of Zacatecas is one of the poorest

[14] The Mexican National Institute for Statistics and Geography (INEGI) carries out a population census every ten years; the last one was completed in 2010, and some preliminary results were published at the end of 2010.

and driest regions in the state, it started to attract migrants in 2004, when a Canadian company opened a mine. Many of those who had left the region to work in Monterrey, Ciudad de Juárez, and Saltillo returned, and workers from other regions in Zacatecas as well as from other states came to work in the mine. Thus, although the mining activities are using a lot of groundwater and contaminating the fields, so that agriculture has become even more difficult, migration ratios have shifted from high outmigration rates to even higher immigration rates.

Figure 4.2: Map of the state of Zacatecas

Source: Google maps (accessed on 23 March 2011)

The extreme south of Zacatecas is less dry than the north and the soil is more fertile. Although agriculture would be more feasible in this region than in the north, only a very small part of the land is cultivated because commercial agriculture does not exist and only a few people are farming for subsistence. Production of mezcal, a strong alcoholic beverage, has been growing in the region over the last years so

that some people started to farm the maguey plant, from which mezcal is distilled. The plant can be cultivated without irrigation systems because the amount of precipitation in the region is sufficient for it to grow. Cattle raising is the most important form of land use, but maize that is used to feed the animals is also grown. Next to cattle raising, international outmigration to the USA is the most important income generating strategy.

This heterogeneity in the state was considered for the choice of the two village communities in which fieldwork took place. Two communities with different migration patterns where chosen to allow for a later climate sensitivity analysis of distinct migration flows. The first selected community, Laguna Seca, in the municipality of Pánuco, is situated in a zone of low international migration but shows high rates of internal seasonal migration. According to the population count by the local health centre in 2007, 1,008 inhabitants lived in 347 households. 502 of the inhabitants are male and 611 are younger than 30, so the population profile is different to the one in communities with high permanent outmigration rates, in which mainly men and young people leave.

The second rural community, which was selected for fieldwork, consists of the three villages El Tigre, El Nuevo Tigre and Ojo de Agua del Tigre. They are situated within walking distance between each other in the municipality of Villanueva. Fieldwork shows that in many villages in this part of Zacatecas international migration is very high and internal migration hardly exists, which is also the case in the three studied villages. According to the 2006 census of the health service provided by ‘Programa Oportunidades’, in El Tigre 1,039 inhabitants lived in 298 households, in El Nuevo Tigre 89 inhabitants lived in 27 households, and in Ojo de Agua del Tigre 37 inhabitants lived in 9 households. Out of this total of 1,165 inhabitants, 377 were younger than 30 and a total of 344 were male. Thus the population on average is older and more women live alone in the villages than is the case in Laguna Seca.

4.2.2 Veracruz

The second Mexican state, in which fieldwork was conducted, is Veracruz de Ignacio de la Llave, commonly referred to as Veracruz. It was selected as an area that contrasts the migration patterns observed in Zacatecas. Veracruz became an international migrant sending state only in the 1990s, so that it does not possess any history of migration that dates back over several generations.

Figure 4.3: The state of Veracruz in Mexico

Source: INEGI

The state of Veracruz extents over more than 1,000 km along the coast of the Gulf of Mexico, and borders on the state of Tamaulipas in the north and on the state of Tabasco in the south. In the south-west, towards the inland, lie the states of San Luis Potosí, Hidalgo, Puebla, Oaxaca, and Chiapas. Due to its proximity to the sea

and because of the many river deltas, mainly in the north and the centre of the state, floods and hurricanes are serious livelihood stressors in Veracruz.

Data provided by the INEGI census and population counts, which take place every five years, show that the population of the state of Veracruz constantly rose from 6.2 million in 1990, to 6.7 million in 1995, to 6.9 million in 2000, to 7.1 million in 2005, and finally to 7.6 million in 2010 (INEGI 2010). Thus while the population growth rate decreased between 1995 and 2005, it shows a tremendous increase between 2005 and 2010. One potential explanation for this demographic development is the increase in international migration during the second half of the 1990s followed by return migration during and after the financial crisis at the end of the 2000s. These data also show that the severe hurricanes and floods, which hit Veracruz in 2005 and 2007, as well as in 2008, 2009, and 2010, respectively were not followed by large waves of outmigration. Internal migration from the state of Tabasco, which was also affected by floods and hurricanes, to the relatively wealthier state of Veracruz should be considered. Yet, it cannot account for the total of the population increase in Veracruz, because the population of Tabasco also increased between 2005 and 2010 (INEGI 2010). Thus, the effect of international economic stressors in this case seems to be stronger than the effect of local environmental stressors.

Covering 71,820 km^2, Veracruz is a medium sized state in Mexico. It is politically divided into 212 municipalities, which show an unequal population distribution and more urban areas than Zacatecas, considering the larger number of municipalities in Veracruz. The highest population concentration can be found in the state capital Xalapa, as well as in Boca del Río, Veracruz City, Coatzacoalcos, Minatitlán, and Poza Rica. Many migrants from rural communities move into these cities in search of work. Veracruz possesses a variety of resources leading to different economic activities, such as the refinement of oil, activities in the freight harbours of Veracruz City and Coatzacoalcos, tourism, as well as agriculture, cattle raising and fishing. Its share of the national GDP is 4.3%, which is the 6^{th} place of all Mexican states.

However, 6.8% of the total population of Mexico live in Veracruz, which makes it the third largest state of Mexico regarding population size (INEGI 2010). This suggests that the GDP contribution per capita is not that high on a national average. As fieldwork showed, the socio-economic status of many village dwellers in the studied communities in Veracruz is below the standard in Zacatecas.

Figure 4.4: Map of the state of Veracruz

Source: Google maps (accessed on 23 March 2011)

The selection of two village communities as research settings was again based on the intention of finding two places with different migration profiles. Yet, as consultations with researchers at the University of Veracruz in Xalapa and at CIESAS Golfo revealed, this selection criterion was unlikely to be useful in Veracruz. Unlike in Zacatecas, where migration profiles are determined on a village level, access to migration networks in Veracruz depends on family connections so

that common migration profiles on the village level do not exist. Nevertheless, there are village communities, which hardly send any migrants, while others send internal and international migrants. One of the selection criteria for the fieldwork setting was thus the fact that migration played an important role in the village. Furthermore, to examine the potential direct effects of floods and hurricanes on migration decisions, villages were selected that had both suffered from at least one flood and one hurricane over the last ten years. Like in Zacatecas, several villages were visited, which showed the diversity of the state regarding the importance of migration, as well as the degree to which people reported that they were affected by floods and hurricanes.

The first village which was selected as a research setting is Cascajal del Río in the municipality of Acayucan, in the south of Veracruz. When fieldwork started in September 2008, a flood of the river San Juan, which borders Cascajal del Río had just inundated the region so that access to the village had been cut off for several days. Next to regular inundations of the fields and part of the village caused by floods during the rainy season, Cascajal del Río lies in a zone prone to hurricanes. The most recent and most severe hurricane which hit the village was hurricane Stan in October 2005. As in many parts of Veracruz, migration patterns are heterogeneous. 2007 census data provided by the local health centre show that out of the total of 1,438 inhabitants, 892 were older than 30 and 422 were younger than 15. This means that the share of the population between 15 and 30 years of age is unproportionally low, which is linked to the fact that over the last years many young men and women have left the village after they finished school.

The second selected research community in Veracruz is Nuevo Renacimiento in the municipality of Gutierrez Zamora at the estuary of the river Tecolutla. It is situated between the geographical centre and the northern border of Veracruz. Nuevo Renacimiento differs from the other three research settings because its inhabitants were resettled from seven village communities after the big flood of the river Tecolutla in 1999. In 2007, the resettled community was hit by the two

hurricanes Dean and Lorenzo within two months. Although the two villages are very different in many aspects, migration patterns are very similar in Cascajal del Río and Nuevo Renacimiento. Access to the only village census data managed by the local health centre could not be obtained in Nuevo Renacimiento. Yet, the official documentation of the resettlement plan shows that 240 houses were constructed after the flood in 1999. Estimating an average of 4 inhabitants per house, the village should count about 960 inhabitants. Given the fact that migration patterns in Nuevo Renacimiento are similar to migration patterns in Cascajal del Río, it is likely that the age distribution in the two villages is also comparable.

4.3 Research methods

Most of the information on which this thesis is based, was obtained during a total of about one year of fieldwork in the four villages described above. This time-frame permitted gaining intensive knowledge of the livelihood situations in the studied communities. An important way of understanding people's livelihoods was the physical stay in the house of one family in each village. In the two villages in Zacatecas and in Nuevo Renacimiento, the host families were found with the help of local scientists who knew the communities and some of its members. In Cascajal del Río, such contacts did not exist, so here the central shop was the first contact point in the village. From there, several options for renting a room were explored until the host family was found. It was also considered very important to interact directly with the village dwellers, which is why the help of an interpreter was not sought. Although communication during the first weeks was difficult because of language problems and having to get used to the local dialect, all interviews were conducted in Spanish. Adapting to the local form of Spanish as well as to local customs enabled the interaction with the village dwellers beyond formal interviews and was very helpful for the understanding of people's livelihoods.

4.3.1 Data collection

Fieldwork consisted of semi-structured interviews, participant observation, life histories, and interviews with people who know the communities in their function as teachers, doctors, nurses, or researchers. Semi-structured interviews were the most important research method. In each community about 50 interviews were conducted. The number of inhabitants in the four communities lies between 1,000 and 1,500 persons, including children. Interviewees were family members of migrants, families who did not send migrants, and migrants who had returned on a temporary or permanent basis. It was considered important to select respondents from all social and economic backgrounds. Members of poorer and wealthier families, with higher and lower social status, landowners and dependent workers, young and old people, and women and men were interviewed because it is conceivable that wealth, social status and landownership, as well as age and gender are factors that influence the process of migration decision-making.

The profiles of the community dwellers were obviously not known in the beginning. One way of getting information about the socio-economic status, the gender and age distribution, and the potential involvement in migration processes of households is conducting a small survey at the beginning of fieldwork. Bernard (1995) describes how such a survey, used as a first step after entering the field, can help finding informants that possess the attributes and qualifications the researcher is looking for. Yet, such a survey is time consuming and requires that people trust the researcher enough to reveal this information in an honest way. It was found during the first days of fieldwork that this trust to village dwellers had to be built up first before people would be willing to talk. In all four communities, the local health centres conduct a yearly population count, which includes some information that would have been interesting for the identification of potential respondents. Yet, data of the population counts are only available in aggregate form, which made them a valuable source for retrieving population statistics but not for the selection of respondents.

Therefore, the first semi-structured interviews were conducted with people who were already known, members of the host family and their acquaintances and relatives. Snowball sampling was started with these people. After the interview, the interviewees were always asked if they might know anybody who had any form of migration experience and who might be willing to talk about it. This form of snowball sampling also allowed the application of selection criteria to make sure that not all respondents belong to the same socio-economic group of people. Selecting a sample which is not representative for the community is one of the major risks of convenience sampling (Bernard 1995), which had, therefore, to be avoided. After several interviews, a new snowball system was started to make sure that not only one group of people who interact with each other or are friends was explored. Several new snowball systems were started by visiting shops, doctor's waiting rooms, schools, church, or social and sports events in the village. During these occasions, people who were willing to talk were identified, a date and place for the interview was agreed upon and at the end of the interview the interviewee was again asked to provide the name of one or more potential new interviewees.

It is believed, that this method allowed approaching as many different people in the village as possible. Some of the interviews were recorded, which was considered important especially during the first weeks when language problems did not allow for asking questions and writing up the answers at the same time. Yet, later it was discovered that respondents sometimes became more talkative when the recorder was not switched on. Migration, especially when it is illegal, is a sensitive issue among most village dwellers in the studied communities. Furthermore, people were not used to the presence of a stranger or even a foreigner in the village. Speculations about the purpose of fieldwork included, therefore, work for the U.S. immigration service or the police, as well as the preparation of a terrorist attack.

Although empirical research does not follow the methodological approach of an ethnography, participant observation was a very important element during fieldwork. It helped gaining insights into people's lives next to the interviews and

also allowed knowing more potential interviewees. Furthermore, after some time a relationship of trust could be established to several members of each community, which increases the chance that these informants tell the truth. Outside the formal interviews, during participant observation, notes were not taken immediately in order to avoid creating a formal atmosphere. Instead, every evening a summary of the events of the day, places visited, people met, and interesting remarks and observations, was written down in a diary. Another form of recording information was a reflective log, which included logistical information regarding fieldwork, but also preliminary thoughts and ideas that had to be explored during the time in the field. A reflective log can have different forms and fulfil different purposes. Bernard (1995) stresses that, during fieldwork, a log is an essential account of how the researcher plans to spend time and how s/he actually manages to follow that time plan. According to Bernard, the main purpose of a reflective log is to force the researcher to “think hard about the questions you really want to answer in your research and the data you really need” (Bernard 1995:394). It is thus a means of organising work in an efficient manner and of getting the most out of the research time available.

Life histories, especially of older residents of the community, were found to contribute to gaining a more elaborate picture of how the effects of climate variability might have changed migratory behaviour in the course of a lifetime. Sabatés (2005) used life histories in his study into the evolution of the labour market in the Mexican city of Léon. He stresses that “...individuals are more likely to correctly recall their own labor histories than to remember what happened in their working careers in any given year“ (Sabatés 2005:525). Interviewees were identified during visits to the weekly gatherings of the elderly residents, which exist in each community. In each village between three and five life history interviews were conducted. Because they are time consuming and often exhausting for the informants, these interviews were always divided into several sessions and some life history interviews included up to seven meetings with the interviewee. Information gathered during the life history interviews was mainly useful to provide

the context of village life. The interviews showed how villages and the livelihoods of people in the villages developed over the last decades. They also showed how migration patterns developed, when the first outmigrations took place, and what had changed since then.

Focus groups, groups of people gathered to discuss a particular topic, are often said to have the potential of providing results that go beyond what can be grasped from individual interviews (Bernard 1995). Yet, as Lamnek (2004) points out, focus groups can have advantages and disadvantages. The two major advantages are that in a relaxed and open atmosphere, a group discussion can generate ideas that would most likely not have emerged in the quieter and isolated situation of an individual interview. Furthermore, group discussions reveal inconsistent opinions and allow participants to debate on conflictive issues. Yet, one of the major disadvantages of group discussions is that people have to reveal their ideas in a semi-public setting if they want to participate in the debate. Fieldwork showed that people in all four villages were not willing to discuss what they considered a sensitive issue, such as their migration decisions, in this form. Although people turned up for the focus group discussion, they did not talk a lot, switched subjects frequently, and generally wished to leave the exercise as soon as possible. Focus groups thus were not a research method that worked well for this research.

Primary data gathered in the studied communities was completed by information from local archives about the history of the villages. Furthermore, several ‘expert’ interviews were conducted. The purpose of these interviews was to gather the ideas of people who know the community well but are outsiders. Interviews were conducted with teachers, doctors, and nurses working in the communities but also with researchers and some politicians working at the state level. Village census data were provided by the health centres in the communities in Zacatecas and in Cascajal del Río. Research on secondary data also included library work in Mexico City, Zacatecas and Veracruz, as well as visits to meteorological stations and institutes to obtain local climate statistics.

4.3.2 Data analysis

Data gathering and data analysis should not be perceived as separate stages of the research but as processes that inform each other and that are interlinked with each other (Lamnek 2004). Therefore, the analysis of data obtained in the interviews, and out of participant observation and secondary resources, started in the field. Every evening when possible, interviews were typed and files created for every person that was interviewed during the day. Due to a strong involvement in family and village life, and because priority was always given to writing the daily fieldwork diary entry, not all interview notes could be typed during the time in the field. Therefore, the break between fieldwork in Zacatecas and fieldwork in Veracruz was very useful to type up the missing interview notes and to transcribe the interviews that were taped. Furthermore, strengths and weaknesses of the existing data could be identified, which was helpful to determine potential needs for changes during fieldwork in Veracruz. Immediately after the second phase of fieldwork in Veracruz, interview notes were typed and taped interviews were transcribed.

The next months were spent reading through interview summaries and field diaries and listening again to the recorded interviews. Following up on the first categorization of information in the field, each interview was saved in a file. In a second step, categories of information were created according to what people had said, and these categories were saved in different files. According to Bernard (1995), the analysis of qualitative data is “based on the search for patterns in data and for ideas that help explain the existence of those patterns” (Bernard 1995:360). The psychologist and sociologist, Paul Lazarsfeld, whose work laid the foundations for empirical social research, stressed the importance of the identification of types of answers for empirical research. Several types of behaviour can thus be constructed by contrasting individual cases with one another (Flick 1998). Boudon (1993:8) specifies that “[e]ach type [...] should be described by a combination of convergent features”.

In the concrete example of this study, this means that each element involved in different forms of migration decisions constitutes a different type. The different types are constructed based on combinations of certain aspects that people mentioned as affecting their migration decisions. These aspects might include the economic situation, the availability of other coping strategies, the social networks in the Mexican communities, and the links to Mexican communities at the destination areas. Based on these constructed categories, a conceptual model of migration decisions was drafted, including elements involved in migration decisions at the micro, meso and macro level, as well as alternative livelihood strategies. Chapters 6 and 7 present the analysis of the empirical data and chapter 7 concludes with the conceptual model of migration decisions in Mexico.

The second part of the methodological approach consists of testing the factors involved in migration decisions, as identified during fieldwork and summarised in the conceptual model, for their sensitivity to climate change. To this end, the principle of a risk matrix is used. A risk matrix measures the probability that a specific event is likely to occur in combination with the impact that this event is expected to have. Accordingly, for the purpose of the analysis of the climate sensitivity of factors involved in migration decisions, a matrix including two axes with possible values on a scale from 1-5 each is constructed. The first axis measures to what extent each element involved in migration decisions is likely to be affected by climate change. The second axis measures how relevant this factor is in the migration decision-making process. Each factor is attributed a score for the question of how important it is for migration decision-making and for the question how much it is likely to be affected by future climate change on the local and on the global scale. The product of the two scores indicates to what extent a specific element involved in migration decisions is likely to cause changes to existing migration patterns when affected by some consequence of climate change. The analysis of the products of scores for all elements involved in migration decisions makes it possible to identify these elements with the highest potential to cause changes to existing migration patterns under future climate

change. The potential differences between the effects of climate change on different forms of migration can also be identified.

4.4 Chapter conclusion

This chapter presented the methodological approach, the research settings and the research methods and methods of data analysis that were used to illustrate the conceptual approach developed in the previous chapter. The first section of the chapter argues that quantitative and qualitative methodological approaches used so far to study the climate change-migration nexus are flawed, mainly because existing studies try to separate climate change from other factors involved in migration decisions. To overcome this methodological problem, and following the conceptual approach of this thesis, the methodological approach suggested in this chapter consists of two steps. During the first step, the elements involved in different migration flows are identified and analysed. During the second step, these elements are tested for their sensitivity to climate change.

This chapter makes a case for a qualitative methodology to illustrate this conceptual approach by using the example of Mexico. Qualitative research is also chosen because of the importance of the emic perspective and of people's perceptions. Furthermore, the research design requires different approaches to gather and analyse different kinds of quantitative and qualitative data. Therefore, the concept of 'bricolage', as used in qualitative research is a helpful tool to select the methods and methodologies best-suited to obtain the results that are needed to answer the research questions of this thesis. The chapter also makes a case for a comparative methodology as opposed to an ethnographic study. The heterogeneity due to different migration flows, different local climate stressors, as well as regional and local particularities of the relationship between climate change and migration in Mexico is acknowledged.

Therefore, two Mexican states with different migration profiles and suffering from different local climate stressors, Zacatecas and Veracruz, were selected as

research settings. In each of the two states, fieldwork took place in two rural village communities to avoid idiosyncrasies as much as possible. The choice for Mexico, the two regions and the two communities within each region is explained in the second part of this chapter.

The third part of this chapter is concerned with the research methods used during empirical fieldwork and with the analysis of the data. It shows that semi-structured interviews were the most important research method; about 50 interviews were conducted in each village. The importance of staying in the village and conducting all interviews in Spanish is also stressed. Participant observation is shown to have been an important informal source of data as well as a means to get to know more potential interviewees. The few life history interviews conducted in each village mainly contributed to the general understanding of the history of the village and of the history of migration patterns. The section also stresses the importance of typing interview notes or transcribing taped interviews as soon as possible and of keeping a field diary and a logbook. Data analysis is considered to be linked with data gathering and not as a separate step. Nevertheless, much of the data analysis took place after fieldwork. Data analysis aimed to identify the factors involved in different migration flows and resulted in a conceptual model of migration decisions in Mexico. In a second step, these factors involved in different migration decisions are analysed for their climate sensitivity. The assessment of climate sensitivity is based on the principle of a risk assessment but measures to what extent each element involved in migration decisions is likely to be affected by climate change and how relevant this factor is in the migration decision-making process. This analysis allows the identification of those elements through which the effects of climate change translate most severely into changes to existing migration patterns. Furthermore, this analysis allows a comparison of the extent of the effect of climate change on different migration flows.

The following chapter presents the research setting and people's livelihoods in these villages. It also introduces the climate stressors people are suffering from and shows how their perception of climate change differs from meteorological data.

Chapter 5: Livelihoods and climate change in the researched communities

After presenting the reasons for the choice of the research settings in the previous chapter, the first part of this chapter introduces the communities in which fieldwork was conducted in more detail. The second part of the chapter analyses the predicted local effects of climate change for Mexico, and particularly for the two Mexican states of Zacatecas and Veracruz, and compares them to people's perceptions of climatic stressors and changes to climate variability patterns. In this context, the chapter shows the differences between measured climatic variability in the past and people's perceptions of this variability.

5.1 The researched village communities

As mentioned in the previous chapter, to better illustrate the factors involved in the relationship between different forms of migration and climate change four village communities were selected for fieldwork, two in Zacatecas and two in Veracruz. The following sections present these communities in detail and describe the socio-economic conditions in each village.

5.1.1 Zacatecas

The first village in Zacatecas is called Laguna Seca and is situated in the municipality of Pánuco. The majority of people in Laguna Seca depend on some form of agriculture for their livelihood. The three dominant forms of agriculture, in which people in Laguna Seca are involved in, are rain-fed agriculture, which is mostly used for subsistence, irrigated commercial agriculture, and greenhouses, in which cash crops are produced. Some greenhouses are owned by local large scale farmers, while others are owned by international companies which export crops. These forms of land use reflect the legal distribution of the land.

The majority of the families living in Laguna Seca are allowed to farm their share of the ‘ejido’,[15] the communally owned land, which is about 5 hectares per family. As in most parts of Mexico, land was confiscated from rich hacienda owners after the revolution in 1910 and distributed among the village communities in the neighbourhood in the form of ‘ejidos’. Many village communities, including Laguna Seca then equally distributed the available land among the resident families. Yet, the current distribution of land is not that equal anymore for several reasons. Families, that came to live in the village after the land was distributed, do not have the right to farm land. 'Ejido' land is inherited to the next generation and, according to Mexican agrarian law, the use rights are not supposed to be divided but to be transferred to only one heir. Landholders are allowed to choose an heir within the family, which might be their partner or one of their children (Nuijten 2003). Yet, as Nuijten (2003) shows, communities developed their proper application of ‘ejido’ law, so that plots are often divided among descendants. This is also the case in Laguna Seca, where people were ambiguous about the question if daughters could inherit ‘ejido’ land. While some village dwellers said that this is the case, others thought that it is only sons who can make use of that right.

Customary law in Laguna Seca thus entails that plots are getting smaller when they are passed from one generation to the next and that people who have got more siblings will inherit a smaller share of land to farm. Also, young people whose parents are still alive usually do not own land, although they work in the fields of their fathers or fathers in law. Since 1991, selling and letting of plots of 'ejido' land is allowed. Therefore, part of the land around Laguna Seca is owned by local large scale farmers and external investors who produce a variety of cash crops, such as beans, maize, potatoes, tomatoes, onions, garlic, and cauliflower. Crops produced in subsistence agriculture are less varied and often limited to beans, maize, and

[15] In the 1917 Constitution of the Republic of Mexico, large land holdings and haciendas were abolished and the landowners were expropriated. The land was given to a group of people, usually the inhabitants of a village or of several villages. After some time, many communities decided to divide the land into allotments, giving a piece of land to every head of family. These allotments stayed in the families as they were inherited to the children. According to the wishes of the parents all the land could go to one child or the land could be divided amongst the children. A change in the law in 1992 allowed selling the allotments, which were by then de facto privatized again.

sometimes some chilli. Yet, fieldwork showed that many people do not farm their plot anymore because they do not consider it productive. The circumstances of this perceived decrease in productivity of subsistence agriculture will be analysed in detail in the following chapters.

Because employment opportunities are scarce, the majority of the village dwellers are working in commercial farming. Both men and women and in some cases also children, are employed as day labourers without an official contract. This means that they do not possess any rights regarding pension or insurance derived from their work. Another major problem with this type of work is the fact that it is usually only available between the end of February and October. People earn between 100 and 120 Mexican Pesos per day, which is more than twice the 2011 general minimum salary for Zacatecas of 56.7 Mexican Pesos[16] but still difficult to make a living on. The situation is aggravated by the fact that most people do not work every day, and in the winter there is no work available at all in commercial farming. About 40 village dwellers work in a brewery in Calera, a small town near Laguna Seca. Transportation to and from the factory is provided by the company and takes about half an hour one way. People working in the brewery are considered lucky because they earn 200 Mexican Pesos per day, receive an annual premium of 5,000 Mexican Pesos, and benefit from paid holidays and health insurance. Furthermore, there is work available all year round. Fieldwork showed that the brewery is the only company, which is formally employing village dwellers, although there are some more bottling plants and small factories based in the vicinity. Some men make use of temporary employment opportunities during periods of road construction near the village.

As opposed to the three other researched villages, many female interviewees in Laguna Seca said that they were working for a salary. On average less than 38% of all employees in Mexico are women (INEGI 2004). Fieldwork suggested that this rate might be considerably lower in rural communities. The relatively high female

[16] http://www.conasami.gob.mx/pdf/tabla_salarios_minimos/2011/01_01_2011.pdf

labour market participation in Laguna Seca might to some extent be explained by the fact that it is often the only option to generate a family income, as men are not accepted in some jobs. Close to Laguna Seca, there is a clothes factory, which employs only women. Salaries are considerably lower than for men in the region, as the female workers are paid 500 Mexican Pesos per week, for 6 days of work. Yet, women who work in commercial farming report that they earn about the same as their male co-workers. Some women commute daily to the city of Zacatecas, which takes about one hour and costs 40 Mexican Pesos for a return ticket. These women work as maids in the houses of the middle class urban population. Their salaries can amount to up to 1,000 Mexican Pesos for five or six days of work, depending on the family that employs them.

The second village community in Zacatecas consists of the three communities El Tigre, El Nuevo Tigre and Ojo de Agua del Tigre in the municipality of Villanueva. El Tigre was a hacienda until the 1940s, when the land became 'ejido' land as in Laguna Seca. In Nuevo Tigre and Ojo de Agua del Tigre, the struggle for land to construct houses and to farm continued until the 1970s. Nowadays, all three villages are 'ejidos'. Agriculture is not as important for people's livelihoods in El Tigre[17] as it is for people in Laguna Seca. Cattle raising is used as a form of generating income by some families, whose socio-economic status is often above the average in the communities. In general, measured by the material circumstances in which most people live, the socio-economic status in El Tigre is higher than in Laguna Seca. In El Tigre houses are mainly built of brick with a brick roof, while houses in Laguna Seca are often made of adobe with corrugated metal sheets as a roof. Also, while in Laguna Seca many houses have got dirt floors, floors in most houses in El Tigre are tiled. Also, the furniture and the electric appliances in many cases hint to relatively higher affluence in El Tigre as compared to Laguna Seca. As many people in El Tigre explained, they constructed and furnished their houses bit by bit with the remittances they received or earned themselves over the years.

[17] From here on 'El Tigre' refers to 'El Tigre', 'El Nuevo Tigre' and 'Ojo de Agua del Tigre'.

The only form of agriculture that is made use of in and around El Tigre is rain-fed subsistence agriculture. The few irrigation systems which exist are not used because equipment and electricity needed to operate and to maintain them are too expensive for the farmers. Like in Laguna Seca, older men are most likely to own land and farm it, while mainly young men between the age of 15 and 35 migrate. This means that farmers and migrants do not belong to the same demographic group of people. The usual stages in the life cycle of male village dwellers are childhood and adolescence followed by several trips to work in the USA until they consider themselves too old to migrate and take over the farming of the land they inherited. This is an important aspect that has to be considered when analysing the relationship between the decline of agricultural productivity and migration. Although usually in El Tigre, and likely in most Mexican villages, parts of the harvests are shared within extended families, a decline in agricultural productivity most often does not directly affect the core family of the potential migrant.

Subsistence farmers in El Tigre mainly farm maize and some beans, although, for the same reasons as in Laguna Seca, harvests in general have been declining over the last years. Some people, therefore, stopped farming and either tried to sell or rent their plot or let it lie fallow. Yet, others continue farming for several reasons. Current research in other parts of Mexico shows that often those who continue farming under adverse circumstances do not depend on agriculture for their livelihoods, while those who live off their farmland are more likely to discontinue farming when harvests decline[18]. Explanations for this phenomenon are linked to the different perceptions of the role that farming plays in people's lives. Those who do not depend on farming for a living do not have much to lose if they continue farming. They can invest as little as possible and see what they get out of their effort. In some cases, when the main source of income is remittances, such as in El Tigre, farmers do not have any alternative occupation. One of the major differences between Laguna Seca and El Tigre is that in Laguna Seca many people depend on agriculture for their livelihoods, while in El Tigre this is not the

[18] Appendini – personal communication, 9 March 2011

case. In Laguna Seca, people discontinue farming their own fields in order to have more time and energy to invest into working in commercial farming because the anticipated return is likely to be higher. In and around El Tigre there is no commercial farming and commuting to the nearest fields is not considered worthwhile, because people think that the available jobs would be assigned to the people coming from the villages nearby. The few jobs that might become seasonally available in road construction close to El Tigre would be taken by young village dwellers who do not possess any farmland yet. Thus the opportunity costs of farming are low for those who hold the right to a plot of the 'ejido' land. Furthermore, fieldwork shows that many people feel attached to their land and do not want to see it abandoned. One farmer, who was 62 at the time of the interview, answered the question why he continued farming under the precarious circumstances he had previously described by saying: "because it is my land".

5.1.2 Veracruz

The first village which was selected as a research setting is Cascajal del Río in the municipality of Acayucan, in the south of Veracruz. The village is only accessible via a dirt road, and although it is situated only a few kilometres away from the capital of the municipality, the bus ride usually takes more than one hour. Village dwellers think that the bad road connection to Acayucan is a major hindrance restricting access to employment opportunities and to secondary schools in the town. Therefore, agriculture as well as cattle raising close to the village is very important for many people's livelihoods. Cascajal del Río, like the two research settings in Zacatecas is an 'ejido'. After three decades of communal management, it was divided into plots in 1973. Every family which lived in Cascajal del Río at the time, received two pieces of land, one close to the river and one further away from the river, to ensure an equal distribution of soil quality but also of the flood risk. Yet, nowadays, after many plots were passed on to the next generation and some plots were sold, the distribution of land is not that equal anymore. Several families own larger plots of land, on which they farm mainly sugar cane as a cash crop. Cattle raising is an important source of income, although very few people own cattle, and

if they do they only possess two or three cows. The majority of people take care of the animals of large scale cattle-breeders in return for the right to sell the milk and to keep one of the calves every year. Selling milk for industrial processing is thus one of the major sources of income for poor people in Cascajal del Río. Some subsistence farming is also done although, like in Zacatecas, it is in decline. The main crop, which is farmed, is maize, followed by beans and chilies. Depending on the time of the year, fishing and foraging for subsistence is used to complement the diets of people willing to spend their time on these activities.

The socio-economic level of Cascajal del Río is average in comparison to other rural communities in the region. Many houses are built of natural material such as adobe for the walls and palm leaves for the roof. While some people said that they do not have the resources to buy construction material, others indicated that they prefer the traditional houses because it is cooler inside. During the time of fieldwork, the last houses of the community were connected to the electricity network so that each house now has got access to electricity. Tap water is available but not every household is connected yet, the major source of freshwater are wells, while the river is still used for washing the laundry by the poorer inhabitants. On the other hand, several households own automatic washing machines. Different socio-economic levels can thus be observed in the village. Remittances from international migration, which started in the early 1990s, have led to a change in demographic and socio-economic structures in the village. While the number of inhabitants is decreasing and the average age is rising because mainly young people and families leave, some of the traditional houses made of adobe were replaced by larger brick houses built by people who brought or sent remittances to their home village.

Cascajal del Río was severely affected by hurricane Stan in October 2005. Parts of the street that connect the village with Acayucan had been completely destroyed so that access to the town was impossible for several weeks. Many houses were also completely or partially destroyed, mainly the roofs made of palm leaves were

blown away. The river San Juan, which is normally about 50 metres away from the nearest houses, flooded half of the village. Village dwellers keep a very strong memory of that event and many are traumatized and fear that another hurricane might destroy their house again. Yet, they are also thinking in a very practical way about the consequences, focusing on rebuilding their houses and on re-establishing the infrastructure in the village.

The second selected research community in Veracruz is Nuevo Renacimiento in the municipality of Gutierrez Zamora. As mentioned in the previous chapter, Nuevo Renacimiento is the result of the resettlement of seven village communities after the big flood of the river Tecolutla in 1999. This flood, caused by heavy rainfalls in combination with mistakes in water management, was much stronger than the inundations that often occur in this region. It washed away whole villages, destroyed the farmland and the orange plantations in the region and killed almost all livestock. Official statistics do not exist but, according to people who survived the disaster, hundreds of people who lived in the villages close to the river as well as in the town of Gutierrez Zamora drowned in the flood.

For those who lost their houses and their belongings in the flood, the government of the state of Veracruz offered to construct 240 houses, for which people in the affected villages were entitled to apply. Houses include two bedrooms, a toilet and a space for washing, a kitchen and a small piece of land around the house to sit outside and to do some gardening. In return, people are officially not allowed anymore to return and to farm their traditional ‘ejido’ plots because the land is now owned by the government. Yet, in practice in many cases this rule is not followed, and many people still visit their land. Nevertheless, in general people said that they could not farm their land anymore as they did in the past, because they cannot access it easily anymore. The distance between Nuevo Renacimiento and the communities of origin of its inhabitants is only a few kilometres. Yet, public transportation into the communities often does not exist or is very unreliable, so

that people either have to walk for hours or pay one of the few people who own a car in Nuevo Renacimiento to drive them there.

Interviews in this research setting were not only conducted in Nuevo Renacimiento but also in the origin communities. Several families still live in the villages because they did not want to leave their land or because they did not receive a new house in the resettled community. Fieldwork thus allowed insights into the question how people coped with the situation of losing their complete livelihood after a disaster, why some did not want to leave their land and others did. Furthermore, the region was touched by the hurricanes Dean and Lorenzo in 2007. Thus, people in a resettled community again lost part of their livelihoods. Yet, unlike people in Cascajal del Río, people in Nuevo Renacimiento in general were not very impressed by the hurricanes. They said that some roofs were blown away, which they repaired but that most of the damage occurred in agriculture.

Although, most of the resettled people cannot farm their land anymore, agriculture remains an important factor for people's livelihoods. Most employment is available in commercial agriculture, although most jobs are limited to the planting and harvesting periods of vegetables or to the orange harvest twice a year. Oranges and other citrus fruits are the major crops farmed around Nuevo Renacimiento. People who remained in their villages still continue farming although they are aware of the threat of losing their investment, should the river Tecolutla rise and flood their land. The phenomenon that people voluntarily stopped farming their land is less common in the villages around Nuevo Renacimiento than it is in Cascajal del Río or in the studied communities in Zacatecas. This is because those who did not want to leave their home villages after the 1999 flood took this decision mainly because they did not want to abandon their land.

Nuevo Renacimiento was also chosen as a research setting because outmigration rates are high. Like in Cascajal del Río, mainly young people, both male and female, leave the village after they finish secondary school. Also like in Cascajal

del Río, destinations of migrants are diverse, including cities within the state of Veracruz and within Mexico, border cities in the north of Mexico as well as the USA. Unlike in Cascajal del Río, legal international migration based on recruitment for temporary employment in the USA or in Canada is an important form of migration. Recruiters have been looking for workers in Nuevo Renacimiento for several years and often contract the same people every time they visit the community. The fact that recruiters come to Nuevo Renacimiento and not to Cascajal del Río is likely to be related to the easy accessibility of the former. Nuevo Renacimiento lies in walking distance from Gutierrez Zamora or can be reached by car in a few minutes from there via a paved road.

5.2 Climate change and climate change perceptions

The previous sections introduced the research settings in more detail, while the previous chapter already explained why Mexico, Zacatecas and Veracruz, as well as the studied villages in the two states were selected. The presentations of the village communities included some information on the major climate related stressors and how these are affecting people's livelihoods, which will be analysed in more detail in the remainder of the chapter. After a short summary of the predicted effects of climate change in Mexico follows an analysis of how and to what extent observed climate data are congruent with people's perceptions of climatic variability. This section also presents people's perceptions of the linkages between climatic stressors, impacts on their livelihoods, and their migration decisions.

5.2.1 Predicted climate change for Mexico

Climatic stressors in Mexico are mainly related to precipitation extremes including meteorological droughts as well as heavy rainfalls leading to floods. Droughts most severely affect the north, west, and centre of the country in which a semi-arid and arid climate dominates. However, also in the southern states droughts have been observed during the previous years. One of the most severe droughts in Mexico occurred in 1997/1998 and caused tremendous losses for farmers (Magaña et al.

2007). Of similar impact was the 2005/2006 drought, which the Mexican media at that time called the worst drought since 50 years and which affected about 500,000 people in Zacatecas alone[19]. However, 2007, 2009, and 2010 were also years of severe droughts, especially in the north of Mexico. In general, over the last decade, more years than average were classified as drought years in many parts of Mexico (Seager et al. 2009).

This accumulation of droughts affecting Mexican agriculture is linked to changes to the distribution of precipitation over the year. A World Bank paper on the future of climate change in Latin America and the Caribbean demonstrates how climate change is likely to lead to anomalies in both summer and winter precipitation over Mexico (Vergara et al. 2007). Furthermore, the increasing number of drought years seems to be closely linked to recent occurrences of El Niño Southern Oscillation (ENSO). Looking into different effects of ENSO on precipitation at different times of the year, it seems that during the winter El Niño leads to more rainfall in northern Mexico, while southern Mexico becomes drier. However, although during El Niño years winters in the northern and central parts of Mexico are wetter than on average, precipitation in the summer months, when rainfall is needed for farming, tends to be below average. Ruiz Barradas and Tejeda Martínez (2008) observe for the state of Veracruz that, while during El Niño events annual precipitation actually increases over most of the state, El Niño can also lead to multiannual droughts. This seemingly contradictory observation can again be explained by the annual distribution of rainfall mentioned above. La Niña, on the other hand, in combination with a warm subtropical north Atlantic, decreases precipitation over northern Mexico and increases it in the south (Seager et al. 2009). Furthermore, La Niña years are associated with an increase in North Atlantic Hurricane activity[20].

Scientific evidence about a potential increase or decrease of the frequency of tropical storms and hurricanes under future climate change scenarios is not

[19] See http://www.jornada.unam.mx/2005/11/10/042n1est.php
[20] http://www.magazine.noaa.gov/stories/mag184.htm

conclusive. While the 2007 IPCC report does not find a clear trend in the annual occurrence of tropical cyclones (Parry et al. 2007), the Pew Center on Global Climate change observes an increase in the frequency of tropical storms and major hurricanes for the period between 1998 to 2007, as compared to the period between 1850 to 1990. They attribute this development to a rise in the North Atlantic Sea Surface temperature, which in turn has been linked to climate change in recent studies. However, fewer hurricanes tend to occur over the Gulf of Mexico during El Niño years and La Niña causes the opposite effect. There seems to be more scientific agreement about the fact that future hurricanes will be more intense, including both an increase in wind speed and precipitation associated with the storm. Again this development is linked to increasing North Atlantic Sea Surface temperatures[21].

In 2008, the government of the state of Veracruz initiated a research project (Programa Veracruzano ante el Cambio Climático - PVCC[22]) with the aim of summarizing existing climate change scenarios for Veracruz, and to understand how climate change is likely to affect the economy, different ecosystems, human health, as well as people's livelihoods in the state. Palma Grayeb et al. (2008) modelled temperature and precipitation changes under different emission scenarios for the state of Veracruz. While their models in general suggest that yearly rainfall is most likely to decrease rather than increase over most of the state, there is a lot of uncertainty as far as the amount of the decrease in rainfall and the change of temperatures is concerned. Palma Grayeb et al. (2008) also stress that the outcome of future climate change related changes to the hurricane activity in the Gulf of Mexico is very uncertain.

5.2.2 Local climate stressors and people's perceptions

In the summer of 2010, several extreme climatic events occurred simultaneously in Mexico. While a drought between July and September destroyed much of the

[21] See http://www.pewclimate.org/hurricanes.cfm
[22] See http://portal.veracruz.gob.mx/portal/page?_pageid=1945,4435384 &_dad=portal&_schema=PORTAL

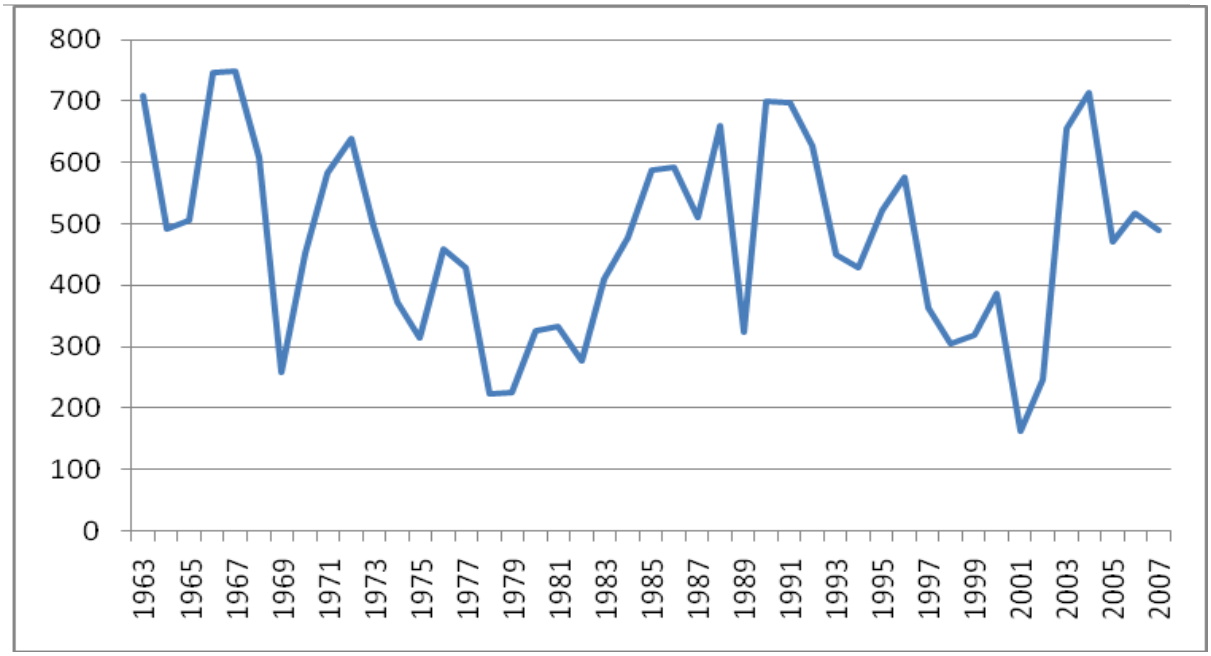
maize harvest in Zacatecas and in other states of the centre, west and north of the country, heavy rainfalls and several hurricanes flooded large parts mainly of Veracruz but also parts of the states of Tabasco, Oaxaca, and Chiapas. At the end of September 2010 the Mexican Ministry of Agriculture announced that 80,000 ha of land were affected by the inundations induced by hurricane Karl which made landfall in Veracruz on 18 September 2010. In comparison, the 2009 drought in the north and centre of Mexico destroyed more than one million hectare of farmland, while results for the 2010 drought were not available at that time (SAGARPA 2010). Obviously, while droughts affect more agricultural land and are a threat for cattle as well, hurricanes and floods affect people's livelihoods more severely because in addition to agriculture and cattle, they also destroy houses and other belongings, depriving many people from the option of finding alternative livelihood strategies when they cannot live off agriculture anymore. The impact of different extreme climatic events on agricultural productivity can thus have different consequences for people's livelihoods. Furthermore, the same event can have different effects on people's livelihoods in different regions. While the production of sugar cane in Veracruz suffered a lot from the consequences of the hurricane and the subsequent floods, sugar cane production in other states with more favourable weather conditions such as Jalisco, Sinaloa and Nayarit was very profitable. Therefore, at a national level sugar cane production increased as compared to the previous year (SAGARPA 2010).

In the context of the PVCC, the effects of climate change on agriculture in Veracruz were analysed using the examples of maize and oranges. The authors found that areas in which cultivation of maize is possible are likely to decrease in size in those regions in which annual precipitation is projected to increase. However, in regions where a decrease of annual rainfall is projected, some areas are likely to shift from the category 'not adequate' to the category 'medium adequate' for maize cultivation. These changes are likely to mainly affect the autumn and winter agricultural cycle, while fewer effects are expected for the spring and summer agricultural cycle. Projected temperature increases are unlikely to affect the

farming of maize because the plant can grow at temperatures between 20°C and 30°C. To the contrary, the decrease of adequate areas for the cultivation of oranges is mainly linked to projected rising temperatures and less to changes of precipitation patterns. These effects are most likely to mainly occur in the centre and in the south of the state (Palma Grayeb et al. 2008).

Environmental stressors were also noticed by many people in the researched communities. In Zacatecas, all respondents who were asked about the climate said that they noticed a change, that it had become drier and that annual patterns of precipitation and temperatures had changed over the last decades. Statistics also show that the most important local climate stressor in El Tigre is the permanent lack of rainfall.

Figure 5.1: Yearly rainfall (in mm) for the Estación Climatológica Villanueva



Source: Author, rainfall data provided by the Departamento de Hidrometeorología, Guadalupe, Zacatecas

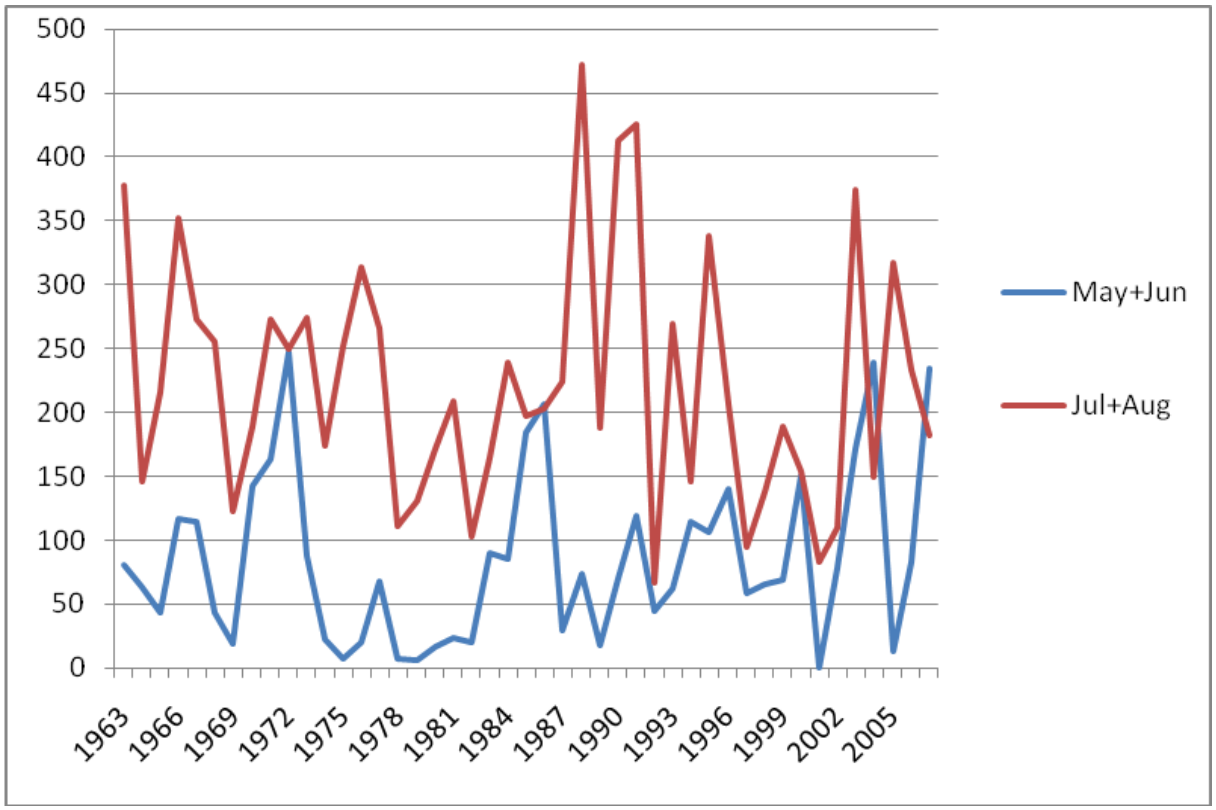
Figure 5.1 shows the development of yearly rainfall (in mm) between 1963 and 2007 in the municipality of Villanueva, which is the closest meteorological station at about 10 km to the south-east of El Tigre. The graph shows a high variability

without a clear tendency of increasing or decreasing rainfall over the last 45 years. Yet, according to people's perceptions, annual rainfall has decreased over the last two to three decades. These perceptions could to some extent be explained by the fact that people refer to the relative high amounts of annual precipitation in the second half of the 1980s and the first half of the 1990s (except for 1989) and take these levels as the "normal" situation. With the exemption of the peaks in 2003 and 2004, the annual amount of rainfall between 1995 and 2005 was lower than between 1985 and 1995.

However, the fact that people think that the annual amount of rainfall has decreased over the last two decades could also be attributed to a change in the annual distribution of rainfall. While people say that the annual rainy season normally starts in May or June, rainfall tends to come later in the year, in July or August, in recent years. These observations correspond to what interviewees said in Alscher's (2009) study into the effects of climate change on migration in Western Tlaxcala. The seasonal distribution of rainfall is important for two reasons. First, as yields have to be harvested before the cold period starts in October or November; rainfall for farming is needed in June at the latest for the agricultural cycle to be completed before October. Second, water holes for cattle usually dry out in May or June so that rain is needed to fill them again.

Figure 5.2 shows the sum of annual rainfall for May and June as compared to the sum of annual rainfall for July and August. As opposed to people's perceptions, in most years it rained more in July and August than in May and June. However, since the end of the 1990s the variability of rainfall in May and June, the crucial months for agricultural activities, has increased, including some years of very high levels of precipitation but also several years of rainfall below 50 mm. People in El Tigre thus notice the climatic variability that is affecting their livelihoods, in this case the rainfall patterns in May and June, and assign these changes to a general decline in precipitation.

Figure 5.2: Comparison annual rainfall May/June and July/August (in mm) for the Estación Climatológica Villanueva



Source: Author, rainfall data provided by the Departamento de Hidrometeorología, Guadalupe, Zacatecas

Like in El Tigre, in Veracruz, different perceptions of climate stressors also tend to depend on the degree to which people's livelihoods are affected by these stressors. In the two communities in Veracruz about half of the respondents noticed a rise in the frequency of floods and hurricanes and in annual rainfall patterns while the other half have not noticed any climate related changes. Fieldwork in Cascajal del Río showed that in general those who are directly affected by floods - people living close to the river or farmers whose fields are on the bank of the river -, think that the regular floods of the river have become more frequent and more severe. However, those who live further away from the river and do not own land close to it, mainly think that floods have always occurred and that they are just stronger in some years than in others.

There was greater consensus among interviewees regarding the question how environmental stressors affect their livelihoods and their migration decisions. People in the researched communities often perceive environmental stressors as stressors to their livelihoods. Yet, in general, they do not think that environmental stressors affect their migration decisions. Only one interviewee out of all in the four communities directly linked his future intentions to migrate to an environmental problem. He had lost his complete harvest after the flood of the river San Juan in Cascajal del Río in September 2008.

> "I will go and look for work somewhere, now the maize is all gone. Maybe just go and come back soon. We will try and farm maize again next year. If another flood comes, we cannot live here anymore. Then I have to leave. "
> "Where will you go?"
> "My brother lives in New York, another brother lives in Monterrey. It depends… the jobs, the money. But not Veracruz, my brother just lost his job there."
> "Will you go alone?"
> "I cannot take them[23]. How? The food, the rent, the electricity, I need to pay everything. For all? How?"
> (Roberto, 25 October 2008 – translation author)

In both studied communities in Zacatecas, people said that droughts did not affect migration decisions in any form. They said, similar to the tenor found in the Mexican migration literature, which will be analysed in the next chapter, that migration was driven by economic necessity but that nobody migrated because of failed harvests as a consequence of dry weather. This perception might to some extent be explained by the fact mentioned above, that farmers and migrants belong to different groups of people. Agriculture seems less important to potential migrants than employment opportunities. Nevertheless, many interviewees considered climatic stressors and failed harvests a threat to their livelihoods. Yet, they do not link these livelihood stressors related to environmental problems to their migration decisions.

[23] He is referring to his wife and his 3 year old grandson as well as to his parents. He had explained earlier in the interview that he feels responsible for taking care of his parents because he is the only son still staying in the village.

Perceptions in the researched villages in Veracruz are very similar. People who became displaced after the 1999 flood of the river Tecolutla in Gutierrez Zamora almost all returned to their villages or resettled in the new community Nuevo Renacimiento. Interviewees did not remember that anybody had left the region because of the flood. Again, this perception does not exclude the possibility that people migrated because of some indirect consequence of the flood, which was perceived as an economic livelihood stressor.

Meanwhile, according to the interviewees, the main reason for people not leaving was the lack of networks in other parts of the country or abroad. Also, it was stated that people did not have any money to leave and that they did not know where they should go. Similarly, interviewed people in both communities in Veracruz do not think that hurricanes are affecting their own or other people's migration decisions. Nuevo Renacimiento and the surrounding villages were affected by hurricanes Dean and Lorenzo in 2007 and Cascajal del Río by hurricane Stan in 2005. Many houses and the harvests of people who own land were destroyed. Rebuilding the houses and the infrastructure of the village was considered the most important priority after the hurricane in both communities. Also here, outmigration was not linked to any environmental stressors but to economic motives. One woman said when asked about the relationship between the hurricanes and outmigration from the village:

> "Many young people are leaving but not because of the hurricanes. It is because they cannot live here. There is no work here."
> "How did the hurricanes affect you?"
> "It was scary. When it is raining I still cannot sleep. First the flood and then the hurricanes."
> "Have you ever thought about leaving the region?"
> "No, where would I go? The children are going to school, I don't want them to drop out. Maybe once they will be older. Who knows, we might leave. But for the five of us we cannot afford it."
> (Asunción, 26 February 2009 – translation author)

5.3 Chapter conclusion

The first part of this chapter analysed in detail the livelihood situation of the four studied village communities in Zacatecas and Veracruz after the previous chapter had already explained why they were selected for fieldwork. By stressing the most important and distinctive characteristics of these villages, it showed the complexity of different natural, political, socio-economic and cultural structures. By this means, the chapter empirically supported the idea of the non-linearity of environment-migration linkages, which was theoretically elaborated in the previous chapter. The previous chapter had already suggested that the effects of climate stressors on people's livelihoods as well as migration decisions are complex processes by themselves. The nexus between those processes is likely to be even more complex.

This chapter also demonstrated that people's perceptions of climatic variability and of recent changes to the climate are not necessarily congruent with data retrieved from climatic monitoring. Often, people only observe changes which directly affect their livelihoods. Examples are the perceived decrease of rainfall during the time when rain is needed for farming in Zacatecas, as well as the different perceptions of an increased frequency and intensity of floods, depending on people's proximity to the river in the two communities in Veracruz. People's perceptions of a changing climate thus seem to be crucial for understanding their adaptation strategies. Grothmann and Patt (2005) stressed the importance of risk perception and perceived adaptive capacity. They developed a model of private proactive adaptation to climate change (MPPACC) around these two factors. This model demonstrates the importance of understanding the psychological component of climate change adaptation, which has so far received little attention. People's perceptions of their adaptive capacity, and of the risks they are exposed to, are also important for a holistic understanding of the nexus between climate change and migration. Empirical evidence, to be presented in chapter 7.1, has shown the importance of perceptions and human agency related to the question if livelihood stressors translate into migration decisions or not.

Another interesting result, derived from the second part of this chapter, is the fact that most people say that climate stressors are affecting their livelihoods but that almost nobody considers climate stressors a driver of migration. In combination with the fact that environmental perceptions do not always mirror realities, it becomes questionable if affected people always consciously consider the complexity of their decision-making processes. It has to be acknowledged that people's actions depend on people's perceptions, so that perceptions might be more important than reality itself for decision-making. Yet, research into environment-migration linkages, which only considers people's perceptions, such as the study by Mortreux and Barnett (2009) for Tuvalu, seems to miss the point that environmental stressors might in turn affect the motives that people indicate they are migrating for. Again, these ideas had already been theoretically considered in the previous chapter. This chapter put them into a practical context in the research settings in Mexico. Thereby it created the basis for the empirical analysis of migration decisions and their sensitivity to climate change, which will be presented in the next three chapters.

Chapter 6: Migration and its drivers in Mexico

Chapters 3 and 4 presented the conceptual and methodological approach of this thesis, which consists of two steps, 1) analysing the potential drivers of migration and the factors that are involved in migration decisions with respect to the destination and to the form of migration, and 2) testing these potential drivers of migration as well as other factors involved in migration decisions for their sensitivity to climate change. This chapter as well as chapter 7 are concerned with the analysis of the factors that are involved in migration decisions, based on the empirical data obtained during fieldwork in Zacatecas and Veracruz, the two Mexican states in which fieldwork was set and which were presented in the previous chapter. After the analysis of migration flows in and from rural Mexico, chapter 8 will then focus on the climate sensitivity of these different migration flows.

This chapter starts with an overview of migration patterns in Mexico, and more specifically in Zacatecas and Veracruz and in the researched communities. After this introduction to the history, development, and forms of current migration in Mexico, a synopsis follows of key explanations of migration in the Mexican context as they are presented in the migration literature. These are then compared to the drivers of migration that have been identified during fieldwork in the four researched communities.

6.1 Migration patterns in Mexico

Migration from Mexico to the USA has a long history, at least in some parts of the country. After the revolution that ended the 'Porfiriato'[24] in 1910, the economic and political climate in the country stimulated migration to the United States. Moving north had been facilitated by the construction of a railway network that connected major cities between the capital and the US border states of California, Arizona and Texas (Sánchez 1993, Canales 2003). The industrialisation of agriculture, particularly in the south-west of the USA, created the need for a large workforce and led to the installation of the 'Bracero'-programme in 1942. This guest worker

[24] The regime of the dictator Porfirio Diaz from 1876 to 1910 (Sánchez 1993)

agreement between the USA and Mexico allowed Mexican nationals to temporarily live and work in the USA. The programme officially came to an end in 1964, but the dependence of the US-American agro- and construction industry on cheap Mexican labour has survived (Sánchez 1993). Nowadays, most border crossings of labour migrants between Mexico and the USA are illegal. However, in many parts of Mexico, recruiters are still looking for workers who want to legally work in the USA for several months. Ten years after the end of the guest worker agreement between the USA and Mexico, Canada established in 1974 a temporary migrant workers scheme, which has yearly recruited Mexican workers until today (Verduzco Igartúa 2007). In 2004, almost half of Mexico-born migrants in the United States originated from the traditional migrant sending states in the Central Western part of the country: Aguascalientes, Colima, Durango, Guanajuato, Jalisco, Michoacán, Nayarit, San Luis Potosi, and Zacatecas[25]. In these states, migration has been a livelihood strategy for generations (Kandel and Massey 2002). In contrast, the southern and south eastern states of Guerrero, Puebla, Veracruz, Oaxaca, and Chiapas only started to send migrants to the USA much more recently.

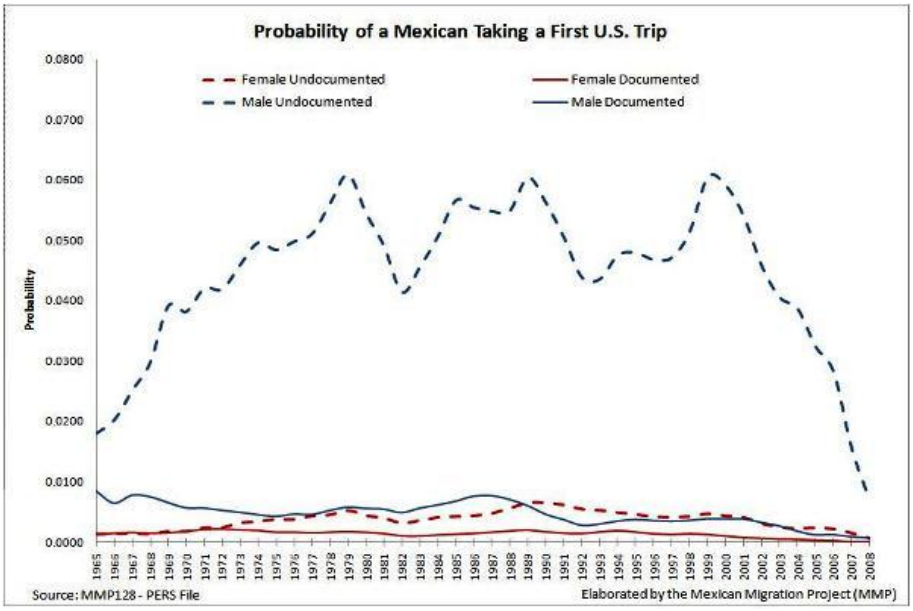
According to Massey et al. (2005) migration from Mexico to the USA is by far the largest flow in the North American migration system. As most of these border crossings are illegal, the exact number of Mexicans entering the USA is unclear, and estimates provided in different reports vary substantially. The OECD International Migration Outlook 2007 identified Mexico as the country with the second largest number of international migrants after China. According to the report (OECD 2007), Mexican out-migration decreased from 175,000 to 164,000 people between 2000 and 2005 but it is still larger than of countries such as the Philippines or India. The OECD International Migration Outlook 2008, however, estimates that about 315,000 people per year migrate illegally into the USA (OECD 2008).

[25] Mexico-US migration started after the revolution in 1910 and boomed again during the guestworker agreement *Programa Bracero* between 1942 and 1964 (Sánchez 1993).

The UN International Migration Report 2006 states a net out-migration rate of 400,000 people per annum for Mexico (UN 2006). In July 2009, the Pew Hispanic Centre published a report based on Mexican and US immigration data and border apprehension statistics. It states that migration from Mexico to the USA began to decrease in the mid-2000s and that this decrease has continued until 2009. Between March 2008 and March 2009, an estimated 175,000 people migrated from Mexico into the USA, which is the lowest number in this decade and only about half of the average of the previous two years (Passel and Cohn 2009).

As figure 6.1, based on data by the Mexican Migration Project (MMP)[26], shows, the probability of a Mexican taking a first trip to the USA decreased for both female and male documented and undocumented migration from the beginning of the 21st century on. Furthermore the graph shows the significantly higher importance of male as compared to female migration. Also, it shows the significant dominance of illegal over legal migration from Mexico into the USA.

Figure 6.1: Probability of a Mexican taking a first US trip



Source: Mexican Migration Project (MMP)[27]

[26] http://mmp.opr.princeton.edu
[27] http://mmp.opr.princeton.edu/results/009firsttrip-en.aspx

Although it has received less academic and policy attention than international migration, internal migration in Mexico is also a very important phenomenon, which is diverse regarding the destinations and the motives for the moves. Escobar Latapí (1997) points out that in the 1980s international migration gained importance in comparison to internal migration. However, in 1990 still 77.6% of the Mexican population that lived outside their state of birth lived in another Mexican state as opposed to the remaining 22.4% living abroad (Escobar Latapí 1997). There are different forms of internal migration motivated by various life situations and involving different groups of people. Fieldwork showed that mainly better off families move from rural communities to nearby towns or cities to offer their children a better formal education. Sometimes older children and adolescents are sent from rural communities to relatives living in urban areas to attend school or university. Furthermore, it is very common that women move from one rural community to a town or to a neighbouring rural community to join the family of their husbands after marriage.

Next to these family related moves, internal migration in Mexico is also often motivated by the search of employment opportunities. There are a number of different destinations for single migrants or families from rural communities who move internally in search of work. The role of the capital as a destination for internal migrants in Mexico has been changing over the last decades. After the Second World War, Mexico City attracted many residents of rural areas because of its fast economic development, while the last two decades of the twentieth century brought a change to this pattern. According to data provided by the Mexican Statistics Institute (INEGI) and analysed by Izazola (2006), in the 1980s more people moved away from Mexico City than moved to the capital from other Mexican states. This was a consequence of the social, economic, political and environmental problems of Mexico City. However, at the end of the 1990s, after living conditions in the city had improved to some extent and the economic crisis had weakened the Mexican periphery, Mexico City became a more frequent destination for migrants from rural parts of Mexico again (Izazola 2006).

Other metropolitan areas in Mexico such as Monterrey and Guadalajara also attract labour migrants. Many migrants also move to the border cities to work in the 'maquiladora'[28] industries, some of them cross the border into the USA at a later stage. As the majority of village dwellers in rural communities are accustomed to agricultural labour, many of them also move to regions in which they can work in commercial agriculture such as the state of Sonora in the North of Mexico.

6.1.1 Zacatecas

Zacatecas is a classic example of a Mexican state dominated by migration. The first migrants were contracted by the USA to build railways and to work in agriculture and mining more than a century ago. During the 'Bracero' Programme from 1942 to 1964, more than 4.5 million Mexicans worked in the USA. Most of them originated from the four states of Jalisco, Michoacán, Guanajuato and Zacatecas (Massey et al. 1987). Nowadays, Zacatecas is still one of the most important international migrant sending states in Mexico. According to the 2000 Mexican census, 4.9% of the population in Zacatecas migrated to the USA, which is the highest rate of all states and far above the Mexican average rate of 1.6 percent[29]. Data presented in Table 6.1 indicate that after a decrease of migrants between 1995 and 2001, migration from Zacatecas to the USA increased again between 2002 and 2008, almost reaching the numbers of 1995.

Table 6.1: Flow of migrants from the state of Zacatecas into the USA by year (in 1,000)

1995	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
25.5	20.4	16.0	12.0	18.7	17.8	17.8	19.7	24.4	22.3	24.2

Source: Data elaborated by the USEG of 'El Colegio de la Frontera Norte' based on the longitudinal study 'Encuesta sobre Migración en la Frontera Norte de México'. SEGOB: INAMI and CONAPO, STPS, SRE and El Colegio de la Frontera Norte[30]

[28] Maquiladoras are factories in the Northern Mexican border cities, mainly operated by US-American investors, that assemble products or parts of products destined for the US-American market. The factory owners benefit from the lower salaries in Mexico and the exemption of import duties for the USA. Maquiladoras attract migrants from all over Mexico to the Northern border.
[29] INEGI. XII Censo General de Población y Vivienda 2000, see www.inegi.gob.mx.
[30] For further information consult the website of the Colegio de la Frontera Norte www.colef.mx or the publication 'Encuesta sobre Migración en la Frontera Norte de México'.

However, the state of Zacatecas is not homogenous with respect to the intensity of international migration. As Delgado Wise et al. (2004) point out, while 23 of the 57 municipalities in the state of Zacatecas show a very high international outmigration rate, seven of the municipalities show a low or very low international migration rate[31]. In general, international migration to the USA is more frequent in the wealthier south than in the poorer north of the state.

Indeed, fieldwork in the two communities Laguna Seca and El Tigre has shown that migration patterns in the two villages differ significantly although they are less than two hours by car away from each other. Although its importance has not been widely acknowledged, migration within Mexico is also an important livelihood strategy in Zacatecas. The population of the state of Zacatecas only accounts for 1.4% of the population in Mexico (own calculation with data of the 2000 INEGI census) but internal migrants originating from Zacatecas account for 3% of the total number of Mexican internal migrants (Pimienta Lastra and Vera Bolaños 2005). The following paragraphs will show the importance of different forms of migration in the two researched communities in Zacatecas, El Tigre and Laguna Seca.

In El Tigre the rate of illegal international migration is very high. The vast majority of migrants go to Chicago where a large migrant community is established, although some families also have access to migrants networks in California. In the 1950s, contractors invited the first migrants from El Tigre to Chicago and after the official recruitment had stopped, people continued to go there. In the 1980s, the first women crossed the border illegally but nowadays it is again almost exclusively men who migrate from El Tigre to Chicago. Many interviewees said that the border crossing has become too dangerous for women for several reasons. One important reason is that the increased border protection measures, including the wall, make the border crossing physically more difficult. People also commented that the

[31] See CONAPO 2001 for a list of all Mexican states and the levels of international out-migration per community.

violence in border regions and particularly the violent behaviour of smugglers has increased, which renders illegal border crossing more dangerous.

Although recruiters from the USA and Canada are still looking for legal migrant workers, the majority of migrants prefer to migrate illegally. Interviewees said that they can earn more money as an undocumented migrant than as a legal migrant. Furthermore, the work contracts of most legal migrants are limited to a few months in which they cannot earn enough money to cover their costs of living. It is also for financial reasons that village dwellers in El Tigre do not consider internal migration to be an option. Several people said that, although they could also find work in other parts of Mexico, they prefer to go to the USA because the salaries are much higher there.

One interviewee answered my question if he preferred to live in Chicago or in Mexico like this:

> "I prefer the village over Chicago but one has to make a living somehow. You can also find work in Mexico but they do not pay you. You will earn ten dollars a day. On the other side[32] I can earn that in an hour. I will leave very soon. To send money to my wife and to my parents so they can buy something else to eat than tortillas with beans. Ten dollars a day… do you want me to leave my family for ten dollars a day?"
> (Juan, 6 March 2008 – translation author)

The perception that internal migration is not worthwhile because of the low salaries in Mexico shows how the social dynamic in the village influences migration patterns. In El Tigre, very few of the interviewees had any internal migration experience or knew anybody who had migrated internally, except for some women who went to live in another village after they married and some young people who temporarily stayed in the city of Zacatecas. Yet, in a village close to El Tigre also in the municipality of Villanueva, three different internal migration flows to Mexico City, to a border village, and also to the state capital Zacatecas could be observed from the 1960s on. Unlike international migration flows, internal migration also

[32] Many people use the term 'al otro lado' – 'on the other side' to refer to the USA.

included women and whole families who migrated either temporarily or permanently (García Valle 2011).

In the second research setting in Zacatecas, Laguna Seca, it is interesting to look at why people do *not* migrate internationally because only very few people do so. The most important reason is the lack of networks because Laguna Seca does not have a history of migration. Most people said they do not migrate because they are afraid of the unknown situation or because some negative previous migration experiences shaped their opinion about international migration. Several stories of people who tried to cross the border and disappeared are told in the village.
For example, a woman told me about her family:

> "I have got seven sisters; they are all married and have got their families. Only one of them is living again with my mother. She lost her husband…"
> "What happened?"
> "He tried to cross as a 'mojado'[33]. 14 years ago. He called us from the border to tell that everything was going well. After that nothing, for 14 years."
> "Did he go alone?"
> "Yes, he went alone, nobody knows what happened."
> (Lucia, 2 February 2008 – translation author)

People also expressed their fear of being unable to organise their lives in a new environment because of a lack of formal education. According to the 2007 village census[34], 28% of the adult population in Laguna Seca did not finish primary education or did not attend school at all. A direct comparison with the situation in El Tigre is not possible because census data about the level of schooling in the village do not exist. However, according to teachers in both El Tigre and El Nuevo Tigre, the level of education in the community is low. It might thus not be the objective lack of formal education that deters people from migrating but people's low perceptions of their educational level as compared to others.

[33] 'Mojado' means wet. It is the colloquial expression for undocumented US migrants that was used by the majority of village dwellers in all four researched communities. It refers to the fact that undocumented migrants get wet when they cross the Rio Grande walking or swimming.
[34] The local health centre carries out a yearly census of the village 'Cedula de microdiagnóstico familiar'.

Furthermore, the socio-economic conditions in Laguna Seca suggest that most people do not possess the financial means for border crossing. Poverty is also a reason why only the wealthier part of the village population responds to the offers of recruiters who are looking for legal labour migrants who want to go to the USA or Canada. Although transportation, the US visa, and lodging in situ are provided, potential migrants have to pay for their passports, which is often unaffordable for them. Unlike in El Tigre, internal migration to the agricultural regions at the coast of Jalisco and in Sonora is a common livelihood strategy during the winter months. As chapter 5.1.1 showed, commercial agriculture is the main source of employment in Laguna Seca and during the months without employment opportunities in agriculture many people move to search for similar jobs elsewhere.

6.1.2 Veracruz

The state of Veracruz shows a very different migration pattern compared to Zacatecas. Unlike Zacatecas, Veracruz has only a very short history of labour recruitment by companies from the USA. International migration started only in the 1990s, which means that people do not possess long-established migration networks on which they can rely. Del Rey Poveda (2007) describes a change in migratory behaviour caused by the economic crisis in Mexico in the 1980s, the land reform, and NAFTA and the new neoliberal policies, which entailed a shortening of subsidies for agricultural produce. He says that as a consequence more families had to send migrants while at the same time regional migrant receiving centres were saturated. Córdova Plaza et al. (2007) describe how changes in the labour market led to a loss of about 20,000 jobs forcing people to start looking for other options, including migration to the northern border and into the USA.

As a consequence, current migration patterns in Veracruz are heterogeneous. Because of a lack of long and shared migration histories within the village communities, destinations of migrants vary, whereas in Zacatecas, as the example of El Tigre shows, very often the vast majority of migrants from a village move to one particular city in the USA. Nevertheless, international migration from Veracruz

increased significantly in the 1990s. The proportion of migrants from Veracruz of the total Mexican migrant population rose from less than one per cent to five per cent between 1992 and 2000 (Canales 2003). Between 1995 and 2007 the absolute number of people migrating from Veracruz to the USA rose from about 5.5 thousand migrants to more than 80 thousand migrants. Yet, this rate decreased again in 2008 to a bit over 56 million people (see table 6.2). The trend that less people migrated in 2008 could also be observed during fieldwork in Cascajal del Río and Nuevo Renacimiento. Many people feared that employment opportunities might be very scarce in the USA because of the economic and financial crisis. Therefore, they reasoned that the investment and the risks entailed by a border crossing are not justified by the decreased probability of finding a well-paid job in the USA. It is thus unclear if this downward trend will continue, or if after the crisis the number of migrants will start rising again and continues to increase.

Table 6.2: Flow of migrants from the state of Veracruz into the USA by year (in 1,000)

1995	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
5.6	15.0	9.0	8.3	22.7	31.6	31.1	41.8	61.1	80.4	56.2

Source: Data elaborated by the USEG of 'El Colegio de la Frontera Norte' based on the longitudinal study 'Encuesta sobre Migración en la Frontera Norte de México'. SEGOB: INAMI and CONAPO, STPS, SRE and El Colegio de la Frontera Norte[35]

Although table 6.2 shows that international out-migration in Veracruz in general is increasing, as in Zacatecas, not all communities send international migrants. In the 2000 INEGI population census, some 122 out of the 210 municipalities in Veracruz showed a very low international migration rate while 5 municipalities did not send any international migrants at all (CONAPO 2001).

Regional labour migration has existed for a very long time, although only people with scarce resources used it as a livelihood strategy (Del Rey Poveda 2007). In

[35] For further information consult the website of the Colegio de la Frontera Norte www.colef.mx or the publication 'Encuesta sobre Migración en la Frontera Norte de México'.

general, internal migration within Mexico is a very common strategy in Veracruz. In 2000, Veracruz was the second largest sending state of internal migrants in Mexico with 1.3 million persons migrating internally (Pimienta Lastra and Vera Bolaños 2005). Migrants from Veracruz account for 7.6% of the total internal migrants in Mexico (ibid.) However, Veracruz is also the state with the second largest number of inhabitants, accounting for 7.1% of the total Mexican population (own calculation with data of the 2000 INEGI census). Fieldwork showed that the destinations of internal labour migrants from Veracruz are as diverse as the destinations of international labour migrants. Thus there is a major difference between internal migration from Laguna Seca, Zacatecas and internal migration from rural communities in Veracruz. People from Laguna Seca almost entirely move to regions in which they can work in commercial agriculture. Migrants from the researched communities in Veracruz mainly move to urban destinations, such as cities at the Northern border, the metropolitan areas of Mexico City, Guadalajara and Monterrey, and the bigger agglomerations within Veracruz, such as the state capital Xalapa and the harbour cities of Veracruz and Coatzacoalcos.

Despite their very different historical, socio-economic, and cultural background, migration patterns in the two research settings in Veracruz, Cascajal del Río and Nuevo Renacimiento, are very similar. Other than Laguna Seca, which does not possess a historical migration network in the USA either, both villages show international illegal outmigration and its importance is growing. However, illegal migration to the USA from El Tigre on the one hand and from Cascajal del Rio and Nuevo Renacimiento on the other hand shows two major differences. First, as was mentioned above, the majority of people from El Tigre move to Chicago, whereas migrants in the two communities in Veracruz do not have any particular destination. Second, using the example of the state of Sonora, Castro Luque et al. (2006) distinguish between migrants from other states who arrive with the intention to cross the border immediately and those who want to stay in the border region first. Migrants from El Tigre belong to the first category, while migrants from Veracruz can be found in both categories. Some leave their villages with a clear idea of

where they want to cross the border, who will help them and where they want to go in the USA. Others leave their village with the intention to go to the USA but they stay in the border region, sometimes for years, to earn money for the smugglers and to establish networks that facilitate the crossing and the arrival.

The choice of the destination of potential migrants does not – as in Zacatecas – depend to a large extent on the migration history on the village but mainly on personal contacts and financial resources. All interviewees who were asked about their plans to migrate said that they will go to a destination where they will be received by a relative or a close friend. Many go to the border cities of Matamoros, Nogales, and Reynosa, others move directly to the USA and those with the smallest resources stay within the state and go to Xalapa or to the Harbour City of Veracruz. Some respondents said that they had several options and that they still had to decide where they wanted to go depending on their financial resources for the journey and on the perceived job opportunities in the different potential destination areas. Another important difference between migration patterns in the researched communities in Zacatecas and Veracruz is the fact that the majority of young people, both male and female, have left or plan to leave their village after they finish school at the age of 14 to 16 years. This showed both in Cascajal del Rio and in Nuevo Renacimiento. A 20 year old woman in Nuevo Renacimiento, who did not want to leave her community, said that she lost all the friends she knew at school because they all migrated. “Women or men, it does not matter, they all left” (Lisa, 27 February 2009 – translation author).

This means that gender does not seem so much a factor that influences the likelihood of becoming a migrant, as it is the case in the Zacatecan villages. However, age is an important factor that distinguishes between different forms of migratory behaviour. The majority of young people in both communities who want to go to the USA prefer to cross the border illegally. In Cascajal del Rio, people from about the age of 35 onwards do not migrate at all or do not migrate anymore, if they had done so before. Older people sometimes follow their children who

migrated to destinations within Mexico but they do not cross the border. However, in Nuevo Renacimiento, where many recruiters from Canada are looking for migrant workers, people from the age of 35 onwards often choose to go to Canada or also sometimes to the USA legally.

6.2 Drivers of migration in Mexico as identified in the migration literature

The previous section summarised the historical development of migration and the existing current migration patterns in Mexico, and particularly in Zacatecas and in Veracruz. This section explores the explanations for migration in Mexico in the migration literature. In the following section they are compared to the drivers of migration identified during fieldwork. This section is divided into two parts. The first part summarises the economic drivers and the second part the social and cultural drivers that have been mentioned as explanations for migration in Mexico. Environmental factors are not considered drivers of migration in the Mexican migration literature.

6.2.1 Economic drivers

In migration theory, economic reasons are the classic explanation for large migration movements between countries with an unequal distribution of wealth. This is also the case in the Mexican context. The two important aspects of economic drivers of international Mexican migration are 1) the lack of sources of income in Mexico and the availability of work in the USA; and 2) the wage differentials between the two countries. Looking at the Mexican labour market first, three problems can be identified: the high level of unemployment, the low salaries or sometimes no payment at all when people are working in family businesses and the instability and temporary character of many jobs, especially unskilled labour (Corona Vázquez at al. 2007). Santibáñez Romellón (2007) is convinced that if quality and quantity of employment offered on the local labour market were sufficient, migration would not be a problem and the management of international migration would not be that complex.

Although the conceptualisation of migration as problematic is questionable, it seems that economic drivers are an important element in the migration decisions of Mexicans. An increase of the number of international migrants is associated with currency devaluations and economic crises in Mexico in the 1980s and 1990s (Martin 1997). Also, shifts in the numbers of internal migrants going to the metropolitan areas of Mexico have been associated with economic reasons. As described in more detail earlier in this chapter, after a decrease of the number of migrants moving to Mexico City in the 1980s, the capital became a more frequent destination for migrants from rural parts of Mexico again in the mid-1990s. The devaluation of the Mexican Peso by the recently elected Zedillo administration in December 1994, as a response to the negative government budget, caused an economic crisis. This crisis was worsened by political instability in the country brought about by the assassination of the presidential candidate Donaldo Colosio and the uprising of the Zapatista movement in Chiapas (Dropsi 1995). However, these were not the only problems. “The crisis in Mexico reflects long-term structural problems including employment generation, low productivity per worker, a large external debt, a highly skewed income distribution and inadequate investment in infrastructure” (Peach 1995:375). Izazola (2006) suggests that as a consequence of the 1994 economic crisis and the problems linked to it more people from the Mexican countryside moved to Mexico again because the size of the city and its economy offered more opportunities than the Mexican periphery in this precarious situation.

However, not only the economic situation in Mexico but also the situation of the US labour market should be taken into account. Already in 1989 Cornelius criticized that “Mexican migration to the USA has usually been analysed and debated from a ‘supply-side’ perspective. There has been much less attention paid to the demand side of the migratory phenomenon” (Cornelius 1989:25). The 2008 global economic crisis affected employment opportunities both in Mexico and in the USA. Instead of an increase of the number of migrants leaving Mexico because of the worsening economic situation, it entailed a decrease of the number of Mexican

migrants who went to the USA because people feared not finding a job in the weak US economy. Return migration also decreased because even those who suffered from the economic downturn in the USA assumed that in Mexico it would be even more difficult to find work (Passel and Cohn 2009). However, as Hanson (2006) remarks, when looking at the effects of economic shocks on migratory behaviour, a distinction between legal and illegal international migration should be made. Hanson (2006) found that legal Mexico-US migration appears to be more or less insensitive to fluctuations of the economy because of the time-lag between the application and the actual issuing of the papers, whereas geographic proximity and migration networks allow undocumented migrants to respond to economic changes relatively quickly.

An aspect that is often ignored when economic drivers of migration are discussed is the fact that changes in the national economy do not necessarily affect individual wealth. A boom of the Mexican economy is not likely to be beneficial for poor people in rural areas where employment opportunities are insufficient and salaries are low, with or without an economic crisis. Those people might at most benefit from an increase in the resources that are available for government aid programmes, such as 'Oportunidades'[36] and its predecessor 'Progreso' in Mexico, with a time-lag of several years. Escobar Latapí's (1997) analysis of the interrelation between economic and social conditions and international migration in Mexico shows that Mexico-US migration increased during a period of relative economic prosperity in Mexico between 1988 and 1994. One might think that the explanation of this could be that growing affluence among the population enabled more people to find the financial resources for their migration projects. However, Escobar Latapí (1997) concludes that some of the reforms intended to improve the Mexican economy in fact created rural instability and worsened the situation of the urban labour market. As a consequence, although the Mexican economy performed better as a whole, the financial situation of many people became more

[36] For further information about the 'Oportunidades' programme see Juárez Bolaños and López Estrada (2008).

difficult. Furthermore, he found that some objective improvements of the quality of people's lives, such as a rising life expectancy, and better education and housing, did not necessarily satisfy people in such a way that they decided to stay. Therefore, Escobar Latapí argues that assessments of the welfare of a society "should include, notably, the relationship between a population and work and income, and also an evaluation of what makes people decide which jobs and living conditions are desirable and will lead to their long-term welfare" (Escobar Latapí 1997:39) .

In the context of an analysis of economic drivers of migration, a distinction should also be made between people who migrate to earn money that is needed to cover the basic needs of their families and people who migrate to maintain or to improve their standard of living. The Mexican rural exodus, as a consequence of the agricultural crisis in the 1990s, was the result of many people temporarily or permanently leaving rural areas and searching to maintain their livelihoods elsewhere. The majority of these migrants left to earn money for food and basic consumer items. Another group of migrants moved to maintain or improve their current lifestyle although they could have made a living without migration. Del Rey Poveda (2007) describes this phenomenon by using the example of Veracruz. He acknowledges that in Veracruz some people also migrate out of a necessity to survive but he argues that many want to accomplish a project, such as building a house, opening a shop, or paying for the higher education of their children.

6.2.2 Social and cultural drivers

Before the role of social and cultural factors as drivers of migration will be analysed, a distinction is made here between social and cultural factors that to various extents *cause* migration, such as the social pressure on young people to migrate, and social and cultural factors that *facilitate* migration processes, such as networks. In this chapter only the former will be discussed, while the latter will be analysed in more detail in chapter 7.

As opposed to the neo-classical approaches that seek the drivers of migration in the economic situation of the migrants only, more recent studies investigated the social and cultural aspects of migratory behaviour. Social pressure and cultural change have also been identified as drivers of migration in the Mexican migration literature. There are two ways in which social and cultural aspects stimulate migration: 1) in some communities the fact that the majority of young people start to migrate at a certain age obliges individuals to follow this example; and 2) increased material desires as a consequence of changing values and norms, as well as rising personal and general living standards in the community force people to seek sources of income elsewhere.

In regions in which migration is an important livelihood strategy, such as in many parts of Mexico, it often has become a part of people's lives. People are expecting and expected to migrate in their young adulthood, a phenomenon that Kandel and Massey (2002) refer to as the ‘culture of migration’. Moctezuma Longoria (2005) quotes several authors who perceive migration as a rite of passage for the transfer into adulthood. Young men move to the USA to become part of the migrant community and to fulfil their home community's expectations about the values and the behaviour of its members.

> “Migration to the United States has become a tradition and a way of life that obliges all young people to migrate. Going north has, during the last years, become a rite of passage” (Alarcón 1988:349-350, quoted in Moctezuma Longoria 2005:98 – translation author).

Social drivers of migration have thus been interpreted as a form of social pressure 'forcing' especially young men to migrate in order to establish conformity with the expectations of the village community. Other authors, however, stress that also changing expectations of the individual about his or her own life create a need to migrate and to raise more money to meet these expectations. Changes to consumption patterns, and the influence of different cultural aspects that migrants encounter during their stay in the USA, increase the need for more material goods

(Cordero Díaz 2007). In many cases, these needs can only be satisfied by means of migrating or by means of the remittances sent by relatives.

As this review of the Mexican migration literature has shown, the discourse is dominated by those who name economic, social and cultural, or both (Cordero Díaz 2007) as the predominant drivers of migration. Environmental stressors are not mentioned in the literature as drivers of migration, neither alone, nor in combination with other drivers. As discussed in chapter 5, empirical results in the four researched communities show that people also do not perceive any linkages between climate or environmental stressors and migration. The following section examines what the people in the researched communities in Zacatecas and Veracruz indicate as potential drivers of migration.

6.3 Potential drivers of migration in the researched communities

This section summarises the livelihood stressors and potential drivers of migration that were identified by respondents in the four researched communities. These livelihood stressors might drive migration but they might also drive other responses. The livelihood stressors that were mentioned in the interviews and that were observed during fieldwork point to differences and similarities between the four communities. Chapter 4 showed that most of the information on which this thesis is based comes from semi-structured interviews, participant observation as well as life histories. This empirical material was searched for references about problems and difficulties that people say they are facing in their home communities. For analytical purposes, these problems threatening people's livelihoods identified during fieldwork have been divided into four categories 1) lack and decrease of employment opportunities, 2) decreasing purchasing power, 3) small-scale and subsistence agriculture and foraging more difficult, and 4) increased desires and aspirations. It has to be acknowledged that the categories overlap and that they are linked to each other to a certain extent. However, they are believed to reflect, in the best possible way, a summary of the opinions that were expressed in the researched communities.

The purpose of this section is to introduce the stressors to people's livelihoods that will in chapter 8 be tested for their climate sensitivity. As chapter 5 showed, although the climate is perceived to be changing by many people in the researched communities, people in general do not perceive these changes as directly threatening their livelihoods and even less as affecting their migration decisions. Therefore, environmental shocks and stresses, do not form a fifth category of livelihood stressors in addition to the four categories mentioned above, although they might be directly or indirectly linked to the first three of the categories. The following sections present the four categories of livelihood stressors as found in the four researched communities, in the order of frequency in which they were mentioned.

6.3.1 Lack and decrease of employment opportunities

The lack of employment opportunities was perceived as the major threat to people's livelihoods and the most important driver of migration in all four researched communities. The majority of interviewees mentioned that one of the most serious problems they are personally facing is the fact that it is difficult to find and keep paid work in or close to their home community. All interviewees said that the lack of employment is in general a serious problem for people living in the village community. Also, those who had migrated before indicated the lack of employment opportunities in and close to their village as one of the most important reasons to migrate. Similarly, when people who had not migrated before were asked why their family members or fellow village dwellers decided to migrate, all interviewees indicated that they could not find employment close to their home and therefore decided to leave. In the two communities in Veracruz, people also commented that employment opportunities have significantly decreased over the last decades.

In Cascajal del Río people link the decrease of employment opportunities to a decrease in the number of large cattle ranches and large scale farmers who used to recruit many day labourers in the village and also permanently employed some

of the people. González-Montagut (1999) describes the rising and falling numbers of livestock in Veracruz since the colonisation in the 16th century. The rising number of cattle after the Mexican revolution in 1810 was accelerated by the growing demand for meat and dairy products in Mexico City. A century later, the introduction of different breeds, improved disease prevention and technologies, as well as the clearance of forests for pasture stimulated the development of large scale cattle ranches in Veracruz. Political support to expand cattle activities in Veracruz attracted migrants from Mexico City and from other regions in Mexico. Territory for cattle ranches was created by transforming forests and agricultural land into pastures, and in the 1970s many small-scale farmers rented their fields to cattle farmers. After a slight decrease of the number of livestock in the early 1980s, it grew again until the early to mid-1990s. Under the presidency of Salinas, subsidies, including the support for cattle ranches were shortened, and Mexico's entry into NAFTA forced cattle ranches in Veracruz to compete with foreign meat production. These developments required an intensification and modernisation of livestock production, which large cattle ranches in northern Veracruz could comply with, while many cattle ranches in southern Veracruz had to turn to alternative forms of land use. Labour extensive monocultures, including Eucalyptus plantations, replaced pastureland in many parts of southern Veracruz from the 1990s on (González-Montagut 1999). Thus, while Veracruz at the end of the 1990s still was the largest producer of livestock in Mexico (Sánchez-Gil et al. 2004), the southern part of the state experienced a substantial decline of cattle ranches and many people who used to work on these ranches lost their jobs, as mentioned by many interviewees in Cascajal del Río.

In general, changing market conditions for agricultural produce throughout Mexico forced many landowners to close down their businesses. Neoliberal policies, initiated in the 1990s, reduced subsidies and eliminated minimum prices for agricultural produce. These developments can also be linked to Mexico's opening to the international market, which many commercial farmers were not prepared for. Husted and Serrano (2002) argue that in the past, Mexican companies, including

agrobusinesses could count on government support in case they were unsuccessful. These policies changed with the North American Free Trade Agreement (NAFTA), which came into force in January 1994 and facilitated the import of subsidized agricultural produce from the USA. As a consequence, many Mexican farmers could not compete with the prices anymore and stopped producing. Therefore, a large number of people lost their jobs and had to find new sources of income elsewhere (Márquez Herrera 2008)[37].

Empirical evidence from Casjacal del Río has shown that, although some migrants still go to the industrial and petrol processing centres of Coatzacoalcos or to the harbour of Veracruz, others think that these destinations are saturated and employment opportunities there are too scarce to justify a move. These people prefer to envisage long distance migration, either to the cities at the northern border or into the USA. In Nuevo Renacimiento, the majority of village dwellers are employed in commercial agriculture, which is mainly based on producing citrus fruits. Harvesting citrus fruits is a seasonal work by its nature with two annual crop cycles leading to two periods of about two months every year in which most of the work is available and the rest of the year in which people have to find other kinds of employment. During these periods many people work in other forms of commercial agriculture, such as weeding the fields and harvesting vegetables, or in the construction industry. Some people also use the money they earned during the times of the harvest to live through the months with fewer work opportunities.

In Laguna Seca, Zacatecas, the majority of the village dwellers are also employed in commercial agriculture, which is seasonal because no farming is possible during the cold winter months. Due to a lack of other employment opportunities on a large scale, some people migrate seasonally to agricultural regions within Mexico, while others stay and live off their savings, as the people in Nuevo Renacimiento do. Many elderly people in Laguna Seca think that the number of employment

[37] For an extensive overview of the decline of productivity of the Mexican agricultural sector by using the example of the state of Zacatecas, see Márquez Herrera 2008.

opportunities in general has decreased in Laguna Seca because some landowners decided not to farm anymore or to farm less for the same reasons that can be observed in Cascajal del Río. As alternative employment opportunities hardly exist, the majority of people are forced into the circle of working in commercial agriculture in the summer and migrating to areas of commercial farming elsewhere in Mexico during the winter months.

In El Tigre the situation is different because almost no employment opportunities are available in the close proximity of the village. There are some jobs in restaurants, hotels, shops, and in the construction industry in the municipal town of Villanueva about 15 km away from El Tigre. However, according to many people interviewed in the village, those jobs would likely already be taken by the inhabitants of Villanueva. Furthermore, there is no public transportation that connects El Tigre with Villanueva. Therefore, people would have to rely on the privately run bus shuttle that leaves El Tigre early in the morning and returns in the early afternoon, invest in private transportation, or walk. Linked to these transportation problems, people in El Tigre who were asked about their intentions of finding a job in Villanueva said that the low salaries they could earn if they were lucky enough to find a job at all would not justify the effort.

There is some commercial farming between Villanueva and the city of Zacatecas. However, again, people in El Tigre assume that those jobs are already taken by the people who live close to the fields and that the small revenues do not justify the effort of commuting there. Furthermore, unlike in Laguna Seca and Cascajal del Río, there are no recruiters looking for agricultural day labourers to work in the neighbouring villages of El Tigre. The land around El Tigre is community-owned ‘ejido’ land and many families in the village dispose of some hectares to cultivate what they need for their own consumption or what they want to sell on a small scale. The land used to be a large land holding (hacienda) owned by a single family. In the 1960s (El Tigre) and in the 1970s (El Nuevo Tigre), people started an uprising to fight for land, which they finally won. Therefore, there are no large land

holdings anymore around the village today. This fact might be linked to the long history of international migration of El Tigre. It is likely that recruiters were successful in El Tigre in the 1950s in the first place because it was a welcome way of escaping the status of a landless day labourer.

The lack or the decrease of employment opportunities, which is the most important stressor of people's livelihoods, has thus two forms. It can be permanent as in Cascajal del Río and in El Tigre, or seasonal as in Nuevo Renacimiento and in Laguna Seca. This distinction is not clearly made in most of the Mexican migration literature that was reviewed in the previous section. Only Corona Vázquez et al. (2007) mention the problem that employment in rural Mexico, especially of unskilled labourers, is often temporal. In combination with the tendency of a decreasing number of employment opportunities in general, formal sources of income are becoming more and more insecure. People do not only have to maintain themselves during periods, in which employment is seasonally not available but they also cannot rely on finding work once the difficult season in the labour market is over.

6.3.2 Decreasing purchasing power

The problem of decreasing purchasing power has two forms in rural Mexico. First, people's purchasing power is decreasing because market prices are rising while wages are remaining the same or sometimes are even decreasing. Rising prices of food items and basic consumer goods are caused by several factors including the global food crisis, the world financial and economic crisis, and government policies that favour international trade agreements over the needs of the local population[38]. Secondly, farming, especially on a small scale, is not profitable anymore because prices for the products needed to farm such as seeds, fertilizers, and agricultural machines are rising, whereas prices for agricultural produce are decreasing. Furthermore, intermediate traders seem to enjoy a very strong position on the

[38] Again, see Márquez Herrera 2008 for a description and an analysis of these policies.

Mexican market, which enables them to buy for very small prices and to sell for very high prices to shops, markets or to the consumers.

These two problems were found in all four researched communities and there does not seem to be a difference between the two states. The aspect that the wages that are paid for unskilled labour are usually insufficient for a family to survive, was perceived as being as important a problem as the actual lack of employment opportunities. Surprisingly, low wages were perceived as being even more problematic than the lack of sources of employment in El Tigre. As mentioned above, in and around this community almost no employment opportunities exist and people do not migrate internally to find work within Mexico. The vast majority of people thus do not have any experiences on the Mexican labour market. Yet, many respondents claim that they could find employment in Mexico if they wanted to but that they do not want to try because it would not be worthwhile due to the low wages they could earn. This argument is used by many as an explanation of their intention to migrate internationally.

6.3.3 Small scale and subsistence agriculture and foraging more difficult

In many rural communities in Mexico, people used to live mainly off the subsistence farming of maize and beans, and off raising small domestic animals such as chickens, turkeys and goats. This was supplemented by the hunting of small animals, fishing where rivers, lakes or the sea are close and the collection of wild plants and fruits such as the cactus fruit in Zacatecas and a wide range of tropical fruits in Veracruz. Elderly people in all communities say that they did not need money when they were young, because they could farm, raise, or collect everything they needed for their diet. Nowadays, both subsistence farming and foraging are perceived to have become more difficult. The older generation often says that young people are unwilling to work hard all day only to satisfy their basic food needs.

While fieldwork showed that this observation seems to some extent to be true, some changes also have affected subsistence farmers and foragers. First, subsistence farming is suffering from the same problem as small scale commercial farming, which has been described in the previous section. Rising prices of seeds, fertilizers, pesticides, and for the machines needed to prepare the soil, made farming for many poor people unaffordable. Second, the extensive use of pesticides and fertilizers and the dominance of monocultures rendered the soil less fertile and productive. Furthermore, pesticides and fertilizers limited the growth of plants and herbs that people used to collect from around the fields. This phenomenon can especially be observed in Cascajal del Río, a community in which wild vegetables and fruits guaranteed a very balanced diets some decades ago. In addition, extensive exploitation and pollution locally extinguished many animal species that people used to hunt. In Cascajal del Río many small animals are now protected and hunting them is prohibited. According to the ‘ejido’ representatives of Cascacal del Río this does not necessarily reduce hunting for people's personal consumption but limits the possibilities of selling the meat to fellow village dwellers.

Another problem is that climate stressors increasingly affect subsistence farming and also the growth of wild plants and herbs. As chapter 5.2 showed, in both communities in Zacatecas, all interviewees said that the climate had become dryer over the last twenty years, that the annual cycle of precipitation had changed, and that rainfall is less frequent but often more severe nowadays than it used to be in the past. These changes are thought to be severely affecting the success of the harvest. Therefore, in recent years, many people decided to refrain from farming. This development was aggravated by the fact that larger investments are needed for more unpredictable results. Longer periods of droughts are also affecting the growth of the cactus and its fruit; both the plant and the fruit are usually consumed in large quantities in El Tigre. Interviewees in both villages in Zacatecas reported that in 1997 a period of frost and snow, which usually does not occur in this region,

destroyed most of the cactus plants in Laguna Seca. Since then, cactus does not grow anymore and people had to adapt their diets accordingly.

In Veracruz, the effects of climate stressors on farming are perceived as being less severe than in Zacatecas. Chapter 5.2 also showed that in Cascajal del Río some people think that floods of the river have become more severe, while others do not think that this is the case. Interestingly, those who own farmland, that is so close to the river that it gets flooded and their harvests get destroyed, think that the flooding is more severe than it used to be some decades ago, while those who only own land further up the hill do not think so. In 2005, hurricane Stan destroyed many houses and almost the complete harvest of the village. Most people are afraid that another hurricane might soon affect their village again, but they do not perceive hurricanes as a threat to their harvests but mainly to their houses. The people in Nuevo Renacimiento were resettled to this village because a huge flood of the river destroyed their native communities and all their farmland in 1999. Many people discontinued farming after that event because the farmland is close to the river and to their old communities and therefore difficult to reach without transportation. None of the interviewees in Zacatecas and Veracruz directly mentioned changes to precipitation patterns and extreme events as livelihood stressors or drivers of migration. Yet it seems that these climatic shocks and stresses contribute to a large extent to the decline of the potential of subsistence agriculture and foraging and indirectly affect people's livelihoods.

6.3.4 Increased desires and aspirations

Cultural change is affecting people's livelihoods in two ways. First, many young people are not willing to continue subsistence farming and foraging because they think that it is hard work that does not offer enough revenues. Sometimes, they help their parents in the fields but they do not want to farm by themselves. In El Tigre this development can be most clearly observed. It is very often the case that young people migrate to the USA and their parents who do not migrate anymore farm the land. If they are physically not able to farm anymore, the fields are

abandoned and many of the young men do not continue farming during the years when they are at home either. They think that their stay at home should be used to relax and to prepare for the next trip and not to be spent working for basic food items only. In Cascajal del Río, there is a disagreement between the younger and the older generation about the reasons why subsistence farming and foraging is decreasing. While the younger people say that the plants just do not grow anymore like they used to some 20 or 30 years ago, many elderly people think that their children are just too lazy to farm. One 55 year old man said about the farming habits of young people:

> "They probably told you that nothing grows anymore. Do not believe them. Everything grows as it did when I was young. They just don't want to work as we did. I always got up at four in the morning to work. Worked in the sun, in the heat, when I was tired. Now they only want to relax and have fun" (Valentin, 8 February 2009 – translation author).

It is likely that both points of view are true to a certain extent. In any case, a decrease in subsistence farming increases people's need for money. Another aspect that increases the need for money, especially among young people, is the changing lifestyle. Many young people are more demanding than previous generations as far as their diet, their way of dressing and their way of spending their free time are concerned. Influenced by their stays in the USA or Canada and by TV shows, many young people want to break with the traditions of their parents and to create their own way of life, which is often more expensive than the lifestyle of the older generations. Their children often take over these new ideas and refuse to wear certain clothes and to eat or drink certain food items.

6.4 Chapter conclusion

This chapter started with an analysis of migration patterns in Mexico and specifically in Zacatecas and Veracruz as well as in the four researched communities. This overview was based on the Mexican migration literature and on information obtained during fieldwork. It showed that migration patterns are heterogeneous within Mexico, and between and also within the two researched regions. In a second step, the chapter showed the drivers of migration identified in

the Mexican migration literature and the stressors to people's livelihoods and potential drivers of migration that were found in the four researched communities in Zacatecas and Veracruz. They are summarized in table 6.3. Both, the literature review and the empirical results revealed economic as well as social and cultural aspects as drivers of migration, while environmental stressors were not mentioned.

The analysed migration literature often focuses on Mexico-US migration because wage differentials between Mexico and the USA and the instability of jobs in Mexico are regarded as major drivers of migration. However, in Cascajal del Río und Nuevo Renacimiento, internal migration is at least as important as international migration and in Laguna Seca international migration hardly plays any role at all. Only in El Tigre, the argument that work is paid better in the USA than in Mexico is used by many people. Nevertheless, it is much more a reason for the choice of destination than for the choice of migrating or not migrating. As there are almost no jobs available in or around El Tigre, people have to leave the village if they want to find paid employment. Thus they do not migrate because of the higher wages in the USA but they choose the USA over destinations in Mexico because of the wage differentials.

Table 6.3: Drivers of migration found in the literature and during fieldwork

	Economic drivers			**Social and cultural drivers**	
Literature	Lack of employment opportunities in Mexico	Wage differentials Mexico-USA	Instability of jobs in Mexico	Increased desires (cultural change)	Culture of migration (social pressure)
Fieldwork	Lack and decrease of employment opportunities, including seasonalities	Decreasing purchasing power	Small-scale and subsistence agriculture and foraging more difficult	Increased desires and aspirations	

Source: author

The majority of respondents in all four researched communities said that one of the major problems was that prices for basic consumer goods were rising while the level of wages was stagnating or even decreasing. The resulting decrease in people's purchasing power is seriously affecting many families because already before the prices rose they had difficulties to meet their basic needs with the income they could earn in Mexico. This problem is not mentioned in the Mexican migration literature because it is a very recent phenomenon that is mainly caused by the global food crisis that started in 2007, and the global economic and financial crisis that started in 2008.

The decrease in the productivity of subsistence agriculture is to some extent linked to the problem of rising prices because all items needed to farm have also become more expensive. However, other reasons such as the degradation of the soil, changes of the climate, and a change of the perception of the importance of farming for the younger generation also appear to play a role. In the 1980s, the crisis of the Mexican countryside was linked to the rural exodus and also to international migration (Arizpe 1983) but afterwards agricultural problems have not been mentioned as drivers of migration anymore in the Mexican migration literature.

The migration literature introduces two forms of social and cultural drivers of migration. First, the fact that the majority of young people in a village community migrate, creates a culture of migration (Kandel and Massey 2002), which socially forces young people to migrate if they want to or not. Second, cultural change brought about by visits to the USA or Canada and by the media entails an increased desire of the younger generation for different kinds of food, clothes, electronic equipment, cars and other items. Fieldwork showed that the latter point was an important aspect, especially in El Tigre, while the former argument was not found in any of the four communities.

This chapter provides the basis for understanding the causes of migration based both on expert opinion and previous studies as well as on the perceptions of village dwellers. However, it has not fully explained why the livelihood stressors identified in the researched communities might lead to migration as opposed to other responses. Chapter 7 seeks to do this by discussing the factors that affect people's willingness and ability to migrate, and the responses that might be available as alternatives to migration. Furthermore, it will analyse what factors influence people's decisions about the form of migration they choose. In chapter 8 the factors that are threatening people's livelihoods and that were analysed in the third part of this chapter will be tested for their sensitivity to climate change.

Chapter 7: Factors affecting migration decisions in Mexico

The previous chapter argued that the potential drivers of migration identified during fieldwork can be summarised in the following categories: Lack and decrease of employment opportunities, decreasing purchasing power, small-scale and subsistence agriculture and foraging more difficult, and increased desires and aspirations. However, these potential migration drivers might also drive other responses. The first part of this chapter is, therefore, concerned with an analysis of other factors that are involved in the decision-making process for or against migration, given the underlying conditions identified in the previous chapter. The second part of the chapter then analyses the choice of the form of migration, internal or international, and legal or illegal. This element of decision-making is critical in terms of the magnitude of any future flows, should these factors change. In the third part of the chapter, alternative response strategies developed by non-migrants or, as an additional source of income, by families which send migrants, are presented. The chapter is based on information obtained during fieldwork in the four communities Laguna Seca, El Tigre, Cascajal del Río, and Nuevo Renacimiento.

7.1 Factors facilitating migration decisions

Fieldwork in the four communities showed that the relationship between the factors that people perceive as affecting their livelihoods and migration is not linear. The answer to the question to what extent these factors translate into migration decisions depends on several aspects, which have been grouped in the following four categories for analytical purposes: the availability of financial resources, the perceived benefit of migration, the perceived ability to migrate, and the willingness to migrate which includes the approval of others. These categories partly match the adaptation appraisal section in the process model of private proactive adaptation to climate change (MPPACC) by Grothmann and Patt (2005:204). Like the categories of drivers of migration, these categories of factors that affect the decision to migrate or not are drawn from fieldwork and they are interlinked and overlap. Many

interviewees also mentioned that a combination of several of these aspects affected their migration decision.

7.1.1 Financial resources

The lack of financial resources, caused by the lack of employment opportunities and increasing prices, is one of the major threats to people's livelihoods and therefore a potential driver of migration in all four researched communities. Paradoxically, however, the lack of financial resources is also one of the major restraints of migration. Migration is expensive because the transport to the destination area, and – in case of illegal international migration – the border crossing have to be provided for. Depending on the services provided and the destination in the USA, the 'coyote' or smuggler charges 2,000 to 4,000 USD for the border crossing per undocumented migrant. Sometimes this amount, or at least a part of it, can be paid off by the migrant's first salaries in the USA but this carries the risk of not being able to pay the debts in case the migrant does not find any employment. In most cases though, a part of the trip, including the transportation to the border by bus, has to be paid in advance. Some families manage to save this money over some months, while others have to borrow the money from a relative or a friend.

Furthermore, the life of migrants away from home costs more than the life in their home communities. The rent for a room and the utilities have to be paid, while people in most cases live in their own houses in their communities where they do not pay any rent and the consumption of gas, electricity, and water per person within the family is smaller than for the single household of a migrant. Food and clothes have to be bought, which is often more expensive in the destination areas than in the communities of origin because many migrants move to Mexican agglomerations, to the border region, or into the USA. Migrants from all four researched communities are usually welcomed by relatives at the destination, provided with food and clothes, and invited to stay in their relatives' homes for the first days or weeks. Although in many cases they are not obliged to pay back all the

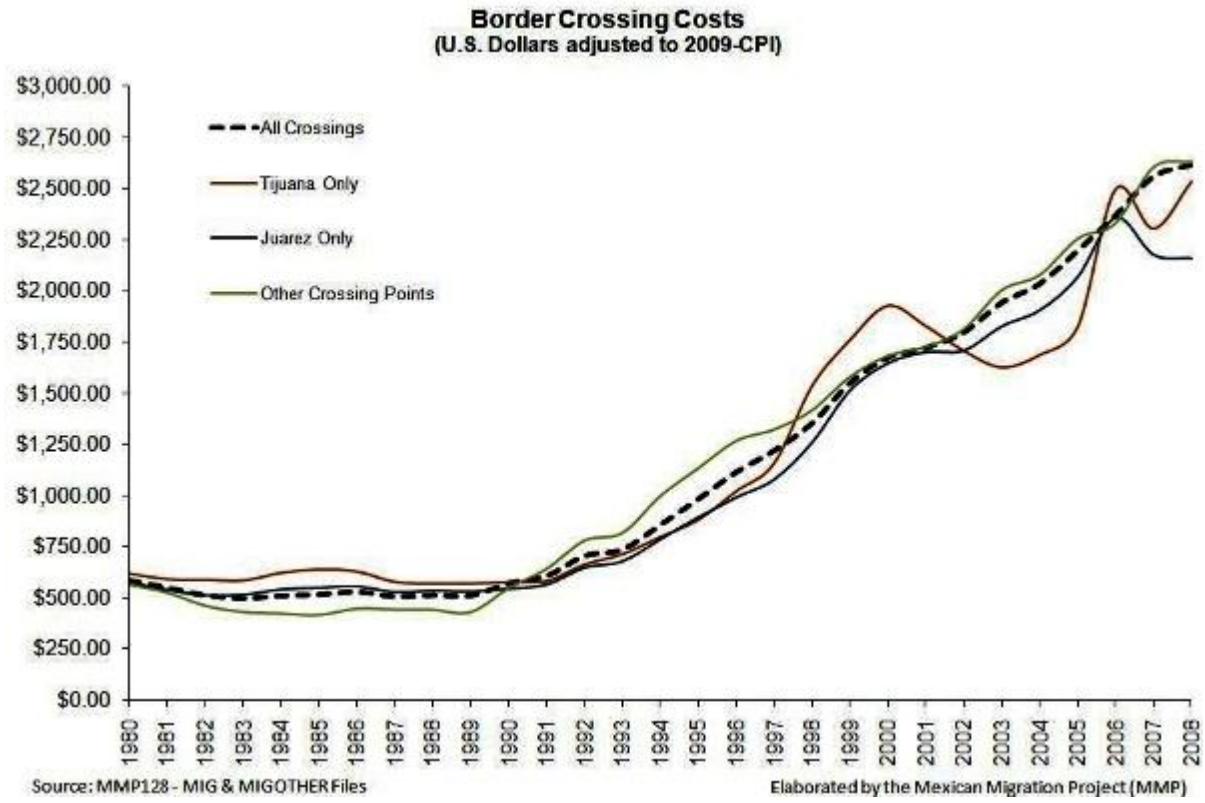
expenses, some kind of reciprocity is expected. This means that migrants who successfully finished the migration process will often have debts in their home communities, with the 'coyote', and at the destination. Therefore, particularly undocumented international migrants either need some financial reserves or a trustworthy social network to rely on for the financing of the project. Also, illegal international migration will only be profitable if the migrant stays for an extended period of time and if he or she finds at least one job. According to people who crossed the border illegally several times before, this is a relatively new development because the border crossing was not so expensive in the past.

Raúl, a 43 year old married man with two children, living in El Nuevo Tigre, has been to Chicago twelve times before. He says that he used to go for a year at most, then come back preferably before Christmas or the celebration for the village Saint in May, stay for a year or two, and go back to Chicago. He explains why this is not possible anymore:

> "[…] Now I have to go for at least two or three years. Because of the family, I don't want to stay longer than that. But just for a year… no, that is not worth it anymore. The 'coyote' is very expensive right now. Before it was less than 1,000 dollars. Now it is at least 3,000."
> "Why did it change?"
> "Have you been to the border? They are building this big wall everywhere. You cannot cross where and when you want anymore. They have got these big lights to find you. When it moves to the left, you start to run. When it moves back you have to be on the other side or you get caught. They catch you three times and you go to prison. […] So the 'coyote' has to choose the route carefully, often the way is also longer than before, so they charge more"
> (Raúl, 10 March 2008 – translation author).

According to Hanson (2006), prices for 'coyotes' have been rising since 2001, when the USA started to enforce their border protection measures. He quotes Orrenius (2001) who found, using MMP data, that between 1978 and 1996 the average price for a 'coyote' varied between 385 and 715 USD. Cornelius (2005) calculated that "between the 1996-98 and 2002-04 periods average coyote prices rose by 37% from 1,180 USD to 1,680.33" (quoted in Hanson 2006:289). Figure 7.1 illustrates the development of the costs of border crossings between 1980 and 2008, adjusted to the 2009 consumer price index.

Figure 7.1: Border crossing costs between 1980 and 2008



Source: Mexican Migration Project (MMP)[39]

Fieldwork also showed rising prices for border crossings between 2004 and 2008/09. Prices for 'coyotes' between 2,000 and 4,000 USD were mentioned by all respondents in Zacatecas and Veracruz, depending on the service requested. Interviewees in El Tigre said that illegal international migration has become significantly more expensive over the last decade and, therefore, it is not an option (anymore) for everybody who would be willing to go in search of work to the USA.

However, also for internal migration, people need some financial resources, mainly for the bus fare and for a place to stay away from their home. Also, some families in the rural communities still farm their own staple food, such as maize and beans. If a family member migrates, he or she cannot benefit from this source of food and has to buy at the destination what will be farmed at home. Furthermore, the family

[39] http://mmp.opr.princeton.edu/results/009firsttrip-en.aspx

might not have the human resources anymore to farm at all if many male family members migrate, and therefore need to buy what they might have farmed if nobody had migrated.

In Laguna Seca, where internal migration to regions of commercial farming in the states of Jalisco or Sonora is the most important form of migration, many people cannot afford to migrate even internally. Ana and her family belong to the poorest people in the community. The family, consisting of the parents, their five children, and a daughter in law lives in a one-room house made of adobe, which is substantially smaller and in a worse condition than the majority of the other houses in the village. Ana complains about the bad employment opportunities in Laguna Seca. All adult family members work as day labourers in commercial farming but often they do not find a job. Nobody in her family ever migrated.

> "It has never been necessary to go away. Now it would be good but it is too difficult. […] It is the money, that's the problem. We don't have enough money to move. If we had enough money, then why would we want to move?"
> (Ana, 4 February 2008 – translation author)

Thus, although Ana would not really be happy to move or to see one of her family members do so, she is aware of a certain benefit in migration to improve the livelihood of her family. Yet, she thinks that it is not possible because of their poverty. It is not certain to what degree this perception is influenced by the actual unwillingness to migrate, the perception of her family as being poorer as others, or the objective impracticality of migration due to a lack of access to financial resources. Access to financial resources as a prerequisite for migration, however, is not necessarily completely determined by the family's income. Ana's family consists of six adults who are able to apply for work in commercial farming, the major source of income in Laguna Seca. They are thus not disadvantaged as opposed to other families working in agriculture who also might find work on some days and not on others. The high consumption of alcohol of her husband that Ana mentioned later in the interview is also not very uncommon in the village and is unlikely to be the only factor that contributes to the household's poverty.

The degree of poverty and, accordingly, the question if a family can pay for the migration of one of its members or not, also depends on the family's social position. If there is not enough money available to pay for the expenses, making use of credit is an option for those who have got networks and strong bonds to relatives or friends. In all researched communities, people are used to asking members of their social group to lend them money. It is likely that a formal credit for a migration project would be very difficult to obtain, unless the applicant has got considerable assets that could serve as a security.

7.1.2 Perceived benefit

Apart from the fact that many families cannot afford migration or cannot choose a certain form of migration because of financial constraints, some people do not want to spend their money on migration. As mentioned in chapter 4, people in El Tigre do not perceive internal migration as beneficial. They think that the low salaries all over Mexico, as opposed to the salaries in the USA, as well as the chance not to find a job at all, do not justify spending money for transportation, rent, and general living expenses. In all four communities some people think that the situation on the labour market at the destination, in the USA or within Mexico, will be the same as in their community of origin. Therefore, for them migration is neither a beneficial nor a logical alternative to staying at home.

The number of people sharing this point of view has increased during 2008, when the consequences of the global economic and financial crisis translated into a decrease of employment opportunities. Since then, migration is seen as having become a more and more insecure endeavour. The labour market tremendously changed, both in the USA and in the traditional migrant receiving regions in Mexico, such as the big agglomerations Mexico City, Guadalajara, and Monterrey, the border cities, and the agricultural zones. As a consequence, many migrants became unemployed. The prospective migrants in all four communities are well aware of this development and people who consider migration, also consider the possibility that they might not find employment at the destination.

Juan lives in Zapotal, a small community close to Nuevo Renacimiento. He had left for New York two months before his village was flooded in 1999. One week after the flood he returned home because he wanted to help his family and the community members to reconstruct his house and the public buildings in the village. He says that he always wanted to return to New York to stay a bit longer and to earn some money. However, he always hesitated.

> "Now is not the time to leave. You see, people are just coming back. They lost their jobs. How would I find one?" (Juan, 27 February 2009 – translation author)

In El Tigre, the researched village with the most important culture of international migration, people are generally more confident to find employment. Many of them have worked for the same employer for many years and they know where to look for work. Pedro shows me a T-Shirt with the logo of a steak restaurant in Chicago.

> "I have worked for them for nine years in total. Every time I went back they had work for me. […] I will always find something. There are many restaurants. People always need help in the kitchen. I can wash dishes, chop vegetables. I also know how to make a pizza. I worked in an Italian restaurant as well."
> (Pedro, 8 March 2009 – translation author)

Thus the perception of the usefulness of migration, also in a precarious economic situation of the destination area, seems to depend on the degree to which the prospective migrant knows (or thinks to know) what he can expect on the labour market. People, who successfully migrated before, are more likely to be confident in finding employment than those who never migrated or who had a negative previous migration experience.

However, in some cases, even those people who worked at the destination for several years lost their job. In light of this situation, in addition to the question about the benefit of migrating, migrants have to ask themselves the question about the benefit of staying over returning home. García Zamora (2009) argues that, contrary to alarming scenarios of a massive return of migrants to Mexico provided by the Mexican press, there is no scientific evidence for this development. He quotes a study by the Colegio de la Frontera Norte (COLEF) indicating that recent figures do

not show a major return of migrants from the USA to Mexico, and speculating that this is also not very likely in the future. COLEF indicates three reasons for this assumption: 1) Part of the Mexican migrants are integrated into the US American society; 2) The increase of border protection measures has increased the costs of returning to Mexico and trying to cross the border again at a later stage; 3) As a consequence of the second argument, patterns of circular migration that were common for Mexico-US migration have been disrupted and more permanent moves occur now instead (García Zamora 2009).

Although evidence for all three above statements was found in the four communities, fieldwork shows that in many families migrants returned home earlier than they had planned or are at least considering doing so. Carolina's husband worked for four years consecutively in a car wash in California. He returned to Cascajal del Río in December 2008 because he could not find any employment anymore. Carolina says that there was always less work in winter because of the rain but that it had never been that bad in previous years. Her husband wanted to earn all the money he needed for the construction of his new house before returning. During the last months in the USA, he was losing money because he had to pay his rent all the time, while working sometimes only one or two days per week. Therefore, he decided to return and to start farming again, hoping to earn enough to maintain his family and to finish his house construction project. Migrants in the USA, but also internal migrants have been affected by the crisis.

Susana also lives in Cascajal del Río. During our first interview in October 2008, she told me about her son who lived in Ciudad de Juárez. She said that he was doing very well, earning a living and also sending some remittances. When I visited her again in February 2009, she told me that her son and his wife had both lost their jobs.

> "It is difficult. They do not know what to do. They cannot send me anything anymore. They can hardly maintain themselves and their son. One day soon they will have to come back. My son is thinking about it. They don't want to live here but where else can they go?"

> “Do you think that many people who left Cascajal will come back here?”
> “I don’t know. Many already came back. There are no jobs here, there are no jobs there. Then they are better off at home.”
> (Susana, 9 February 2009 – translation author)

Many migrants were not able to make the profit they expected to make and some of them were also losing money while trying to maintain themselves at the destination areas without earning anything. Thus, while employment opportunities in rural Mexico are declining, the perceived benefit of migration also declines for many people. Yet, still many mainly young people have got the intention to migrate, often to leave their home village which they think has nothing to offer for them. For example, again in Cascajal del Río, in autumn 2008 eight out of the twelve students in the last year of secondary education indicated that they wanted to leave the village right after finishing school or at least very soon thereafter.

7.1.3 Willingness to migrate and approval of others

As fieldwork showed, in most cases, the expected benefit or non-benefit of migration over staying in the home village is financial. However, some people in the researched communities do not consider migration as beneficial for different reasons. Many of them think that the social cost of leaving their family and friends behind does not outweigh the financial gain they might expect. For some people, the emotional bonds with their home community are so important that they do not want to leave.

Roberto lives with his wife and three children in Laguna Seca. He went to Chicago twice, making use of the migration networks of his wife who was born in El Nuevo Tigre. After the birth of his second child, he decided with his wife that he would not migrate again. Because of his employment in road construction in San Luis Potosí, a neighbouring state in the south-east of Zacatecas, for several years and now in a mine in the extreme north of the state of Zacatecas, he is used to being away from home during the week or sometimes for several weeks. However, he does not want to go to the USA anymore, where he would be obliged to stay for a year or longer.

> "With the work I have, I can maintain my family and help my parents. I just could not construct a new house for my parents so far, I promised them to do that. […] In 1999 and 2001 [the years in which he migrated – author], I earned enough money to construct this house. So now I prefer to be here. Now my children are small and my parents still alive. (Roberto, 9 June 2008 – translation author)

Concerns for the family and the old parents are often a reason for, or at least a factor leading to, the decision not to migrate. Another example is Bertha in Nuevo Renacimiento. She does not want to migrate and says that one factor that influences this decision is that she does not want to leave her mother alone with the care for her handicapped brother. Arturo in Cascajal del Río is considering to migrate but is concerned because all his siblings have already left. He does not want to leave his old parents alone in the village and he thinks that he will not be able to maintain them in case they would want to move with him and his family. Therefore, he thinks that he will most likely stay in the community as long as his parents need his help.

Thus people are often unwilling to migrate because of the responsibility they feel for family members. Yet, social pressure to take care of family members also affects migration decisions. The literature about migration in Mexico, presented in chapter 5, showed that in some communities people are socially 'forced' to migrate because migration is a rite of passage and all young people should make this experience and earn money away from home for the family. However, fieldwork showed that in some cases people can also be socially 'forced' to stay. The disapproval of migration by family members discourages some potential migrants from leaving the village. This is especially the case for women who have small children. They are expected to take care of their children, their parents and their parents in law and, therefore, often cannot migrate.

Mariana said that her father left the family in El Tigre to go and work in Chicago in 2002, when she was 11 and her brother 1 year old. Her mother followed him two years later and left her children with the parents of her husband. In El Tigre it is very common and socially accepted that husbands and fathers migrate and leave

their family alone for many years. However, the decision of a mother to leave their children with the grandparents is regarded as being “the bad example” and put a stigma on the whole family. Mariana would now like to migrate herself but does not do so because she feels responsible for her brother and because she is expected to stay and help her grandparents take care of him.

Next to the feeling of responsibility and the social pressure with respect to taking care of family members, some people feel very attached to their life in the village, their house, their cattle, their land, or other belongings. Fieldwork in the surrounding villages of Nuevo Renacimiento shows that many people refused to leave their home communities that were destroyed after the flood in 1999 although they were offered a house provided by the government in Nuevo Renacimiento. Those who moved to Nuevo Renacimiento still miss their village and their farmland after eight years in their new house. They are only a few kilometres away from the communities in which they used to live and still do not feel at home. Many of them said that they would never want to move further because now they can sometimes go back to their land although they often do not farm it anymore.

Eduardo and his wife live in Corronado about ten kilometres away from Nuevo Renacimiento on the other side of the river Tecolutla. Their house was flooded in 1999 and was completely destroyed. They also lost the complete harvest and all their cattle. The government offered them a house in Nuevo Renacimiento eight months after the flood and they refused.

> “I was afraid that the government would take away my farmland if I leave. So, I stayed with my son for two months and then we returned to clean the house. […] This is a high danger zone for floods now. So far, nothing has happened. When we see that a big flood is coming, we will go to Zamora” [Gutierrez Zamora, the nearest bigger agglomeration where his son lives – author].
> (Eduardo, 25 February 2009 – translation author)

The fact that people do not want to leave their village is also often caused by their fear of the dangers of migration. The stories about people who disappeared on their way into the USA that circulate in Laguna Seca were already mentioned in the

previous chapter. Also migration within Mexico, mainly to the border cities, is considered very dangerous by many people. People are aware of drug wars and crime but also of pollution and the danger of accidents in big cities. As they are not confronted with these problems in their home communities, many people prefer to stay. Often, those who never left their village before said that they found migration a very dangerous endeavour. Yet, also some people who have been away from their community and returned, resent the idea of migration. Sometimes this is founded in fear or in the memory of a bad experience; sometimes it is caused by a general unwillingness to leave a familiar environment.

Lilia has lived in Cascajal del Río for all of her life. Her three adult daughters moved to Matamoros at the US border some years ago. Her son is still living in the house of his parents with his wife and his two children. Lilia often takes the coach service to Matamoros to visit her daughters. She is convinced that they are leading a better life there than they would be able to have in the village.

> "I have been thinking about moving there as well for a long time. I could open a food stand and take care of my grandchildren when their mothers are working. Renato [her husband – author] and I like Matamoros. There are many opportunities there, which we don't have here. […] But then I come home and I wonder how I could live in this heat, in this dust. The city smells bad. Everything is green and fresh here. […] And we worked so hard to build the house.
> (Lilia, 2 November 2008 – translation author)

7.1.4 Perceived ability

As migration is not only expensive and potentially dangerous but also an endeavour that requires a certain degree of physical and mental fitness, some people do not consider themselves, or are not considered by others, as suitable to migrate. Age and gender are the most important factors that limit people's ability to migrate. People over 50, or sometimes even younger people, often do not think that they will be able to successfully finish the journey and to obtain employment at the destination area. Therefore, they often do not think that migration is a suitable livelihood strategy for them anymore. Fernando lives in El Nuevo Tigre and is 55

years old. He has been to Las Vegas four times for several years when he was younger.

> “I really liked to be in Las Vegas but not anymore. Now I am too old for that. Walking for days to cross the desert, climbing the wall, no, not for me. And, even if they carried me there, nobody would employ me anymore.”
> (Fernando, 11 March 2008 – translation author)

It was mentioned in the previous chapter already that gender affects migration decisions in different ways in Zacatecas and in Veracruz. In Zacatecas, women often do not consider themselves or are not considered by their husbands or parents as capable to migrate, at least not internationally. Furthermore, migration is often perceived as being too dangerous for them. This attitude has developed over the last twenty or thirty years in El Tigre. In the 1980s many women migrated to Chicago, mainly following their husbands but sometimes also on their own or with relatives. Angelica lived in Chicago for two years with her husband in the mid-1980s.

> “Yes, I crossed the desert as well. It was not dangerous at that time, just a very long walk. Today, I would not do that anymore, and I certainly don’t want my daughters to do it.” (Angelica, 22 March 2008 – translation author)

In Veracruz, women migrate, internally and internationally, and people do not seem to consider them less suited to do so than men. However, also in Veracruz mainly young people cross the border illegally.

People's experience in coping with unknown environments and their confidence in it, also contribute to their perceived ability to migrate. Mainly those who never left their village before are afraid of doing so and never would consider leaving in search of work. In Laguna Seca, several people said: “I cannot even find my way in Zacatecas. How do you want me to find my way anywhere further than that?” Often combined with an unwillingness to leave their village, the fear of not being able to cope with a new environment deters many people in Laguna Seca from migrating. Also the lack of formal education shows to be a barrier to migration, or even to leaving the village to visit family members. Illiteracy is a major problem among

adults in rural Mexico. Although Mexico on average has an illiteracy rate of 7.2% among people of the age of 15 or over (UNDP 2009), in villages of less than 2,500 inhabitants, the rate is 20% (INEGI 2006). Many people who cannot read and write fear that they will get lost on the way to their destination or at the destination.

Carla lives in Cascajal del Río with her husband and two grandchildren. The parents of the grandchildren she is taking care of live on a ranch close to Cascajal del Río. Two of Carla's sons live in Coatzacoalcos and a daughter lives in the Harbour City of Veracruz. If she wants to visit them, she has to take the bus to Acayucan and then another bus to either of the two destinations.

> "They sometimes come and visit me but they are all working and the children have to go to school, so they don't have time. They always want me to come and visit them and they will pay for the bus fare. I can go to Acayucan, but any further? How do I find the right bus? I cannot read what it says on the bus. People can tell me anything and then I end up in Mexico City." (Carla, 22 October 2008 – translation author)

A lack of formal education and of a secondary school diploma is also perceived by many people as a reason for not finding employment. However, in Mexico, the positive relationship between education and success on the job market only exists for women, while for men the rates of unemployment are similar for all levels of education (INEE 2008). Nevertheless, the assumption that only those who study will find a job is shared by many people in Laguna Seca.

> "It used to be a good idea to start working as early as possible to earn money. School has never been important here. Now, if you don't finish secondary school you will not work at all. In Zacatecas they want papers [meaning a diploma in this context – author] for everything. If you want to sell shoes they ask for papers, if you want to clean public toilets, they ask for papers." (Ruth, 9 June 2008 – translation author)

The previous sections showed that, in general, migration projects in Mexico are well-planned. People know that migration is expensive and that it therefore requires financial resources, but they also know that migrants need some personal strengths to be able to cope with the journey and with the demands at the destination areas. Those who fear that they cannot comply with these requirements

prefer not to migrate. Furthermore, although the lack of financial resources is a major problem in rural Mexico and an important driver of migration for many, some people consider their quality of life as more important than their financial well-being. Taking care of family members and relatives is a desire for some and a social obligation for others. In both cases it influences the decision not to migrate. Thus, the relationship between potential migration drivers and real migration decisions has proven not to be linear. Those who want to migrate also need to decide about the form of migration. The next section is concerned with this decision.

7.2 The choice of the form of migration

Migration can be internal or international, legal or illegal, temporary or permanent, and people can migrate alone or with the whole family or with some family members. Apart from personal preferences and the financial resources needed for the migration project, fieldwork shows that decisions about the form of migration are mainly influenced by people's access to migration networks and recruiters.

7.2.1 Migration networks

Fieldwork shows that migration networks have been and are crucial for the development of international migration in Zacatecas, and for both international and internal migration in Veracruz. Migration networks provide support to new migrants and help to share the financial and emotional costs of migration by providing credits to pay for the move, accommodation at the destination area, support in finding employment, and reassurance in a new environment. In El Tigre, fifty years of US migration, mainly to Chicago, shaped a network to which everybody who wants to migrate internationally has got access. However, in Laguna Seca, such a network never developed which is why almost nobody migrates to the USA illegally, except for those people who have got access to the migration networks of friends or relatives who live in a village with stronger migration networks. Perez Monterosas (2003) describes how migration networks developed first in the classical migration states Zacatecas, Michoacán, Guanajuato, Nayarit, and

Durango after the 'Bracero' programme ended in 1964, and Mexicans did not have any legal access to employment in the USA anymore. However, Mines and De Janvry (1982) argue that illegal migration, and as a consequence migration networks, already developed long before the end of the 'Bracero'[40] programme.

> "In the 1940s men from Las Animas, Zacatecas started to move to the USA again after the depression in the 1930s. Soon, many of them abandoned their *bracero* contracts or crossed the border illegally from the beginning. As illegal workers in the USA they could earn higher wages and stay longer than contracted labourers." (Mines and De Janvry 1982:451).

It is likely that in different communities, illegal migration developed at different times. However, it is evident that in Zacatecas, migration networks developed as a consequence of the legal access that was provided to the first migrants by the 'Bracero' programme.

People in Veracruz never had access to the 'Bracero' programme, and international migration only started in the 1990s. Nevertheless, this new migration flow did not develop without migration networks. Perez Monterosas (2003) explains that people in Veracruz made use of existing migration networks in the classical migration states. This happened in two ways. First, in the early 1990s, Veracruz was still one of the most important migrant receiving states in Mexico. Therefore, migrants from the classical migration states also moved to Veracruz. Often the migrants invited locals in Veracruz to join them on their next trip to the USA and offered to use the migration network of their village. Second, people from Veracruz also migrated to other destinations within Mexico, where they met migrants from the classical migration states and became involved in their migration networks (Perez Monterosas 2003).

This historical development explains the observation during fieldwork in Cascajal del Río and Nuevo Renacimiento that migration networks in both communities seem to be more 'individual' than in El Tigre. In El Tigre, the whole community shares one network. In the two communities in Veracruz, different families have got

[40] See chapter 4 for a more detailed description of the 'Bracero' programme.

access to different networks. Although these networks and links to different destinations in the USA exist, some people in the communities in Veracruz say that they cannot migrate to the USA because they do not know anybody there. This means that the migration networks are not open to all village dwellers as it is the case in El Tigre.

7.2.2 Recruiters

Recruiters for employment in the USA thus historically played an important role in contributing to the development of international migration networks. However, also nowadays, recruiters from the USA but mainly from Canada search for workers in rural Mexico. Employers in the USA can apply for the admission of seasonal labourers from several countries, including Mexico, in agriculture or in non-agricultural occupations under the H-2A or H-2B immigration schemes, respectively[41]. The majority of these visas are issued to Mexicans. In recent years, 90% of the H-2A and 60% of the H-2B visas were issued to workers from Mexico (Mohar 2007). Recruiters in Mexico then contract the requested number of workers and a visa application for the worker is filed. Canada has a similar temporary foreign worker scheme[42], which already exists since 1974 without interruption (Verduzco Igartúa 2007).

For some people, going to the USA or to Canada with a legal working contract is a safe alternative to illegal migration. However, like illegal migration, international legal migration requires some financial resources. Although the migrant workers are not supposed to bear any of the visa costs[43], people in all four researched communities said that the prospective migrants usually have to pay for their passports and for the immigration test themselves because the employers refuse to pay for them. Furthermore, migrant workers need to travel to Mexico City or Guadalajara to apply for their papers, and sometimes several visits are necessary,

[41] See information of the U.S. Citizenship and Immigration Services: http://www.uscis.gov/portal/site/uscis
[42] See information of Citizenship and Immigration Canada: http://www.cic.gc.ca/english/index.asp
[43] See the statement of the US based 'Farm Labor Organizing Committee': http://cgi.unc.edu/programs/mellon/working_group_papers/LaborRecruitment.pdf

which is expensive and time-consuming. Additionally, the prospective migrant bears the risk of losing his money if the passport, the visa, or entry into the USA or Canada are not granted. While a 'coyote' is only paid when the border crossing is successful, applicants for legal employment programmes in the USA or Canada are not reimbursed for their costs if their application is not successful. Therefore, the use of recruiters is not an attractive option for everybody and some people do not have access to them at all.

Corona Vázquez et al. (2007) suggest that recruiters for work in the USA are likely to be effective in finding workers among the population in the classical migration states and in the North. They argue that those people already have got migration experience and will more easily cross the border with contracts. However, fieldwork in El Tigre shows that those who possess international migration networks are unlikely to follow the invitation of recruiters because they prefer to migrate illegally. Usually they argue that when they go without a legal contract they can earn more, work as many hours as they want, and stay as long as they want. Furthermore, many people in El Tigre would have problems passing the admission test of the USA. According to the Immigration and Nationality Act[44], admission to the USA cannot be granted for five years if the candidate has been expelled from the country once, or for twenty years if the candidate has been expelled from the country several times. As many people have been arrested and sent back to Mexico when they tried to cross the border illegally, they would not fulfil this requirement.

However, also in El Tigre, some people decide to migrate legally, mainly to Canada. Miguel was 17 years old at the time of the interview and watched how most of his friends started to move to Chicago. He did not want to migrate illegally because he said that it was too dangerous.

[44] See the legal code of the Immigration and Nationality Act at: http://www.uscis.gov/portal/site/uscis/menuitem.f6da51a2342135be7e9d7a10e0dc91a0/?vgnextoid=fa7e539dc4bed010VgnVCM1000000ecd190aRCRD&vgnextchannel=fa7e539dc4bed010VgnVCM1000000ecd190aRCRD&CH=act.

> “My brother is in Chicago now for two years. He suffered a lot when he crossed the border. And now he is unhappy, he always has to hide. He is not free. I don't want this. I applied to go to Canada. We will see, if not I stay here and help my father.” (Miguel, 10 April 2008 – translation author)

While in El Tigre the majority of people do not want to migrate legally, in Laguna Seca the majority cannot afford it. Only some people have got the money and the confidence to apply for papers and for a job. Often those people leave for six months or a year, return and apply again.

Also in Nuevo Renacimiento, some people make use of recruiters for the same job every year. Leonardo has been to Canada four times and he was always recruited by the same company. He is expecting to be able to go again soon.

> “Unfortunately, this year the recruiter came to my house when I was visiting my daughter in Mexico City. He will probably come again. He knows where I live and they always liked my work. If it is too late this year, then certainly next year again.” (Leonardo**,** 12 March 2008 – translation author)

In Nuevo Renacimiento mainly men over 30 are making use of recruiters. As opposed to people at the same age in El Tigre they are not used to illegal international migration and often find it dangerous and irresponsible towards their families. Furthermore, the temporary migrant worker scheme for Canada is limited to men between 22 and 45 and for women between 23 and 40 years of age and people on average are 38 years old when they participate in the programme. Only 3% of the participants are women (Verduzco Igartúa 2007). Therefore, young people, women and men, in Nuevo Renacimiento who want to leave Mexico, migrate illegally while legal migration is an alternative for middle-aged men who can still work but think that they are unable to migrate illegally or do not want to do so.

In Cascajal del Río, which is the most remote village of the municipality of Acayucan, few people leave with recruiters. They do not come into the village, potentially because of its remoteness and only few people approach recruiters in other villages.

As the previous sections have shown, all four communities show different migration patterns, which have been shaped to a large degree by the access to migration networks and to recruiters. Those who do not have access to either of the two, only have got the choice between migrating internally or staying at home. This is the case for the majority of people in Laguna Seca, while in the other three communities people have got access to at least one of the facilitators of international migration, networks or recruiters.

7.3 Alternative responses

Migration – in its different forms – can be one response to livelihood stressors. However, as the first section of this chapter showed, some people cannot or do not want to migrate. Nevertheless, they experience shocks and stresses affecting their livelihoods and have developed responses. Chapter 5 already introduced the most important livelihood strategies in the four researched communities. This section analyses in more detail how those who stay respond to the potential drivers of migration identified in the previous chapter.

7.3.1 Conversion of assets into money

In times of economic hardship, many people try to use the assets and skills they have to earn money. The most common strategies are starting micro-businesses, selling land and livestock and making use of credits. While men are responsible for contributing to the household income by looking for paid work, they tend to despair very fast when no jobs are available instead of looking for alternatives, such as starting their own business. This is a female domain and not always welcomed by husbands because it happens that women earn more with their small businesses than men in their jobs, which undermines the male idea of being the breadwinner. Therefore, women sometimes only work for their businesses when their husband is away to work or with his friends. Carmen in Laguna Seca has got two businesses. In the village she sells pottery for her cousin who owns a pottery shop in Zacatecas, and she does sewing work for her fellow village dwellers but also for

the school or the church, if they need new curtains or dresses for a special occasion.

> "I usually sew at night when the house is clean and the children are sleeping. This only works when Roberto [her husband, he works in a mine in Mazapil and is only home for about ten days every month - author] is not here. He does not like that I am doing this. When he is here, I always have to cook, or he wants me to watch television with him. I never get anything done when he is around."
> (Carmen, 7 February 2008 – translation author)

The range of products that women sell and of the services they offer is diverse. The most important business, which requires some investment, is a convenience shop in the village. Laguna Seca with its about 600 inhabitants counts at least 15 small shops selling mainly candy and basic food and household items. Those who do not want or cannot invest a lot of money in their business, produce and sell homemade food items such as cheese, bread, hamburgers, tacos, or ice cream. This kind of activity can be observed in all four communities in Zacatecas and Veracruz.

In El Tigre and Laguna Seca, many women also sell products that they or one of their relatives buy in bigger agglomerations and bring to the villages such as pottery, clothes, and diapers. In Laguna Seca, many women have got a contract with a shop in the city of Zacatecas. They offer products such as clothes, shoes, bedding, and household items. The women receive a provision of 10% of the value of each product that they sell. Customers can pay the amount in as many instalments as they want. Shops in the city do not offer this option because they are afraid of losing too much money if customers do not manage to pay everything. Some women in all four communities have got contracts with direct sales companies such as Jafra, Avon and Tupperware. Furthermore, many women offer services such as cutting hair, ironing, and tailoring and repairing clothes in their homes. Obviously, the success of these micro-businesses depends on the financial situation in the village communities. If nobody has got money to spend, nobody will require any of the products or services offered. Therefore, in Nuevo Renacimiento, many women use the proximity of Gutierrez Zamora, which is a larger town with

shops, hotels, and a bus and a coach station, to sell their products there. The walking distance between Nuevo Renacimiento and Gutierrez Zamora is about twenty minutes; a bus ride takes less than five minutes and costs 3 pesos. The three other villages are more remote, and the loss of time and money for the bus fare are considered too significant, so that women do not bring their products to town.

Another way to convert existing assets into money is to sell land or livestock. Large parts of the former communal 'ejido' land were privatised after the agrarian reform in 1992, so that farmers can now decide to sell their piece of land. In Cascajal del Río some farmers have done that, leading to a distribution of farmland into larger parcels because most of the land was bought by larger-scale farmers. In Nuevo Renacimiento, the option of selling land is limited because many people exchanged their house and farmland in their native communities against a house in Nuevo Renacimiento after the flood in 1999. Some of them still farm the land but do not legally own it anymore so that they cannot sell it. Furthermore, the farmland in the communities around Nuevo Renacimiento has been declared to be situated in a high risk zone for floods. In Zacatecas, more and more farmers are not farming their land anymore or intend to stop doing so soon. This is caused by the loss of productivity of the land as a consequence of the lack of rainfall, low soil fertility, and rising costs of farming equipment, as described in chapter 6. Many of them would be willing to sell their land, but they either do not find a potential buyer, or the prices are so low that the majority of people prefer not to sell. Selling land is thus a profitable livelihood strategy only in Cascajal del Río among the researched communities.

The selling of livestock is an important livelihood strategy in El Tigre because a large number of families still own cattle. Many people regard owning cattle as an insurance against shocks and stresses to their livelihoods. However, apparently the number of people who are willing to take care of cattle is decreasing.

> “If somebody dies, you have to pay for the funeral. You can sell a cow. If somebody gets ill, you need to pay for the treatment. You can sell a calf. This is how it should work. Nowadays people often do not want to work anymore. They sold all their cattle for parties, or to have a bigger house. Now, somebody gets ill or dies, what do they do?” (Claudia, 13 March 2008 – translation author)

Another problem that severely affects cattle holders in El Tigre is the lack of rainfall leading to a drying up of water holes at the end of the dry season. During the last years, people had to bring their cattle to their houses to give them tap water several times a week between May and August or September. Furthermore, plant growth is limited due to a lack of water and, therefore, the animals often also have to be fed for several months a year. Many people cannot afford buying fodder for their animals and have to sell them, others see that the benefit of cattle raising is decreasing and do not want to continue working for a smaller profit.

The development that seems to have started in El Tigre, namely that more and more people are selling their livestock, took place some decades ago in Laguna Seca. Nowadays very few families still own cattle. However, older people remember that some decades ago, almost every family had farm animals. Rosario was 72 years old at the time of the life history interview and had lived all her life in Laguna Seca.

> “When I was young, there was more life in the village. Cows were everywhere in the street – and donkeys. Today you only see chickens and sometimes a pig. […]”
> “What happened?”
> “Well, people sold the animals. Some families were really rich, now they have got nothing anymore.” (Rosario, 12 February 2008 – translation author)

In Cascajal del Río, few people own cattle but many people take care of cattle for the richer farmers. In exchange, they can sell the milk and keep every second calf that is born to the cows they are taking care of. Often people raise their calves for a year and then sell them. In Nuevo Renacimiento very few people still own cattle because the majority does not own and farm land anymore. Selling cattle is thus a livelihood strategy that only very few people can make use of.

During times of financial hardship, people in all four researched communities were making use of formal or informal credits. While informal credits among family members and close friends are a common strategy in all communities, there are some differences between the accessibility of formal credits between the communities. In El Tigre, people can go to a bank providing farmers' credits, which is located in Villanueva, about twenty minutes away from the village. As many families still own cattle and/or receive remittances from family members in Chicago, projects can often be financed by taking a small credit at the bank.

In Laguna Seca, the situation is different for two reasons. First, most people neither own cattle, nor do they receive remittances, so that they cannot provide any security for a bank. Second, as opposed to people in El Tigre, people in Laguna Seca are less used to acting outside of their village so that going to a bank in Zacatecas, which is about an hour away, and negotiating a credit is too big a challenge for many of them.

Both in Nuevo Renacimiento and in Cascajal del Río, companies providing micro-credits come to the villages to offer their services. They mainly do business with women and only exceptionally with men when no woman lives in the household. In both villages, about twenty women jointly hold a credit. They meet every month and pay part of their debts back. If one participant fails to pay, the others have to jointly pay the missing amount. Apparently, this creates a social pressure big enough to make the system work because according to the chairs of both 'credit groups' so far always everybody paid in time. The prerequisite for being allowed to join a group that is sharing a credit is to have plans for a certain project, ideally a micro-business. Women who want to open a shop or expand a small one, need seed money to do so, which they often do not possess. Therefore, micro-credits encourage the formation of micro-businesses, another important livelihood strategy in rural Mexico.

7.3.2 Relying on external aid

Although many people find a variety of income resources in times of economic and financial hardship, others do not succeed in doing so. Those people often manage to adapt their needs to the precarious circumstances. In Laguna Seca, during the winter months when no employment in commercial farming is available, “living with what there is” is one of the most important strategies in many families. For some families, it is sufficient to postpone their spending on clothes, make-up, and toys for the children to the summer months when many family members are likely to be working again. Others need to cut down their nutrition and medical expenses as well.

Also in the other three communities, several people say that they had to learn to live with less money over the last years. Some of them do not want to migrate, neither do they think that any other livelihood strategy would work for them. As a consequence, next to adapting their needs, some people rely on external aid. This is especially the case in times of environmental hardship, such as the drought years of 2006, 2007 and 2008 in Zacatecas, and after the floods and hurricanes that the inhabitants of Cascajal del Río and Nuevo Renacimiento suffered from. In Veracruz, aid in form of blankets, clothes, and food packages was provided by the local government and international agencies, such as the Red Cross, after the floods and the hurricanes. People, who suffered the 1999 flood close to Gutierrez Zamora, were offered new houses by the government in Nuevo Renacimiento. People in Zacatecas and Veracruz also regularly receive small items, such as milk for the children, blankets, kitchen utensils, or construction materials. Often, these are sponsored by political parties, which expect to attract voters for the next elections.

Structural government aid is another important form of household income, and for some households even the only income. The programme ‘Oportunidades’[45] is designed to support the poorest families in each rural community, although the

[45] http://www.oportunidades.gob.mx

decision of who should be integrated into the programme and who should not be integrated seems to be ambiguous. Recipients of the support need to fulfil a variety of requirements if they want to stay involved in the programme such as taking care of the health of the family, sending the children to school, following advice about nutrition and hygiene, and seeing to it that all family members finish their primary and secondary education. Families receive 420 pesos every two months and can get a small grant for every child they send to school. The 'Oportunidades' programme also provides basic health insurance for those who are unemployed or are not ensured via their employer or a relative. 'Procampo' is another government programme that has been specifically designed to support farmers. In Zacatecas many farmers benefit from this programme. Every landowner is supposed to receive 1,000 pesos for every hectare of land he farms. However, this system is abused by some farmers who prepare their land, receive their money, and then do not farm at all.

7.4 Chapter conclusion

Table 7.1 summarises the results of this chapter regarding the different forms of migration that can be found in Laguna Seca, El Tigre, Cascajal del Río and Nuevo Renacimiento. The chapter explained how historical, social and financial factors affect decisions about destinations and about who migrates and who does not migrate. The chapter also showed the different alternative livelihood strategies that people make use of instead of migration or in addition to the migration projects of their family members.

Chapters 6 and 7 analysed the migration patterns in the researched communities in Zacatecas and Veracruz. The previous chapter analysed the empirically identified drivers of migration and compared them to the drivers of migration in Mexico found in the literature. This chapter analysed how these drivers of migration translate into actual migration decisions, taking factors such as financial resources, human agency, access to networks and to recruiters as well as alternative livelihood strategies into account.

Table 7.1: Factors involved in migration decisions in the researched communities

	Main factors affecting migration decisions	**Dominant forms of migration**	**Major alternative livelihood strategies**
Laguna Seca	Fear to migrate internationally, often no money to migrate internationally or at all, perceived lack of education, lack of international networks	Internal rural, some legal international	Small businesses ranging from selling products for direct sales companies to sewing (women)
El Tigre	Long history of international migration, easy access to network in Chicago, money for migration projects from remittances, young men expected to migrate, internal migration and legal international migration not considered worthwhile, high aspirations to change existing life among the young	Illegal international, some legal international	Selling livestock (sometimes land), credits
Cascajal del Río	Short history of international migration, access to networks by family, hardly access to recruiters, sometimes fear to migrate mainly among elder generation, high aspirations to change existing life among the young, destinations depend on financial resources and preferences	Internal rural, internal urban and illegal international	Small businesses (women), micro credits for women

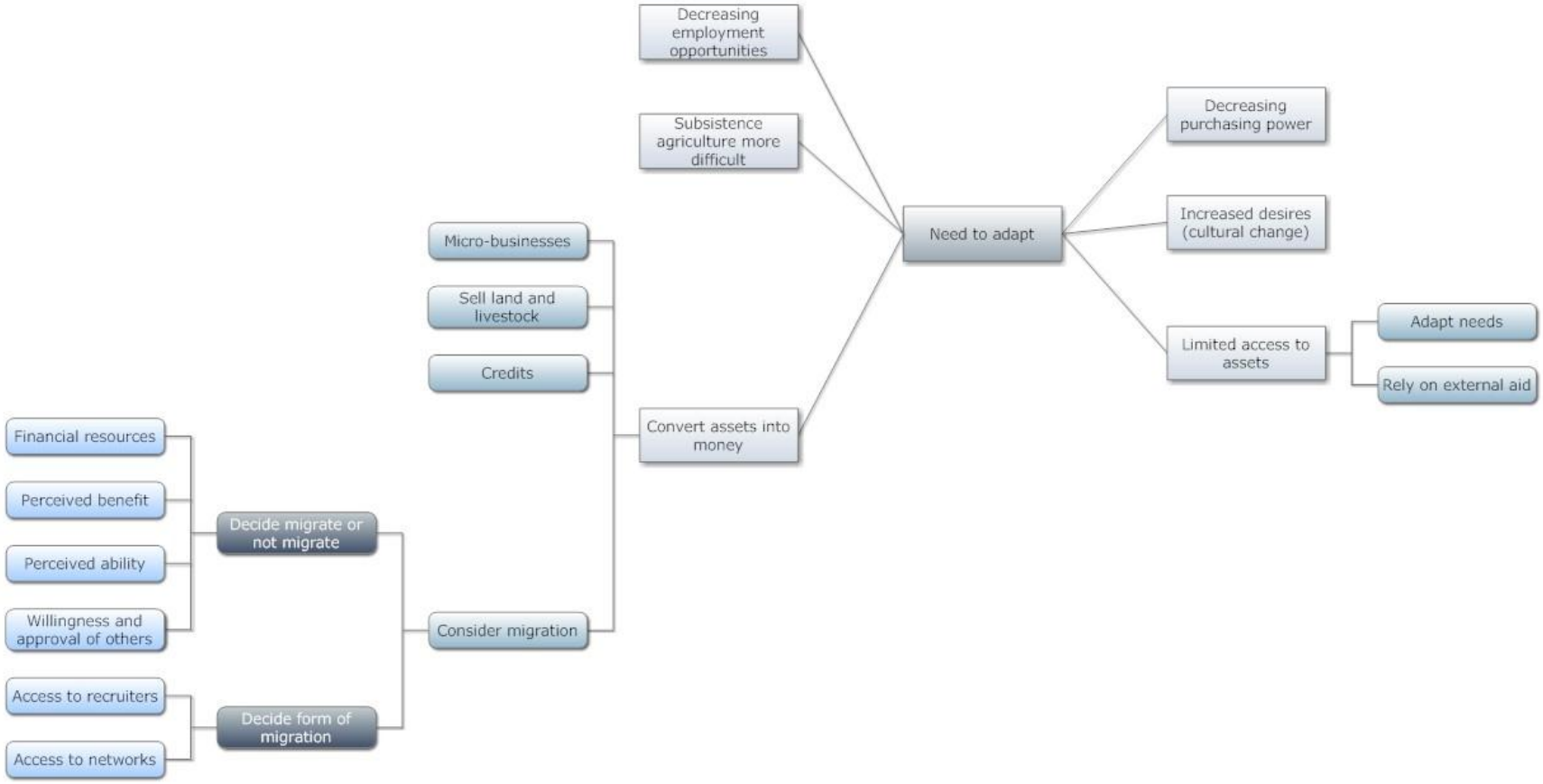
Nuevo Renacimiento	Short history of international migration, access to networks by family, also access to recruiters for some families for many year, sometimes fear to migrate mainly among elder generation, high aspirations to change existing life among the young, destinations depend on financial resources and preferences	Internal rural and urban, illegal and legal international	Small businesses, also outside the village (women), micro credits for women

Source: author, based on own empirical fieldwork

The chapter is based on the three assumptions that 1) drivers of migration do not directly translate into migration decisions but depend on intervening factors, 2) that migration has different forms and 3) that drivers of migration also drive different responses.

The results of chapters 6 and 7 are summarised in figure 7.2. This mind map shows people's different responses to external livelihood stressors, as well as the role that migration might play as one potential adaptation strategy among others. It also shows the elements that are affecting migration decisions at the meso and the micro level, leading to decisions for or against migration, as well as to decisions for the most suitable form of migration.

Figure 7.2: Migration decisions in Mexico



Source: author, based on empirical fieldwork

The livelihood stressors, which might become drivers of migration as analysed in chapter 6, lead to a need to adapt. If people have got access to assets, they might convert them into money, otherwise they need to wait for external aid or adapt their consumption patterns. If migration is considered, two decisions have to be taken, the decision to migrate or not at all, and – if the decision for migration is positive – the choice of the most appropriate form of migration. The decision to migrate at all, requires that the financial resources are sufficient or that somehow money for the migration project can be acquired, that people think that migration is beneficial, that people think they are able to deal with the often difficult journey to the destination and that they will find a job, and that people are willing to leave their home community and that this is accepted by family members and their fellow village dwellers. The choice of the form of migration depends, in addition to the amount of the financial resources available, to a large extent on the access to individual or village networks and to recruiters. The next chapter will analyse the sensitivity to climate change of the migration flows that were described in chapters 6 and 7. All elements involved in migration decisions, summarised in figure 7.2, are tested for their sensitivity to the direct and indirect effects of climate change at the local and the global level.

Chapter 8: Climate sensitivity of migration flows in Mexico

The previous two chapters analysed the perceived livelihood stressors in the researched communities, explained under what circumstances these livelihood stressors might become drivers of migration, what alternative strategies are used, and how intervening factors are involved in migration decisions in the two Mexican states of Zacatecas and Veracruz. In chapter 6 the perceived livelihood stressors, which are potential drivers of migration but also of other livelihood strategies, were summarised in the categories 'small-scale and subsistence agriculture and foraging more difficult, 'lack and decrease of employment opportunities', 'decreasing purchasing power', and 'increased desires and aspirations'.

Table 8.1: Livelihood stressors in the researched communities

Livelihood stressor	**Detailed process**
Small-scale and subsistence agriculture and foraging more difficult	• Variability in precipitation and temperature patterns • Extreme events such as droughts, hurricanes, floods • Decreasing soil fertility • Low revenues for yields • High prices for seeds, fertiliser, irrigation
Lack and decrease of employment opportunities	• Lack of industries or services in or near the communities • Lack of infrastructure to facilitate commuting • Lack of formal education needed to obtain work • Seasonal employment in agriculture decreasing
Decreasing purchasing power	• Low and decreasing salaries • High and increasing prices for basic consumer goods
Increased desires and aspirations	• Cultural change • Some young people unwilling to work hard for little revenue • Increased material desires (food, clothes, cars)

Source: author

Table 8.1 shows these categories of livelihood stressors as well as the detailed processes that were empirically observed in the four researched communities, and from which the four categories were derived. The climate sensitivity of these elements is analysed in the first part of this chapter. In the second part of the chapter, these results are integrated into the analysis of the climate sensitivity of the four different forms of migration that were found during fieldwork in Zacatecas and Veracruz: illegal international migration, legal international migration, urban internal migration, and rural internal migration.

Some of the empirically observed livelihood stressors listed in the table are likely to become affected by the local consequences of climate change, such as changes to temperature and precipitation patterns as well as extreme events in the researched communities. Other livelihood stressors are more likely to become influenced by the global consequences of climate change, such as the development of world market prices. While people's increased desires and aspirations do not seem to be directly related to climate change, they might play into decisions about solutions when climate change is affecting livelihood strategies. The following two sections analyse the susceptibility of the livelihood stressors shown in table 8.1 on a local and on a global level, respectively.

8.1 Sensitivity of livelihood stressors to local effects of climate change

The effect of changing precipitation and temperature patterns on yields has often been cited as the most important consequence of the local effects of climate change. Climate models indicate that area mean precipitation in Central America is predicted to be decreasing in all seasons, with the exception of some parts of north-eastern Mexico, where some increases in summer precipitation are projected (Solomon et al. 2007). Furthermore, as shown in chapter 3.1, extreme events such as droughts, hurricanes, and floods, which affect agriculture, are likely to become more frequent (droughts) or more severe (hurricanes). However, as chapter 3.1 also showed in detail, a large degree of uncertainty exists regarding the degree of

temperature and precipitation changes as well as regarding changes to the frequency and severity of extreme events.

Based on climate models, the working group II report of the 2007 IPCC assessment predicts a possible yield reduction of 30% in Mexico, considering direct CO_2 effects, as well as a 73% to 78% reduction in coffee production due to climate change in Veracruz (Magrin et al. 2007). Yet, in the context of the debate around the nexus between climate change and agricultural productivity, the 2007 IPCC assessment report stresses Latin America's high level of heterogeneity "in terms of climate, ecosystems, human population distribution and cultural traditions" (Magrin et al. 2007: chapter 13.2.1). This statement also holds true for Mexico with its climatic zones ranging from deserts in the north to tropical rainforest in the south, and its various ecosystems and forms of land use. Therefore, the prediction of a possible yield reduction on the country level seems to be very imprecise. Nevertheless, it shows that in general, yields are more likely to decline in Mexico as a consequence of climate change as opposed to, for example, Argentina, for which a 5% increase of yields is predicted under the same conditions (Magrin et al. 2007).

Compared to the rather brief section about the likely effects of climate change on crop yields in the 2007 IPCC assessment report, the subject has gained growing scientific attention from the early 1990s onwards. One of the first international initiatives was a workshop on climate change and world food security at the University of Oxford in 1993 followed by a special issue of the journal "Food Policy" (Downing and Parry 1994). In the same year one of the first and most widely cited analyses was published by Rosenzweig and Parry (1994), in which the authors combine the results of national and regional crop growth models under different climate change scenarios, and integrate them into a world food trade model to predict how these potential changes to the productivity of crop yields are likely to affect global food prices and the number of people without access to food. They find that climate change will increase the worldwide production disequilibrium for

cereals between developing and developed countries. In low latitude, i.e. mostly developing countries, adaptation measures that were considered feasible for farmers, such as slight changes to the planting date, the use of more water where irrigation systems already exist, as well as the use of different crop varieties, which are accessible, are not considered likely to be sufficient to compensate for yield losses brought about by climate change.

Adaptation measures that are more complex and likely not accessible to all farmers, such as the use of fertilisers, the installation of irrigation systems, and the development of new crop varieties, were found to compensate for yield losses under moderate climate change scenarios, while under more severe scenarios even the complex adaptation mechanisms were found not to be able to compensate for the negative impacts of climate change. The authors conclude that, while in the developed world agricultural production might not be affected or even benefit from climate change, yields are likely to decline in developing countries, even if adaptive measures are included in the equation. As a consequence, cereal prices are projected to rise, putting a larger amount of the world population at risk of hunger (Rosenzweig and Parry 1994). Rosenzweig and Parry's model does not distinguish between small-scale subsistence and commercial agriculture. Fieldwork in Mexico, however, showed that this distinction is empirically important as the following two sections indicate.

8.1.1 Climate sensitivity of small-scale and subsistence farming

With the model described above, Rosenzweig and Parry developed one of the first integrated assessments analysing the likely effects of climate change on food availability and prices. Their scenarios include demographic, economic, and technological developments, as well as different degrees of potential adaptation measures. Yet, their conclusions imply that farmers will continue farming as good as they can under more precarious circumstances. However, as fieldwork in Zacatecas and Veracruz showed, many people have become discouraged from farming in the first place because of a combination of environmental and economic

factors as shown in table 8.1. As analysed in more detail in chapter 6, one of the crucial factors that determine why people stop small-scale or subsistence farming is the discrepancy between the revenues they get and the amount of money they need to invest. According to many interviewees, farming is not beneficial anymore because seeds, fertilizers, and the maintenance of machinery have become very expensive, while the macro prices for the yields they could sell after feeding their families are very low. Furthermore, due to climatic variability the outcome of farming is perceived to have become more uncertain over the last decades. Already in 1994, Appendini and Liverman mentioned that after the Green Revolution in the 1970s, the output of small-scale farming became more risky with regard to climatic variability:

> "In favourable weather conditions, improved seed and fertilizer give much higher yields of crops such as wheat and corn, especially with irrigation. However, when drought, frost or flood destroys the crop, farmers are often left in debt because of the cost of the technical inputs (Walsh, 1993). Previously farmers did not purchase inputs, they kept seed from one year to another and perhaps used some green or animal manure as fertilizer. They might lose their crop to drought, and be hungry, but would not be making a major financial risk."
> (Appendini and Liverman 1994:158)

Decreasing soil fertility is another aspect affecting agriculture and mainly small-scale subsistence agriculture. The report of the conference "Climate change – can soil make a difference", organised by the Environment Directorate-General of the European Commission, stresses both the role of healthy soils for climate change mitigation as well as the fact that climate change is likely to "put further pressure on soil quality and will increase the risk of desertification and land degradation" (European Commission 2008). The 2011 Foresight Report on the Future of Food and Farming (Foresight 2011) suggests that climate change is likely to negatively change the impact of pests and pathogens on the quality and fertility of soils and on plant life. According to the interviewees in both Zacatecas and Veracruz, decreasing soil fertility started about one generation ago and has worsened since. Farmers do not connect it to the changing climate but attribute it to previous mismanagement of the farmland by using fertilisers (see Head et al. 2011). As a consequence, the soil was left without natural nutrients and dependent on

industrial fertiliser, which people often cannot afford to buy anymore. This argument has been repeated in many publications about the link between intensive farming and soil degradation. Yet, in addition, decreasing precipitation and increasing temperatures brought about by climate change negatively affect the moisture of the soil needed for farming (Fischer et al. 2005). Terrazas-Mendoza et al. (2010) who investigated the climate sensitivity of soil fertility in Mexico, show unsurprisingly that rainfed agricultural soil is more likely to be sensitive to climate change than irrigated soil, so that mainly subsistence farming will be affected. Decreasing soil fertility, which might be worsened by the local effects of climate change, is thus another factor that adds to the perceived decrease of profitability of small-scale and subsistence agriculture.

In addition to not being profitable and bearing a huge financial risk, in many households farming is increasingly not perceived as an attractive livelihood strategy. As chapter 6.3.4 showed, many young people think that their increased desires and aspirations, as compared to the previous generations, cannot be met with a farmer's income or with the prospect of living a farmer's life. Rosenzweig and Parry's analysis implies that different degrees of temperature increases and precipitation decreases will accordingly affect agricultural output at different degrees. Yet, using the example of monthly precipitation in Zacatecas, chapter 5.2.2 showed that people's perceptions of climate variability are not necessarily congruent with scientific climate observations. In El Tigre, increased variability in rainfall during the months in which most rainfall is needed for farming over the last two decades was perceived as a general decline in annual precipitation, and many people abandoned or reduced farming as a consequence. Also, in Cascajal del Río, Veracruz, perceptions of more severe floods over the last years have discouraged many families who own land close to the river from farming.

Thus the analysis of Rosenzweig and Parry (1994) misses the important element of human agency. The case of Mexico shows that a growing part of the Mexican rural population has discontinued farming because of a combination of high

investments for seeds and equipment, low revenues for agricultural produce, and uncertain yield outputs, which are to a large degree caused by uncertain climatic conditions. This development, reinforced by cultural change creating higher aspirations of the younger generation, has led to a situation in which fewer people than in the past still want to farm. The observation that farming is now rarely the main family income of rural dwellers in many parts of Mexico (Appendini and Torres-Mazuera 2008) supports this argument.

Therefore, it does not seem unreasonable to conclude, at least for the case of Mexico, that the climate change related threat to small-scale agriculture is caused by the fact that climate variability and therefore yield uncertainty is increasing. Yet, the severity of these changes to climate variability do not seem to matter that much. Models of changes to agricultural productivity under climate change, such as the one by Rosenzweig and Parry (1994), tend to rely on calculations of expected yield losses under different scenarios of temperature increase and precipitation decrease. While these models provide valuable results for societies in which farming is the only livelihood strategy, they fail to take into account the fact that people might anticipate that farming is becoming less and less cost-effective, and switch instead to alternative livelihood strategies. For the case of Mexico, this shift seems irreversible under future climate change, unless adaptive measures become affordable and accessible for farmers, and people consider farming more attractive again under these circumstances.

8.1.2 Climate sensitivity of commercial agriculture

The lack of employment opportunities is an important livelihood stressor and potential migration driver throughout Mexico, and commercial farming is an important source of employment. Therefore, the climate sensitivity of commercial agriculture will not only affect the livelihoods of large-scale farmers but also of large parts of the Mexican rural population. While the majority of labourers in rural Mexico are needed in commercial farming, others are employed by factories, in road construction, or mining. The effect of climate change on the availability of non-

agricultural employment opportunities is likely to be small. Yet, it is perceivable that investment into industries that need large quantities of freshwater will remain low in regions with low and decreasing groundwater resources due to lack of rainfall, such as Zacatecas. Also, the danger brought about by the potential increase to the severity of hurricanes and related floods (Solomon et al. 2007) might limit the investment of companies in coastal regions including Veracruz. Furthermore, the accessibility of places of potential employment as well as schools regularly becomes limited when roads are flooded or washed away during torrential rainfalls so that commuting is very difficult. This problem might worsen as a consequence of changing precipitation patterns brought about by climate change. Thus climate change, in combination with infrastructural problems, might to some extent affect the availability of non-agricultural employment opportunities in Mexico.

Nevertheless, climate change is likely to have the most important effect on employment opportunities in commercial agriculture. Commercial farmland in Zacatecas is often equipped with irrigation systems so that even if rainfall is ‘too little’ or ‘too late’, production is not necessarily affected. Yet, the irrigated farmland is not protected against torrential rainfall, hail, and early frost, which are increasingly destroying harvests according to commercial farmers in the region. Interviews with four large-scale commercial farmers who employ day labourers on their fields close to Laguna Seca, Zacatecas demonstrate that landowners realised that farming, also on irrigated fields, has become more difficult. All four interviewees noted that uncertain weather conditions and low market prices for agricultural produce are the main problems threatening their businesses. They all used the example of maize, which has a long growing cycle so that harvests often fail because of early frost. One strategy to overcome the problems brought about by increasing climatic uncertainty might be the diversification of crops. Yet, while the interviewed landowners agreed that farming maize is increasingly unproductive and none of them farms only maize, they hold different views about the crops that they should farm instead.

Thus Raúl Torres[46] argued that he started farming “a bit of everything”, which also enables him to spread the planting and harvesting periods over the year. As his fields are equipped with irrigation systems, he reported planting beans very early in the year, so that they can be harvested in July before the most important rainfalls occur, and the risk of torrential rainfall and hail increases. He suggested that crop diversification will increase the need for agricultural workers because “one worker can easily harvest some hectares of maize on his own but harvesting onions is much more labour demanding.” Yet, Alejandro Alemán[47], a farmer whose family has been specialising in the production of garlic for more than 30 years, commented that many large-scale farmers will start producing fodder for animals, which can be produced at low cost but also sells for a very low price. The production of fodder is easier than of maize, beans or vegetables, so that fewer day labourers need to be employed. Alemán also reported that some of his friends advised him to specialise in ecological products. However, he felt that too few people will be able to afford those products so that he risked making a big investment without the prospect of adequate revenues. Ignacio Hernández, one of five brothers who own most of the land around Laguna Seca and who employ many inhabitants of the village told me:

> - “There are two things we can do to stay in the business, just farming chilli is not doing it anymore. I have been thinking about changing to stronger crops such as alfalfa. You receive very little but the production is cheap and simple [....]. I also thought about getting a greenhouse. It is very expensive though but you can produce whatever you like. If tomatoes do well on the market – I think you saw the greenhouse with tomatoes – you can do tomatoes. Or you can change to anything else, you just need the money to build it [the greenhouse], then you can do whatever you want.”
>
> Q: “What does this mean for the number of workers you need? Will you employ the same number of people?”
>
> A: “If we do alfalfa we need very few people and the job is simple so we can pay them less. We need to make a profit by saving costs. For the greenhouse, we need more people, also well-trained people to operate it. But they [the well-trained people], usually come here from Spain. For the planting and picking the same workers we have now can come but we would need people all year round. So it really is expensive.”

(Ignacio Hernández – 22 March 2008 **–** translation author)

[46] Interviewed on 12 June 2008
[47] Interviewed on 12 June 2008

Over the last decade, in the centre of the state of Zacatecas, agricultural production in greenhouses became increasingly important, showing a mean annual growth rate of the cultivated area of more than 30% between 2001 and 2007. The total cultivated area in greenhouses in Zacatecas was estimated to be about 185 hectares in 2008. Tomatoes were cultivated on about 95% of this area, almost exclusively for export to the USA and to a smaller extent to Canada (Padilla Bernal et al. 2010). Julio, who works as a supervisor in one of the greenhouses at Vallehermosa, a neighbouring village of Laguna Seca, explained that greenhouses offer protection against temperature and precipitation extremes and allow two cycles of plant growth per year. The first growing cycle of the year starts in January and the harvest is between May and June. In July, the second growing cycle begins for a harvest in December. Production in greenhouses offers the further advantage that insects usually cannot enter and therefore there is less crop damage. One of the major advantages for investors in greenhouses is thus its potentially high return on investment. Padilla Bernal et al. (2010) argue that the proximity of Zacatecas to the US border is another factor acting in favour of the growing importance of greenhouse tomato production for export in Zacatecas. This argument does not seem to be very convincing though, because of the distance of about 600 km to the closest border cities in the south-east of the USA, and taking into account that states at the Mexico-US border, such as Sonora and Chihuahua, also produce greenhouse tomatoes for export (Padilla Bernal et al. 2010).

The most important disadvantage of greenhouses is their cost. Ignacio's brother Mario Hernández estimated a construction cost of three million pesos per hectare of land. He expressed his interest in building a greenhouse on his land, yet said that he could not afford it, despite the fact that he thought that the Mexican government paid for three quarters of the construction costs. According to the Mexican Ministry of Agriculture, Livestock, Rural Development, Fisheries, and Food (SAGARPA), government support for the construction of greenhouses can be granted for up to 50% of its cost, but not exceeding 4 million pesos for each project (SAGARPA 2010). Nonetheless, many local landowners and large-scale farmers,

despite their relative wealth in relation to the majority of the rest of the population in the region, appear unlikely to be able to construct greenhouses over large areas of their land. As a result, greenhouses in Mexico are often constructed and operated by foreign investors, mainly from the USA (Padilla Bernal et al. 2010). In the area around Laguna Seca in Zacatecas, several greenhouses owned and operated by Spanish investors exist.

As the example of Laguna Seca illustrates, existing climatic variability affects commercial agriculture in a different way than small-scale or subsistence agriculture. While many small-scale farmers have abandoned farming because of low prices for crops and uncertain climatic conditions, commercial farmers think about adaptation by crop diversification. Whether this will lead to the availability of fewer or more jobs in commercial farming depends on landowner's decisions about the crops they want to farm in the future. Historically, beans have been the most important commercial crop in Zacatecas, followed by maize and chilli (Márquez Herrera 2008). Compared to these "traditional crops", the decision to switch to cheaper and more robust perennial crops, such as alfalfa, would entail a need for fewer workers. In contrast, a switch to crops such as tomatoes, potatoes, carrots, onions, cauliflower, and cucumber would imply a need for more workers during different times of the year. Beans, maize and chilli usually only have one growing cycle per year. According to local commercial farmers, potatoes can be farmed twice a year as they only need up to 90 days between planting and harvest. For the harvest of some of these crops machines might be used in the future, which would entail a loss of a large amount of jobs in the long run. Yet, at the moment, human labour is cheaper than machines, so initially crop diversification is likely to lead to more employment opportunities in commercial farming. A third option might be a growing investment in greenhouses, which would also create a need for more unskilled labourers as well as for technicians to operate and maintain the heating and irrigation systems. Indeed, employees in greenhouses are needed all year round and they often receive contracts over several months, which should provide

access to more benefits and rights than the status of a day labourer without a contract.

So far, all three developments can be observed in Zacatecas. Some landowners are farming alfalfa; others different kinds of vegetables; whilst some greenhouses mainly operated by foreign investors exist as well. The question of how climate change is likely to affect the availability of employment opportunities thus depends to a large extent on landowners' decisions about what crops they will farm in the future. These decisions will certainly depend on price developments for seeds and agricultural produce, but also on individual preferences. It is also feasible that some large-scale farmers might discontinue farming and sell their land to investors who seek to build more greenhouses, especially when the farmland is passed from one generation to the next.

8.2 Sensitivity of livelihood stressors to global effects of climate change

The global effects of climate change on the observed livelihood stressors will most likely be expressed by changing prices on a regional or a global level. These price changes might affect the currently low revenues for agricultural products, and the high prices for seeds, fertiliser, and irrigation, which many interviewees identified as major factors which render small-scale or subsistence agriculture more difficult and which they argue cannot be attributed to local climatic conditions. Also the fact that people think that their purchasing power is decreasing, caused by low and decreasing salaries, as well as high and increasing prices for basic consumer goods, might be affected by price developments linked to climate change.

8.2.1 Climate sensitivity of agriculture

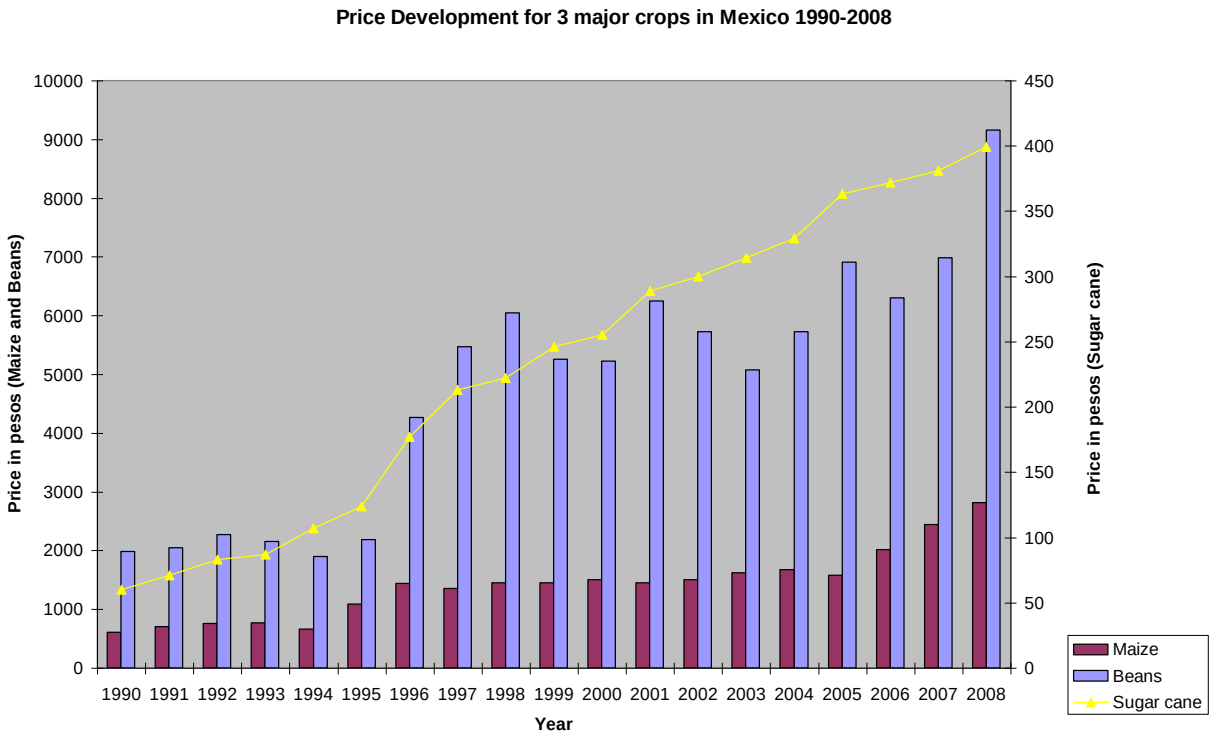
Conde et al. (2007) apply the concept of 'double exposure' introduced by O'Brien and Leichenko (2000) to Mexican agriculture. They argue that agriculture in developing countries, such as Mexico, is both vulnerable to economic globalisation and its often negative consequences for local farmers, as well as to the consequences of climate change. This conceptualisation acknowledges that the

success of farming is not only susceptible to local climatic conditions but also to price developments of agricultural inputs and outputs. Yet, the approach by Conde et al. (2007) does not take into account that price developments of seeds, fertilisers, water, and energy for irrigation as well as retail prices for agricultural produce might also become affected by climate change. The 2011 Foresight Report on the Future of Food and Farming (Foresight 2011b) noted that agricultural production will become more vulnerable as a consequence of increasing seed and fertilizer prices, particularly with respect to the uncertainties of climate change. Thus from the perspective of food producers, food production is likely to become less lucrative. Yet, the same Foresight Report as well as other assessments of the effects of climate change on food prices predict a global increase in commodity prices because of a significant global reduction in the production of staple foods such as corn, wheat, and rice (Foresight 2011b, Brown and Funk 2008, Lobell et al. 2008). Thus, from the consumers' perspective, food is likely to become more expensive and fewer people might have access to sufficient food in the future.

Past changes to agricultural commodity prices in Mexico over the last three decades have mainly been attributed to political developments such as internal market reforms and the creation of NAFTA (Eakin 2005, Márquez Herrera 2008) and not to environmental stressors. The main arguments are that farming became more expensive because of the withdrawal of subsidies, while the value of agricultural produce decreased because of favourable conditions for imported agricultural products, mainly from the USA but also from Canada. Yet, farmers' observations that the revenues they receive for their produce have been decreasing over the last years seems to be contradicted by the price movements of staple food crops such as maize and beans, and for the cash crop sugar cane. As figure 8.1 shows, prices for all three crops have been rising in real terms over the last 20 years. The steep rise of the price for maize and sugar cane since 2005 could be explained by the demand of these crops for the production of biofuels, which also caused a rise in the consumer price for maize and tortillas. Yet the price for beans also shows a tremendous rise from 2,000 Mexican Pesos per ton in 1990

to more than 9,000 Mexican Pesos per ton in 2008 with a steep rise in the mid-1990s and again in the second half of the first decade of the 21st century.

Figure 8.1 Price development for three major crops in Mexico between 1990 and 2008 (Average cost price per ton in Mexican Pesos)



Source: author, based on INEGI 2009: Estadísticas históricas de México

Thus, statistics of average prices for the entire country contradict empirical observations in the four researched communities. It has to be mentioned that the above presented data are constant prices and do not take inflation into account. Yet, interviewees referred to decreasing absolute prices in Mexican Pesos for their agricultural produce as opposed to a decrease of their purchasing power. Although observations in these four communities are not necessarily always representative for entire Mexico, it is unlikely that all four communities differ so much from the national average. Obviously, as chapter 5.2 showed regarding the discrepancy between rainfall statistics and interviewees' thoughts about changing rainfall patterns, people's perceptions do not always match reality. Nonetheless, the contrast between a general consensus about decreasing prices for produce locally,

and the sharp increase in recorded prices at a national level over the last years is both striking and surprising. One plausible explanation is that, as Márquez Herrera (2008) shows for rural areas in Zacatecas in the 1990s, small-scale farmers usually do not receive the official price for their products but have to negotiate with mediators who tend to make a huge profit themselves. While some farmers receive less than the official price for their produce, others are not paid at all or with a very large delay. For example, five farmers in Cascajal del Río, Veracruz said that they had farmed sugar cane on their fields and delivered it to a local processing plant. However, at the time of the interviews they had not received any payment for more than a year. Several weeks after the interviews, after their representative had been sent to talk to the operators of the processing plant, these farmers received part of their payment, but when fieldwork in Cascajal del Río ended three months later, they claimed they had still not received the full payment for their produce.

This means that although prices for agricultural produce are expected to rise under scenarios of climate change, farmers will likely not benefit from increased revenues – or at least are likely not to believe that they will benefit. Therefore, the link between the prices that farmers receive, which are the revenues that might motivate them or not to continue farming in the future, and climate change seems to be difficult to establish. Fieldwork suggests that Mexican farmers did not even benefit from the increased market price of maize caused by the demand for biofuel production over the last years. Therefore, it is unlikely that they would benefit from any increases of the official market price for agricultural produce in the future.

8.2.2 Climate sensitivity of purchasing power

Interviewees attribute the perceived decrease in purchasing power to the generally low and decreasing salaries as well as to the generally high and increasing prices for basic consumer goods. The climate sensitivity of salaries seems to be low as the level of salaries depends on the supply and demand of labour and on government policies. Yet, some changes to the payment of day labourers in commercial agriculture might occur as a consequence of a changing demand for

workers brought about by the different adaptation measures to increasing climatic uncertainty, as demonstrated above. As landowners might need more or fewer workers, depending on their choice of which crops they will farm in the future, daily salaries might decrease or increase. However, also if more labour is needed but the supply stays much higher than the need for workers, salaries might remain the same.

The climate sensitivity of prices for basic consumer goods can to a large extent be measured by assessing the climate sensitivity of consumer prices for agricultural produce because rural households in Mexico spend the most important amount of their household income on food items. Diets in rural Mexico are traditionally based on agricultural produce including staples such as tortillas made of maize, beans, rice, chillies, eggs, vegetable oil, as well as some fruits and vegetables if families can afford them. People also claim that products which cannot directly be linked to agricultural production – such as soap and detergent – have become more expensive.

Fischer et al. (2005) develop an assessment to predict the impact of climate change on agro-ecosystems until 2080. They link the different regional outcomes of the model to world market prices for agricultural produce by matching global demand with global supply. Their findings suggest that price increases for agricultural produce caused by climate change are likely to be relatively modest at around 2-20% or 4-10% using different climate change models. Also the global GDP for agriculture is projected to be only marginally affected with changes ranging from -1.5% to +2.6% again depending on different models. In line with earlier assessments (e.g. the one by Rosenzweig et al. in the 1990s), the assessment by Fischer et al. (2005) predicts positive effects of climate change on agriculture for most developed countries with some exceptions for parts of Europe and mainly negative consequences for agriculture in developing countries with the exception of Latin America. In a similar exercise, Parry et al. (2004) assess the effects of climate change on crop yields and in a second step simulate the impact

of these changes to crop productivity on global food prices and the number of people at risk of hunger worldwide. They find that in a reference scenario of a world without climate change, agricultural production worldwide would rise, yet because of an increase in the global demand for food, world market prices for cereals would also be projected to rise by between 30% and 160% compared to current market prices, depending on different scenarios. In a world with climate change, a severe decrease of agricultural production would be expected without considering CO_2 fertilisation effects. Consequently, the authors model large world market price increases for cereals without considering CO_2 effects and find that while most models project that prices are likely to double by 2050, under some scenarios price increases of more than 350% were to be expected by 2080. Yet, considering CO_2 effects, a much more moderate projected price increase between 10% and 20% as compared to current market prices can be observed by 2080, while some scenarios even suggest a price decrease between 2050 and 2080 (Parry et al. 2004). More recent studies though have shown that the expected effect of high CO_2 concentrations in the atmosphere are likely to have a much smaller effect on yield productivity than previous research suggested (Good et al. 2010).

However, agricultural losses are mainly expected in developing countries (Rosenzweig and Parry 1994, Brown and Funk 2008, Lobell et al. 2008). Therefore, climate related stressors such as droughts might impact on the national budgets of poor countries and therefore on their ability to supply their citizens with staple food items purchased on the international market. Brown and Funk (2008) use the example of Tanzania, which had to compete for maize with ethanol producers and pig farmers in the USA, leading to higher prices and a reduced access to food for the poor. Thus, the question of the worldwide distribution of food seems to be more important, also under future climate change, than the question of global availability of food. For the case of Mexico this means that international and national policies and agreements about export and import of food need to be in favour of the needs of people, bearing in mind that agricultural conditions in many

parts of the USA and Canada, Mexico's NAFTA partners, are likely to improve under future climate change (Lane and Jarvis 2007). Thus, food security in Mexico might also be achieved by negotiating affordable prices for imported crops in Mexico. Furthermore, the problem of rising prices for basic food items on the local market is closely linked to the problem of the high production costs of staples such as maize and beans, as well as the profits of intermediate traders, as shown above.

8.3 Summary: Climate sensitivity of livelihood stressors

Feng et al. (2010) quantitatively analysed the climate sensitivity of agriculture and its effect on migration in Mexico. According to different climate change and adaptation scenarios, they predict an additional 1.4 to 6.7 million Mexicans to migrate to the USA because of changes to precipitation patterns and subsequent yield decreases by 2080. They acknowledge the impact of factors such as economic growth in Mexico as compared to the USA, demographic change in Mexico, the importance of farming for people's livelihoods and agricultural policies, as well as immigration policies and border enforcement, on the development of migration flows. Yet, their analysis is only based on the predicted impact of climate change on yields, which in turn they predict to affect migration. This approach bears several shortcomings. As shown above, assessments of the impacts of climate change on yields, such as the one by Rosenzweig and Parry (1994), seem to assume that people continue farming under most precarious conditions until no farming is possible at all anymore. Thus, they fail to acknowledge that people might stop subsistence farming when it becomes increasingly unproductive and turn to alternative livelihood strategies, potentially including migration. Furthermore, as chapter 6.3 showed, young people's interest in farming is generally declining in Mexico. Also, those who continue farming, in many cases belong to an age group for which international migration in particular has already become very difficult, due to the physical effort demanded at the border crossing and the prospects of finding employment at the destination. Thus, those who farm often do not migrate and vice versa. Climate change also might create more or fewer jobs in commercial

agriculture, depending on how landowners decide to diversify crops under changing climatic conditions. As the previous sections showed, some crops are likely to require more labour, others less, resulting in opposite developments of the need to migrate as an alternative to finding local employment. Nevertheless, many of these moves might also be seasonal and internal, as empirical evidence from the village of Laguna Seca in Zacatecas shows.

Barbieri et al. (2010) also analyse the climate sensitivity of existing migration patterns by focusing on the climate sensitivity of stresses to people's livelihoods. Unlike Feng et al. (2010), they concentrated on the climate sensitivity of generic economic migration drivers, mainly the income differentials between different regions in Brazil. They acknowledge that their approach "emphasizes an economic perspective on human migration, and does not consider the operation of other adaptation mechanisms" (Barbieri et al. 2010:351). Thus, both studies, the one by Feng et al. (2010) and the one by Barbieri et al. (2010) base their analysis on the climate sensitivity of migration to only one potential driver of migration. Although it has to be acknowledged that both decreasing agricultural productivity and a decreasing availability of employment are important livelihood stressors, climate change might, to various extents, affect other livelihood stressors in the sending areas. Furthermore, climate change might affect these livelihood stressors at the local and at the global level.

So far, this chapter has analysed the climate sensitivity of the livelihood stressors empirically observed in Zacatecas and Veracruz. As opposed to the studies by Feng et al. (2010) and Barbieri et al. (2010), the approach applied in this chapter so far has aimed at a holistic analysis of the potential local and global effects of climate change on existing livelihood stressors. The results of this analysis are summarised in table 8.2.

Table 8.2: Climate sensitivity of livelihood stressors in the researched communities

Livelihood stressor	**Projected climate change impact**	**Local vs. global climate sensitivity**	**Degree of climate sensitivity**
variability in precipitation and temperature patterns	increased uncertainty leads farmers to abandon farming	local	very high
extreme events such as droughts, hurricanes, floods	more frequent or more severe, uncertainty increasing	local	high
decreasing soil fertility	increased risk of land degradation and of pests and pathogens	local	medium
low revenues for yields	caused by decreasing yields, revenues likely to increase on a global level. Yet, in Mexico counterbalanced by policies	global	very low
high prices for seeds, fertiliser, irrigation	feasible but not documented	global/local	very low
lack of industries or services in or near the communities	potentially less investment because of lack of water or risk of floods or hurricanes	local	medium
lack of infrastructure to facilitate commuting	potentially some impacts on accessibility of work places	local	low
lack of formal education needed to obtain work	potentially some impacts on accessibility of schools	local	low
seasonal employment in agriculture	depending on crop choice by landowners increase or decrease of employment possible	local (uncertain climate), global (prices)	very high
low and decreasing salaries	potential for some changes caused by need for more/fewer workers in commercial farming	local, global	low
high and increasing prices for basic consumer goods	danger of price increase due to decreasing yields on a global level, can be mediated by national policies	global	high
cultural change	plays into farming decision, but not affected by climate change	none	very low
some young people unwilling to work hard for little revenue	plays into farming decision, but not affected by climate change	none	very low
increased material desires (food, clothes, cars)	plays into farming decision, but not affected by climate change	none	very low

Source: author

While livelihood stressors are potential drivers of migration, as chapter 7 showed, elements, such as human agency, financial resources, access to recruiters and networks, and the availability of alternative livelihood strategies are also important elements in migration decisions. As these intervening elements might also become affected by the local or global consequences of climate change, the role they play in migration decisions might change in the future. Furthermore, the availability of employment opportunities at migrants' destinations might to various extents become affected by climate change. Therefore, a holistic assessment of the potential effects of future climate change on migration needs to include all elements involved in migration decisions at the macro, the meso and the micro level. It also needs to analyse the potential differences regarding the climate sensitivity of different migration flows. The next sections are concerned with the analysis of different migration flows observed in Zacatecas and Veracruz.

8.4 Climate sensitivity of different forms of migration

One interesting result of the analysis of migration decisions in Mexico in chapters 6 and 7 is that the livelihood stressors at the macro level are identical in the historically and socio-economically different communities El Tigre and Laguna Seca in Zacatecas, as well as in Cascajal del Río and Nuevo Renacimiento in Veracruz. However, the manner and extent to which these livelihood stressors contribute to migration decisions, or to the choice of alternative livelihood strategies, is very different in the four communities. These differences are to a large extent caused by intervening factors at the micro and the meso level such as agency, including people's individual choices and preferences, networks, recruiters, and financial resources.

Table 8.3 shows the different forms of migration that were identified in the communities Cascajal del Río, Nuevo Renacimiento, Laguna Seca, and El Tigre, and seeks to summarise the empirical findings regarding the destinations, origins, and the intervening factors at the meso and micro levels involved in these different migration flows. Chapter 7 analysed the different degrees of importance of these

elements for different migration flows. One example is that, while access to networks at the destination is a crucial factor for international illegal migration decisions, it is helpful but not mandatory for internal migration decisions.

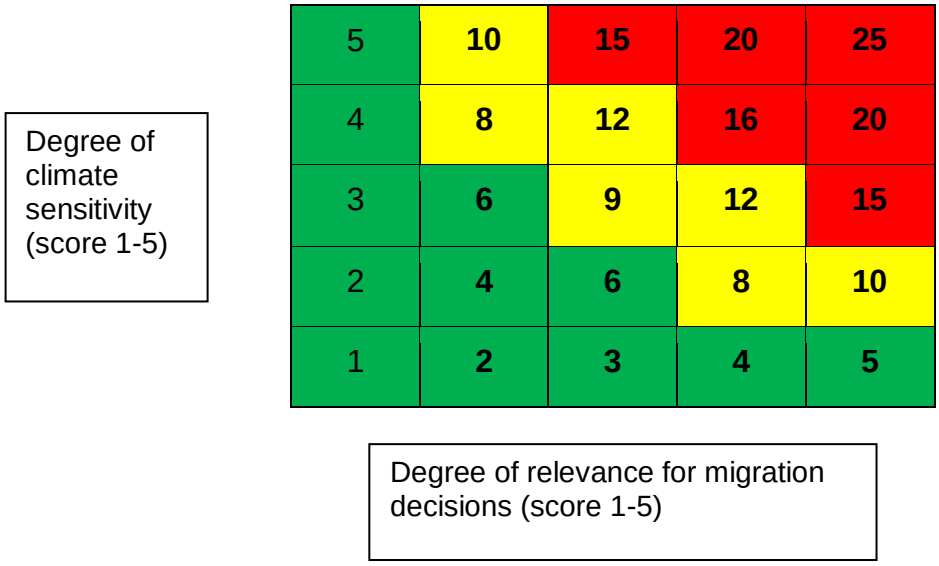
Table 8.3: Migration flows in the researched communities

	Illegal international	**Legal international**	**Internal urban**	**Internal rural**
Destination	US cities or agricultural regions	US cities or agricultural regions	Local agglomerations, northern border cities, Mexico City, Monterrey, Guadalajara	Farming regions in Jalisco, Sinaloa, and tropical states including Veracruz
Origin	El Tigre, Cascajal del Río, Nuevo Renacimiento	Cascajal del Río Nuevo Renacimiento, Laguna Seca	Cascajal del Río, Nuevo Renacimiento	Laguna Seca, Cascajal del Río, Nuevo Renacimiento
Facilitators	Access to networks mandatory	Access to recruiters mandatory	Access to networks helpful	Access to networks or recruiters helpful
Financial resources needed	3000-4000 USD for the border crossing	Up to 500 USD for passport and papers	Money for the journey and for accommodation and food at destination in case of no networks	Money for the journey and for accommodation and food at destination in case of no networks
Agency	Perceived ability to cross border and find work, willingness and approval of others (no disapproval because of danger and long separation from family), in El Tigre social restrictions for women migrating alone, in Veracruz not a problem.	Perceived ability to obtain papers and work, willingness and approval of others (no disapproval because of long separation from family), perceived benefit (often income perceived to be inferior compared to illegal migration	Perceived ability to find work and manage life outside of home village, perceived benefit (salaries in Mexico are lower than in the US), willingness and approval of family members	Perceived ability to find work and manage life outside of home village, perceived benefit (salaries in Mexico are lower than in the US), willingness and approval of family members, especially for women in Veracruz

Source: author

An assessment of the climate sensitivity of existing migration flows in Mexico thus needs to take into account the different degrees of climate sensitivity of all above mentioned elements involved in migration decisions. It also needs to consider the different degrees of relevance for migration decisions of these elements. The following matrix combines these two factors: 1) to what extent each element involved in different forms of migration is sensitive to climate change; and 2) how relevant this element is for this form of migration. This combination of factors measures to what extent the effects of future climate change on each specific element involved in migration decisions will affect different migration flows as a whole.

Figure 8.2: Matrix measuring the effect of climate change on migration flows



Source: author

This approach is a modified version of the qualitative risk assessment, which measures the impact of a phenomenon, in relation to the likelihood that this phenomenon will actually occur (Fletcher 2005). As figure 8.2 shows, possible scores are the following: 1 = very low, 2 = low, 3 = medium, 4 = high, and 5 = very high. Table 8.4 explains the meaning of each score and of the colour codes, which

are attributed to the degree of climate sensitivity and to the degree of relevance for migration decisions of the elements involved in different migration flows.

Table 8.4: Scores for degree of climate sensitivity and relevance for migration decisions

	Degree of climate sensitivity	**Degree of relevance for migration decisions**
1 (very low)	effect very unlikely, negligible	almost nothing to do with migration decisions, negligible
2 (low)	small effect possible, yet non-climate factors stronger	small effect on migration decisions possible, yet other factors more important
3 (medium)	some changes to existing situation possible but no large ones, other factors might be stronger	some effect on migration decision, yet not a determining argument
4 (high)	substantial effect, changes of existing situation likely	strong effect on migration decisions
5 (very high)	very substantial effect, changes of existing situation almost certain	major factor in migration decision, determining argument

Source: author, adapted from Fletcher (2005)

In the analysis which follows, the product of the scores for the degree of climate sensitivity and for the degree of relevance for migration decisions is calculated for each element involved in migration decisions. The potential results range from 1 (very low effect) to 25 (very high effect). As figure 8.2 shows, results between 1 and 6 indicate a very low and low impact of climate change on migration, results between 8 and 12 a medium impact, and results between 15 and 25 a high to very high impact. Elements scoring very high for the combination of the degree of their climate sensitivity and of their relevance for migration decisions are likely to contribute most to changes to existing migration patterns caused by future climate change. As chapter 7 showed, several elements involved in migration decisions can be of different degrees of importance for different forms of migration. Therefore, also the impact of climate change can be expected to be different on different forms of migration.

Table 8.5 seeks to show the climate sensitivity of different migration flows in Mexico based on empirical fieldwork, which was analysed in detail in chapters 6 and 7[48]. Scores marked in red identify the elements involved in migration decisions, which, when affected by climate change, are likely to bring about the most significant changes to existing migration patterns. The highest positive effect of future climate change on illegal international migration can be expected when climate change negatively affects the availability of employment opportunities in industries or services near the sending areas and when climate change causes price increases for basic consumer goods. The availability of financial resources also scores very high, yet, the relationship between access to money and illegal international migration is positive. Illegal international migration is the most expensive form of migration. The negative effects of household income in the form of decreasing agricultural outputs and a decreasing availability of employment opportunities, partly caused by climate change and resulting in decreasing financial resources, are likely to entail severe restrictions to potential international migrants. Empirical evidence from Zacatecas and Veracruz showed that international migrants often rely on financial support from members of the extended family in the sending and the receiving areas. Without these informal credits, fewer people are likely to be able to afford the high costs for the journey, the crossing of the border and maintenance in the USA.

[48] See appendices 1-4 for separate tables for each migration flow, including explanations why the degree of climate sensitivity and the degree of relevance for migration decisions was set at the values presented in table 8.5.

Table 8.5: Climate sensitivity of different migration flows in Mexico

	degree of climate sensitivity	**degree of relevance: illegal international migration**	**score: illegal international migration**	**degree of relevance: legal international migration**	**score: legal international migration**	**degree of relevance: internal urban migration**	**score: internal urban migration**	**degree of relevance: internal rural migration**	**score: internal rural migration**
variability precipitation/ temperature patterns	very high (5)	low (2)	10	low (2)	10	high (4)	20	very high (5)	25
extreme events	high (4)	low (2)	8	low (2)	8	high (4)	16	very high (5)	20
decreasing soil fertility	medium (3)	low (2)	6	low (2)	6	high (4)	12	very high (5)	15
low revenues for yields	very low (1)	low (2)	2	low (2)	2	high (4)	4	very high (5)	5
high prices for seeds, fertiliser, irrigation	very low (1)	low (2)	2	low (2)	2	high (4)	4	very high (5)	5
lack of industries or services in or near the communities	medium (3)	very high (5)	15	very high (5)	15	high (4)	12	high (4)	12
lack of infrastructure to facilitate commuting	low (2)	medium (3)	6	medium (3)	6	medium (3)	6	medium (3)	6
lack of formal education needed to obtain work	low (2)	very low (1)	2	very low (1)	2	medium (3)	6	very low (1)	2

seasonal employment in agriculture	very high (5)	low (2)	10	very high (5)	25	high (4)	20	very high (5)	25
low and decreasing salaries	low (2)	very high (5)	10	very high (5)	10	medium (3)	6	low (2)	4
high and increasing prices for basic consumer goods	high (4)	high (4)	16	very high (5)	20	very high (5)	20	very high (5)	20
cultural change	very low (1)	very high (5)	5	very low (1)	1	medium (3)	3	very low (1)	1
unwilling to work hard for little revenue	very low (1)	very high (5)	5	very low (1)	1	very low (1)	1	very low (1)	1
increased material desires	very low (1)	very high (5)	5	low (2)	2	very low (1)	1	very low (1)	1
access to networks	low (2)	very high (5)	10	medium (3)	6	medium (3)	6	medium (3)	6
access to recruiters	low (2)	very low (1)	2	very high (5)	10	low (2)	4	medium (3)	6
financial resources	medium (3)	very high (5)	15	very high (5)	15	medium (3)	9	low (2)	6
agency	low (2)	very high (5)	10	medium (3)	6	high (4)	8	medium (3)	6
alternative livelihood strategies	medium (3)	very low (1)	3	very low (1)	3	medium (3)	9	very high (5)	15

Source: author

Anecdotal evidence from interviews during the second phase of fieldwork, which coincided with the 2008/2009 global financial crisis, suggests that, because of decreasing financial resources, many families could not afford international migration any more. The latest Mexican Census data (INEGI 2010) show that Mexico-US migration had decreased over the last years, which might or might not have been caused by the effects of the global financial crisis. Yet, the decrease of Mexico-US migration coincides with two phenomena: 1) the global financial crisis, which severely affected employment opportunities in the USA and in Mexico and decreased household income; and 2) climatic extremes which might be attributed to climate change, such as severe droughts in some parts of Mexico including Zacatecas, and severe floods in other parts of Mexico including Veracruz. This observation suggests that the negative effect of economic factors on illegal international migration is likely to be stronger than the positive effect of phenomena related to climate change. In sum, it seems unlikely that future climate change will increase illegal Mexico-US migration. It seems more likely that economic restraints, reinforced by the consequences of climate change, will result in illegal international migration either decreasing or remaining stable in the future.

The role that climate change is likely to play in relation to legal international migration is similar to the effects of climate change on illegal international migration. The most important difference is related to the effects that climate change might have on the availability of seasonal employment in commercial agriculture. Where the possibility exists at all – i.e. where recruitment agencies operate, and/or social connections exist, legal international migration is accessible to a larger group of people than illegal international migration because it is cheaper. Therefore, if employment opportunities in commercial agriculture in the sending areas were to decrease, more people would be likely to consider working in the USA or in Canada, also likely in commercial farming. Yet, as this chapter has demonstrated, two scenarios are feasible regarding the impacts of climate change on the availability of employment in commercial agriculture in

Mexico. The diversification of commercial farmers to more labour intensive crops and the expansion of greenhouses would be expected to entail a need for more workers, also possibly during different times of the year, in which previously no work in commercial farming was available. Yet, a change of commercial farmers to crops which need fewer workers, or the abandonment of farmland, would lead to more pressure on agricultural workers to seek employment opportunities somewhere else.

The second scenario might, in combination with a decrease of internal migration, also lead to an increase of legal international migration. Access to recruiters in or near their home communities, however, is mandatory for legal international migration and, as fieldwork showed, recruiters are not active all over rural Mexico. Furthermore, the generic climate sensitivity of migrants' destinations was not included in table 8.5 because rural agricultural destinations are likely to be affected differently by climate change than urban destinations. Mexican migrants work in both agricultural and non-agricultural jobs in the USA. Nevertheless, it is feasible that the effects of climate change might also lead to changes to commercial farming in the USA. The effect of climate change on legal international migration thus remains unclear because it is subject to uncertainties in both the sending and the receiving regions.

Like the two forms of international migration, the two forms of internal migration are likely to become affected in similar ways to each other by future climate change. The major difference between international and internal migration is that the direct effects of climate change on agriculture, manifested by changing temperature and precipitation patterns and extreme events, are likely to contribute to a larger extent to changes in internal migration patterns than to changes in international migration patterns. Internal migrants often rely much more still on subsistence agriculture and on jobs in commercial farming than international migrants, particularly people engaged in illegal international migration. Changes to prices of basic consumer goods are also important

elements in the decision for internal migration, both to rural and to urban destinations. Yet, internal migration is less expensive than international migration and access to migration networks or recruiters is not necessary. Therefore, internal rural or urban migration is accessible to most of the rural population, although the poorest village dwellers might still be unable to pay for the journey. It is thus likely that climate change, by depriving people of several sources of their income, might stimulate internal movements. Nevertheless, as mentioned above, climate change is likely to also affect destination areas, so that rural destinations within Mexico might become less attractive. Furthermore, both rural and urban destinations might become saturated when more people from entire Mexico decide to move.

Another major difference between international and internal migration is the importance of the availability of alternative livelihood strategies. While the potential effect of climate change on alternative livelihood strategies on both forms of international migration is likely to be minimal, it is likely to be much bigger on internal migration, particularly on rural internal migration. The reason for the importance of alternative livelihood strategies for internal rural migration is the fact that internal moves to rural destinations are often seasonal and temporal. As empirical evidence from Zacatecas shows, many migrants only move during the winter months, when commercial farming does not offer any jobs. Their intention is to find some kind of income, which enables them to secure their maintenance during these months. Some village dwellers who do not migrate, manage to do so by setting up micro-businesses. However, due to the general lack of money in the winter months, they often lack customers who can afford to buy their products. Furthermore, these micro-businesses in general do not generate enough money for a whole family to survive. Therefore, in many cases they are not considered an alternative to international moves or to moves to urban areas in Mexico, which are often more permanent. Yet, they are an alternative to internal rural migration, which can be used to bridge the lack of

income during the months when few employment opportunities in agriculture are available.

8.5 Chapter conclusion

This chapter has analysed the potential effects of climate change on existing migration flows in Mexico. It has argued that the consequences of climate change will manifest at the local and at the global level. Therefore, climate change will also affect elements involved in migration decisions on both levels. The first part of the chapter was concerned with an analysis of the climate sensitivity of the livelihood stressors that were empirically observed in Zacatecas and Veracruz. It demonstrated that the local effects of climate change will most seriously affect subsistence and commercial agriculture. Previous assessments of the effects of future climate change on agriculture calculated the yield losses that the effects of climate change on agriculture will entail. However, unlike these assessments, this chapter has argued that small-scale farmers are likely to stop farming altogether when uncertain weather conditions lead to a significant risk of losing money that is invested in agriculture. This argument is based on empirical evidence in Zacatecas and Veracruz, which has shown that uncertainty of precipitation and temperature patterns has already led some farmers down this path.

While subsistence farmers may not have the means to adapt to changing climatic conditions and may stop farming altogether, adaptation measures are a more realistic option for many commercial farmers. However, based on empirical observations, the chapter has presented three adaptation options for commercial farmers in Mexico as a response to climate change. All three responses are based on diversification away from traditional crops including maize. This development has already started as the example of Zacatecas showed. Importantly, farmers consider switching either to crops which demand more labour or to crops which demand less labour. Depending on the investment capacity, greenhouses are a third option. Thus, the effects of climate change on

the availability of employment in commercial farming, an important source of employment for Mexican village dwellers, depends on the future choice of crops. Growing local and foreign investment in greenhouses in particular is likely to increase the availability of jobs, and greenhouses demand labour during times of the year in which conventional farming does not employ workers.

Agriculture might also become affected by the global effects of climate change. Rising prices for agricultural inputs, in combination with local climate stressors, are currently rendering farming less profitable. This might add to people's decision to abandon their farmland. Furthermore, the global consequences of climate change are likely to translate into growing prices for basic consumer goods, negatively affecting people's purchasing power. Although consumer prices for agricultural products are predicted to increase under future climate change, these price increases are likely not to be transferred to producers because of the strong position of middlemen involved in the buying and selling of agricultural produce.

Based on analysis of the climate sensitivity of the livelihood stressors and potential drivers of migration at the macro level, it was argued that an assessment of the climate sensitivity of migration flows needs to include all elements involved in migration decisions at the macro, the meso and the micro level. Two recent studies – by Feng et al. (2010) and Barbieri et al. (2010) – have analysed the climate sensitivity of migration drivers but both concentrated on only one element. In contrast, this chapter presented an approach that includes an analysis of the climate sensitivity of livelihood stressors, which might translate into drivers of migration, access to networks and recruiters, human agency, as well as the access to alternative livelihood strategies. It has argued that these elements are likely to be affected in different ways by the consequences of climate change and that these elements are of different degrees of relevance in the decision-making process for different forms of migration. The chapter has developed a matrix, based on the principle of the risk matrix used for qualitative

risk assessments, which measures the degree of climate sensitivity against the degree of relevance for migration decisions for each element involved in different forms of migration.

The results of this analysis show that local climate stressors are likely to affect internal migration but can be expected to have a much smaller effect on international moves. Global effects of climate change on people's purchasing power are the most important element that might put pressure on people to migrate both internally and internationally. Yet, this effect is countered by the negative effect that climate change is likely to have on people's access to financial resources, which are needed for international migration. Thus, decreasing purchasing power might entail more internal migration but is unlikely to lead to more international migration.

This chapter analysed the climate sensitivity of migration flows in rural Mexico. It stressed the complexity of the likely impacts of climate change on migration patterns at the local and the global level. The chapter demonstrated that research into the climate change-migration nexus requires an in-depth understanding of the local context. The following chapter – the conclusion of this thesis – argues for a shift of research and policy interest towards such an understanding of the complex relationship between climate change and migration.

Chapter 9: Conclusion – Towards a better understanding of the climate change-migration nexus

This thesis has been concerned with the potential nexus between climate change and migration in Mexico. It argues that most existing predictions of people expected to become displaced by the future consequences of climate change are unconvincing on conceptual and methodological grounds. As a result, these approaches have failed to deliver a complete understanding of the complex relationship between climate change and migration. Indeed, concrete, empirical knowledge about the circumstances under which future climate change might lead to more or less migration in particular places is scarce. Meanwhile, estimates of large numbers of 'climate change refugees' have dominated the public discourse over recent decades. This concern with estimating the volume of climate change related migration, and with finding definitions and categorisations for people whose migration decisions are affected by climate change, have been unhelpful in terms of advancing scientific understanding.

In response, this thesis has argued for a shift away from attempts to define and categorise climate related migration towards the development of approaches that seek to understand the complex relationship between climate change and migration. This thesis aims to contribute to this understanding by developing an alternative conceptual and methodological approach for research into the climate change-migration nexus. The first part of this concluding chapter analyses these theoretical contributions to the debate about the nexus between climate change and migration. The second part demonstrates how this approach is applied to the case of Mexico and highlights the most important empirical results. These empirical findings include information on different migration flows in Mexico, the main causes for migration in Mexico, as well as the climate sensitivity of these migration flows. Furthermore, empirical results suggest that people’s perceptions of climate change are not necessarily always congruent with statistical evidence. The third and fourth part of this conclusion then analyse how these empirical results could influence the direction of future research and inform policies. Finally,

this chapter acknowledges the limitations of the work presented in this thesis, and considers its theoretical and empirical contribution to a future better understanding of the nexus between climate change and migration.

9.1 Theoretical contribution of this thesis

This thesis has argued that understanding of the potential nexus between climate change and migration has significant gaps. Chapter 3 demonstrated that one of the reasons for this research gap is the lack of a clear and convincing conceptual approach. Most existing approaches identify climate stressors and analyse how and to what extent they are likely to affect migration. In contrast, the approach developed in this thesis starts with existing migration flows and analyses the climate sensitivity of the elements involved in migration decisions.

9.1.1 Beyond definitions and categories

A first impediment to the understanding of climate change-migration linkages is the prioritisation of definitions and categories. Chapter 2.2 showed that several definitions of 'environmental refugees', 'climate change refugees' or 'climate change migrants' exist. Attempts to define people who migrate because of climatic stressors have been ongoing for more than a decade (Black 1999, 2001) and have not resulted in a universally accepted definition so far. The main issue regarding existing definitions is that they fail to capture the complexity of both migration and climate change and implicitly assume a linear relationship between the two. Yet, the multi-causality of migration and the complex effects of climate change on people's livelihoods, analysed in chapter 3, demonstrate that the relationship between climate change and migration cannot be linear.

Furthermore, empirical evidence, presented in chapters 7-9, has shown that separating climate stressors from other drivers of migration is not possible because the elements involved in existing migration flows can be expected to be affected by the direct and indirect consequences of future climate change at the local and the global level. Furthermore, chapter 7.3 argued that not all changes

to people's livelihoods caused by the consequences of climate change necessarily lead to migration, as people are making use of various alternative responses. Thus, the complexity of the relationship between climate change and migration adds to the difficulty of defining and categorising people whose migration decisions are influenced by the consequences of climate change.

Attempts to define, categorize and estimate the volume of future migration related to climate change need to be based on a sound theoretical framework and on profound empirical knowledge to produce valid results. The complexity of the climate change migration nexus raises doubts about the question if it is feasible at all to define and categorise climate-related migration. This thesis has shown that separating climate change from other drivers of migration is not possible because climate change is likely to directly and indirectly affect existing migration patterns at the local and at the global level. The category of 'climate change migrant' is thus difficult if not impossible to define. Instead, it is preferable to concentrate on achieving a holistic understanding of the complex relationship between climate change and migration, based on a new conceptual and methodological approach.

9.1.2 A new conceptual and methodological approach

Chapter 3 developed the conceptual approach of this thesis on which the methodological approach presented in chapter 4 builds. Unlike previous approaches, which assume a linear relationship between environmental stressors or climate change and migration, the approach presented in this thesis acknowledges the complexity of these linkages. It further argues that climate stressors cannot be separated from other elements in migration decisions as several previous studies have tried. In contrast, it develops an approach that starts with existing migration flows and analyses the extent to which these migration flows might become affected by the consequences of climate change.

A small number of studies do already exist that are based on an approach that analyses how climate change might affect existing drivers of migration. In particular, research by Feng et al. (2010) and Barbieri et al. (2010) for Mexico and Brazil, respectively, analysed the climate sensitivity of what they considered the most important driver of migration in their studied region. Barbieri et al. (2010) studied the potential effects of climate change on economic differences in different regions of Brazil and how migration might be affected by these changes. Feng et al. (2010) concentrated on the projected impact of climate change on yield output and on the effects that decreasing agricultural productivity might have on the volume of Mexico-US migration.

Feng's study concluded that migration from Mexico into the US can be expected to increase by 1.4 to 6.7 million people by 2080, depending on different emission scenarios. Yet, recent Mexican census data (INEGI 2010) shed some doubts on the validity of this forecast. It shows that the volume of international migration from Mexico has actually decreased over the last decade. At the same time, as chapters 5.2 and 6.3 show, farming has been perceived to become more and more difficult in different parts of Mexico. Thus while farming became more difficult, fewer people migrated to the US, which is the opposite development to what Feng et al. (2010) forecast. One of the major issues regarding the studies of both Barbieri and Feng is that, although they acknowledge that other factors are involved in migration decisions, they analyse the climate sensitivity of only one migration driver. In contrast, another study by Black et al. (2011) developed a conceptual framework, based on the analysis of the sensitivity to changes to local climate stressors of *all* drivers of migration that had been identified for a region. This approach is illustrated by two case studies for Bangladesh and Ghana to show how this methodology can be applied in different contexts.

The conceptual approach of this thesis goes a step further and includes the predicted local as well as global consequences of climate change and its potential effects on migration. Thus it also considers how, for example, climate

change might indirectly affect migration through changes to commodity prices and related increasing stresses to people's livelihoods. It includes factors at the meso and micro level, such as access to networks and recruiters as well as individual perceptions and preferences. It considers how people's access to alternative livelihood strategies, such as micro-businesses, might be affected by climate change. It also considers how the attractiveness of particularly rural destinations, where migrants go to work in commercial farming, might be affected by a changing climate.

The qualitative analysis of the climate sensitivity of elements involved in migration decisions provides a more profound understanding of climate change-migration linkages in Mexico. Based on this qualitative analysis, an adapted risk matrix measures the degree of climate sensitivity of elements involved in migration decisions against the importance of these elements for migration decisions. Elements scoring high on both scales can be expected to have the highest impact on existing migration flows under future climate change.

9.1.3 Empirical findings on Mexico

The qualitative analysis of migration and its climate sensitivity in Mexico is based on empirical data obtained during long-term empirical fieldwork in the Mexican states of Zacatecas and Veracruz. Previous fieldwork mostly concentrated on single case studies into the effects of local climate stressors on migration, whilst the climate sensitivity assessments of migration described above (Feng et al. 2010, Barbieri et al. 2010, Black et al. 2011) were based on secondary data. In contrast, this thesis provides an assessment of the sensitivity of migration flows based on first-hand empirical data. The next section provides a detailed overview of the main empirical findings of this thesis and analyses what they contribute to the theoretical understanding of the nexus between climate change and migration.

9.2 Main findings

Qualitative data from the four studied village communities in Mexico allow a better understanding of the linkages between climate change and migration. These empirical results show that people are affected by various livelihood stressors, Yet, how these livelihood stressors translate into migration decisions or not depends on intervening factors on the micro and the meso level as well as on the availability of other livelihood strategies. Also, different forms of migration exist in rural Mexico, which are motivated by different factors. Next to detailed data about different forms of migration and its causes, this thesis also provides information on people's perceptions of changing climatic conditions and their responses.

9.2.1 Causes of migration in Mexico

Chapter 6 analysed the livelihood stressors that might lead to migration found during fieldwork and compared them to drivers of migration found in the Mexican migration literature. Both the migration literature and empirical data suggest that economic drivers are the dominant motive for migration in Mexico. A lack of employment opportunities can be considered the most important cause of migration found in the literature and mentioned by interviewees in all four researched communities. The migration literature stresses the general lack of employment opportunities in Mexico and the instability of jobs, mainly in the informal sector. Fieldwork showed that next to the general lack of employment opportunities, seasonal fluctuations of the availability of labour are of major concern to village dwellers.

Fieldwork showed that the fact that small-scale and subsistence agriculture has become increasingly difficult is perceived as a serious stressor to people's livelihoods. Yet, difficulties related to farming were not identified as a driver of migration in the literature. Chapter 5.1 of this thesis argues that in many cases farmers and migrants do not belong to the same group of people in rural Mexico. While international migrants are most often adolescents and young adults, the

generation of their parents are farmers. The older generation owns the land and often they feel too old to take the strains of the journey and of the border crossing. Furthermore, they are aware of the difficulties of finding a job, which often involves hard physical labour. Thus, while people perceive the decreasing productivity of agriculture as a livelihood stressor, in many cases it does not translate into migration decisions. Next to the lack and the seasonality of employment opportunities and decreasing agricultural productivity, fieldwork showed that people perceived decreasing purchasing power as an important livelihood stressor. This includes both rising prices and the decreasing value of salaries taking inflation into account. Furthermore, increased material desires and aspirations, particularly of the younger generation, have led to a larger need for money as compared to previous generations.

Despite the different socio-economic and cultural backgrounds of the four researched communities, the perceived livelihood stressors were the same in all four villages. Yet, there is a large difference in how these livelihood stressors translate into migration decisions and between the different forms of migration that can be found in each community. Fieldwork showed that migration decisions depend to a large extent on people's access to networks and recruiters but also on people's perceptions of the feasibility and the utility of migration. Indeed, while economic stressors are important drivers of migration, particularly international migration is also an expensive endeavour, which not everybody can afford. Perceived livelihood stressors thus not necessarily translate into migration. People are also making use of several other livelihood strategies such as micro-businesses, formal and informal credits, and the selling of land or livestock. Fieldwork shows that the village history plays a large role in people's access to migration networks and recruiters and in how different forms of migration are perceived. While illegal international migration is the dominant form of migration in some villages in Mexico and internal migration is not considered worthwhile, other villages are not connected to international migration networks. People in these villages are likely to consider international migration as too dangerous and

prefer to migrate internally to diversify their income. This leads to different migration patterns and to different migration flows in different parts of rural Mexico. Empirical evidence about these different migration flows and about their causes is presented in the next section.

9.2.2 Different migration flows in Mexico

Fieldwork identified four migration flows for rural Mexico, illegal international migration, mainly to the USA; legal international migration to the USA and to Canada; internal rural migration to centres of commercial farming within Mexico; and internal urban migration to the big cities in Mexico and to larger agglomerations within each state. The development of these migration flows in each village has been strongly linked to the migration history of the four communities. Zacatecas has got a century long history of migration to the USA and has been one of the major migrant sending states in Mexico. Yet, patterns of international migration in Zacatecas are heterogeneous. Some communities, such as El Tigre, show a very high international migration rate, with flows concentrated on one destination in the USA. These migration patterns already exist for centuries and were developed when the USA actively recruited migrant workers in the context of the 'bracero' programme in the middle of the 20th century. After the end of this programme in 1964, networks and knowledge built during the phase of labour recruitment were used to facilitate illegal access to the USA. Villages which lack this history of international migration, such as Laguna Seca, often do not have access to migration networks and few people from these villages migrate internationally.

The history of international migration from Veracruz is much younger than the migration history of Zacatecas. Therefore, migration networks developed differently in the two states. When illegal international migration started growing in the 1990s, migrants from Veracruz used the existing migration networks of other states. Prospective migrants often met fellow migrants from traditional migration states and crossed the border with them. This led to the development

of different migration patterns in Veracruz. The case of El Tigre illustrates that communities with long-established migration networks tend to send their migrants to one single destination in the USA because migration networks developed at the village level. In the states from which international migration is relatively new, such as Veracruz, migration networks developed at the household level and are based on individual relationships with migrants, who have access to the migration networks developed in their communities.

In contrast to international migration, internal migration seems to depend to a lesser extent on people's access to migration networks. The degree of importance of internal migration varies between the four studied communities and seems to be connected to the role of international migration in each village. In El Tigre, where illegal international migration has been an important livelihood strategy for several generations, people do not consider internal migration a worthwhile strategy because the low Mexican salaries do not justify the efforts and costs related to moving away from their home village. In contrast, in Laguna Seca internal migration is the only feasible form of migration for many village dwellers because most of them do not have access to migration networks or recruiters. In both researched villages in Veracruz, internal migration had been an important livelihood strategy before the growing importance of international migration since the 1990s. Fieldwork shows that today they co-exist and are both considered useful alternatives to staying in the village. Empirical data from the four researched communities thus demonstrates that the same livelihood stressors translate into different forms of migration depending on intervening factors at the meso and the micro level.

9.2.3 Climate change perceptions vs. statistical evidence

Although this thesis is not primarily concerned with people's perceptions of climate change, fieldwork provided some insight into the ways how people perceive and react to climate stressors. Integrating these results into this thesis is important for a holistic understanding of climate change-migration linkages.

Fieldwork has shown that village dwellers in general have observed some changes to climate patterns in previous decades. People in Zacatecas said that rainfall in general had decreased and that more temperature and precipitation extremes such as frost, hail and snowfall during the winter months have occurred in recent years. In Veracruz, people affected by the flooding of their houses or their fields remarked that floods happen more often than in the past. In contrast, people not directly affected by floods said that they had not noticed any changes to the frequency and severity of floods in their village. Most interviewees only once or twice experienced a hurricane in their own village, and they do not have a way of comparing it to tropical storms elsewhere. Thus, most people in both communities said they had not noticed changes to the frequency or to the severity of hurricanes.

A comparison of rainfall data in Zacatecas with interview data obtained during fieldwork suggests that statistical evidence is not always congruent with people's perceptions. These differences might potentially be linked to some inaccuracies of the available precipitation data. Yet, they also might be linked to the fact that people tend to concentrate on climatic and non-climatic developments that affect their own livelihoods but not necessarily on all the others. For the example of Zacatecas, interviewees said that the amount of annual rainfall was decreasing, rendering farming more difficult. Participant observation in both Laguna Seca and El Tigre confirms that people were waiting for enough rainfall to be able to start farming, and that waterholes for the cattle were drying out during the time of the fieldwork in the first half of 2008. Precipitation statistics show that rainfall has been decreasing over the last decades for the crucial months for farming in early summer but not necessarily for all of the year as perceived by farmers.

The important point here is less to analyse the exact discrepancy between statistics and people's perceptions but to draw attention to the fact that this discrepancy exists and that it should be acknowledged in studies into climate change and migration. Another observation made during fieldwork relates to the

importance of climate stressors as an element in the decision-making process of potential future migrants. In general, people held that climate stressors were affecting their livelihoods and often rendering them poorer. Meanwhile, people's perceived relationship between climate stressors and migration became less clear in the interviews. Many interviewees said that the environment or climate stressors have got nothing to do with migration. Nevertheless, climate change might indirectly affect the elements involved in migration decisions in different ways. The following section analyses how different migration flows might or might not become affected by different consequences of climate change.

9.2.4 Climate sensitivity of migration flows in Mexico

The approach in this thesis builds on the insight that climate change is likely to affect existing migration flows in various ways. The elements involved in different migration decisions, as specified in the previous sections of this chapter, were tested for their sensitivity to the local and global consequences of climate change. This approach provides two general outcomes. First, it allows the identification of those elements involved in migration decisions with the highest potential to alter existing migration patterns under future climate change scenarios. These are the elements involved in migration decisions scoring high on both axes of the risk matrix. This means that they are both of high importance to migration decisions and highly sensitive to the various consequences of climate change. It is suggested that these elements involved in migration decisions deserve the highest attention of policy makers to mitigate the potential negative effects of climate change on people's livelihoods.

The second general outcome of this approach is the fact that it allows to distinguish between the different effects of climate change on different migration flows, which can be found in rural Mexico. Previous empirical research since the 1990s (Findley 1994, Henry et al. 2004, Gray and Mueller forthcoming) has found that the effects of environmental stressors entail different consequences for different migration flows. There has thus been evidence that the distinction

between internal and international migration and potentially, depending on the existing migration patterns in the regional context, between other forms of migration is important. Yet, the scientific and policy debate in most cases still seems to refer to migration as a generic concept and to ignore these differences. For the example of Mexico, four different migration flows were identified: illegal international migration, legal international migration, internal rural migration and internal urban migration. The impacts of future climate change on livelihoods are obviously the same for migrants involved in all four forms of migration, although different degrees of vulnerability at the household level to these livelihood stressors need to be taken into account. Yet, it is argued that these projected impacts of future climate change will have different impacts on the four different migration flows. The most important empirical results stressing these differences are highlighted in the following section.

Table 8.5 in the previous chapter suggests that the most important effects of climate change on illegal international migration can be expected to be caused by changes to the availability of employment opportunities near the sending areas, by changing commodity prices and by changes to the financial capital of prospective migrants. Investment in employment opportunities near the villages and control of prices for basic consumer goods might therefore mitigate the expected impact of climate change on international illegal migration. As illegal international migration is the most expensive form of migration, the negative impact of climate change on people's financial resources might enable fewer people to migrate internationally. The increased pressure to migrate might thus be balanced by the more difficult access to illegal international migration. Furthermore, many causes of illegal international migration are unrelated to climate change such as increased material desires and the culture of migration in the village. Also, wage differentials between Mexico and the USA have shown to be important in decisions for international migration as opposed to internal migration. Currently, many people with previous international migration experience say that they consider migration within Mexico not worthwhile

because the low salaries do not compensate the costs of moving. International migrants stressed the lack of local employment opportunities as a major cause for their decision to look for work in the USA. Yet, local salaries would need to be high enough for people to make a living.

Therefore, much depends on the global effects of climate change on commodity prices, which potentially create a higher need for migration as a livelihood strategy. Yet, higher prices might also render families and communities poorer, which will make access to financial resources needed for international migration more difficult. It may also increase the profitability of agricultural production, if agricultural prices rise, providing an incentive for farmers to stay. Meanwhile, the availability of employment at migrants' destinations might also be affected by climate change, directly in commercial farming but also indirectly through a weak economy. Thus it seems that the effects of climate change on illegal international migration are likely not very high – or at least may be rather contradictory. Indeed, there is the potential that illegal international migration might decrease under scenarios of future climate change. This trend observation is confirmed by 2010 Mexican census data[49], which suggest that in general migration from Mexico to the USA has been decreasing over the last decade (Lozano 2011). Furthermore, according to a study by the BBVA bank (BBVA 2011), also based on 2010 census data, remittances sent from Mexican migrants in the USA, decreased by 18.3% between 2007 and 2010. Also the number of households receiving remittances decreased by 27%, mainly in rural marginalised areas (BBVA 2011). This development might potentially be linked to the economic situation in Mexico and the USA as a consequence of the global food crisis, the financial crisis and the agricultural crisis in Mexico. If and to what extent this trend will continue is unclear.

[49] The census is carried out by the Mexican Institute for Statistics, Geography and Informatics (INEGI) every 10 years. The latest census took place in 2010 and was published in early 2011.

The effects of developments in farming on international illegal migration are low because the profile of illegal international migrants (no own land, young, access to resources to pay for the trip) differs from the profile of farmers (own land, middle-aged, often too poor to afford migration). Yet, agricultural productivity for subsistence farming and access to jobs in agriculture are important determinants of decisions for legal international migration and even to a larger extent of decisions for internal migration. Legal international migration is less expensive than illegal international migration but requires some financial resources and access to recruiters. Therefore, it is not accessible for many people.

Yet, internal migration requires fewer financial resources and not necessarily access to strong networks. Therefore, it is accessible for most people and often used as a livelihood strategy by poor farmers and day labourers in commercial agriculture. Therefore, the effects of climate change on internal migration to urban or rural destinations in Mexico are measurable through the local and global effects of climate change on commercial and subsistence agriculture. Fieldwork has shown that there are two potential scenarios for subsistence agriculture, leading to different needs of workers. First, some large-scale farmers might consider diversifying their production and switch to more labour intensive crops in order to spread the risk of failure of a single crop. Under this scenario more workers would be needed. Second, others might decide to farm labour extensive crops, which are more resistant to climate extremes but also cheaper so that the financial loss of a failed harvest would be smaller. This scenario requires fewer workers, who might potentially be paid less because of the nature of the work and because a decrease of job availability often entails lower wages.

The effects of climate change on the development of commodity prices are also important determinants for internal migration. A decrease in agricultural productivity in combination with higher prices for basic food items is endangering many people’s livelihoods. In the future thus more people might need to make use of internal migration as a livelihood strategy when prices rise, subsistence

farming becomes more uncertain and commercial farming might require fewer workers. Yet, the same livelihood stressors are likely to affect destination areas. Therefore, unless the need for workers substantially increases in rural and urban migrant receiving areas, they are unlikely to be able to respond to the needs of an increased number of future migrants.

9.3 Implications for further research

As the previous sections showed, the relationship between the effects of climate change on migration is very complex and different for internal or international forms of migration. Therefore, this thesis argues for a shift of future research priorities away from a focus on improving forecasts of the number of people to become displaced by climate change towards a detailed understanding of the nexus between climate change and migration.

9.3.1 The search for numbers

As was argued earlier in this chapter, so far no convincing and generally accepted definition of 'climate change migrants' exists, despite numerous attempts. The most important impediment to formulating such a definition is linked to the difficulty in separating climate change from other causes of migration. The focus on definitions and categorisations of people expected to become displaced by climate change is closely linked to the search for numbers of those people. Researchers have been concerned with predicting the volume of future ‘environmental change migrants’ or ‘climate change migrants’ for decades without conclusive results. As chapter 2 demonstrated, existing predictions are often still based on estimates dating back to the 1990s and lacking a sound scientific approach.

There is likely to be an intrinsic reason for attempts to estimate the volume of future migration related to climate change, which have been made for such a long time, not being successful. The climate change-migration nexus is highly complex and context-specific, requiring a profound understanding of existing

migration patterns. Yet, as the previous section demonstrated, different migration flows are likely to be affected in different ways by climate stressors. If at all possible, predictions of the volume of future migration related to climate change thus need to be based on a profound and detailed understanding of different migration flows around the world.

Yet, this thesis has also shown that it is not feasible to separate climate change from other drivers of migration because the direct and indirect consequences of climate change are likely to impact on many elements involved in migration decisions at the local and the global level. This complexity of the relationship between climate change and migration suggests that a categorisation and definition of ‘climate change migrants’ might not be possible at all. Without a concrete definition of who should be counted, the search for numbers of ‘climate change migrants’ does not seem to contribute much to the advancement of a scientific understanding of the nexus between climate change and migration.

9.3.2 Understanding the climate change-migration nexus

Instead, research has an important role to play in advancing the understanding of the complex relationship between climate change and migration. This understanding is of scientific interest but also has got the potential to influence policies at the global and the local level. As chapter 2.3 shows, the results of a profound understanding of the climate change-migration nexus can also contribute to other fields of research such as development studies, conflict studies and research on climate change adaptation.

The approach developed in this thesis, which has been adapted to the case of Mexico, can also be used in other geographic contexts. It is based on an understanding of people’s livelihoods, their adaptation measures to shocks and stresses, of the role of migration as an adaptation strategy and of the elements involved in migration decisions. While these elements are likely to be different in other parts of the world, some conclusions of the research presented in this

thesis seem to be generic. These include the use of different responses to livelihood stressors depending on the economic and social status, gender and individual preferences; the existence of more than one type of migration in any one locality; and the multi-causal nature of most migration streams.

The conceptual and methodological approach developed in this thesis could thus be considered a generic tool to gain a more profound understanding of the climate change migration nexus at the global level. It can also be used to conduct research to identify region-specific policy priorities in response to climate stressors. Based on the results presented in this thesis for the case of Mexico some policy recommendations can be made, to which this chapter now turns.

9.4 Policy implications

This thesis has implications for policies at two levels, regarding future research into the nexus between climate change and migration in general and regarding country specific policy priorities in response to climate stressors. In particular, a case can be made for a shift towards a needs-based approach, which includes migrants as well as people affected by climate change and is not restricted to people displaced by climate change only.

9.4.1 Is a protective mechanism needed?

Calls for a protective mechanism so far have claimed that people displaced by climate change or environmental change more generally need legal protection. So far, no such mechanism exists. The lack of such a protective scheme seems to be caused by two factors. First, as this thesis has shown, a comprehensive definition of ‘climate change migrants’ does not yet exist and there is doubt if such a definition is feasible at all. Partly due to this lack of a definition, reliable estimates of the volume of climate related migration do not exist either. Installing a legal protection scheme for a category of people, which is not well-defined and the volume of which is unknown, seems to be practically difficult.

The second impediment to the installation of a protective mechanism for people displaced by climate change is related to the fact that governments are likely to be unwilling to commit to another humanitarian protection scheme, while struggling to comply with existing schemes. Chapter 2.2 shows that it has been suggested that protection of 'climate change migrants' could also be addressed under the auspices of inter-governmental bodies. Yet, this would also require a commitment to soft-laws and non-binding agreements, which so far has not been achieved.

It seems that legal protection for people displaced by climate change cannot easily be achieved. One could argue that efforts still should be made to urge governments or other bodies to install such a scheme. Yet, it is also questionable if such a scheme would address the right issues related to climate change and migration. This thesis has shown that the effect of climate change on the volume of international migration is likely to be small and potentially negative. Although in some other regional contexts this might prove to not be the case, the focus on international migration triggered by climate change alone does not seem to do justice to the complexity of the issue. This does not mean that international migrants, including Mexican migrants, should not benefit from a protection scheme. Yet, such a scheme should extend to protection to all migrants who cross a border with the intention to offer their human capital to the host society.

On the other hand, empirical evidence from Mexico suggests that the effect of climate change on internal migration might be substantially bigger, which might justify a call for a protection scheme of internal 'climate change migrants'. Yet, definitional issues also apply to internal migrants and their moves are not caused by climate stressors alone. Furthermore, such a protection scheme would exclude those who are affected by the consequences of climate change and are forced to stay. Instead, it seems to be more efficient for governments to concentrate on a set of policy priorities in response to climate stressors. The next section will make suggestions of these policy priorities for the case of Mexico.

9.4.2 Recommended policy priorities in response to climate stressors

This thesis has produced results on issues that can be expected to have the most important impact on people's livelihoods and migration decisions when affected by climate change. Empirical evidence for Mexico suggests that the negative effects of climate change on people's livelihoods are highest in three areas. The first area of concern is the lack and decrease of employment opportunities in rural Mexico. Unemployment has been identified as a major driver of internal and international migration and there are signs that climate change might worsen the already precarious situation. Efficient policies could thus aim at creating employment opportunities in the country and at assuring salaries, which are high enough to make a living on.

The second area of concern is Mexican agriculture, including both the commercial and the subsistence sector. Climate change together with non-climate stressors, such as pricing policies, is likely to seriously affect large parts of the Mexican rural population through its negative effect on agricultural productivity. The lack of employment in commercial agriculture and the decreasing output of subsistence agriculture are also major drivers of internal migration in Mexico. Climate change is likely to have negative effects on these migration flows as more people than before might want to migrate internally in response to decreasing agricultural output in their home communities. Yet, rural migrant receiving areas are likely to experience similar problems and might thus not be able to accommodate migrants from other areas of Mexico. Meanwhile, urban destinations might also not be able to provide for the livelihoods of more migrants as employment opportunities are already scarce in many parts of Mexico. Thus people might not be able to make use of internal moves as a livelihood strategy anymore, which can be expected to have serious consequences for their well-being.

The effects of the lack of employment opportunities and the decrease in agricultural productivity are aggravated by the expected negative effects of

climate change on global food and commodity prices, which is the third area of concern. As a consequence, people are likely to experience an increased pressure to migrate due to the decrease of their purchasing power. Yet, especially international migration is very expensive, so that some people might not be able to migrate internationally anymore. Climate change is therefore likely to deprive some people from using both internal and international migration as a livelihood strategy in response to climate change. Policies thus should not only focus on climate change related migration. The protection of people who cannot migrate (anymore) in response to the livelihood stressors aggravated by climate change seems to be of equal importance. A potential way forward might be the focus on needs-based approaches in the context of climate change adaptation and migration. These approaches should include affected people as stakeholders in the process of the development of appropriate response mechanisms.

9.5 Limitations and future prospects

Although the conceptual and methodological approach developed in this thesis might be considered an improvement as compared to existing approaches, it has some limitations, which have to be acknowledged. One of the inherent limitations to the prediction of any future development is its uncertainty. Due to unforeseen political or environmental events, realities might change quickly, making projections based on the current situation obsolete. Nevertheless predictions of future developments regarding the impacts of climate change on migration are useful to tailor future policies accordingly. Furthermore, as this thesis shows, they also provide a better understanding of the current situation. This thesis explicitly refrains from specifying a time frame for the predicted effects of climate change on migration. Instead it aims to provide an indication of likely trends that can to some extent already be observed today.

The approach developed in this thesis seeks to integrate all elements involved in the relationship between climate change and migration decisions. Understanding all these elements and processes requires time, whereas the development of

effective policies to protect people from the effects that climate change is projected to have on their migration decisions is relatively urgent. Although the approach tried to capture as many context and local-specific aspects as possible, some generalisations had to be made. Categories of elements involved in migration decisions were constructed and during this process some nuances might have been lost. Furthermore, it could not be avoided that some of the categories overlap and are interlinked with each other.

Nevertheless, the conceptual and methodological approach of this thesis has been designed to acknowledge the complexity of climate change, migration and of the relationship between the two phenomena. For the case of Mexico it provided a holistic picture of the projected effects of climate change on people's livelihoods and more specifically on migration at the country level. There could be a potential for this approach to be used in other regional contexts. Similar research in other parts of the world would allow a comparison between the projected effects of climate change on migration in different contexts. Similarities and differences might be identified to achieve a comparison between the most urgent issues related to climate change and migration in different regions of the world. This might lead to a better understanding of the climate change-migration nexus at the global level and help identify policy areas, in which action is most urgently needed at the local and the global level.

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ANNEX

Annex I: Climate sensitivity of illegal international migration

	degree of climate sensitivity	**comments**	**degree of relevance for migration decisions**	**comments**	**score**
variability in precipitation and temperature patterns	very high (5)	increased uncertainty leads farmers to abandon farming	low (2)	farmers (older generation) and migrants (youth) are often not the same group of people	10
extreme events such as droughts, hurricanes, floods	high (4)	more frequent or more severe, uncertainty increasing	low (2)	farmers (older generation) and migrants (youth) are often not the same group of people	8
decreasing soil fertility	medium (3)	increased risk of land degradation and of pests and pathogens	low (2)	farmers (older generation) and migrants (youth) are often not the same group of people	6
low revenues for yields	very low (1)	caused by decreasing yields, revenues likely to increase on a global level. Yet, in Mexico counterbalanced by policies	low (2)	farmers (older generation) and migrants (youth) are often not the same group of people	2
high prices for seeds, fertiliser, irrigation	very low (1)	feasible but not documented	low (2)	farmers (older generation) and migrants (youth) are often not the same group of people	2
lack of industries or services in or near the communities	medium (3)	potentially less investment because of lack of water or risk of floods or hurricanes	very high (5)	major reason to migrate	15
lack of infrastructure to facilitate commuting	low (2)	potentially some impacts on accessibility of work places	medium (3)	often perceived as problem but not determining for migration	6

lack of formal education needed to obtain work	low (2)	potentially some impacts on accessibility of schools	very low (1)	same problem at destination, inverse effect feasible	2
seasonal employment in agriculture decreasing	very high (5)	depending on crop choice by landowners increase or decrease of employment possible	low (2)	severe problem in Veracruz but not at all in El Tigre	10
low and decreasing salaries	low (2)	potential for some changes caused by need for more/fewer workers in commercial farming	very high (5)	higher salaries in USA are a major pull factor	10
high and increasing prices for basic consumer goods	high (4)	danger of price increase due to decreasing yields on a global level, can be mediated by national policies	high (4)	salaries in Mexico often considered too low to maintain family because of high prices	16
cultural change	very low (1)	plays into farming decision, but not affected by climate change	very high (5)	international migration became (El Tigre) or is becoming (Veracruz) a rite of passage	5
some young people unwilling to work hard for little revenue	very low (1)	plays into farming decision, but not affected by climate change	very high (5)	change of young generation's aspirations	5
increased material desires (food, clothes, cars)	very low (1)	plays into farming decision, but not affected by climate change	very high (5)	desire to satisfy own and family's wishes and to compete with fellow village dwellers	5
access to networks	low (2)	small effects on willingness to help network members as consequence of effects on destinations feasible	very high (5)	migration not possible without networks	10

access to recruiters	low (2)	number of jobs in farming at destination areas might decrease	very low (1)	recruiters not involved	2
financial resources	medium (3)	bad harvests in the village might decrease financial potential of family members to pay for migration	very high (5)	most expensive form of migration, large resources necessary	15
agency	low (2)	some people might become more willing to migrate when environments deteriorate	very high (5)	migration not feasible without positive attitude towards it	10
alternative livelihood strategies	medium (3)	selling of land and livestock susceptible to climate change, other strategies less so	very low (1)	migrants and people making use of alternative livelihood strategies often not the same group of people	3

Source: author

Annex II: Climate sensitivity of legal international migration

	degree of climate sensitivity	comments	degree of relevance for migration decisions	comments	score
variability in precipitation and temperature patterns	very high (5)	increased uncertainty leads farmers to abandon farming	low (2)	farmers and migrants often not the same group of people	10
extreme events such as droughts, hurricanes, floods	high (4)	more frequent or more severe, uncertainty increasing	low (2)	farmers and migrants often not the same group of people	8
decreasing soil fertility	medium (3)	increased risk of land degradation and of pests and pathogens	low (2)	farmers and migrants often not the same group of people	6
low revenues for yields	very low (1)	caused by decreasing yields, revenues likely to increase on a global level. Yet, in Mexico counterbalanced by policies	low (2)	farmers and migrants often not the same group of people	2
high prices for seeds, fertiliser, irrigation	very low (1)	feasible but not documented	low (2)	farmers and migrants often not the same group of people	2
lack of industries or services in or near the communities	medium (3)	potentially less investment because of lack of water or risk of floods or hurricanes	very high (5)	major reason to migrate	15
lack of infrastructure to facilitate commuting	low (2)	potentially some impacts on accessibility of work places	medium (3)	often perceived as problem but not determining for migration	6
lack of formal education needed to obtain work	low (2)	potentially some impacts on accessibility of schools	very low (1)	same problem at destination, inverse effect feasible	2
seasonal employment in agriculture	very high (5)	depending on crop choice by landowners	very high (5)	major reason for migration where recruiters operate	25

decreasing		increase or decrease of employment possible			
low and decreasing salaries	low (2)	potential for some changes caused by need for more/fewer workers in commercial farming	very high (5)	prospect of earning more in USA or Canada	10
high and increasing prices for basic consumer goods	high (4)	danger of price increase due to decreasing yields on a global level, can be mediated by national policies	very high (5)	need to maintain family	20
cultural change	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	migration often unwanted	1
some young people unwilling to work hard for little revenue	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	migration perceived as hard work, too	1
increased material desires (food, clothes, cars)	very low (1)	plays into farming decision, but not affected by climate change	low (2)	migration often to satisfy basic needs	2
access to networks	low (2)	small effects on willingness to help network members as consequence of effects on destinations feasible	medium (3)	networks not crucial but sharing of experiences might be desirable	6
access to recruiters	low (2)	number of jobs in farming at destination areas might decrease	very high (5)	crucial	15
financial resources	medium (3)	bad harvests in the village might decrease financial	very high (5)	expensive, need to obtain papers for travelling	15

		potential of family members to pay for migration			
agency	low (2)	some people might become more willing to migrate when environments deteriorate	medium (3)	migrants need to feel capable of doing the job but often do not want to migrate	6
alternative livelihood strategies	medium (3)	selling of land and livestock susceptible to climate change, other strategies less so	very low (1)	migrants and people making use of alternative livelihood strategies often not the same group of people	3

Source: author

Annex III: Climate sensitivity of internal urban migration

	degree of climate sensitivity	**comments**	**degree of relevance for migration decisions**	**comments**	**score**
variability in precipitation and temperature patterns	very high (5)	increased uncertainty leads farmers to abandon farming	high (4)	decreasing subsistence agriculture often reason to migrate	20
extreme events such as droughts, hurricanes, floods	high (4)	more frequent or more severe, uncertainty increasing	high (4)	decreasing subsistence agriculture often reason to migrate	16
decreasing soil fertility	medium (3)	increased risk of land degradation and of pests and pathogens	high (4)	decreasing subsistence agriculture often reason to migrate	12
low revenues for yields	very low (1)	caused by decreasing yields, revenues likely to increase on a global level. Yet, in Mexico counterbalanced by policies	high (4)	decreasing subsistence agriculture often reason to migrate	4
high prices for seeds, fertiliser, irrigation	very low (1)	feasible but not documented	high (4)	decreasing subsistence agriculture often reason to migrate	4
lack of industries or services in or near the communities	medium (3)	potentially less investment because of lack of water or risk of floods or hurricanes	high (4)	lack of employment often reason to migrate	12
lack of infrastructure to facilitate commuting	low (2)	potentially some impacts on accessibility of work places	medium (3)	often perceived as problem but not determining for migration	6
lack of formal education needed to obtain work	low (2)	potentially some impacts on accessibility of schools	medium (3)	might be the same at destination but sometimes no choice but to try	6
seasonal employment in	very high (5)	depending on crop choice by	high (4)	important reason to migrate	20

agriculture decreasing		landowners increase or decrease of employment possible			
low and decreasing salaries	low (2)	potential for some changes caused by need for more/fewer workers in commercial farming	medium (3)	slightly better salaries expected in the cities but still on Mexican level	6
high and increasing prices for basic consumer goods	high (4)	danger of price increase due to decreasing yields on a global level, can be mediated by national policies	very high (5)	major reason to look for work elsewhere	20
cultural change	very low (1)	plays into farming decision, but not affected by climate change	medium (3)	some migrants trying to escape village life	3
some young people unwilling to work hard for little revenue	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	work in cities also perceived as hard	1
increased material desires (food, clothes, cars)	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	migration mainly to satisfy basic needs	1
access to networks	low (2)	networks in cities not likely to be affect by climate change	medium (3)	networks helpful but not mandatory for migration decisions	6
access to recruiters	low (2)	work in cities not likely to be affect by climate change	low (2)	migrants usually go without recruiters	4
financial resources	medium (3)	financial support of relatives often needed, dependent on agricultural output	medium (3)	travel often affordable, but maintenance in city expensive	9
agency	low (2)	people unwilling	high (4)	willingness to live	8

		to migrate might consider their decision if maintenance in the village becomes more difficult		in the city needed	
alternative livelihood strategies	medium (3)	selling of land and livestock susceptible to climate change, other strategies less so	medium (3)	if alternative strategies available, some people likely to consider staying	9

Source: author

Annex IV: Climate sensitivity of internal rural migration

	degree of climate sensitivity	comments	degree of relevance for migration decisions	comments	score
variability in precipitation and temperature patterns	very high (5)	increased uncertainty leads farmers to abandon farming	very high (5)	decreasing subsistence agriculture major reason to migrate	25
extreme events such as droughts, hurricanes, floods	high (4)	more frequent or more severe, uncertainty increasing	very high (5)	decreasing subsistence agriculture major reason to migrate	20
decreasing soil fertility	medium (3)	increased risk of land degradation and of pests and pathogens	very high (5)	decreasing subsistence agriculture major reason to migrate	15
low revenues for yields	very low (1)	caused by decreasing yields, revenues likely to increase on a global level. Yet, in Mexico counterbalanced by policies	very high (5)	decreasing subsistence agriculture major reason to migrate	5
high prices for seeds, fertiliser, irrigation	very low (1)	feasible but not documented	very high (5)	decreasing subsistence agriculture major reason to migrate	5
lack of industries or services in or near the communities	medium (3)	potentially less investment because of lack of water or risk of floods or hurricanes	high (4)	lack of employment major reason to migrate, although work in agriculture often preferred	12
lack of infrastructure to facilitate commuting	low (2)	potentially some impacts on accessibility of work places	medium (3)	often perceived as problem but not determining for migration	6
lack of formal education needed to obtain work	low (2)	potentially some impacts on accessibility of schools	very low (1)	irrelevant for agricultural labour	2
seasonal	very high (5)	depending on	very high (5)	reason for	25

employment in agriculture decreasing		crop choice by landowners increase or decrease of employment possible		seasonal moves to other agricultural regions	
low and decreasing salaries	low (2)	potential for some changes caused by need for more/fewer workers in commercial farming	low (2)	salaries at destination often the same	4
high and increasing prices for basic consumer goods	high (4)	danger of price increase due to decreasing yields on a global level, can be mediated by national policies	very high (5)	need to migrate during times of unemployment	20
cultural change	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	irrelevant	1
some young people unwilling to work hard for little revenue	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	work at destination as hard as at sending area	1
increased material desires (food, clothes, cars)	very low (1)	plays into farming decision, but not affected by climate change	very low (1)	migration mainly to satisfy basic needs	1
access to networks	low (2)	people at destinations might become less willing to help networks members in difficult times	medium (3)	helpful but not crucial for migration decisions	6
access to recruiters	low (2)	climate change might increase or decrease the need for workers	medium (3)	helpful but not crucial for migration decisions	6
financial resources	medium (3)	financial support of relatives often needed,	low (2)	travel and maintenance often affordable	6

		dependent on agricultural output			
agency	low (2)	people unwilling to migrate might consider their decision if maintenance in the village becomes more difficult	medium (3)	willingness to temporarily leave the village needed	6
alternative livelihood strategies	medium (3)	selling of land and livestock susceptible to climate change, other strategies less so	very high (5)	if alternative strategies available, many people likely to consider staying	15

Source: author