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„Environmentally Induced Migration and the Concepts
Vulnerability, Resilience and Adaptation
to Climate Change

A Qualitative Content Analysis“

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Gregor Zehetner

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Univ.-Prof. Dr. Petra Dannecker, M.A.

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List of Abbreviations

AR4	Fourth IPCC Assessment Report
ADB	Asian Development Bank
AU	African Union
FAD	Food Availability Decline
GIS	Geographic Information Systems
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
NAPA	National Adaptation Programs of Action
TAR	Third IPCC Assessment Report
TCLM	Colombian Temporary Circular Labour Migration Scheme
UN	United Nations
UNEP	United Nations Environmental Programme

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1. Introduction

The relationship between the environment and human migration has gained enormous attention in recent years. As climate change is a phenomenon heavily debated on various levels of scientific, political and public debate, the impacts of environmental change on human livelihoods are increasingly taken into account. Human migration is generally considered as one of these phenomena, heavily affected and aggravated by ecological change. While environmental factors have always had some influence on human migration patterns, the enormous ecological challenges that many communities and socio-ecological systems are facing are seen as an additional factor adding new complexity to this relationship.

However, the weight of adverse environmental changes on human and socio-ecological systems is not always clear and knowledge regarding the phenomenon stays fragmented and limited. Even though a whole range of heterogeneous actors, including natural scientists, social scientists, policy makers, and the media, have engaged in a debate on environmentally induced migration, the actual mechanisms at stake stay rather blurry.

While there is no consensus between the various disciplines on methodological issues, analyzing the vulnerability of human actors and socio-ecological systems is considered a fruitful approach to disentangle the complex relationship between human migration and climate change.

A hypothesis of the present thesis is that the degree, to which adverse ecological changes affect social actors, is ultimately a matter of their vulnerability and resilience. The degree of vulnerability and resilience towards negative ecological effects varies tremendously between different human actors or socio-ecological systems. Taking into account agency makes clear that social actors have always at least some degree of capacity to adapt to a changing environment.

The purpose of this thesis is therefore two-fold. First, the attempt is made to shed light on the complex nexus between the environment and migration. The influence of vulnerability, resilience and adaptation to climate change on human migration therefore constitutes the first research question of this thesis.

There is a whole variety of approaches and schools of thought working with these concepts, applying sometimes similar, sometimes contradictive assumptions.

Therefore, it is a core concern of this paper to portray these approaches and analyze their significance regarding environmentally induced migration. The detailed analysis of the most influential approaches regarding vulnerability, resilience and adaptation to climate change constitutes the first half of this thesis.

The second endeavor of this paper is to analyze and portray how relevant policy papers present the described concepts and how the concepts have been applied throughout the years. In order to answer this, a qualitative content analysis is applied in the final part of this thesis.

The two latest assessment reports of the Intergovernmental Panel on Climate Change (IPCC), published in 2001 and 2007, demonstrate a perfect sample of data with which to analyze the specific concepts, both in terms of scientific validity and significance, to a wider spectrum of public, including policy makers.

A total of four chapters of the two IPCC assessment reports (the third report published in 2001, the fourth in 2007) are analyzed on vulnerability, resilience and adaptation and their implications for human migration.

A third main chapter of this thesis deals with a number of highly relevant questions if one truly wants to understand various aspects of the phenomenon of environmentally induced migration. This chapter tries to put issues, such as the politics of definition and legal issues, into perspective and furthermore analyzes why the environmental factor has been neglected in popular migration theories of the 20th century.

1.1 Obstacles and Uncertainties

A whole range of heterogeneous actors including natural scientists, social scientists, activists and policy makers have engaged in a sometimes-heated discussion about environmentally induced human migration. As will be described in the chapter about the opposing perspectives, everyone agrees that there is some relationship between the environment and human mobility. However, the particular standpoints regarding coherencies vary widely. This is why an extensive review of literature was crucial in preparation of this thesis. While it is important for every scientific publication to check the sources properly, this was the case even more for this thesis.

The estimated numbers of persons affected vary widely because of various reasons. Additionally, what will be called “the politics of definition” in a later chapter illustrates

why deciding on status and definition of the persons concerned is such a complex and highly political endeavor. However, it is not a central concern of this paper to shed light upon these matters.

Another heavily debated term used in this paper is “climate change”. The term generally implies that the climatic changes taking place are anthropogenic, resulting from the influences of human beings. It is nowadays widely accepted that climate change is not simply manifested in changing average temperatures and long-term conditions, but may be experienced via extreme weather events such as hurricanes and floods.

This paper will not discuss whether or not observed changes have an anthropogenic origin. Yet it takes into account that there is scientific proof for those changes, regardless of their origin. Although uncertainties regarding climate change remain, answering the complex origin of given changes lies outside the scope of this paper.

1.2 Research Methods

For the content analysis of this paper, I apply methods of qualitative research.

In order to answer the research questions, I work with qualitative content analysis, which is generally regarded as a flexible method for analyzing text data. Keeping in mind comprehensibility, which is crucial for any scientific methodological approach, I utilized a number of analytical steps, presented hereafter.

The first step of analytical process was to define the categories to be applied. As the qualitative content analysis is only one part of a comprehensive thesis about particular concepts regarding climate change and migration, it was a logical choice to focus on vulnerability, resilience and adaptation. These concepts constitute the core of the content analysis, as well as of the whole paper.

Subsequently, I formulated research questions to be answered on the basis of qualitative analysis. The first research question draws on the theoretical perception of the concepts. Taking into account the divergent implications of climate change on human migration patterns, the first research question aims at the definition and notion of vulnerability, resilience and adaptation to climate change in chosen text data.

The second research question was formulated after the available text data was screened and two documents published by the same scientific body were chosen. Accordingly, the second research question enquires as to whether the applied perception of concepts was consistent throughout the six years between the publication dates of the chosen documents.

The third research question aims precisely on migration, and asks how the nexus between human migration and climate change is represented in the investigated documents.

The third step of analytical process was to select the sample to be analyzed. Given that the different approaches to the categories examined in the content analysis were extensively described in a previous chapter of this thesis, I choose documents in a way of applying the principles of theoretic sampling. While screening the available text data, the theoretical considerations and objectives of the content analysis constituted a priority. In choosing two documents published by the IPCC, it was a goal to analyze a relevant sample of text data to specify the concepts. The two latest assessment reports of the IPCC appeared to be suitable both in terms of significance and trustworthiness of data. Therefore, I chose two chapters of each report, most relevant for the defined categories. The four chapters combined represent a data sample of about 110 pages.

The coding process, as the next step, organized this quantity of text into much fewer content categories. In qualitative content analysis, categories are topics or themes, directly named in the text data or derived from the text through analysis (Hsieh/Shannon 2005). The three concepts (vulnerability, resilience and adaptation) constituting the main categories of analysis, where directly expressed in the text while the additional sub-categories were derived through analysis. In this sense, I applied processes of two different approaches, the conventional content analysis and the directed content analysis. In both of the examined IPCC assessment reports adaptive capacity is viewed as the core internal characteristic of systems, while resilience is neglected. This is why I addressed all passages of text regarding internal characteristic in one main category titled resilience and adaptive capacity, even though adaptive capacity does not play a core role in the concepts chapter of this thesis.

The sub-categories were developed after the first serious reading of the chosen text samples and are composed of key-words, such as; “vulnerability and exposure”,

“adaptive capacity and social factors”, or “migration as failure of adaptation”. Counting and comparison of key-words as applied in summative content analysis, was not part of the process.

Implementing the coding process including sub-categories represented the next step. The final but certainly most important step of the whole process was to analyze the results of the coding process. In order to ensure a clear and comprehensible form, I grouped the findings in four sub-chapters: vulnerability, resilience and adaptive capacity, adaptation, and migration.

2. Theoretical Framework: Vulnerability, Resilience and Adaptation

2.1 Vulnerability

Climate change, climate variability and environmental degradation have increasingly become a major concern for policy makers and researchers for many reasons. One of them is the assumption that climate change has an impact on human migration. It is widely accepted in the contemporary academic discussion that environmental factors do have consequences in terms of migration patterns and that their impacts can be expected to increase (Piguet et al. 2010). However, there is no consensus about the magnitude of this impact.

While some stress the direct impacts of ecological factors on human mobility, others emphasize the context of social, economic and political realities in which migration patterns take place.

These researchers advocate that conceiving the significance of environmental factors in human migration requires analyzing the vulnerability and resilience of individuals and social groups. It is crucial to understand the various potential coping mechanisms and adaptations, because migration is only one among many other adaptation options (Piguet et al. 2010: 1).

Numerous research traditions have tried to disentangle the link between climate change and migration and have mainly failed doing so. However, Piguet (2010) proposes that two research traditions could contribute significantly towards building a broader understanding of the environment–migration link.

The first tradition empirically questions the importance of the environment in on-going migration patterns. This aims to describe the environmental element among other migration drivers. The second useful research tradition is mainly descriptive and puts vulnerability and resilience in the center of analysis. This approach aims to identify the so-called hotspots, regions threatened by environmental degradation, to then assess the vulnerability and resilience of their inhabitants. This is meant to provide insights into possible future migration patterns.

Thus it is reasonable to approach the climate-migration nexus with the concept of vulnerability. This section of the paper will try to contribute to a better understanding of the complex nexus of environmental change, and its implications on livelihoods by analyzing a number of research traditions.

Certainly there is an important social element that seeks to explain why some individuals or groups of persons are more exposed to mentioned ecological changes than others. As discrete ecological events are becoming more common, these events expose underlying vulnerabilities and test the coping capacity of communities. This is the case for both acute-onset events like tsunamis or floods, and for slow-onset events like sea level rise for small island states. However, it is now widely accepted by the vast majority of approaches that extreme meteorological phenomena imply highly divergent effects on social groups, depending on the economic and political context. Yet this incongruity was not always the case as is shown in some early research traditions and approaches.

Piguet et al. (2010) state that various societies and countries feel the impacts of climate change differently, as socio-economic determinants shape the vulnerability to natural phenomena.

As environmental stress does not impact all individuals equally, information regarding climate change is not perceived in the same way by everyone everywhere (Desai et al. 2003; Marx et al. 2007). Piguet et al. give an insight into the multiple determinants shaping vulnerability:

„This includes for example gender, as changes in livelihood patterns affect men and women differently, not only because of their different social positions, but also because gender is known to influence the perception of risks (which is a crucial variable in migration strategies), as

well as the way people experience displacement.” (Pecaud et al. 2010: 10).

In fact, awareness to risk of ecological perturbation in many ways affects decisions being made by members of socio-ecological systems, with migration being one of these. To this end, the higher the vulnerability (or perceived vulnerability) of a person to environmental change, the higher the probability the person will attempt to migrate. For the simple reason that the ability to move is dependent on one’s access to capital, this leads to certain portions of a population being “trapped”, as portrayed in Figure 1. While impoverished people lack the means to move away from environmental stress, their insufficient financial resources even increases their vulnerability to climate change.

Furthermore, there might be what has been called “confounding socio-political factors” for example in war-torn locations, like Somalia, where armed conflict makes movement more complicated or even impossible (Kollmannskog 2009), or as in New Orleans, USA where the evacuation plan for Hurricane Katrina presupposed that all residents had access to a car (Cutter 2011). The rise in rural poverty alongside environmental disasters might even lead to decreased emigration, as was the case in Mali during the severe drought of 1983-1985 (Findley 1994). Black et. al point to the costs of mobility and a relationship leading to the phenomenon of trapped populations:

“Migration is often expensive, and those most vulnerable to environmental change are usually poor.” (Black et al. 2011: 448)

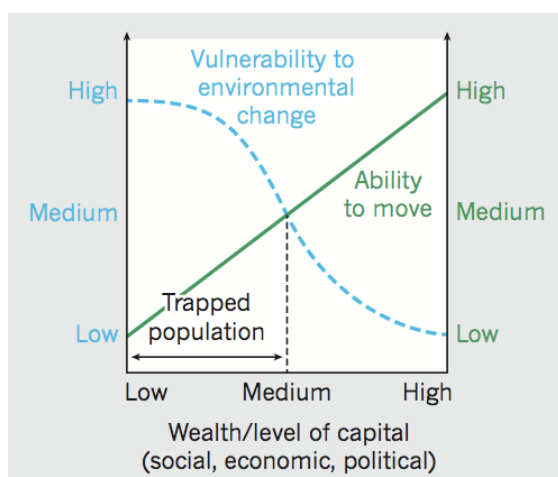


Figure 1: Trapped populations
Source: Black et al. (2011)

2.1.1 Research Traditions and Approaches

A number of scientific disciplines and traditions use the term vulnerability. Naturally, the concepts of the term vary widely. Depending on the discipline and its orientation, the unit of analysis stretches from the ecological vulnerability of a country or region to the social vulnerability of a group of persons.

Two traditional and fundamentally different research traditions seem to have been the basis for the various approaches of the current vulnerability research (Adger 2006: 270).

These antecedents are a natural-deterministic approach, generally referred to as natural hazards approach or hazards paradigm, and the so-called social vulnerability approach or entitlement theory, which relies on social constructionism and understands vulnerability as a lack of entitlement. Even though these two traditions both have their academic origin in disaster research of the 1970s, 80s and 90s, they clearly have different reference systems and problem definitions.

2.1.1.1 Natural Hazards Approach / Risk Hazard Approach

The natural hazards, or risk hazard approach incorporates physical science, engineering and social science to analyze vulnerability to natural risks and hazards. However, the emphasis is clearly put on natural sciences. Unlike current mainstream climate-related research, according to the natural hazards approach, natural events function largely independently of human activities. Consequently, large parts of social systems may also be regarded as operating independently of natural events (Burton et al. 1978: 19). Accordingly, an integrated perception of human-ecology relations does neither occur concerning problem definition, nor response to problems.

Vulnerability is considered mainly as a result of exposure to natural events such as hurricanes, droughts and earthquakes. Accordingly, the frequency and intensity of hazardous natural events set the grade of vulnerability.

In this sense, a dose-exposure relation between a social and a spatial framework determines vulnerability. Certainly this simplistic cause and effect model seems abridged considering the many parameters influencing people's wellbeing.

External stressors, in the form of hazards, decisively represent the focal point of this theory.

Famines, following the natural hazard perspective, embody the outcomes of natural events in connection to technologic failure of adaptation. The causes therefore lie primarily outside social, economic or political spheres (Dietz 2006: 14). Essentially, institutional structures can mediate hazards, yet if they fail to do so, even the increased economic activity of some individuals does not decrease their degree of vulnerability to adverse environmental events. Even though external stresses like ecological disasters are presented as exposing every member of society to hazards, in terms of coping with extreme events, it is assumed that some kind of choice is always involved.

In the book “The environment as hazard”, a publication that in many ways set the underlying logic for the natural hazards approach, the authors acknowledge that natural systems are neutral and neither positively nor negatively driven towards their members.

“It is *people* who transform the environment into resources and hazards, by using natural features for economic, social, and aesthetic purposes.”

(Burton et al. 1978: 19-20)

To this end, the impacts of a hazard are understood to be functions of exposure to the hazardous event. Thus, individuals contribute to a natural event becoming a hazard.

The socio-economic characteristics of an affected person are widely neglected and only taken into account since the grade of vulnerability depends for many natural hazards on the place of residence of affected persons.

Even though the natural hazards approach has, throughout the years, lost scientific significance to measure or explain the grade of people’s vulnerability, much research on migration and ecological inference still argues with the same logic. It is a popular approach to try to disentangle the linkages between human migration and the ecology based on area characteristics.

This leads to the assumption that there should be a correlation between the intensity of natural disasters and the emigration rates of this area (Piguet 2010: 2).

However, taking into account only the two variables of exposure to ecologic disasters and emigration rate falls short of identifying the various push factors that come into play regarding migration.

Furthermore, exposure is not measured on the individual level but for spatial aggregates. This well-known problem is called “ecological fallacy” (Robinson 1950). Even the word “ecological” indicates that the unit of analysis is not an individual but a pre-defined geographical area (Piguet 2010: 2).

Focusing on geographical maps of risk makes it very difficult to differentiate the impacts of environmental factors between subgroups of the population, according to socio-economic status or gender. One must, therefore, keep in mind that this kind of analysis might be useful in determining the area’s vulnerability to hazard, but most certainly not of the individuals populating it.

2.1.1.2 Entitlement Approach / Social Vulnerability Approach

The economist Amartya Sen set the academic basis of the social vulnerability approach in the 1970s. His presumptions on vulnerability to food insecurity are still used in the various approaches of current social vulnerability studies. Sen’s studies on development as freedom and structural violence examine the differences between peace and the absence of violence.

Before Sen’s publications on famines and vulnerability, natural disasters were considered as solely ecological phenomena. Institutional and sociological elements of vulnerability were fully ignored. Entitlement-based explanations of vulnerability, however, emphasize mainly the economic and social element of the issue.

Sen analyzed the Bengal famine of 1943, along with other famines and rejected the common assumption that food availability decline (FAD), is the simple explanation of famines.

In the book “Poverty and Famines: An Essay on Entitlement and Deprivation” that was first published in 1981, Amartya Sen develops the so-called entitlement theory.

According to which, vulnerability to food insecurity is an effect of linked economic and institutional factors. Vulnerability to this end is the outcome of processes shaped by human actors, which they can almost always prevent (Adger 2006: 270).

“Starvation is the characteristic of some people not *having* enough food to eat. It is not the characteristic of there *being* not enough food to eat. While the later can be cause of the former, it is but one of many *possible* causes. (...) In order to understand, it is, therefore, necessary to go into the structure of ownership.” (Sen 1981: 1)

Famines in entitlement theory are explained with institutional and economic failure, sometimes adding to food availability decline caused by natural causes.

One example being the Bengal famine of 1943, which according to Sen occurred due to ill-founded political choices and inherent market mechanisms, not because of food availability decline¹. However, food availability decline was and still is a common approach to propose explanations to famines.

In relation to research on environmentally induced migration, Sen's argumentation points to the multiple determinants of migration. Human migration is a product of heterogeneous factors adding to one another, and the environmental factor is almost in every case converging with other factors, highly dependent on economic, social and political context (Asian Development Bank 2012; Boano et al. 2008; Piguet et al. 2010). Just like in migration, the environmental factor regarding famines is only one factor that can function as an additional burden in an already tense situation in political, economic, demographic or social terms.

Finally, the entitlement approach puts the focus on starvation, which is to be differentiated from famine mortality, given that many deaths during famine are caused by epidemics induced by population movements or decreased sanitation (Sen 1981: 50).

The term famine, according to Sen, describes a situation where many people lack the ability to command food (through legal means), this disability is due to failure of entitlement. Entitlements of individuals or social groups constitute of various

1

Even though 1943 was not a highly fertile year in the West Bengal region, it was certainly not a disastrous year either. Crop supply in 1943 had only decreased five percent compared to the average of the proceeding five years (Sen 1981: 63). Nevertheless, the Bengal famine caused the death of at least 1,5 mio. people (Famine Inquiry Commission India 1945).

elements. Failure of entitlement to food is the most severe form of vulnerability, as ownership of food constitutes the most basic property right.

“The entitlement approach concentrates on each person’s entitlement to commodity bundles including food, and views starvation as resulting from a failure to be entitled to a bundle with enough food.” (Sen 1981: 45)

A good example of failure of entitlement to food leading to migration is the case of the so-called Dust Bowl migration. Between 1935 and 1940, approximately 100,000 people participated in a large-scale regional migration out of Oklahoma, USA, to California (Gregory 1989; Hale 1982; McLeman/Smit 2006; McWilliams 1942; Stein 1973). The highest level of out-migration took place from areas where cotton and corn were main crops, cotton being the principal source of wealth (McLeman/Smit 2006: 42, 44).

Even though a number of political, economic and social parameters were subject to change in the second half of the 1930s in that area, several scholarly studies agree upon the weight of environmental factors contributing to this migration pattern. (Gregory 1989; McLeman/Smit 2006; McWilliams 1942; Stein 1973; Worster 1979). The widespread and almost complete failure of cotton as source of wealth, following the droughts of 1934 and 1936, and to the flooding of 1936, was considered a climatic “signal”. The environmental factors meant that poor tenant farm families were most likely to have to emigrate.

The entitlement approach not only shows the internal market mechanism when shocks occur, but draws attention to underlying questions of resource allocation and distribution of power. The concept is so relevant for the examination of ecological shocks because it shows the widely varying impacts they have on different groups of society.

“While famines involve fairly widespread acute starvation, there is no reason to think that it will affect all groups in the famine-affected nation. (...) different groups typically do have very different commanding powers over food, and an over-all shortage brings out the contrasting powers in stark clarity. “ (Sen 1981: 43)

It seems evident that this is not only the case in occurrence, of famines but for various kinds of ecological stresses.

Even though Sen's focus of analysis is put on famines and starvation, the entitlement approach definitely shows, how vulnerability of livelihoods to shocks occur, when people experience a breakdown of potential sources of income or endowment. Whatever the cause of livelihood disruption may be, its weight felt by different social actors varies significantly.

Amartya Sen was the first scientist to address and describe these socio-economic factors determining the grade of vulnerability. The interpretation of vulnerability not as exposure to external threats, but as an internal characteristic means a radical departure from natural deterministic argumentation. In comparison to the natural hazards approach, Sen's publications therefore constitute a theoretical enhancement of vulnerability research.

2.1.1.3 Human Ecology Approach

The human ecology approach can be identified mainly in the tradition of analysis to vulnerability to hazards. However, in relation to the static understanding of natural hazards, the human ecology approach establishes a multi-dimensional concept of vulnerability that involves the social complexity of disasters. It is reasoned that the discourse of hazard management failed to take into account the structural and political context of vulnerability, due to the dominance of engineering approaches (Adger 2006: 271).

The human ecology stream acknowledges that there are some human properties that make some persons less "robust" than others. Hence some persons are more likely to die from premature death or injuries, caused by behavior or not.

However, research within the hazards perspective has tended to treat such notions as irrelevant or incidental in disasters, to the extent that losses have been viewed as indiscriminate and survival as a matter of chance (Hewitt 1997: 142).

Kenneth Hewitt in his book "Regions of Risk" (1997) describes the growing interest in the question of vulnerability following large losses for the insurance industry caused by earthquakes, hurricanes and oil spills.

Vulnerability is described in the human ecology approach as the opposite of safety and security. Accordingly, increased vulnerability means decreased safety.

An important contrast to the hazards paradigm is the assumption that vulnerability is not simply the exposure to natural hazards but a condition that is created or formed by human actions, deliberately or by default (Hewitt 2006: 142). Moreover, the importance of human differences and resourcefulness in the face of dangers is underscored.

“Vulnerability itself is a property or a circumstance of persons, activities and sites. The forms and degree of vulnerability to storm or famine are often related to gender and wealth, to influence or lack of it.” (Hewitt 2006: 142)

In addition, the human ecology approach takes some “absolute vulnerabilities” into account. Entire societies and even biospheres seem totally vulnerable to these hazards, including nuclear wars and comet impacts. In the case of almost every other risk there is something that humans can do and do to mitigate or reallocate vulnerability (Hewitt 1997: 143). In this regard, the human ecology approach is on the same page as the natural hazards approach, both streams acknowledge the ability of institutional factors to mediate the impact of hazards. However, in contrast to the natural hazards approach according to human ecology, economic and social characteristics have the potential to help mitigate the hazards.

A major question of human ecologists is why impoverished and marginalized groups face the highest risk from natural hazards. The conceptual framework explaining this question emphasizes the importance of location. Poor persons are forced to live in certain adverse areas, which puts them at risk of environmental stresses. An analysis of hazards demonstrates this in the case of Lima, Peru.

“The people most vulnerable to the effects of an earthquake in the city are those with limited options in terms of access to housing and employment. The inhabitants of critical areas would not choose to live there if they had any alternative, nor do they deliberately neglect the maintenance of their overcrowded and deteriorated tenements.” (Maskrey 1989: 12)

Interestingly, the emphasis on the location of individuals seems contradictory to the argument that vulnerability is a property of persons. If impoverished persons are forced to live in risky areas, which make them more vulnerable to natural hazards, their vulnerability should be considered rather a consequence of their economic situation rather than as a personal property. Therefore, how robust a person is, basically another word for resilience, is not as arbitrary as it might seem, but rather a result of resource distribution.

Even though the human ecology approach is not very specific, it acknowledges both the exposure to physical hazards and, to some extent, social factors as contributing to the vulnerability of persons. In this sense, some parallels to the pressure and release model and other succeeding approaches can be identified, even though, unlike these approaches, the human ecology tradition clearly emphasizes the physical factor.

The biggest achievement of human ecologists is the rephrasing of vulnerability rather as an outcome formed by human actions than as a condition of exposure. However, the contradiction between human action and personal property remains.

2.1.1.4 Pressure and Release Model / Access Model

The pressure and release model considers disasters to be the result of two different kinds of pressures. The first characteristic of vulnerability is presented by physical or biological hazards. The second pressure is the result of “cumulative progression of vulnerability”, including root causes, geographical characteristics and social context (Blaikie et al. 1994).

Any ecological disaster is the result of the additive pressure of physical hazards and social vulnerability. The disaster in its final characteristic embodies the temporal and spatial expression of the vulnerability of particular members of society.

Hence, the approach emphasizes physical hazards, while at the same time acknowledging the social realm of vulnerability from a human ecology perspective. Scholars, to this end, have called the pressure and release model a successful synthesis of social and physical vulnerability.

The goal of this approach is to identify important elements that can be used to reduce vulnerability to ecological stresses. Blaikie et al. (1994), therefore, analyze political

and socio-economical factors that are important in the development of so called “unsafe conditions”. These factors are also relevant in resource and income allocation. Accordingly, Blaikie et al. (1994) describe the development of vulnerability as a dynamic process that can only be understood if one takes into account the underlying structural and ideological factors, determining the allocation of power and resources in society. These socio-political and economic dynamics (dynamic pressures) translate the social asymmetries at hand into unsafe conditions like settlements affected by erosion and other ecological stresses.

The model gives advice in terms of mitigation and recovery from disasters, focusing on reducing the vulnerability of persons living in unsafe conditions.

Due to the fact that the pressure and release model gives equal weight to hazards and underlying vulnerability as pressures, it has received criticism that the analysis falls short in quantifying the relationship between hazards and vulnerability.

2.1.1.5 Political Economy and Double Exposure Theory

The political economy approach analyzes vulnerability in connection with dominant political and economic structures. Distribution of power in society is considered a core factor in analyzing vulnerability. Michael Watts and Hans Bohle consider vulnerability, a:

„ (...) multi-layered and multi-dimensional social space defined by the determinate political, economic and institutional capabilities of people in specific places at specific times.“ (Watts/Bohle 1993: 43)

The emphasis on capability implies the human ability of mitigating vulnerability. It implies that vulnerability is to some extent manmade.

According to political economists, vulnerability can only be understood if one acknowledges the multidimensional character of vulnerability and starts an analysis from a multilayered perspective. The argument of the multidimensional character of vulnerability goes along with the multi-causality of migration. Even though it might seem tempting to consider vulnerability as an easily measured and uniform factor, the political economy approach argues for recognizing the multidimensional

character of vulnerability. Similarly, the environmental factor in migration patterns is usually less an isolated severe push factor than just one among many other determinants influencing migration streams.

Karen O'Brien and Robin M. Leichenko (2000) refined the political economy perspective to vulnerability to the concept of double exposure. In this approach the authors examine the interactions between effects of climate change and economic globalization. They assume that the consequences of neoliberal globalization, e.g. liberalization and privatization of resources and markets, in conjunction with impacts of climate change, cause a structure of "winners and losers" of these processes. They conclude that certain adaptive strategies (e.g. fertilizers, irrigation systems,...) are beyond small-scale farmers reach, due to their socio-economic position and missing financial resources. In the case of Mexico, they represent small-scale farmers competing in international markets as well as wage laborers as "double losers" because of both, climate change and globalization (O'Brien/Leichenko 2000: 229).

Clearly the political economy and double exposure theory have a fundamentally different scientific background than natural deterministic research traditions like the natural hazards approach. Of course, in scenarios in which the political economy theory examines the grade of vulnerability of persons, the environmental factor might have some relevance. However, it is considered only one of many others and is most certainly not the most important factor determining vulnerability of persons to environmental changes.

Subsequently, the multi-layered perspective of both the political economy and double exposure theory can help to add clarity to the complicated matter of vulnerability.

2.1.1.6 Vulnerability to Poverty in Development Assistance

Until recently, development assistance and climate change were considered separated areas of concern. It was due to indigenous civil societies and governments of the South that concepts of sustainable livelihoods and basic security for subsistence farming were included in the climate change debate.

In development assistance, the notion of vulnerability is based on Robert Chambers' (1989) publications on vulnerability. Chambers distinguishes between poverty and

vulnerability by defining poverty as “deprivation, lack or want”, while defining vulnerability as “defenselessness, insecurity, and exposure to risk, shocks and stress” (Chambers 1989: 2). This concept of vulnerability has been highly influential for many approaches of vulnerability throughout the 1990s. Even though vulnerability and poverty are certainly two different subjects, it seems obvious that there is a certain degree of interrelation between the two, since vulnerability, in Chambers sense, determines the ability to leave the vicious circle of poverty (Dietz 2006; Yanin et al. 2005).

The distinction between vulnerability and poverty seems especially relevant, as income maximization does not necessarily mean reduction of vulnerability. As Chambers shows, borrowing financial capital can reduce poverty in the sense of low income, but such debt makes households more vulnerable in terms of long-term safety (Chambers 1989).

Even though it seems clear that poverty and vulnerability is not the same, in the context of development assistance, the low consumption of impoverished persons and households acts as a manifestation of vulnerability.

In this area of research, livelihoods are understood as dependent on both, capital assets and ecosystems. However, physical and ecological dynamics of risk are hardly taken into account (Adger 2006: 272).

Yanin et al. (2005) criticize this research tradition for disregarding the importance of vulnerability:

“(…) mainstream development approaches still neglect vulnerability. The focus of attention remains poverty reduction with poverty defined mainly in monetary metrics and policy interventions focused on improving incomes.”
(Yanin et al. 2005: 5)

Like in many other research traditions, the socio-economic sphere of vulnerability is given considerable relevance in development assistance. However, unlike the human ecology approach and the pressure and release model, the economic situation of individuals clearly outweighs all other factors determining vulnerability. As vulnerability in development assistance is considered the disability of sustaining a livelihood, it seems surprising that risk and physical dynamics are widely neglected.

In this respect, the concept of vulnerability in development research falls short to incorporate the various characteristics that influence people's safety.

2.1.1.7 Summary

While even psychology and engineering work with the concept of vulnerability, in particular, human ecology and human geography have theorized vulnerability to climate change. Within environment-related studies, there are of course, some differences, but many commonalities in vulnerability research.

Vulnerability is generally understood as the degree of susceptibility to threat as a consequence of exposure, and as missing adaptive capacity (Adger 2006: 268).

Mobility is one among many other possible reactions to this condition.

It is widely agreed on by various disciplines, that vulnerability is driven by human action and that vulnerability to climate change cannot be analyzed without taking into account the wider political and economic context of resource use. Nevertheless, not every approach acknowledges this assumption to the same extent.

The differences in interpretation, conceptualization and analysis between the several research traditions exist due to dissimilar strategic foci and different comprehensions of climate change. However, some key-parameters can be identified in all traditions of vulnerability research.

These are exposure to stress, sensitivity and adaptive capacity. Even though there is no official definition that all approaches agree on, these terms are used in a similar fashion.

Exposure is theorized as the degree to which systems experience negative ecological effects like adverse climate. This environmental stress is characterized by the hazard's "magnitude, frequency, duration and areal extent", as stated by Ian Burton et al. (1978: 20).

The grade of sensitivity defines how much a system is affected by perturbation, while adaptive capacity draws on the potential to accommodate environmental stress (Adger 2006: 270). Generally the limits between economic, ecological and social vulnerability stay undefined.

Important conceptual and semantic questions refer to the notion of vulnerability. Different approaches have different ideas on whether vulnerability should be seen as a system's inherent characteristic or the outcome of an environmental process. Neither is there consensus in terms of the static or dynamic concept of vulnerability, determining if vulnerability is understood regarding an external threat or as the result of given threat (Füssel/Klein 2002: 305).

2.1.2 Measuring Vulnerability

None of the research traditions described in the chapters above provides comparable metrics for vulnerability. Integrated analysis of vulnerability must reflect both the social processes and the material outcomes within systems. Mapping the linkage of elements determining the degree of vulnerability of a system or individual is very hard to grasp.

Since the complexity of vulnerability should not be reduced to a single metric, it is not easy to measure vulnerability qualitatively, how W. Neil Adger acknowledges:

„While it is easy to recognize personally the feeling of vulnerability and perhaps to grasp the outcome of vulnerability in others in a similar situation, the translation of this complex set of parameters into a quantitative metric in many ways reduces its impact and hides its complexity.“ (Adger 2006: 274)

Of course, there are multiple methods trying to quantify vulnerability using various sets of data. The approaches vary from measuring susceptibility to drought from psychology-based bottom-up perspectives to using technical geographic information systems (GIS) to measure the vulnerability of coastal communities to sea level rise. Many of these approaches follow simplistic patterns of argumentation such as, the stronger the stressors and the more valuable the resources at risk, the more vulnerable the region or people populating the region will be. Other methods include not only using maps of risk but also taking into account policy considerations, like the planned development of dams and other infrastructure projects.

Füssel and Klein (2006) identify several prototypical assessment stages of vulnerability. They distinguish between four different stages of climate change vulnerability assessment. Namely, and in chronological order, these are “impact assessment”, “first-generation vulnerability assessment”, “second-generation vulnerability assessment” and “adaptation policy assessment” (Füssel/Klein 2006: 310). These stages not only differ in terms of implication on policies, the very research questions differ widely.

The development of climate change assessment shows a trend from assessment, which considers multiple effects of climate change, to assessment that focuses on policy recommendations for minimizing risks (Füssel/Klein 2006: 324).

2.2 Resilience

Within research traditions on social-ecological systems, the concepts of resilience, vulnerability and adaptation interact closely. Therefore, resilience cannot be analyzed without bearing in mind the correlation between those. According to Folke et al. (2002) a social-ecological system with a high degree of vulnerability, has lost its resilience, implying decreased adaptability.

Generally the concepts of vulnerability and resilience have more similarities than distinctions; however, different aims of study require different methods of research. Both types of research aspire to portray the very nature of social–ecological systems and human-environmental interactions.

Studies on the vulnerability of social-ecological systems have proven that the increase or decrease of social-ecological resilience, influences the grade of vulnerability considerably. These elements are the capability to absorb shocks, the autonomy of self-organization and the ability to adapt to expected shocks as well as in response to already occurred shocks (Adger 2006: 269).

Consequently, the grade of vulnerability of a particular group of persons, an ecosystem or a socio-ecological system is directly connected to the grade of resilience. To this end, the lower the grade of resilience is, the higher the grade of vulnerability will be. Contrary to the notion of vulnerability, resilience is usually portrayed in positive terms and emphasizes the positive and prospective capacity.

Following this argumentation, it might seem like resilience is nothing else than the opposite or positive equivalent of the incapacity component of vulnerability and that there is no need for the new analytic construct of resilience (Obrist et al. 2010).

However, a rather holistic concept of resilience goes beyond the capacity component of vulnerability. Therefore, combining the concepts of vulnerability and resilience as equivalent concepts bears the potential of understanding the underlying phenomena that can lead to environmentally induced migration.

2.2.1 Research Traditions and Approaches

2.2.1.1 Resilience as Robustness

Resilience research derived from ecology research of the 1960s and early 1970s, and was especially influenced by studies of interacting populations (Folke 2006: 254). The concept was applied early in North America in research on the management of rangelands, freshwater systems and fisheries. However, various disciplines outside ecology soon picked up the concept.

The earliest definition of resilience goes back to Crawford Stanley Holling, referring to ecological resilience as a:

“(...) measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables (...)” (Holling 1973: 14)

In this view, resilience centers its attention on the persistence of populations within a given ecosystem. The measurement for this notion of resilience is a population's probability of extinction.

Formerly dominant perspectives have assumed that the environment would self-repair into equilibrium once stresses induced by human actors were removed, because of the stable and infinitely resilient character of nature. In this notion, resilience is defined as the time the ecosystem needs to return back to equilibrium. This approach has been labeled “engineering resilience” (Holling 1996) and is very similar to the concept of elasticity.

This static view bears little insight about the consequences of disruption in case of a system not near equilibrium. Nevertheless, this perspective has dominated the natural resource and environmental management debate for a long time.

2.2.1.2 Resilience as Reorganization

The original ecological definition of resilience was later extended and strongly influenced by the theory of complex adaptive systems. The academic focus was shifted to the critical structure and processes of ecosystems.

This rather contemporary view of resilience shifts attention from stable systems to realities far from equilibrium. Resilience is therefore defined as:

“(...) the amount of disturbance that a system can absorb before changing to another stable regime, which is controlled by a different set of variables and characterized by a different structure. (Brand/Jax 2007: 3)

Lance Gunderson and Crawford Stanley Holling defined the extended meaning of resilience similarly:

“(...) the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behavior.” (Gunderson/Holling 2002: 4)

To be able to apply this extended ecological definition to particular cases, it is important to specify resilience of “what to what” (e.g. resilience of a specific forest to drought) (Carpenter et al. 2001). It takes this operational step to make resilience concrete.

Yet, resilience has a more comprehensive element than only drawing on persistence and robustness to disturbances, it can also be seen as capacity for renewal, reorganization and development. In this regard, resilience provides the capacity to adapt (Smit/Wandel 2006). In resilient systems, disturbances have the potential for innovation and can, therefore, be seen as an opportunity.

However, this does not mean that resilience is always a positive condition. Scientists have argued that transforming a resilient system into a more desirable state may prove to be a highly difficult endeavor (Gunderson/Holling 2002; Walker et al. 2004). Of course, what is desirable and what is not depends very much on the valuation of the beholder. Central to this notion is not the idea of controlling a system, but its management in order to increase its coping range and adaptive capacity.

Scholars in favor of this view argue that management of resilience increases the chances to successful development in a situation shaped by environmental change and high climate variability (Adger et al. 2005a; Walker et al. 2004).

Carl Folke (2006) emphasizes the necessity to learn to manage by change, not simply react. Surprise is “part of the game” and one needs to adapt accordingly.

This shift in dominant perspectives, perhaps, shows a certain degree of acceptance of the severity of change, many ecosystems are currently facing.

2.2.1.3 Social Resilience

Much recent research has focused on the social realm of resilience. It has been argued that it is crucial to not only manage an ecosystem’s vulnerability to risk but to build up the resilience of human actors. Thus, it is necessary to frame and explore resilience from the point of view of social structure (Obrist et al. 2010). It is important to analyze how society structures the resilience of human actors and how human actors structure resilience in social interactions. This abstract question might be a fruitful approach for mitigation research because self-organization is regarded as a constitutive component of resilience (Folke et al. 2002; Obrist et al. 2010).

It is widely recognized that it is social actors who not only cope with and adjust to certain stresses, but even have capacities to create pathways for mitigation and overcoming adversity. This proactive factor shifts the emphasis to increasing the competence of humans and goes far beyond the reactive element. Insofar social resilience bears the potential of being a protective enabling factor (Obrist et al. 2010). Scheffran et al. (2011) describe resilient communities and their capacities in terms of managing new environmental situations:

“Resilient communities are active agents that influence their environment, anticipate and resist to future stresses and recreate themselves according to their motivations and capabilities. Combining absorption, resistance and recreation in social resilience transcends the reactive nature of adaptation towards anticipatory learning.” (Scheffran et al. 2011)

The degree to which some actors can influence the ways, in which ecological events impact socio-ecological systems, depends on their social, economic and cultural characteristics. This symbolic capital (Bourdieu 1984; 1986) determines how human actors are exposed differently to the same hazard and thereby face different constraints and opportunity in building resilience (Obrist et al. 2010). Not only are impoverished social groups more vulnerable to ecological hazards, as argued in the previous chapter, but financial savings also make it easier to react and adapt to changes of the environment and thus make livelihoods more resilient.

Other dimensions influencing the grade of people’s resilience are rather institutional and include governance, infrastructure, and access to information and technology. Building resilience through improvements in these factors can reduce the need for people to migrate, however, migration can also be a way to improve these factors (Asian Development Bank 2012). International migration can be highly beneficial to both sending and receiving countries and can play a key-role in fostering the resilience and adaptive capacity of households and communities (for example, through remittances), as shown in a following chapter.

Glavovic et al. (2003) introduce a framework following which sustainable livelihoods consist of layers of resilience. On the lowest level, individuals cope or even prevent disturbances by learning technical skills and thus build resilience.

On the next level, social groups, for example, households, communities or organizations, utilize collaborative efforts to strengthen their resilience.

On the highest level of resilience, national and international institutions can enable people to access private and public services, and therefore foster resilience, building on the lower levels of livelihood systems.

The framework of levels of resilience helps to understand the interconnectedness of different dimensions of livelihood systems. Building resilience on one of these levels may positively influence efforts on another level. However, progress on one level does not automatically translate to other levels.

2.2.2 Resilience of Socio-Ecological Systems

Unlike the descriptive definitions of resilience, there are more hybrid concepts, that not only focus on ecology, or on human actors but combine these two.

Many scientists have argued that it is crucial not to portray the environment as an independent system, totally separated from human actions, but to embrace a vision of resilience according to which social and environmental systems are inherently coupled (Andries et al. 2006; Folke et al. 2002; Walker et al. 2004). Similarly, as argued above regarding the concept of vulnerability, in resilience research too, the split between nature and human actions should be critically revised, since humans can be regarded as part of an ecosystem.

It is sometimes assumed, if social systems performed adaptively, environmental resources would be managed in a sustainable fashion.

However, even though some societies show great ability to cope and adapt to ecological change, the means of adaptation might be the starting point of new ecological problems and at the expense of the capacity of the ecosystem to sustain such an adaptation. This shows that, even if talking about human adaptation, one needs to keep in mind that an explicit differentiation between social and natural systems does not make sense and is arbitrary.

If environmentally induced migration and displacement is considered a socio-ecological phenomenon, then an attempt to tackle the issue solely through the improved management of ecosystems will fail.

Especially regarding an issue as complex as the nexus of migration and the environment, the management paradigm falls short in delivering durable solutions and solving underlying problems.

2.2.3 Resilience as a Boundary Object

As resilience is currently used by various disciplines and its meaning has been transformed considerably, resilience is increasingly conceptualized as a paradigmatic approach to analyze social-ecological systems (Folke et al. 2002; Folke 2006).

Fridolin Simon Brand and Kurt Jax (2007) consequently claim that resilience has become a “boundary object”. Similar to many other boundary objects such as

concepts of sustainability and to some extent even vulnerability, the term resilience scrapes together different parties, that otherwise would have little incentive to engage in a debate.

“Boundary objects are able to coordinate different groups without a consensus about their aims and interests. If they are both open to interpretation and valuable for various scientific disciplines or social groups, boundary objects can be highly useful as a communication tool in order to bridge scientific disciplines and the gap between science and policy.”
(Brand/Jax 2007: 11)

Especially this vagueness and the fact that they can be interpreted in various ways, make boundary objects so successful in political terms (Eser 2002).

However, there is a significant disadvantage to this. The use of boundary objects might hide conflict and uneven power relations when partners in cooperation use the same term but suppose a different meaning.

The positive aspects of the boundary object resilience in terms of political success seem to be opposed to negative aspects in terms of scientific progress. To this end Brand and Jax (2007) conclude that boundary objects can in fact, hinder scientific progress.

2.2.4 Summary

Even though, first introduced as a descriptive ecological term in a seminal paper by Holling in 1973, resilience throughout the years has been extended by a number of dimensions. A wide range of disciplines, including sociology, economy and psychology, now use the concept. Different interpretations of resilience cause confusion, putting both practical relevance and conceptual clarity in danger. Thus it is crucial to specify resilience as “what to what”. Only if this is clear, an operationalization of the term is possible.

Certainly it is not easy to measure resilience. However, an appraisal of resilience can be a valuable insight into the complicated structure of environmentally induced human migration, if one keeps in mind the interdependencies.

Carpenter et al. (2001) introduce a framework of three core elements of the resilience of socio-ecological systems, which summarize the different dimensions of resilience quite well.

The first element describes the magnitude of disturbance a system can accommodate without changing into a fundamental different state. Other scholars have referred to this point as resistance. The second aspect is described as the capacity to which the system is able to self-organize. This needs to be distinguished from reorganization forced by adverse external factors.

The third element constitutes the capacity to which the system can establish or enhance adaptive capacity.

It is crucial to keep in mind that resilience is not a question of yes or no. Human actors and ecosystems always do have some degree of resilience. In regards to migration that means that even when confronted with severe ecological stress, human beings and communities are resilient to some degree and have at least some minimum level of agency in deciding to migrate or to adopt other adaptation strategies (Piguet 2010: 1-2).

2.3 Adaptation

Similar to the debate about vulnerability and resilience, the definitions of adaptation in the context of ecological change vary widely. Especially if one accepts climate change as a severe problem in terms of scale and continuity, it is crucial to not only discuss the vulnerability of humans or socio-ecological systems, but also possible adaptations to the new reality.

The concept of adaptation, even though conceived in different terms, bears commonalities with the element of resilience, which refers to the chance of renewal. In this regard, successful adaptations of a system can decrease its vulnerability and positively influence its resilience in the long run. However, adaptation is more complicated than that, as the different scientific approaches show.

The concept of adaptation, as currently applied in climate change research, has its basis in evolutionary biology. It refers to organisms and systems, developing characteristics of gens and behavior, which allow them to cope with climatic variability for survival and reproduction (Futoyma 1979).

Social sciences use this concept on the individual level in integration research. Accordingly, adaptation describes a socio-cultural alteration of someone's behavior to the social and political structures of a new context (Dietz 2006: 23).

Another application of the term in social sciences draws to potential survival or extinction of cultures. Anthropologists in favor of this approach understand adaptations as a continued form of selection based on cultural practices, which have historically played a major role in survival of cultures (O'Brien/Holland 1992).

In this darwinian view, a culture that fails to cope with changes in the ecosystem will lose in a competition for scarce resources and will be unable to persist (Smit/Wandel 2006).

In more recent social scientific publications, adaptations are considered cultural practices, which increase a society's chance of survival, due to altered behavior or technological innovation (Denevan 1983). This includes, but is not limited to, ecological stress.

Even though several definitions can be found regarding human adaptation to climate change, they usually refer to processes, actions or outcomes in a social system to increase the ability to cope with, manage or adjust to various changes, stresses or opportunities (Smit/Wandel 2006: 282). Thus these definitions do not differ as much as definitions of vulnerability. Smit et al. (2000) show quite nicely that the subject of adaptation neither has to be a social nor an ecological system, when they define adaptations as:

“(...) adjustments in ecological-social-economic systems in response to actual or expected climatic stimuli, their effects or impacts.” (Smit et al. 2000: 225)

Considering the political relevance of the topic, research on the dynamics of adaptation to ecological change is a relatively new field of research. According to Richard Klein (2002), this is because two influential scientific schools deliberately rejected research on adaptation to climate change for a long time, although for different reasons.

Advocates of the preventionist school, assuming anthropogenic (man-made) climate change, fear that a comprehensive debate about adaptation might reduce the public

and political commitment to reduce carbon emissions. Thus they suggest trying to prevent climate change instead of mitigating its effects.

The adaptionist school, however, assumes that societies have adapted to climate change automatically for ages. Hence it is assumed that active intervention in the form of political implementation of adaptation programs would prevent this natural response and entail high social costs.

It was due to scholars like Richard Klein and others advocating for the realist school that research on adaptation to climate change experienced some revaluation beginning in the 1990s (Dietz 2006). According to supporters of the realist school, the fact that climate change is anthropogenic cannot be denied. However, assertions about specific impacts can only be made with great uncertainty. To overcome this problem, further knowledge about local communities and their adaptation strategies regarding climate change are necessary. Only in this way can the uncertainties of climate research be reduced.

2.3.1 Central Questions Dominating Adaptation Research

There are several central distinctions in the debate about adaptation to climate change that might help to define the character of a particular adaptation measure.

The various ways, in which adaptation to ecological change occurs, highly depends on the temporal, spatial and fundamental characteristic of the contemplated phenomenon. Furthermore, a number of political and institutional factors come into play. The following scientific questions are a useful tool to analyze the nature of adaptation measures.

2.3.1.1 Adaptation to what?

Historically a main distinction of adaptation efforts was the differentiation between adaptation to climate change and climate variability (Watson et al. 1996). The term climate change implies prospective and continuing effects of global warming and, in this regard, is dependent on scientific forecasts and climate scenarios.

However, the term climate variability refers to current and not necessarily continuing changes in weather patterns.

The emphasis on this distinction on the policy level obscures the actual reality of the impacts. If a climate catastrophe is to be considered due to climate change or climate variability is not important regarding its immediate effect or consequence (Dietz 2006). Similar to early definitions of vulnerability, this differentiation focuses mainly on the nature of the hazard. As later publications on vulnerability and resilience have shown, an analysis that neglects the inherent characteristics of a system falls short in truly understanding the grade of vulnerability of this system.

2.3.1.2 Who or what adapts?

Based on questions of resource allocation and power relations, some scholars have highlighted the different spatial and societal scales in which adaptations occur (Adger 2001; Adger et al. 2003; Downing 2001). Similar to the framework of resilience by Glavovic et al. (referred to in the resilience chapter), the adaptation of a system might occur on one of several levels. If this happens on the level of individuals, households, regions or state depends heavily on human actors and who induces certain adaptation processes. It is important to note that adaptation in the form of the purchase of globally traded genetically modified seeds, or by using locally traded seeds means different beneficiaries.

The nature of the chosen adaptation strategy is always a result of a negotiation process in which some interests prevail over others (Dietz 2006).

The political ecology approach demonstrates this, by claiming that the relationship between ecosystems and political economy is categorically linked to political and social power relations. Political ecologists claim that social, economic and political processes at higher scales shape the adaptive capacity of social actors and communities. Environmental change is not a neutral process amenable to technical management since costs and benefits of these processes are not distributed among actors equally (Bryant/Mohai 1992).

Following this argumentation adaptation, as much as vulnerability and resilience, is the result of social differentiation.

2.3.1.3 How does adaptation occur?

A popular distinction of adaptation measures is the dichotomous distinction into autonomous and planned adaptations. Autonomous adaptations, also called private adaptations, are considered to happen automatically or naturally and are understood to be bottom-up approaches. Planned or public adaptations are the result of political negotiation processes, implemented in a top-down manner.

Earlier approaches to adaptation focused on the top-down manner and global climate model scenarios. As the deficiencies of this approach became apparent, adaptation strategies relevant on a local scale were emphasized and a rather bottom-up approach developed.

Regarding the dichotomous distinction, one needs to take into consideration that actions taken on one of these two levels do not occur independently of one another. In a democratic system, negotiation processes are always imbedded in the political and social context in which they occur. Thus, even marginalized groups have at least some means to influence the outcomes of these processes. Even though the power relations of contextual actors (states, multilateral institutions, large businesses) and relatively weak grassroots actors (e.g. poor farmers, fishers, shifting cultivators) may be highly unequal, they are rarely, if ever, one-way (Bryant/Bailey 1997).

Furthermore, adaptation strategies taken at the private level are always influenced by decisions taken at a higher level. Since adaptations to altered climatic conditions always occur in the specific context of societal inequality and patterns of resource distribution, they should not be considered completely autonomous (Dietz 2006).

A different approach to differentiate between adaptation measures is to take into account the magnitude of adjustment or change necessary for the original system (Risbey et al. 1999).

A simple form of adaptation for an agricultural community affected by water shortage might be the use of more water resistant cultivar. A more severe adaptive strategy might be to abandon crop farming in favor of pastoralism. While an even more substantial form of adaptation is to completely abandon farming and engage in other forms of earning income.

2.3.2 Levels of Adaptation

2.3.2.1 Autonomous / Private Adaptations

Adaptation strategies on the private level consist of various measures and range from planting different crops to changing place of residence. What they have in common is the aim to sustain or, preferably, better the current living standard in the face of expected changes of environmental parameters (Aalst et al. 2008: 170).

The determinant of information is of substantial importance. Several case studies have shown that forecasts offer farmers enough information to make strategic choices that help them improve their harvests.

Whether or not the affected (and informed) people attempt to adapt depends on their perceived adaptive capacity and a number of other socio-cognitive constraints (Grothman/Patt 2005). Provided that they have the financial means to do so.

Private adaptations are sometimes considered to be either taken for private benefit, if the entire benefit accrues directly back to the adapter, or for public benefit.

Even though sometimes portrayed with this contrast in the relevant literature, it is misleading to draw this distinction, as almost all successful adaptation measures taken on the private level, benefit both the adapter and the community.

Although not very prominent at the institutional level, an important form of autonomous adaptation to climate change is migration. Different kinds of migratory behavior all constitute a proactive way of adapting to the new ecological circumstances, as will be shown in a later chapter.

In conclusion, it is crucial to note that autonomous adaptation is not proof of desperation, as sometimes implied in the literature, but a proactive way for individuals and communities to shape their ecological realities. Autonomous adaptation, thus, is not a substitute for public action, rather autonomous and public adaptations should be considered two sides of the same coin.

2.3.2.2 Public / Planned Adaptations

Adaptation measures taken on the public level often involve creating policies and regulation to build the adaptive capacity of communities. These actions emphasize the regulatory sphere of institutions, but also rely heavily on technical solutions.

Big infrastructure projects like the establishment of early-warning systems, protective barriers or irrigation systems are, above all, a manifestation of confidence in technical solutions to climate-related problems. These approaches to adaptation rely heavily on the input of “western science” and professional expertise. Taking into account that states, businesses and multilateral institutions are direct or indirect contributors to environmental problems, it is a striking fact that actors who have often played a major role in contributing to environmental problems in the global South, are also largely in charge of devising solutions to those problems (Bryant/Bailey 1997: 36-37).

Even though migration seems to be more of a private than public adaptation strategy, historical examples show how governments have organized the resettlement of parts of the population from areas of environmental stress. For instance, the Ethiopian government was forced to resettle tens of thousands of its citizens from drought-stricken part of the country in 1984 and 1985 (Adugna 1989).

The most debated example in the literature about climate change and migration is without doubt the fate of low-lying small island states, located in the South Pacific. It is argued that if temperatures and, consequently, the sea level rises as expected, at some point migration would be the only adaptive option and would happen on a publicly organized scale (Hay/Beniston 2001).

As the literature on adaptation to climate change further indicates, public adaptation efforts are usually cross-scale dynamics and reach across regulatory or stakeholder landscapes (Adger et al. 2004; Adger et al. 2005b; Rotmans/Rothman 2003; Wilbanks/Kates 2002).

These scales of regulation may comprise of governments, environmental regulation agencies and private companies. While governments are associated with communicating climate change information and raising awareness through public information campaigns, they usually do not implement elaborated adaptation plans.

The formulation of strategies happens on the next tier of regulation, which encompasses governmentally supported institutions. Implementing the adaptation strategy by establishing an infrastructure project or altering consumer behavior by

increasing the price of resources and services tends to occur on the level of private or public businesses.

Adger et al. (2005a) reveal that there are some major lessons to be learned from research on cross-scale dynamics. The issue of adaptation can become a multiplier for existing conflicts over resources and how to handle them. More importantly, how an environmental problem is handled within a jurisdiction is a reflection of the interests and power of the actors involved. This is the case in both definition and handling of a particular ecological problem.

2.3.3 Adaptive Capacity, Adaptability and Coping Range

The term adaptive capacity is closely linked to a number of other popularly used concepts in the field of climate change. These include the concepts of coping ability, adaptability, flexibility, stability, robustness, and resilience (Adger/Kelly 1999; Fraser et al. 2003; Füssel/Klein 2006; Smit et al. 1999; Smit/Wandel 2006). While it is not in the scope of this paper to narrowly define all of these concepts, it is important to bear in mind that the capacity of a vulnerable system to adapt successfully is, among other factors, dependent on inherent characteristics. Accordingly, adaptations, representing adjustments of systems to better deal with ecological problems, are manifestations of adaptive capacity (Smit/Wandel 2006: 287).

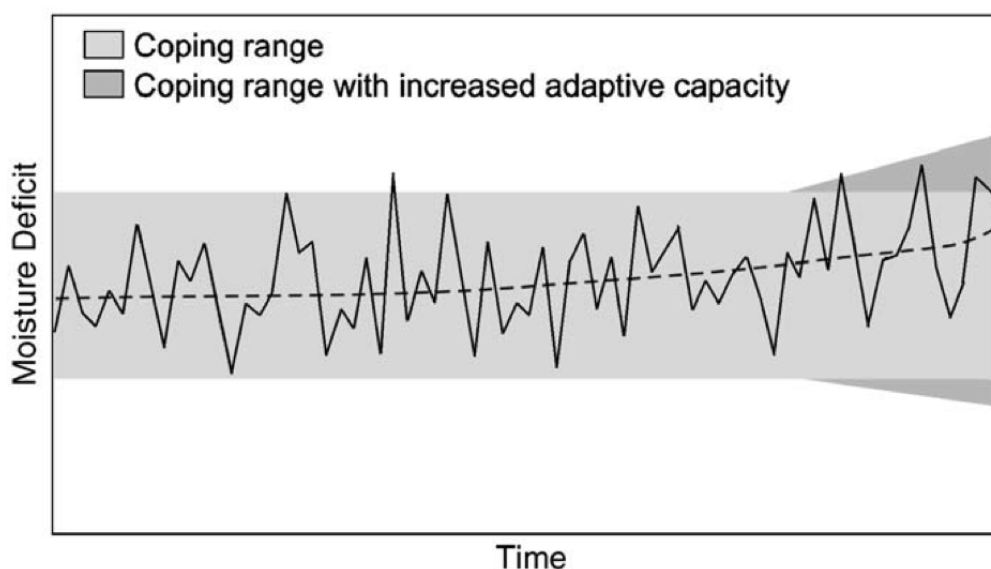
However, it must be emphasized that these inherent system characteristics are not static but dynamic. As broader economic, social, political and institutional conditions, are reflective of adaptive capacity of the local context, changes in these determinants might increase or decrease a system's capacity to adapt.

The scales of adaptive capacity do not function independently of one another, since it is a very context-specific matter (Smit/Wandel 2006: 287). The capacity of an individual to adapt to ecological hazards is therefore dependent on the community's enabling environment, while the community's adaptive capacity is a reflection of the resources and political processes of the country or society (Smit/Pilifosova 2003; Yohe/Tol 2002).

If one or more factors determining the adaptive capacity of a system are altered, it subsequently impacts the coping range of this system. The coping range is the range in which the effects of ecological change, beneficial or negative, are tolerable to the

system's long-term functioning. As the graphic representation shows, this range might increase or decrease over time. If the system increases its adaptive capacity, it can cope even with increased frequency of ecological risks. However, if the system is exposed to severe ecological risks beyond its coping range, the damage or losses are no longer tolerable, increasing the system's vulnerability.

Figure 2: Coping range and extreme events (here moisture deficit)



Source: Smit/Wandel (2006)

2.3.4 Migration and Adaptation

Since human beings have always been dependent on environmental resources, even more so in the past, we can assume that migration has always been an adaptive response to environmental risk.

Initially, migration was considered very little in the debates about adaptation to environmental change and was never mentioned in policy papers like the National Adaptation Programs of Action (NAPAs). Migration seemed to be, and to some observers still is, only an adaptive response for inhabitants of small island states threatened by sea level rise.

However, there is growing evidence that migration, in combination with income diversification, can be a crucial strategy to decrease a family's or community's

vulnerability to climate related or non-climate related stresses (Tacoli 2009). Therefore, migration is acknowledged more and more as a liable adaptation strategy. The relevant literature refers to various beneficial effects in the context of mobility and adaptation, which are summarized in the following three groups.

2.3.4.1 Adaptation Preventing Forces Migration

Various strategies to adapt to an altered environment are to some extent actions taken to avoid forced migration. Communities, when faced with severe climate risk, are forced to increase their chances of survival and improve their livelihoods. All over the globe communities have engaged in vast numbers with different adaptation strategies, including adopting a semi-nomadic lifestyle and seasonal migration.

Through this angle of observation, literally all forms of local adaptation can be considered strategies to sustain livelihoods so that relocation from the area of ecological stress does not become a matter of last resort. Yet it is crucial to note that migration in the minority of cases represents a failure of adaptation. Hence, we should avoid framing it as such.

2.3.4.2 Migration as Adaptation

Various scholars have illustrated, that migration is sometimes a long-term adaptation strategy that individuals adopt in order to improve livelihoods, and to reduce risk and vulnerability (Black 2010; McLeman/Smit 2006; Piguët et al. 2010).

As studies in diverse areas including Asia, Africa and the Arctic have shown, migration is often not a response to immediate risk, but rather a proactive diversification strategy (Berkes/Jolly 2001; Boano et al. 2008; Hussein/Nelson 1998).

Richard Black (2010), one of the most relevant contributors in the debate on environmentally induced human migration, shows how temporary migration acts as a coping strategy against both slow onset environmental disasters (soil degradation, desertification, drought, sea level rise, ...) and acute onset environmental disasters (floods, tsunamis, hurricanes, ...). In Bangladesh, for instance, rural-urban migration constitutes a popular response in the face of flooding. A study conducted in 2008

shows that 22% of Bangladeshi households affected by tidal-surge floods and 16% of those affected by riverbank erosion, decided to move to cities (Penning-Roswell et al. 2011).

A study from Kenya reveals that from 2004-2005, temporary labor migration was especially popular among households working with poor soils. Hence, temporary labor migration was 67% lower in households farming lands with high-quality soils, than in families having to use poorer soils (Gray 2011).

Migration as adaptation is usually framed in the literature as a strategy for household diversification. Subsequently, it is more of a collective than an individual decision.

This assumption is based on the new economics of migration theory, in which not an individual, but a larger unit like a family or household is the main focus. According to this approach, the aim of human migration is mainly household diversification, which is especially necessary in the global South due to a lack of private insurance markets or government programs (Massey et al. 1993). Following this argumentation, family members are sent abroad or to other parts of the country to diversify and improve the income of the family, both in absolute and in relative terms (compared to other households in the home region).

Regarding migration in terms of income diversification and spread of risk, it is, therefore (at least according to the new economics of migration), more likely that one member of a household migrates and sends (financial) remittances back to the family, than that the whole household engages in migratory activities.

Despite other efforts for local adaptation taken by communities, mobility remains a legitimate strategy. In this regard, a household can engage in local adaptation, send a family member away for income diversification, or do both at the same time.

2.3.4.3 Migration for Adaptation

The decision of some individuals to engage in migration can help to strengthen the resilience of a community and increase its adaptive capacity in the long run. That can be the case if financial assets and goods are sent back to the home region, acting as a powerful source of investment.

Additionally, there are other beneficial determinants contributing to technical and institutional improvements in the home community. These might be the transfer of knowledge or the utilization of returned migrants' experiences.

Evidence from household surveys demonstrates how remittances reduce poverty (Ratha 2012) and as a result have significant influence on vulnerability.

Even though remittances are mostly used to meet family needs, parts of it can be used to support long-term projects like, for example, adapting to climate change.

Subsequently, remittances are considered to have direct effects on the resource base, economic well-being and resilience of communities (Adger et al. 2002).

This argument is especially relevant when contemplating the size and drastic decrease of financial remittances throughout recent years. In Africa, for example, where the majority of migrants crossing borders do not leave their sub-region, remittances quadrupled between 1990 and 2000, nearly amounting to a total of USD 40 billion, and consequently surpassing official development assistance since 2007 (Ratha et al. 2011).

As remittances are the first source of foreign investment to the global South and reached a new high with a global total of USD 351 billion in 2011, some countries are increasingly dependent on it, most of all Tajikistan, with remittances constituting for 31% of its GDP in 2010 (Ratha 2012).

A critical factor of remittances in the environment-migration-adaptation nexus is whether people can stay in areas of high ecological risk, while relying solely on financial remittances.

As mentioned in the resilience chapter, it may prove difficult to transfer a resilient system into a more desirable state. These remittances now might prevent a system from changing towards a more desirable state if the capital is solely used to pay for property damages after ecological disasters.

In conclusion, it is crucial to note that remittances do not per se mean adaptation to climate change in the host countries. Rather they bear the potential of adaptation if used in a beneficial way.

2.3.5 Summary

As portrayed in the previous chapters, adaptation to climate change is highly dependent on a system's vulnerability and resilience. Successful adaptations decrease a system's vulnerability and can help to strengthen its resilience.

Contemplating the character of particular adaptation measures can approach the complex nature of adaptation. Since different adaptation strategies depend on temporal, spatial and institutional factors, it makes sense to start an analysis by contemplating these determinants.

Previously, the debate about adaptation was circled about the question of what a system should adapt to. However, if a particular strategy was aimed at adapting to anthropogenic climate change or simply to climate variability, it was not considered of considerable significance and lost relevance throughout the years.

A much more relevant question, defining the character of particular measures, refers to the subject of adaptation. As demonstrated, individuals, households or states might induce adaptations. The level to which the adaptation strategy takes place is always a result of negotiation processes.

The question of whether adaptations occur in an autonomous or planned fashion is considered to be of particular significance, defining the character of adaptation. Scholars have advocated increasing financial resources for national adaptation strategies, arguing that since financial resources for adaptations in the global South are missing, adaptations are currently only occurring on the local level (Nath/Behera 2010). This implies that local adaptations are an inferior substitute to national, top-down strategies. However, bottom-up and top-down adaptations should not be viewed in opposition, but mutually beneficial strategies.

A core element throughout the whole chapter was the proposition that adaptation to climate change is something highly political. Various levels of political participation are highly relevant in determining which adaptation strategy is to be implemented. Whether multiple stakeholders with the potential of affecting the success or failure of adaptation measure are isolated or have the means to influence one another, depends essentially on the political context. While the reduction of green house emissions might have a global effect, local adaptations are narrowly bound to questions of equality and resource allocation.

The fact that social criteria are among the most important determinants influencing adaptations shows that adaptation and adaptive capacity are always, deliberately or not, socially and politically induced (Dietz 2006: 29). Consequently, we should not make the mistake of viewing adaptation as a matter of choice. Even though individuals and communities always do have some level of capacity to adapt to new environments, socially and ethnically marginalized communities might have limited capacity to do so.

Just like other adaptation strategies, migration as adaptation to climate change is heavily influenced by political factors. It is, therefore, crucial that mechanisms for funding adaptations account for mobility as a strategy of building resilience (Black 2011). National and regional policies need to make sure that safe channels of migration are accessible and obstacles to circular migration are dismantled. Only then the full potential of migration as an adaptive strategy can be fully utilized.

2.4 Roundup

One way to disentangle the complex relationship between migration and the environment is by contemplating the concepts of vulnerability, resilience and adaptation. If it is true that ecological factors do have an influence on livelihoods, and that is undisputed, then we have to find ways to analyze this relationship. One promising way of doing so is to put the vulnerability and resilience of humans and socio-ecological systems in the center of analysis. These two concepts are definitely very helpful tools to describe a person's relationship to various kinds of ecological threats.

As argued in the previous chapters, the vulnerability, resilience and adaptation strategies of communities to ecological change have significant influence on migratory behavior. A community highly vulnerable to climate change is more likely to engage at least one member of the community in any form of migration.

The explanations of the community's vulnerability differ widely depending on the applied theory. Two schools of thought have acted as a foundation for numerous approaches to vulnerability. These are the natural hazards approach and the social vulnerability approach.

For the natural hazards approach, the vulnerability of a community is solely the result of the degree of, and exposure to ecological risk. The model applies a simple dose-exposure relation, meaning the higher the ecological threat and exposure, the higher a person's vulnerability. Consequently, vulnerability is the outcome of geographical location and the grade of threat. Even though institutions have the means to alter people's vulnerabilities by applying technological adaptation measures, the causes of vulnerability lie primarily outside of social, economic or political spheres.

This analysis differs drastically to the social vulnerability approach, which focuses on the social realm of vulnerability, according to which vulnerability is the manifestation of complex relations between social, economic, political and institutional determinants. Even though many environmental phenomena might affect all people inhabiting an ecosystem, these people will be affected in different quality and intensity. Thus, environmental disasters bring out the contrasting powers within society in stark clarity. Amartya Sen's distinguished analysis of famines can be applied generally regarding people's vulnerability to climate change, which is why it has been analyzed extensively in the social vulnerability chapter.

Various other approaches have dealt with the multiple determinants dominating the degree of vulnerability and have enhanced the two original models. Important conceptual questions refer to the notion of vulnerability as a starting point or outcome of an assessment, and whether vulnerability is an inherent characteristic of individuals and ecosystems, or the outcome of climate risk.

By now there is broad consensus that inherent characteristics, like resilience or adaptive capacity, influence the vulnerability of social-ecological systems.

These elements determine the ability to absorb ecological shocks, the autonomy of self-organization and the ability to adapt to ecological stresses. Consequently, the grade of vulnerability is directly connected to the grade of resilience.

It should be emphasized that resilience is not static but dynamic. As resilience is closely bound to broader economic, social and political conditions, changes in these determinants might mean changes of a systems grade of resilience.

Even though within research on social-ecological systems, the concepts of resilience and vulnerability interact closely and do have some similarities, it is important to not see resilience as the positive equivalent of vulnerability. Resilient systems are not only resistant to ecological stress; they also bear the capacity for renewal,

reorganization and development. In this regard, in resilient systems, ecological disturbances can be an opportunity for innovation.

This element of reorganization and development is an important feature of adaptations to climate change. Successful adaptations, therefore, decrease a system's vulnerability and positively influence its resilience in the long run.

Albeit it is crucial to not only assess adaptations in terms of being successful or not, there are also several central questions that might help to define the character of particular adaptation measures. Numerous factors come into play determining the characteristic of contemplated adaptation; these might include social, economic and political factors.

A core proposition of the chapter was the thesis that adaptation to climate change is a highly political matter. Which adaptation measures are to be implemented and which ones are not considered worth striving for, depends on various actors involved. As shown, there are multiple relevant levels of political participation.

A prominent way to determine how adaptation occurs is the distinction between autonomous/private, and planned/public adaptations.

Which adaptation measure is to be implemented is not simply a matter of sober appraisal. Different adaptation strategies mean different beneficiaries. Even though these two forms indeed differ regarding scope and level in which they are advocated, it should be taken into account that actions taken on one of these two levels do not happen independently of one another. Top-down as well as bottom-up measures both are imbedded in the political context in which they take place.

One research question of this paper draws attention to the fact that there is no consensus on the definition and implication of the contemplated concepts. For the qualitative content analysis of this thesis it was subsequently highly important to introduce the different interpretations and its political implications.

The other research question refers to the connection between adaptation, ecological change and human mobility. This is why the chapter about migration and adaptation is of high significance. It has been demonstrated how mobility in conjunction with income diversification can act as a strategy to reduce vulnerability to environmental risk.

Human mobility is often more a proactive strategy, than a response to immediate ecological stress. Multiple cited examples show how migration of at least one

household member is more likely in communities exposed to harsh ecological conditions than by their counterparts with better ecological conditions.

Migration can be considered as a proactive form of adaptation, having beneficial effects for adaptation. As argued, the migratory activity of some people can help to strengthen the resilience of a community and increase its coping range. Beneficial effects increasing a community's resilience might include transfer of knowledge and the utilization of experiences of returned migrants. However, the most relevant argument for migration for adaptation is the one of financial remittances. If money is sent back to the home region, it has the potential of acting as a powerful source of investment. As demonstrated, there is evidence from household surveys showing how remittances reduce poverty and subsequently have a significant influence on vulnerability.

Migration acts as a proactive form of adaptation and furthermore has potential to increase the resilience of communities faced by ecological threat. Yet we should not forget, that political factors influence migration heavily. Subsequently, removing obstacles to legal migration could mean a real milestone in decreasing people's vulnerability to climate change.

The concepts of vulnerability, resilience and adaptation are closely related and do have significant influence to environmentally induced migration patterns. This conceptualization has explicitly been displayed in the first part of this thesis.

However, the conceptualization does not necessarily imply that it is possible, or that it makes methodologically sense to numerically measure the concepts, in order to compare them. Of course there are multiple methods trying to get hold of vulnerability and resilience by using various methods. But there is little consensus on a robust and comprehensive model of elements and processes that shape vulnerability and resilience. Community-based analysis has shown that conditions shaping vulnerability, resilience and potential adaptation strategies depend on the local context. For instance, technological innovation might be beneficial in all cases of adaptation to climate change. The way in which technology influences vulnerability, however differs from community to community (Smit/Wandel 2006: 288). Even if vulnerability and resilience are evident at the community level, they are reflective for the broader forces and drivers, shaping local vulnerability.

3. Theoretical and Academic Discourses

3.1 The Migration – Environment Nexus

The nexus between human mobility and the environment is at the very core if one wants to understand what some call; climate displacement, environmentally induced migration, or environmental migration.

The phenomenon of climate change is of great concern and definitely has various impacts on human livelihoods. Whether or not human migration is one such impact is of great interest not only for researchers, but also for policy-makers. This might explain the increased scientific interest in the subject in recent years. However, considering the keen interest and high relevance of the issue, scientific proof and empirical evidence of the relationship is surprisingly limited.

As shown in a separate chapter, the consequences of a relationship, either direct or indirect, between climate change and human mobility is highly disputed. Some observers stress indications for direct links and expect many million “climate refugees” to take flight as a direct consequence of increased climate change.

Others assume that environmental factors have only indirect impacts on human migration and therefore reject terms like “environmental refugees” or “climate displaces”.

As suggested in the previous chapters on vulnerability, resilience and adaptation, increased environmental pressure on livelihoods can lead to the amplification or reduction of migratory movements. These highly contradictory findings point to a very complex relationship between human migration and the environment. In addition, such findings highlight the great relevance of vulnerability and resilience of communities, having a determining influence on this relationship.

There is a significant body of literature pointing to the fact that prehistoric human settlement and migration patterns were heavily linked (Gribchenko/Kurenkova 1997; Tyson et al. 2002).

Many different forms of societies, especially nomadic pastoralists, have for centuries, if not millennia, reacted closely to environmental changes and climate related events. There is well-documented evidence that nomadic pastoralists in China, have reacted closely to environmental changes (Smit/Cai 1996).

Research in Western Africa suggests that land degradation and other long-term environmental changes, may have greater effects on human mobility than catastrophic events due to climate variability (Henry et al., 2004; McLeman/Smit 2006).

To understand the relationship between the environment and human migration, it is crucial to distinguish between different kinds of environmental phenomena, as well as different kinds of mobility. The assumptions behind particular terms vary tremendously.

„Indeed, notions such as „displacement“, „mobility“ or „migration“ (and the associated predicted numbers of people concerned) refer to situations that range from a few hours spent in a temporary shelter in fear of a hurricane to the relocation of whole communities whose land has disappeared following sea-level rise.“ (Piguet et al. 2010: 11)

According to Piguet et al. (2010), acknowledging the diversity of migration, means taking into account at least the following three variables.

The first variable draws on the temporal nature of migration, and enquires if the taken migration action is a short- or long-term strategy. At present, there is an UN-inspired distinction (United Nations 1998) between temporary displacement (1-3 month), short-term migration (3-12 month) and long-term migration (+12 months). Many researchers indicate that temporary displacement and short-term migration are the two forms of mobility most associated with environmental change.

The second variable points to the fact that migration can be short- or long-distance, internal or international. An overwhelming majority of publications focus on cross-border movements, particularly migration flows from South to North. However, the majority of migration associated with environmental factors is internal (Cournil 2011; Kraler et al. 2011).

Thirdly, it is argued that human mobility may be forced (displacement) and voluntary (migration). However, it should not be forgotten that the complex realities of individuals facing adverse environmental effects on their livelihoods, are caught between the simple concepts of absolute voluntariness and force.

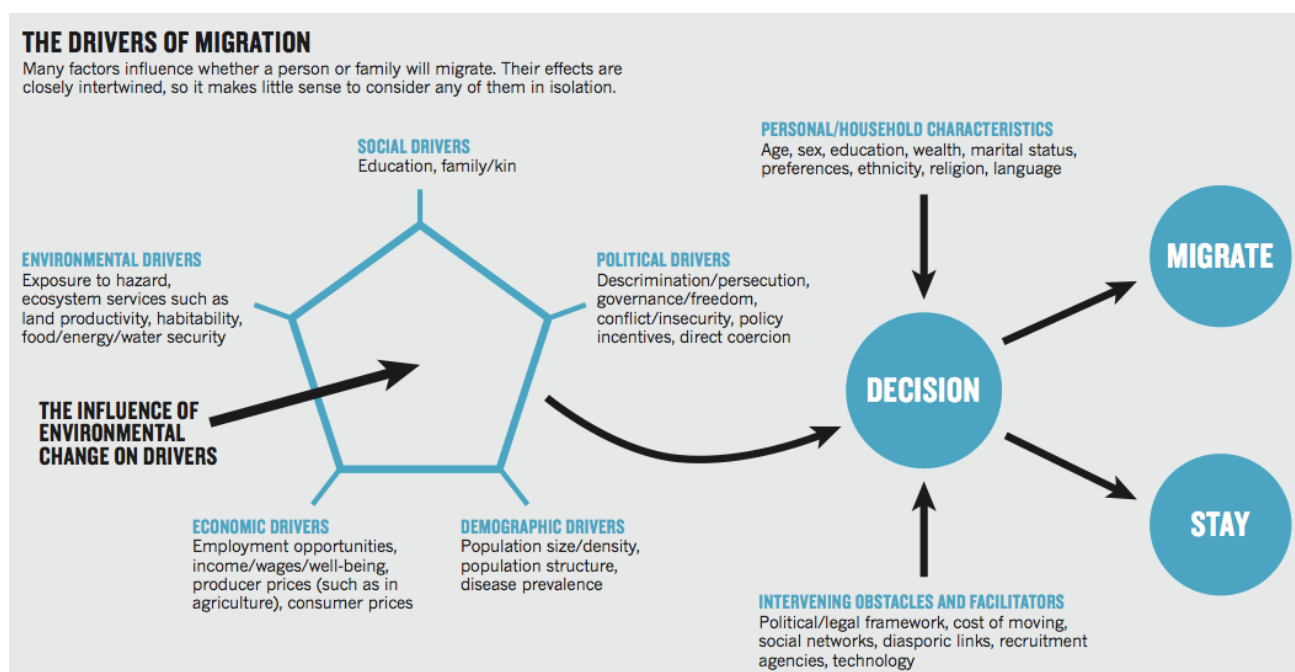
Disentangling the migration – environment nexus, means taking into account that the environment is not the only factor influencing human mobility. There is consensus

among researchers that even significant push factors are not the only ones determining a person's decision on whether or not to migrate. Subsequently, all migration patterns are product of various converging factors amplifying or suppressing one another. These mixed causes might include economic, social, political, and, among many other determinants, environmental factors.

The multiple forms of environmental migration (distinguished by the variables above) have only in exceptional cases not more than one single cause. This is why researchers acknowledging the complex relationship between migration and the environment have called to embrace multi-causality.

Richard Black et al. (2011) illustrated in the following figure the multiple drivers of migration. Amongst these drivers are political, social, demographic, economic and preexisting environmental drivers; environmental change is just one additional driver of migration. These aggregated drivers alone do not determine if a person or community will decide to stay or migrate. The decision is heavily influenced by intervening obstacles and facilitators, as well as personal or household characteristics (intensely influencing vulnerability and resilience of social actors).

Figure 3: The drivers of migration



Source: Black et al. (2011)

Accordingly, climate change is just one additional factor influencing whether a person may engage in migratory activity or not. Environmental factors may, however, play an

increased role in a context already characterized by various kinds of tensions. It is therefore crucial to recognize that climate change does not automatically lead to displacement.

„(...) identifying the „primary“ cause of migration is probably impossible, as all causes may mutually reinforce each other. Environmental factors may also play a greater role if they emerge in a context already characterised by political, demographic, economic or social tensions; climate change would thus be an *additional* burden, which can have a multiplier effect.“ (Piguet et al. 2010: 9)

3.2 The Factor Environment in Traditional Migration Theories

Ecological factors in migration theories are generally perceived as a new phenomenon or as a new necessity following the increased adverse effects of climate change. However, serious reading of traditional migration theories shows that environmental factors are highly ranked in the oldest theories of human migration. According to a publication by Ernest George Ravenstein dating back to 1889, currents of migration of the past and present can be attributed to unattractive climate (Ravenstein 1889: 286).

The geographer Ellen Churchill Sempler wrote in 1911, that the search for good quality land, mild climate and easy living conditions would be reason for many people to migrate (Sempler 1911: 143).

Yet, the early recognition of environmental factors as important explanatory elements for human migration was to vanish from migration theories throughout the twentieth century.

Piguet et al. (2010) identify four main reasons explaining the declining interest in natural or environmental factors.

Firstly, consistent with a powerfully idea especially prevalent in the USA and Europe, technological progress would diminish the role of the environment on human beings over time. This perception goes as far as to view environmentally induced migration

as a “primitive form of migration” that would increasingly be overcome as humans gradually increase their control over nature (Piguet et al. 2010: 2).

The second reason for the decline of environmental considerations in migration theory was that environmental factors were rejected for their deterministic causality. This trend occurred to the profit of socio-cultural theories.

Third, whether in Marxism inspired or in neo-classical economics, economic factors were understood to be playing the core role determining a person’s wellbeing. According to neo-classical economic theories of migration, migration decisions are based on the rational choice of an individual’s or household’s desire to accumulate capital (McLeman/Smit 2006: 38). Even though environmental factors might be one of the reasons influencing the rational choice to migrate, they are only subordinate factors within economic considerations.

Fourth and lastly, especially forced migration studies have increasingly focused on the political realm of the phenomenon, according to which “states make refugees” (Piguet et al. 2010: 3). The assumption is that, while states have the responsibility to protect individuals, safeguarding their basic rights, it is ultimately the political failure of the state if an individual becomes a refugee.

A big variety of migration theories focus both on individual decisions (neo-classical economics, the new economics of migration) as well as on structural causes (dual labor market theory, world systems theory) and rely on a push-pull framework. However, the push-pull model does not take agency of individuals and households into account and neglects the multiple causes that might lead to human migration. Researchers have developed a model of environmental push-pull instead of the prominent economic push-pull logic (e.g. Van der Geest 2009). However, the theoretical advantages of this proposition are questionable.

As Gunvor Jonsson (2010) argues, push-pull approaches disregard the complex synergy between migration and structural causes and therefore fail in explaining cumulative causation, where migration patterns become self-sustaining social processes.

„At worst, the push factor approach de-politicises and de-contextualises the causes of migration – downplaying the importance of factors like wealth and welfare gaps or political conflict and portraying history, culture, identity,

networks, household and livelihoods as rather insignificant factors in migration.“ (Jonsson 2010: 24)

In addition, push-pull theories cannot explain non-migration, that is if a strong push or pull factor is present, but the affected people do not engage in migratory activity. This is because adaptation and coping mechanisms, even though crucial in the context of environmental degradation and environmental stress, are completely neglected.

All these shortages of push-pull approaches show that substituting an economic push-pull model with environmental push-pull logic does not seem theoretically progressive. In addition, the pertinence of the environmental factor might be overstated, if relying solely on environmental considerations, neglecting the complex context in which human mobility takes place.

3.3 Discourse: Alarmist vs. Skeptical Perspective

As outlined above, the relationship between environmental factors and migration are heavily disputed. Environmental migration and estimating the number of people concerned has been in the center of an academic and political debate that started in the mid-1980s. Two prominent perspectives have developed, which differ drastically in applied methodology, numbers of persons concerned and political implications. These two opposing concepts are called the alarmist, and the skeptical perspective.

The alarmist perspective is made up mainly of environmental scholars, NGOs, and to some extent the media. Migration flows are seen as among the most devastating consequences of climate change and as an issue of high political concern. The forecasts of environmentalists make up the assumption that the environment is the most important, if not the only relevant, cause of human migration, and that increased climate change would automatically lead to mass displacement.

A United Nations Environment Programme (UNEP) paper, written by Essam El-Hinnawi in 1985, used the term “environmental refugee” for the first time and several publications by Norman Myers (Myers 1993; Myers/Kent 1995; Myers 1997) were most relevant in setting the theoretic background of this perspective. According to Norman Myers (1997), there were at least 25 mio environmental refugees in the mid-1990s, even more than the official number of political refugees, defined after the

1951 Geneva Refugee Convention. He expected this number to double until the year 2010 as a direct result of climate change and assumed that about 200 million people would be at risk of displacement.

As the term alarmist suggests, Myers predicted that even if western countries tried to minimize immigration of climate refugees, it would be impossible to withhold the “rising flood” of refugees of the Global South. Eventually, refugee camps and slums would become; “breeding grounds for civil disorder, social upheaval and even violence” (Myers/Kent 1995: 161). Accordingly, environmental displacement is presented as a security risk.

In the alarmist perspective, the whole issue of migration and climate change is framed as an environmental issue. This environmental determinist view considers the environmental factor as decisive. Internal characteristics of systems and human actors, such as vulnerability, resilience and adaptive capacity, are not regarded as being of high importance. However, the alarmist perspective has been most influential in shaping the representations and policy discourses of environmental migration.

In addition, it is a significant character of alarmist publications that the estimated numbers of people concerned are extremely imprecise. That is the case for many predictions regarding the effects of climate change as well. For instance, the fourth IPCC assessment report estimates, that by the 2080s, an additional 5-170 mio people will be at risk of hunger due to climate change (Schneider et al. 2007: 791).

In stark opposition to the alarmist perspective stands the skeptical perspective, which is primarily made up of migration scholars, social scientists and people engaged in the protection of political refugees. People in favor of this approach argue that there are no environmental refugees in the narrow sense of the term. Even though they acknowledge the environment as one factor playing a part in forced migration, they insist on multi-causality of migration. Richard Black (1998), for instance, argues that environmental factors are always closely linked to various political and economic factors, which is why focusing solely on the environment does not help in the endeavor to grasp displacement. In a Working Paper published by the UNHCR, Black makes it clear that he considers the concept of environmental refugees a myth, and even a highly politicized and potentially misleading one (Black 2001). Other social scientists conclude that; “there is no such thing as a natural disaster” (Hartman/Squires 2006), pointing to the various political and social factors

determining the impacts of a natural event on a particular person and the responsibility of state.

As migration scholars generally consider the environment as one among many other drivers of migration, they are very careful in estimating numbers of people engaging in migratory activities for environmental reasons.

Of course, in viewing the issue so differently, the two opposing perspectives also differ in terms of how to handle, or on which political level to handle the topic.

While the early research on the issue, representing the alarmist perspective, was especially heavily embedded in a climate change agenda, the skeptical perspective seeks to locate policy discussions on a level that protects the current rights of political refugees.

Even though, there is a traditional divide between social and natural scientists regarding migration and the environment, it seems like the disciplinary gap is incrementally being overcome. Scholars from both sides have taken into account elements that they used to ignore. Natural scientists seem to use more caution, especially when it comes to estimated numbers, and dismiss the apocalyptic predictions. On the other hand, many migration scholars make sure not to underestimate the environmental drivers for migration.

According to Piguet et al. (2010), there are three lessons that can be learned from the history of the debate.

First, the debate is fundamentally based on the intellectual history of natural science and social science. The significance, which is accredited to environmental, political, social or economic factors, is first of all a question of intellectual tradition. Hence, historical migration patterns can be initially read in environmental terms, but later (sometimes after decades) re-interpreted in political or economic terms. Examples include the Irish Famine Exodus of the 19th century, the American Dust Bowl Migration of the 1930s, and in this case right after the event, Hurricane Katrina (Hartman/Squires 2006; McLeman/Smit 2006; Scally 1995). Following this argumentation, the contemporary focus on environmental migration can be read as a paradigmatic shift, rather than a new phenomenon (Piguet et al. 2010).

Second, this matter of research is inherently political, considering the political implications of specific numbers of environmental migrants and the call for action by scholars of the alarmist perspective. In addition, the debate about climate change itself is highly politicized.

Finally, even though the phenomenon has been paid increased attention in the previous years, empirical evidence stays limited. Comprehensive in-depth studies regarding various aspects of issue are needed to contribute to a better understanding of environmentally induced migration.

3.4 The Politics of Definition and Legal Issues

Terms for people engaging in migratory activities in connection to environmental reasons reach from “disaster victims” to “ecological migrants” to “climate refugees”. While the term climate refugee is popularly used in the media and public debate, it is a misnomer under international law. Even though the term has proven to be successful in terms of attracting public attention to the phenomenon, it is not precise enough to cover all differing forms of human migration, which may be connected to the environment (Laczko/Aghazarm 2009: 18-19).

There is no doubt that the conceptual discourse around the terms best fitted for the people concerned goes beyond conceptual issues and is highly political. It emphasizes the question, which status should be granted to particular migrants and of the responsibility of the international community to provide protection. This explains why there is so much at stake in deciding on commonly used terms, and why the debate about the status of people concerned is so heated.

The legal document for determining if an asylum seeker qualifies for the status of refugee is the “1951 Geneva Convention relating to the Status of Refugees”. Taken into account is only political persecution, which is why people displaced for environmental reasons are not considered refugees in the legal sense. An additional factor, complicating the quest for a suitable term, is that the displaced people do flee their livelihood, however, they do not always flee their country. The term refugee not only implies that the person has been, or has well-founded fear of being, politically persecuted, it also implies that the person crossed at least one border.

In addition and making the discussion about status even more complicated, climate change adds a new dimension to the traditional distinction between forced and voluntary migration.

A person displaced by an ecological disaster might not have been displaced by political force, as the term displaced usually implies, however; implying that the migration was voluntary also seems incorrect.

The International Association for the Study of Forced Migration (IASFM) applies a rather comprehensive definition of displacement, including “people displaced by natural or environmental disasters, chemical or nuclear disasters, famine, or development projects” (IASFM 2013).

Because the empirical realities of individuals moving for environmental reasons vary widely, it is hard to fit them into a definition of one sentence or one paragraph. This is why a rather broad definition makes sense, aiming to include a wide range of affected persons.

While an internationally agreed definition is nonexistent, various organizations have developed working definitions. The International Organization for Migration (IOM) has developed a working definition of environmental migrants in 2007, which is considered a successful attempt and has been applied in similar form by the Asian Development Bank (ADB).

“Environmental migrants are persons or groups of persons who, for compelling reasons of sudden or progressive change in the environment that adversely affects their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad.” (Laczko/Aghazarm 2009: 19)

Even though, as argued before, defining the persons concerned is a highly political matter and important for possible protection, the debate should not be solely focused on status. As Walter Kaelin, Representative of the UN Secretary-General on Human Rights of Internally Displaced Persons argued, a semantic discussion about status could be distracting without adding to practicability. Provided that people participating in the debate agree on basic fundamentals such as multi-causality of migration and different degrees of vulnerability, discordant terminology does not necessarily stand in the way of scientific progress and the development of commonly agreed efforts (Kaelin 2008).

As much of the debate about environmentally induced migration has focuses on status in the past, little attention has been given to questions of policies and other instruments of protection. The fact that none of the popular terms describing the persons concerned is legally defined, leads to an institutional and normative vacuum (Piguet et al. 2010).

There are numerous calls to restructure international refugee law to redefine the responsibilities of states in order to provide protection to people most affected by environmental issues. These propositions stretch from modifying the 1951 Geneva Convention relating to the Status of Refugees to include environmentally displaced persons, to the development of completely new binding international laws.

With no specific legal norms, regarding the protection of environmentally induced migrants in place, relying on already existing legal instruments and applying them to the persons concerned, constitutes a different strategy. As the empirical realities of migrants vary widely, this means that not all environmentally induced migrants are covered under the same legal instrument.

For instance, migrants not crossing any border, which is the most frequent case for environmentally induced migration, are covered under the Guiding Principles on Internal Displacement. This instrument of soft law compiles different provisions in international law and recognizes several environmental factors, such as disasters, as causes for displacement (OCHA 2004). Even though the Guiding Principles on Internal Displacement are not binding to signatory states like the 1951 Geneva Convention, this soft instrument might turn out to be much more effective than other soft law instruments, because it is well grounded in international law (Kaelin 2001).

Ultimately, the form of protection granted depends heavily upon the states where displacement occurs.

Another promising development regarding the protection of persons concerned is the “African Union Convention for the Protection and Assistance of Internally Displaced Persons in Africa”, better known as the Kampala Convention. Signatory to his legal instrument, which went into force in December 2012, are 31 of the 53 African Union (AU) member states. The Kampala Convention specifically establishes state responsibilities to address displacement due to natural disasters and large-scale development projects.

„States Parties shall take measures to protect and assist persons who have been internally displaced due to natural or human made disasters, including climate change.“ (African Union 2009)

That the numerous different measures for protection and relief of environmentally displaced persons can take different forms becomes obvious when analyzing the “Colombian Temporary Circular Labour Migration Scheme” (TCLM). This bilateral agreement between Colombia and Spain gives Colombian families facing natural disasters the opportunity to work temporarily in Spain (International Peace Institute 2011).

Bilateral treaties like the TCLM can act as an effective instrument to help the affected areas recover through remittances.

These examples show that in the absence of a comprehensive binding convention, regional and national legislation as well as effective disaster management and risk reduction plans can act as beneficial instruments.

This of course does not mean that new legal norms and conventions are irrelevant, however, it shows that, in the absence of a wide reaching consensus, there are other measures that can be implemented to protect the persons concerned.

Without question, the development of a new binding convention relating to the protection of environmental migrants touches several highly sensitive issues.

As shown before, agreeing on the status of persons affected has proven to be quite complicated, not to mention agreeing on criteria to grant protection. In addition, negotiations will eventually bump into other sensitive matters like climate change and who is responsible for it. As Biermann and Boas (2008) argue, the protection of environmentally displaced persons must be particularly the responsibility of industrialized countries, which have caused most past and present greenhouse gas emissions. Climate change, but even more so the responsibility of climate change, has been a very prominent challenge in international discussions and might complicate reaching a consensus on the protection of persons concerned even more. Another concern is that policy instruments could focus on environmental disasters at the expense of environmental degradation.

„All too often, governments and policy-makers seem to react above all to disasters that force people to leave over night; this applies to some of the

most documented cases of environmental migration, like the 2004 Asian Tsunami and the 2005 Hurricane Katrina in New Orleans. By contrast, the „silent crisis“ fuelled by progressive environmental change, while affecting potentially very high numbers of people, is the object of much less policy attention.“ (Piguet et al. 2010: 17)

Even though, receiving much less policy attention, this slow-onset and less visible crisis will potentially affect huge numbers of people, which is why it must not be underrepresented in legal instruments.

4. Qualitative Content Analysis

4.1 Introduction to the IPCC Assessment Reports

The Intergovernmental Panel on Climate Change represents the leading scientific organization for the assessment of climate change and was established in 1988 under the auspices of the UN, in order to present; “a clear scientific view on the state of knowledge in climate change and its potential environmental and socio-economic impacts” (IPCC 2013a).

In accordance with its mandate, the IPCC has so far completed four assessment reports (1990, 1995, 2001, 2007). These reports aspire to present a scientific, technical, and socio-economic analysis to a broad public, in order to strengthen comprehensive understanding of the complex dynamics of anthropogenic climate change, as well as to give insights to potential mitigation and adaptation strategies (IPCC 2013b). The four assessment reports are written in a non-technical style suitable for policy makers. The contributions of hundreds of scientists are divided into three Working Groups. The Working Group II reports of the last two assessment reports were titled “Impact, Adaptation and Vulnerability”, which is why Working Group II was most relevant for the content analysis in this thesis. The IPCC embraced vulnerability as a key-category in the third assessment report (TAR) in 2001. As shown in the qualitative content analysis, vulnerability in the third and fourth assessment reports is defined in negative terms. Since the IPCC assessment reports

are highly influential and considered an authoritative source of climate change knowledge, this definition has been adopted in countless publications.

The IPCC's influence regarding the scientific perception of climate change has been called an "epistemological hegemony" (Mayer/Arndt 2009), as the IPCC assessment reports impact scientific fields beyond climate change research (Vasileiadou et al. 2011).

The first two assessment reports can be called the first generation of impacts and adaptation studies. Without doubt, and as has been argued in the previous chapters of this thesis, social factors are highly determinative for impacts of climate change on human actors and socio-ecological systems. However, the IPCC has been criticized for being biased towards natural sciences, while the role of social sciences and interpretative studies is limited (Vasileiadou et. al 2011).

Even though natural sciences are definitely prioritized over social sciences, the four chapters analyzed in this qualitative content analysis provide a good insight in the IPCC's perception of vulnerability, resilience and adaptation, and what they imply for human migration patterns.

4.2 Vulnerability

The authors of the third IPCC assessment report admit, that knowledge about the distribution of impacts of climate change is limited (Smith et al. 2001: 936).

Analyzing impact distribution to various systems must emphasize the concepts of vulnerability, resilience and adaptive capacity. The TAR acknowledges that some impacts of human induced climate change on various systems are already observable, even though the mechanisms of impact distribution are not always clear:

“(...) some specific examples of unique and threatened biological systems are present. Many others also are threatened by climate change (...).”
(Smith et al. 2001: 930)

Even though the IPCC has been exposed to criticism for applying a rather biased approach towards natural sciences via social sciences, it is acknowledged in the TAR that vulnerability plays a core role in understanding the distribution of impacts.

Thus, the TAR follows that the consequences of climate change cannot be calculated in physical terms alone, and that “understanding the dynamics of vulnerability is as important as understanding climate itself” (Smit et al. 2001: 894).

Since publication of the TAR in 2001, both scientists and policy makers have progressively focused on identification of “key-vulnerabilities”. The AR4 focuses even more on climate change impacts and associated risks than the TAR did.

It is assumed that climate change impacts on physical and biological systems are clearer and easier to understand than those on socio-economic systems. The underlying assumption is that socio-economic systems are simultaneously undergoing various non-climate-related changes, such as economic development or urbanization. Surely it is a delicate proposition to separate the ecological signal from other factors influencing the lives of human actors. This is especially the case regarding ecological threats influencing possible migration decisions. However, it should be emphasized that, especially because of the complex matter of analyzing the role of ecological factors determining the impacts on socio-economic systems, the concepts of vulnerability, resilience and adaptive capacity can contribute to a better understanding.

Additionally, as mentioned in a previous chapter, the division between biological systems and social systems is problematic and arbitrary. It assumes that humans are living in an isolated space detached from ecology, and that nature is a system separated and uninfluenced by human actions. Without a doubt, neither of these assumptions is correct.

The AR4 argues that the term “social system” is used in a wide fashion, describing human systems, including both market systems and social systems (Schneider et al. 2007: 790). This approach takes into account valuation of market impacts (e.g. financial loss) and non-market impacts (e.g. loss of human life, species loss). Nevertheless, the distinction between the social and the ecological sphere persists.

Furthermore, the valuation of non-market impacts depends on a range of normative judgments, limiting the degree of consensus (Schneider et al. 2007: 790). This might be the reason why both the TAR and the AR4 focus on market impacts rather than on non-market impacts, such as number of displaced persons or loss of life. The IPCC follows the prominent neo-classical logic of measuring various phenomena in monetary parameters.

Regarding mean temperature rise and its impact on vulnerability, the TAR claims that:

“(...) vulnerability to climate change is likely to increase rapidly in importance because the frequency and magnitude of such events will increase as global mean temperature rises.” (Smith et al. 2001: 948)

The assumption that global mean temperature, extreme events (e.g. hurricanes or draughts) and vulnerability are connected might very well prove to be true. However, the underlying notion of cause and effect seems quite simplistic. In this regard, the AR4 accepts the complex nature of impact distribution and postulates that vulnerabilities can vary quite considerably. For example, the impacts of climate change on agriculture vary tremendously depending on an area's latitude. Allegedly, increased crop yield can be expected in mid- and high-latitude areas up to about 3°C of temperature increase, whereas low-latitude areas can expect decreased yields and higher risk of malnutrition at low levels of increased temperature (Schneider et al. 2007: 791).

As Barry Smit was amongst the lead authors of both reports, the TAR and AR4, both work with definitions of concepts following Smit et al. (1999), which have been discussed in the chapter on concepts in this thesis. Accordingly, vulnerability is the:

“Degree to which a system is susceptible to injury, damage, or harm.” (Smit et al. 2001: 894)

Even though the definition of vulnerability is the same, the underlying notions vary throughout the IPCC's assessment reports.

The TAR describes vulnerability as the degree to which a system is “in danger” or exposed to changes in climate and as a function of adaptive capacity (Smith et al. 2001: 879, 926). The emphasis on exposure is similar as in the natural hazards approach, even though not as strong. The natural hazards approach describes vulnerability as determined mainly by exposure to threat. The TAR, however, focuses more on inherent characteristics such as adaptive capacity.

Unlike in the TAR, in the AR4 vulnerability is described as:

“(...) the degree to which systems are susceptible to, and unable to cope with, adverse impacts.” (Schneider et al. 2007: 781)

This notion clearly stresses the inherent characteristics determining the degree of vulnerability and lacks the element of exposure. That vulnerability, according to the AR4, is shaped by the absence of adaptive capacity is definitely an innovation compared to the TAR.

However, the TAR also declares the importance of adaptive capacity influencing vulnerability, yet not as openly. The TAR refers to studies of similar environmental events occurring at different times, but showing largely different consequences. These less severe consequences are represented as proof of increased vulnerability due to societal transformation occurring between the events.

“(...) rainfall and temperature fluctuations in Western Europe have far milder effects on human well-being today (society is less vulnerable) than they did in the medieval and early modern periods, essentially as a result of enhanced practices, economics, and government programs.” (Smit et al. 2001: 895)

Similarly, extreme climate events have vastly different consequences and entail higher losses of life in developing countries, compared to developed countries, due to different degrees of adaptive capacity (Smit et al. 2001: 895). Declaredly, even though the understanding of vulnerability of developed countries has improved throughout the years, the TAR recognizes that the information about developing countries was or is still quite limited. Nonetheless, the TAR assumes that not only vulnerability and adaptive capacity are distributed unequally among countries; additionally impoverished people in wealthy societies are negatively affected by this distribution. Albeit low income groups in wealthy countries tend to have more adaptive capacity due to institutional factors such as the availability of social safety nets (Smith et al. 2001: 939).

Vulnerability, in developed and developing countries, is often an expression of multiple causes, including social marginalization. Consequently, indigenous groups are usually amongst the most vulnerable members of society. This is because such groups generally earn low incomes, live in adverse locations and maintain a lifestyle

that tends to be tied to the current climate. This makes them more exposed to both social problems and more vulnerable to climate related disasters due to “inadequate structural protection measures and services” (Smith et al. 2001: 935).

While in the TAR there was a strong understanding of the distribution of vulnerability between developing and developed countries, the differential distribution within societies was assumed, but stayed rather blurry. One of the most important updates in the AR4 is the new evidence on the high variability of vulnerability, even within developed countries (Schneider et al. 2007: 781).

There is ample evidence that the wider policy context influences vulnerability, especially of the poor. This is underlined in a study by Adger (1999), which shows how the transition to a market-based agriculture in Vietnam has made it harder for the poor to access social safety nets (Smith et al. 2001: 939); a phenomenon that has been discussed in a previous chapter of this thesis as double exposure theory.

It is assumed in the AR4 that socio-economic conditions determine the degree of vulnerability of social groups and that these conditions might change rapidly. This implies a dynamic representation of impacts. Taking into account the potential of socio-economic conditions raises the potential role of future development strategies, increasing or decreasing people’s vulnerability to climate change.

Both researched assessment reports acknowledge the potential of some development strategies to enhance adaptation to climate change, however, they raise the point that others might increase vulnerability. This refers to the phenomenon of adaptations turning out as “maladaptations”. These might appear to be successful in terms of economic growth while increasing dependency on current ecological conditions. As shown in the chapter on vulnerability to poverty in development assistance and inspired by Robert Chambers publications (e.g. 1989), there is a certain degree of interrelation between poverty and vulnerability to climate change, yet some strategies, like borrowing, can reduce poverty in terms of low income, but increase vulnerability in the long run.

The TAR mentions multiple times that as a result of climate change, food production in low altitude areas would decrease while it would increase in high latitude areas, and that “losses to the poor can be compensated by gains to the rich” (Smith et al. 2001: 938).

An update in the AR4 following new evidence shows that net market benefits from climate change would peak at low magnitudes of global mean temperature rise (Schneider et al. 2007: 781).

This shows that world food production is in fact, more vulnerable to climate change than expected in the TAR. Even if world food production was not decreased and only differentiated according to the latitude of area, it would still be doubtful if mentioned losses to the poor would in fact, be compensated by gains to the rich. How Amartya Sen argued in the social vulnerability approach, famines are less a result of food availability decline, than by lack of entitlement.

According to the TAR, there is “medium confidence that climate change would exacerbate income inequalities in and within countries” (Smit et al. 2001: 895). If that is the case, and if vulnerability is bound to economic situation (how both assessment reports acknowledge), it would mean a vicious circle that makes poor countries and individuals even more vulnerable. This would most certainly be a negative effect for vast numbers of people already in a vulnerable situation.

Yet the AR4 raises the point that one metric (in this case poverty) is not enough to understand the complexity of vulnerability (Schneider et al. 2007: 784). Vulnerability differs across and within social groups and even between individuals of similar socio-economic status. This points to the necessity to reconsider the notion that all poor countries and individuals would (equally) be negatively affected by further climate change in terms of vulnerability.

The third and forth assessment reports of the IPCC are both clear on the fact that developing countries have a higher degree of vulnerability to climate change, since they are heavily dependent on agriculture economically (Smith et al. 2001: 938; Schneider 2007: 797).

Additionally, the AR4 takes into account that in developing countries, poor people are more likely to be engaged in agriculture and consequently are more vulnerable. A similar picture arises when taking into consideration that in most developing countries, the majority of labor force in the agricultural sphere consists of women. In addition, women in agricultural societies tend to be “affected by relative insecurity of access and rights over resources and sources of wealth such as agricultural land” (Adger et al. 2007: 730). This disproportionate distribution of vulnerability seems to be even more apparent regarding weather related disasters.

“These different impacts include number of deaths, and well-being in the post-event recovery period. The disproportionate amount of the burden endured by women during rehabilitation has been related to their roles in the reproductive sphere.” (Adger et al. 2007: 730)

The different distribution of vulnerability and adaptive capacity is a result of wider patterns of structural gender inequality. The AR4 indirectly recommends a gender sensitive approach to adaptation measures when it concludes, “climate interventions that ignore gender concerns reinforce the differential gender dimensions of vulnerability” (Adger et al. 2007: 730).

4.3 Resilience and Adaptive Capacity

Without doubt the third and fourth assessment report of the IPCC both consider the internal characteristics of a system to be highly relevant for determining the impacts of climate change. How much adaptation can reduce vulnerability depends greatly on adaptive capacity.

Groups with limited adaptive capacity have a greater degree of vulnerability to climate change, as described in the AR4 and discussed in the previous chapter.

The TAR and AR4 definitely focus on adaptive capacity as the key-concept of internal characteristics and disregard resilience, which plays a core role in so many other publications about the impacts of climate change. The TAR and AR4 define resilience as the, “Degree to which a system rebounds, recoups, or recovers from stimulus.” (Smit et al. 2001: 894). This notion is akin to what I have described as resilience as robustness.

According to the TAR definition, a perfectly resilient system rebounds from external stimulus and does not change any of its variables and processes. This concept descends from Crawford Stanley Holling’s original definition of resilience as persistence.

If a system adapts to adverse persistent stimuli by changing some of its characteristics, it already changes to a different state. In other words, according to the IPCC’s perspective, adaptation is a proof of lack of resilience.

The applied concept entirely lacks the regenerative element of resilience as reorganization. This perspective sees resilience as a source of renewal and development and describes resilient dynamics not necessarily in an equilibrium steady state. To make resilience concrete, operationalization of this approach requires the specification of what a system should be resilient to. The resilience approach of the TAR and AR4 does not require this step. It simply describes the degree to which a system is capable to rebound from stimulus.

This is similar to what I have discussed as coping range, a defined sphere within which a system can tolerate external stimulus.

Adaptive capacity, however, is defined in the TAR and AR4 as:

“The potential or capacity of a system to adapt to (to alter to better suit) climatic stimuli or their effects or impacts” (Smit et al. 2001: 894)

Systems with a high degree of adaptive capacity can be regarded as being able to cope with stress, which is within the coping range of the system, and as the capacity to move or expand the coping range through adaptations (Smit et al. 2001: 883).

The AR4 characterizes adaptive capacity as the ability to respond to climate change in a successful way. This might include adjustments in behavior, resources and technology (Adger et al. 2007: 727). Consequently, adaptive capacity is not only a prerequisite for successful adaptations; it also enables systems and actors to take advantage of climate changes impacts.

According to the AR4, market and social systems show considerable potential for adaption to climate change, while the adaptive potential of biological and geophysical systems is much lower (Schneider et al. 2007: 804). Yet, the knowledge about costs of adaptations and capacities of institutions is still limited and appears to be highly unequal in terms of distribution across the world. It is stated in the TAR that adaptive capacity is especially limited in the Global South. Supposedly, if current trends in development continue, “few developing countries will have the financial, technical, and institutional capacity and knowledge base for efficient adaptation” (Smith et al. 2001: 941).

Moreover, the TAR is certain that in many cases, high degree of exposure to adverse climate change impacts is coupled with low degree of adaptive capacity.

„The most vulnerable regions and communities are those that are highly exposed to hazardous climate change effects and have limited adaptive capacity.“ (Smit et al. 2001: 879)

Similarly to vulnerability, adaptive capacity is understood to have a multidimensional function. Accordingly, while one's country or group's adaptive capacity might be very limited economically it could be highly adaptive in terms of behavior, or vice versa.

There is a whole range of variables influencing the adaptive capacities of individuals, communities or countries including economic resources, technology, information and infrastructure. The TAR draws attention to the argument, that adaptive capacity will be greatest if social institutions assure that access to resources within a community and allocation of power is equally distributed (Smit et al. 2001: 897). In conclusion, rather egalitarian societies have higher chances to adapt to a situation shaped by changes in climate.

As mentioned in the TAR, there is reason for the assumption that developing countries have lower adaptive capacity due to higher dependence on climatic resources and agriculture. However, there is some suggestion that western industrial monocultures are highly vulnerable to climate change, and lack adaptive capacity compared to “multi-species, low- to middle-intensity farming systems”, characterizing much of the developing world's agriculture (Smit et al. 2001: 898). This is most certainly an interesting consideration; however, one, should take into account that through developments like the so-called green revolution, biodiversity in many developing countries has declined tremendously.

The TAR suggests, that since the publication of the third IPCC assessment report in 2001, there has been an increased base of evidence that next to economic development and technological innovations, the social realm of adaptive capacity, including human capital and government structures play a core role in adaptation.

The AR4 is convinced that little adaptive capacity can be problematic also for regions and individuals with high economic activity (Adger et al. 2007: 728).

“Although economic development may provide greater access to technology and resources to invest in adaptation, high income per capita is considered neither a necessary nor a sufficient indicator of the capacity to adapt to climate change.” (Adger et al. 2007: 728)

The increased role of social factors over economic and technological variables, determining adaptive capacity, is a core improvement of the AR4 over the TAR and the biggest distinction regarding adaptive capacity between the two.

The numerous studies apprehended in the AR4 show that “human and social capital are key determinants of adaptive capacity at all scales” and, consequently, are “important at all levels of income” (Adger et al. 2007: 728). To some extent this insight can be acknowledged as emancipation and one step forward from economistic approaches (like the social vulnerability approach), which focus mainly on the economic situation of persons.

age, gender, ethnicity, educational attainment and health. This essentially draws attention to the phenomenon of social marginalization.

Compared to the TAR, the AR4 gives precise insight into determinative dimensions of adaptive capacity. While variables like education, health and income are generic factors and might increase adaptive capacity to various kinds of ecological threat, factors like technology, institutions and knowledge are specific, meaning they might be beneficial facing some threats while useless for others (Adger et al. 2007: 727).

As other variables affecting adaptive capacity, social and human capital is dynamic and might change over time. The AR4 refers to the examples of native communities, where a sense of communal responsibility has historically been an adaptive strategy to build resilience. In the case of small island developing nations, the sharing of risk in extended family structures has been a successful strategy to diversify climate risks. However, changes in cultural patterns and a rather individualistic lifestyle in the wake of economic development have reduced the role of this social factor in adaptive capacity (Adger et al. 2007: 728). There is a similarity in this example to the argumentation of the double exposure theory to vulnerability. While according to this approach ecological threat and neo-liberal development increase communities vulnerability to climate change, in the case of small island developing states, consequences of economic growth decrease community’s adaptive capacity.

As both assessment reports recognize the importance of community’s adaptive capacity, they both advocate for policies aiming to increase it. The AR4 recommends considering the local context of communities and individuals and emphasizes that:

“(...) high priority should be given to increasing the capacity of countries, communities and social groups to adapt to climate change in ways that are synergetic with wider social goals of sustainable development.” (Adger et al. 2007: 737)

4.4 Adaptation

According to the applied definition in both IPCC assessment reports, adaptation indicates “adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts” (Smit et al. 2007: 879). Similarly to other concepts influencing the impacts of climate change and climate variability, adaptation is narrowly dependent on adaptive capacity and other socio-economic characteristics. Furthermore, the tempo of climate change determines the chance if taken adaptation measures are successful or not (Smit et al. 2007: 782). Slow changes in climatic conditions imply a higher chance that successful adaptation may occur in time.

The fourth assessment report concludes that geophysical changes would occur relatively slow, hence leaving a bigger time span for successful adaptation.

Even though it seems harder to adapt to rapid onset events than to slow onset climate change, critiques have argued that this argument would postpone adaptation measures and ultimately prevent committed adaptation strategies to be implemented. Interestingly, in the TAR’s applied perspective, adaptation is not viewed as a way of reversing or hindering negative effects of climate change. However, successful adaptation might reduce vulnerability by shifting thresholds for adverse impacts to higher magnitudes of climate change (Smith et al. 2001: 920). Similarly, the AR4 assumes that “adaptation to current climate variability can also increase resilience to long-term climate change” (Adger et al. 2007: 721).

As mentioned above, the IPCC assessment reports lack a comprehensive perspective regarding systems and speak of social, ecological or market systems. The AR4 now alleges that social and market systems have the highest potential to adapt to adverse impacts of climate change (Schneider et al. 2007: 782). Future impacts are expected to be apprehended first in biological systems, since the impacts are more direct. According to the perspective applied in the AR4, the

potential for adaptation depends greatly and is biggest in systems under human management and control (Schneider et al. 2007: 798). Even though it seems clear that systems under the management of human actors are more dynamic and, therefore, more capable to adapt, this perspective can be seen as too optimistic and another form of the management paradigm. Various socio-ecological systems with a high degree of human management have been proven to be relatively resistant towards beneficial alterations.

Especially the TAR distinguishes between autonomous and planned adaptations. Accordingly the term autonomous adaptations refers mainly to alterations in processes, occurring reactively in unmanned natural systems, whereas planned adaptations are undertaken by private decision makers or governments. However, even communities may engage in adaptations that might be attributed as autonomous adaptations if planned adaptation measures are not taking place (Schneider et al. 2001: 879). Yet relying on these reactive autonomous adaptations might involve substantial ecological, social and economic costs. Consequently the TAR considers adaptations not planned or implemented by high levels of government as an adverse fallback option.

Even though the TAR clearly advocates the advantages of planned adaptations, it concludes that various communities and regions will rely on autonomous adaptation measures. The reasons for this prediction are not specified in the TAR. One reason could be that policy makers often tend to delay measures that seem to be not of high importance at the moment. Another reason could be that adaptation to climate change is always involved with costs. Relating to this, the AR4 takes into account that relevant adaptation activities are currently underused, in part because of the costs, particularly in developing countries (Schneider et al. 2007: 795). Furthermore, technical and institutional capacity for planning successful adaptation measures is limited in many regions.

The TAR raises the point that even the favored, planned adaptations have some disadvantages. Planned adaptations face the difficulty that extreme events may occur stochastic, which makes it hard to plan in advance. Therefore, planned adaptations must rely on model adaptations with all their uncertainties (Smith et al. 2001: 958). That means that real life adaptations will be most effective if precise information about future climatic events is available. Developed countries generally have high technical and institutional capacities to generate information required for

planning adaptations, however, climate change usually does not constitute a “here and now priority” (Adger et al. 2007: 735).

The perception of vulnerability and adaptive capacity is crucial and greatly influences the adaptation taken. Regardless if in developing or developed nations, in order to take adaptation measures, the necessity to adapt must be recognized (Smit et al. 2001: 896). Information and recognition about potential negative impacts does not necessarily translate into action. Human cognition can even limit adaptation (Adger et al. 2007: 735).

In the TAR it is taken into account that decision makers can usually take several options and that even cultural concepts come into play.

“Rarely do people choose the best responses – the ones among those available that would most effectively reduce losses – often because of an established preference for, or aversion to, certain options.” (Rayner/Malone 1998 as cited by Smit et al. 2001: 889)

Potential “limits” and “barriers” to adaptation are an important argument in the fourth assessment report. Provided that human actors have certain information and recognition regarding climate change, there are still two sets of limits and barriers to adaptation (Adger et al. 2001: 719). The first one is described extensively throughout the AR4 and refers to technical, financial, behavioral and cultural constraints. These constraints basically refer to several reasons of limited adaptive capacity.

Since adaptive capacity of systems can theoretically get increased according to the IPCC assessment reports (as long as they are under a certain degree of human management), these particular constraints are barriers to adaptation, not limits.

The second set constitutes the inability to adapt to a certain form or magnitude of climate change. If the magnitude of adverse ecological impacts increase by a certain rate, it is impossible for the particular system to adapt. Limits in this sense are defined as largely insurmountable.

As mentioned earlier, the IPCC assessment reports assume thresholds in resilience. The system would have to radically alter its functioning state to adapt to high magnitudes of change. Even then successful adaptation would not make climate change negligible or positive (Adger et al. 2007: 733).

According to the AR4, a rise of mean temperature above a certain level would impede adaptation and increase vulnerability of various systems.

“Global mean temperature changes greater than 4°C above 1990-2000 levels, would lead to major increases in vulnerability (very high confidence), exceeding the adaptive capacity of many systems (very high confidence).”
(Schneider et al. 2007: 781)

The case of many small island states emphasizes this point. These states have the highest degree of vulnerability to climate change and sea level rise. The AR4 assumes that further sea level rise will represent a “serious threat to the ecosystems, economy, and, in some cases, existence of many small island states” (Smith et al. 2001: 935). Even though the AR4 mentions planned adaptation, it is assumed that not only high resilience or adaptive capacity can sustain the future of inhabitants in this location. This is probably the best example of limits to adaptation.

4.5 Migration

The third and fourth IPCC assessment reports both discuss the nexus of human migration patterns and climate change briefly, but neither comes to a substantive conclusion. Even though human migration is considered a form of adaptation to climate change in some passages of the reports, the consequences of this appraisal stay rather blurry.

According to the AR4 there is a long record of historic practices that human actors have engaged in, to adapt to ecological impacts, migration being one of these (Adger et al. 2007: 721). However, the TAR portrays migration as being both a failure to adapt and a possible adaptation response. Among the possible consequences of failure to adapt might be significant deprivation, morbidity, mortality and displacement (Smit et al. 2001: 884). Nevertheless, the same report mentions change of location as an adaptation or response option.

How migration patterns are viewed depends as well on the temporal characteristics. The AR4 refers to temporal migration as a historic form of “risk management response to climate variability”, while claiming that, “permanent migration may be

required when physical or ecological limits have been surpassed” (Adger et al. 2007: 736). In other words that means that permanent migration is necessary if the magnitude of ecological change exceeds the resilience of a particular system. Efforts to increase resilience or adaptive capacity are not an option in this argumentation.

The AR4 paraphrases Mendelsohn et al. (2007) and argues that climate change, which reduces productivity, has negative and direct consequences in rural poverty. Consequently, the negative effects of climate change in rural contexts may make migration a necessary, even though an undesirable adaptation measure (Adger et al. 2007: 736).

Both the TAR and the AR4 bring up a phenomenon that has been referred to in the concept chapter of this thesis as trapped populations. The TAR mentions that migration as an option in the face of hazards is not equally available for everyone and depends greatly on resources and availability of potential destination areas (Smit et al. 2001: 889). Similarly, the AR4 suggests that decisions regarding personal mobility are not exclusively controlled on the individual or household level, and that people may be deprived from the ability to change location. Furthermore, it emphasizes social capital, which can remove the need for relocation and plays a key role in influencing the potential success of failure of migration as an adaptation strategy (Adger et al. 2007: 736).

In the case of small island states in danger of sea level rise, the TAR considers outmigration as a potential direct consequence of permanent inundation (Smith et al. 2001: 935). According to the AR4, “rapid sea level rise that inundates islands and coastal settlements is likely to limit adaptation possibilities”, consequently decreasing the potential role of migration as an adaptation strategy (Adger et al. 2007: 734). However, human migration is rarely a response taken exclusively because of ecological reasons. The example of the Sudano-Sahel region in Africa shows that continuous below average rainfall and drought have affected physical and ecological limits, adding to a range of phenomena, including internal displacement and cross border migration (Adger et al. 2007: 734). This shows how, according to the AR4, climate change can have an indirect but existent impact on the relocation of people.

4.6 Summary

The four surveyed chapters of the third and fourth IPCC assessment reports contain a number of interesting insights into the dynamics and impacts of climate change. The chosen chapters mainly address vulnerability and adaptation to climate change, concepts representing a key-role in analyzing the consequences of climate change on various systems.

The two assessment reports were published within six years of one another and partly were written by the same lead authors and contributing authors. For example, Ian Burton, a scientist who was very influential in early approaches to vulnerability (as represented in the chapter on natural hazards approach of this thesis), is among the lead authors of the examined chapter on adaptation in the TAR, as well as of the chapter on vulnerability in the AR4.

The relative proximity of time along with the fact that some of the authors are the same, might explain why the notion of the concepts vulnerability, resilience and adaptation have not changed considerably. In this regard the two IPCC assessment reports do not contradict each other. However, the remarks differ in implications.

Like in other scientific debates, throughout the six years between the TAR and AR4 the specific focus within research on impacts of climate change has not stayed the same. This explains why the AR4 emphasizes the identification of key-vulnerabilities and limits and barriers to adaptation, whereas the TAR does not devote itself with this issue. Generally the TAR assumes various correlations between climate change and human behavior but stays rather blurry. By contrast, the AR4 describes the relations much more precisely.

Even though the two reports officially apply the same definitions of concepts, it seems that since the TAR, additional knowledge has been gained about the mechanisms determining the impacts of climate change.

The TAR admits that when it was published in 2001, knowledge about impact distribution of climate change was limited and research on the phenomenon in its infancy. Effects of climate change were observable, but the impacts were mostly unclear. The AR4 focuses on the identification of key-vulnerabilities and thus concentrates even more on climate change impacts and associated risks than the TAR did.

For the TAR the degree to which a system is “in danger” is crucial for determining its vulnerability. This draws on the importance of exposure, according to the TAR. However, as shown in the previous chapters, internal characteristics play a key-role for vulnerability in both assessment reports. Vulnerability in the AR4 is even described as the “degree to which a system is susceptible to, and unable to cope with, adverse impacts” (Smit et al. 2001: 894).

One of the most substantial achievements of the AR4 relates to insights into impact distribution. The TAR assumes that vulnerability and adaptive capacity are distributed unequally, not only among countries. The AR4 now quotes studies that show new evidence that vulnerability varies widely, even within developed countries. Even though the TAR assumed the same phenomenon, the AR4 points to new evidence to prove this fact.

Simultaneously, the AR4 portrays how socio-economic conditions determine the degree of vulnerability of social groups and how these conditions may change over time. This dynamic representation surely is an accomplishment, compared to rather static representations of vulnerability.

Resilience is a concept widely ignored by the IPCC assessment reports. Both investigated reports apply a very narrow definition of resilience that is similar to what has been described as resilience as robustness. This notion entirely lacks the regenerative element of resilience. In the IPCC’s perspective, adaptation to climate change is a proof of missing resilience of a system. What has been described in this thesis as resilience as regeneration is very similar to the IPCC’s adaptive capacity concept; the potential to react effectively to climate change, including adjustments in behavior, technology and resources. This potential even enables systems and actors to take advantages of climate change.

The TAR and AR4 both mention that among the adverse effects of climate change on various systems, positive effects, at least in some regions, are to be expected.

Accordingly, there may be increased crop yield in mid- and high-latitude areas at low levels of mean temperature warming. However, the AR4 reveals that net market benefits would peak at low magnitudes of global mean temperature rise. Generally regarding the positive effects of climate change, the third assessment report was more optimistic than the forth. For instance, regarding large-scale events, the AR4 concludes that since 2001, there is no more confidence that events like de-glaciation of major ice sheets can be avoided.

Concerning adaptive capacity, the AR4 states that market and social systems show considerable potential, while the adaptive capacity of biological systems is much lower.

Generally the AR4 assumes that the potential for adaptation is greatest if the system shows a high degree of human management and control.

The TAR states that adaptive capacity is lowest in the Global South. Supposedly if current progressions of development proceed as anticipated, few developing countries will have the capacity to adapt successfully to the expected degree of climate change. This simplistic cause and effect model, which assumes that higher magnitude of climate change, would imply higher vulnerability of systems, runs through the whole TAR. The AR4 however, accepts the complex nature of impact distribution and does not follow such simplistic assumptions.

Since the assessment report of 2001, there has been increasing evidence that besides economic and technological factors positively influencing adaptive capacity, social factors as well play a key-role in enabling effective adaptations. This increased emphasize on determinants such as human capital and government structures is the most important update of the AR4 regarding adaptive capacity. Additionally, the AR4 is convinced that even regions and individuals with high economic activity can be subject to little adaptive capacity.

This departure from explanations solely focusing on the economic dimension can be considered an achievement. In this regard, the AR4 takes into account social factors even more than for instance, the social vulnerability approach, which in fact, considers economic factors as decisive.

Adaptation itself, according to the IPCC, refers to adjustments in both actual and expected climatic stimuli and their effects over time. In the TAR's perspective, adaptation is not a way of seeking to reverse or hinder negative effects of climate change. However, successful adaptation might shift thresholds of adverse climate change effects to higher magnitudes of climate change, thus reducing vulnerability. In a similar manner, the AR4 proclaims that adaptation to current climate variability has potential of increasing a system's resilience to long-term climate change (Adger et al. 2007: 721).

Both examined assessment reports take into account that successful adaptation requires that affected people recognize the necessity to adapt. This recognition might be exacerbated by cultural preferences or aversions. Accordingly, social factors

cannot only act as an enabling element increasing adaptive capacity, but also as a barrier to adaptation as well.

The IPCC's assessment reports consider adaptations to represent far-reaching changes in social and ecological processes. There is ample evidence that institutions play a crucial role in enabling private actors to adapt successfully, just like the wider policy context influences vulnerability, especially of the poor. Furthermore, the investigated reports state that adaptation to climate change is expected to be more important if efforts are consistent with other programs that address non-climatic stresses. Eventually the impacts of climate change are felt as economic and social stress as well.

The nexus of climate change and human migration is discussed in the TAR and AR4 briefly, yet no substantive conclusion is made as to whether an increase in rate and magnitude of climate change would really mean an increase in human migration.

In different sections of the TAR, it refers to migration in the context of climate change as both an adaptation strategy and as a failure to adapt.

The AR4 understands migration as one of the oldest forms of adaptation to changes in climate. Additionally, the AR4 acknowledges change of location as a necessary but undesirable adaptation option, if climate change effects lead to adverse impacts in one's economic situation.

The third and fourth assessment reports both bring up a phenomenon that has been referred to previously in this thesis as trapped populations. It is acknowledged that migration in the face of hazards is always a question of resources and availability of potential destination area. Subsequently the option of changing location is not equally available for everyone.

As brought up before, the AR4 stresses the importance of social capital for successful adaptations. Similarly, social capital is considered to be decisive about success or failure of migration, if taken as an adaptive strategy.

Generally both assessment reports do not consider human migration to be an adaptive strategy of high relevance. Only in the case of small island states is migration considered a crucial, sometimes even the only, adaptation option.

5. Conclusion

As has been shown in this thesis, the relationship between human migration and climate change is complex and not as clear as sometimes assumed. Migration is a multi-dimensional phenomenon that only in the least of all cases can be attributed to one single factor. Likewise climate change is a complex environmental process that does not have uniform consequences anywhere or for anyone.

Especially social factors have a mediating function determining the impacts of climate change on human livelihoods.

This is why three concepts with tremendous influence regarding the impact of climate change on social actors and socio-ecological systems have been analyzed. Various approaches to the concepts vulnerability, resilience and adaptation have been examined regarding their implications for human migration.

Concerning the concept of vulnerability, two schools of thought have been described to be the foundation for numerous approaches to vulnerability.

While for the natural hazards approach, the vulnerability of a community is solely the result of the degree of and exposure to ecological risk, the social vulnerability approach understands vulnerability as the manifestation of complex relations between social, economic, political and institutional determinants.

There is broad consensus by the majority of approaches that the vulnerability of social-ecological systems is also influenced by inherent characteristics, like resilience or adaptive capacity. These elements determine the ability to absorb ecological shocks, the autonomy of self-organization and the ability to adapt to ecological stresses. Consequently, the grade of vulnerability is directly connected to the grade of resilience.

Adaptation to climate change, being the third analyzed concept, reduces the vulnerability of a system and positively influences its resilience in the long run.

A central message of the chapter on adaptation was that the question of which adaptation measures are to be implemented is a highly political matter. Different adaptation strategies occur on different levels and as a consequence have different beneficiaries. While some adaptation programs taken on a public level involve whole communities and institutions, adaptation on a private level may mean that one family member engages in migratory activity.

A core proposition of this thesis is that vulnerability, resilience and adaptation to climate change cannot be analyzed in isolation from the wider political economy of access to resources.

The two IPCC assessment reports discussed in the qualitative content analysis of this thesis take into account the determinative character of economic activity regarding vulnerability, resilience and adaptation. However, the fourth assessment report of 2007 demonstrates how social capital plays a key-role in enabling effective adaptations. It is this emphasis on social factors as well as on institutional factors that represents the most important update of the fourth in comparison to the third assessment report.

The fourth assessment report shows that solely concentrating on the economic parameter influencing the vulnerability, resilience and adaptive capacity of individuals and communities falls short in truly understanding the observed concepts.

This departure from explanations mainly focusing on the economic dimension can be considered an achievement and step towards a more comprehensive understanding of climate change impacts

The findings of this thesis imply that the alarmist prediction of millions of people displaced as a direct consequence of increased climate change is simplistic and incorrect. Keeping in mind the multicausal nature of migration means construing climate change as one additional factor and in many cases an additional burden determining a person's mobility or immobility.

In addition, this paper reveals that the adverse effects that climate change currently has on some individuals and communities are not a guaranteed outcome. A significant degree of global mean temperature increase will inevitably be accompanied by increased vulnerability of some communities. However, future research and policy programs should devote themselves to identifying in detail the parameters at stake to decrease vulnerability and increase the resilience and adaptive capacity of individuals and socio-ecological systems.

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Appendix 1: Abstract

This research looks at the complex nexus between human migration and climate change. Environmental factors and in particular climate change impacts have different implications for different social communities and socio-ecological systems. The goal of this study is to show how the concepts vulnerability, resilience and adaptation play a key role in determining the impacts of adverse climate change events. A number of sometimes similar, sometimes significantly diverging approaches of the three relevant concepts are described and analyzed on their implications regarding environmentally induced migration.

The second endeavor of this paper is to analyze and portray how relevant policy papers present the described concepts and how the concepts have been applied throughout the years. In order to answer this, a qualitative content analysis is applied in the final part of this thesis. The two latest assessment reports of the Intergovernmental Panel on Climate Change (IPCC), published in 2001 and 2007, demonstrate a perfect sample of data with which to analyze the specific concepts.

The two analyzed IPCC assessment reports take into account the determinative character of economic activity regarding vulnerability, resilience and adaptation. However, the fourth assessment report of 2007 demonstrates how social capital plays a key-role in enabling effective adaptations. It is this emphasis on social factors as well as on institutional factors that represents the most important update of the fourth in comparison to the third assessment report.

The findings of this thesis imply that the alarmist prediction of millions of people displaced as a direct consequence of increased climate change is simplistic and incorrect. Keeping in mind the multicausal nature of migration means construing climate change as one additional factor, however, in many cases an additional burden determining a person's mobility or immobility.

Appendix 2: Zusammenfassung

Diese Arbeit beschäftigt sich mit dem komplexen Zusammenhang zwischen menschlicher Migration und Klimawandel. Ökologische Faktoren und im speziellen Klimawandel haben unterschiedliche Auswirkungen auf verschiedene soziale Gruppen und sozi-ökologische Systeme. Ein Ziel dieser Arbeit ist es zu zeigen welche Rolle die ausgewählten Konzepte Vulnerabilität, Resilienz und Anpassung bezüglich der Auswirkungen von Klimawandel spielen. Eine Reihe von teilweise ähnlichen, teilweise sehr unterschiedlichen Theorien und Ansätze wird deshalb auf ihre Rolle bezüglich Auswirkungen von Klimawandel untersucht. Speziell die Implikationen der Theorien auf mögliche Migrationsentscheidungen werden untersucht.

Das zweite Bestreben dieser Forschung ist es zu untersuchen wie die Konzepte Vulnerabilität, Resilienz und Anpassung in relevanten Policy Empfehlungen vorkommen und was die Konzepte in ihrer jeweiligen Form implizieren. Um diese Forschungsfrage zu beantworten wird eine qualitative Inhaltsanalyse im zweiten Teil der Arbeit durchgeführt. Die beiden letzten Assessment Reports des Intergovernmental Panel on Climate Change (IPCC), veröffentlicht 2001 und 2007, stellen ein gutes Datenmaterial für die angestrebte Untersuchung dar. Die beiden analysierten IPCC Berichte demonstrieren die ausschlaggebende Rolle von ökonomischen Faktoren für den jeweiligen Grad von Vulnerabilität und Resilienz, jedoch betont der vierte Assessment Report von 2007 die Wichtigkeit von sozialen und institutionellen Parametern. Diese Abkehr von einseitig ökonomistischen Erklärungsmustern stellt den größten Unterschied zwischen den beiden IPCC Berichten dar.

Die Ergebnisse dieser Recherche implizieren, dass die alarmistischen Vorhersagen von zusätzlichen Millionen Flüchtlingen auf Grund von verstärktem Klimawandel simplifizierend sind. Klimawandel stellt bezüglich des multikausalen Phänomens Migration lediglich einen zusätzlichen Faktor dar. Jedoch kann dieser zusätzliche Faktor in Kontexten von ohnehin sozial und politisch angespannten Situationen eine zusätzliche Belastung bedeuten.

Appendix 3: Curriculum Vitae

Personal Information

Name: Gregor Zehetner
Contact Details: zehetner.gregor@gmail.com

Education

2007 – 2013	International Development Studies, Magister/eq. MA University of Vienna, Austria
2008 – 2011	Political Science, Bachelor Degree University of Vienna, Austria
2009 – 2010	Academic Exchange, International Relations Faculty Istanbul University, Turkey

Languages

Language Levels*

German:	mother tongue
English:	C2
Turkish:	B1

* Based on the principles of the European Centre for the Development of Vocational Training [CEDEFOP]

Appendix 4: Lebenslauf

Angaben zur Person

Name: Gregor Zehetner
Kontaktdaten: zehetner.gregor@gmail.com

Ausbildung

2007 – 2013	Internationale Entwicklung, Diplomstudium Universität Wien, Österreich
2008 – 2011	Politikwissenschaft, Bachelorstudium Universität Wien, Österreich
2009 – 2010	Akademischer Austausch, Fakultät für Internationale Beziehungen, Universität Istanbul, Türkei

Sprachen

Sprachkenntnisse*

Deutsch:	Muttersprache
Englisch:	C2
Türkisch:	B1

* basierend auf den Grundlagen des European Centre for the Development of Vocational Training
[CEDEFOP]