Climate Change, Water Stress, Conflict and Migration: Taking stock of current insights through a vulnerability lens

Leon M. Hermans

Faculty of Technology, Policy and Management
Delft University of Technology
P.O. Box 5015
2600 GA Delft, The Netherlands

INTRODUCTION

There is a growing awareness in international policy circles that climate change may be a driver of increased migration flows. In addition to political refugees and economic migrants, also climate change induced migration and environmental migrants are increasingly recognized as categories in human migration. As climate change-induced migration is a relatively new phenomenon, there is little established policy or legislation on how to deal with the associated pressures and how to address the needs and rights of environmental migrants. International decision-making on climate change and its impacts would need to address these new emerging issues.

A prerequisite for well-informed international and national decision-making on climate-induced migration, is a better understanding of the phenomenon. It is plausible that the four terms of climate change, water stress, conflict and migration have causal linkages, but the exact nature and direction of these linkages are likely to be context-dependent and difficult to assess (Institute for Environmental Security, 2011). Furthermore, it is plausible that climate change-induced migration causes vicious cycles, whereby climate change leads to water stress, which leads to conflict, which leads to more migration, which leads to increasing pressures on water resources , thus increasing water stress and conflict, which in turn further fuels migration, and so on.

The two aspects of international decision-making and a better understanding of the associated phenomena, were the subject of the Symposium on 'Climate Change, Water Stress, Conflict and Migration'. This paper reviews and discusses some of the main results of this Symposium. The paper starts with a review of the current understanding of climate change induced migration, and the role that water stress and conflict play in this phenomenon. This review follows the Symposium contributions that addressed three aspects: the realities on the ground, the international policy responses, and the current state of understanding. This review is followed, in the second part of this paper, by an attempt to put this debate in a more theoretical perspective. Although based on cues given by Symposium speakers, this second part of the paper also goes beyond the Symposium contents. Literature on vulnerability is explored and linked to livelihoods frameworks as a promising way to further our understanding of the links between climate change, water stress, conflict and migration. Finally, returning to the Symposium's presentations and discussions, the implications for policy-making are addressed.

PART 1: TAKING STOCK OF REALITIES ON THE GROUND, INTERNATIONAL POLICY RESPONSES AND (LIMITS TO) CURRENT UNDERSTANDING

Realities on the ground: the case of Bangladesh

A good way to start a review of current knowledge on the links between climate change, water stress, conflict and migration, is to look at these four terms and their linkages for specific countries. To this end, the presentation and discussion of the situation in Bangladesh is instrumental. Available evidence, facts and trends on the situation in Bangladesh clearly suggests a degrading cycle exists between climate change, water stress, conflict and migration (Muniruzzaman, 2011).

Due to its location, Bangladesh is vulnerable to the impacts of climate change on Himalayan glacier melting. As the origin of the major rivers that run through the country, glacial melting may change the flow regimes in rivers from perennial flows to seasonal rivers in the future. Also, Bangladesh suffers from the impacts of climate change on sea level rise, which will affect the safety and salinity in its coastal regions. In addition to these 'slow but steady' changes in longer-term patterns, climate change will also lead to an increased occurrence of extreme weather events, in a society already plagued by such events under the current conditions. Added to this mix of 'soft' security concerns related to water, food, and livelihood security, are the 'hard' security concerns. These 'hard' security concerns are related for instance to risks of radicalization, socio-political unrest and intra- and interstate conflicts. For instance, a conflict between Bangladesh and India over the construction of dams in some major rivers, at locations upstream of Bangladesh (Muniruzzaman, 2011).

This makes Bangladesh one of the loci where part of the current projections used by IPCC, International Office of Migration and others will materialize: "It is estimated that by 2050, 150 million people could be displaced by climate change related phenomenon like desertification, increasing water scarcity, floods and storm etc." Indeed: "Large-scale migration will add extra pressure on the scare resources in Bangladesh and thereby heighten competition and conflict over resources. Intra-regional forced migration, such as those from Bangladesh to India is subject to stimulate bilateral tensions." (Muniruzzaman, 2011).

International policy responses

Given these international dimensions, it is clear that climate migration matters would need to be addressed also at the regional level between countries, and that they can not be left solely for national and local governments to cope with. A first step towards such international policy responses would be the international recognition of an increased flow of climate migrants as a real and important consequence of climate change. A review of current international law and treaties on migration, refugees and displacement, shows that environmental refugees and climate change-induced migrants, are not recognized yet (Flavell, 2011). The existing treaties and conventions provide a basis for certain rights and protection for persons that are displaced due to natural hazards, but environmental migrants as such can claim little structural protection under international law. Even if migration and mobility may be considered a human right, the protection of this right is not explicitly arranged under current laws and treaties. In this regard, the recognition in the UNFCCC Cancun agreements that climate change may induce displacement and migration should be considered a helpful starting point and building block: "Measures to enhance understanding,

coordination and cooperation with regard to climate change induced displacement, migration and planned relocation, where appropriate, at national, regional and international levels." (para. 14f, COP 16 Cancun / Mexico, December 2010).

Understanding migration as a multi-faceted phenomenon

The development of such formal policy responses, both internationally and nationally, is complicated by the fact that migration is a multi-faceted phenomenon. Human migration has multiple causes, of which environmental factors are just one. Recent research by the United Nations University and others shows that various factors play a role in households to migrate (Afifi, 2011). These include:

- *"Profession (mainly farmers and cattle herders)*
- *Attachment (land ownership, family, history)*
- *Cultural issues (e.g. language)*
- *Financial means*
- *Alternative livelihoods in other villages/regions*
- *Pull factors in villages/regions/countries of destination." (Afifi, 2011)*

This is in line with other reports, such as the assessment report on environmental migration published by IOM in 2009. This reports states that:

> *"It is generally agreed that the key drivers of migration are:*
>
> *(a) factors related to the region or country of origin, including political instability and conflict, lack of economic opportunities, and lack of access to resources ('push' factors);*
>
> *(b) factors related to the region or country of destination, including the availability of employment and demand for workers, higher wages, political stability or access to resources ('pull' factors);*
>
> *(c) intervening factors that facilitate or restrict migration, including ease of transportation, family or social networks, government immigration or emigration policies, economic ties such as trade and investment linkages, or social and cultural exchanges.*
>
> *However, what is not so clear is how these different factors interact with each other to inform migration behaviour or, more importantly, for the purpose of this chapter, the extent and magnitude of the role that the environment plays in these decisions" (Laczko & Aghazarm, 2009, p.48).*

Thus, the influences of climate change and environmental drivers are difficult to isolate from other influences on decisions to migrate. Current knowledge also is not clear on causes and consequences related to intermediate parts in the causal chains that connect climate change and migration, such as water stress and conflict. For instance, an often heard assumption is that water stress would lead to more conflict. Possibly, the relationship between water stress and conflict may be another. There is a lot of evidence that suggests that conflict is *less* likely in areas under stress, but instead, conflicts are more likely in areas that have resource to fight over (Witsenburg, 2011). A special issue of the Journal Peace Research suggest that there is more violence in time of abundance. Also a more generic link between climate change and conflict is difficult to prove, as supported by the data from the database of the Peace Research Institute in Oslo (Witsenburg, 2011).

Even if we set aside the difficult questions of cause and effects, also the sheer size of the terms in the equation are insufficiently known. Few data are available on the size of the current problems (Truong, 2011). What is the size of environmental migration flows? Forecasts vary between 25 million to 1 billion climate migrants by 2050, with the most often cited projections suggesting as much as 200 million climate change-induced migrants by 2050 (Laczko & Aghazarm, 2009, p.5). But even if cited by the IPCC, IOM and the Stern Review (see IOM, 2008, p.11-12), they are forecasts and not established facts. As a recent publication puts it, citing these projections again and again, does not make them more (or less) accurate (*reference unknown*). What is needed, is sound monitoring information on the size of current flows, and their development over time.

The absence of such information regarding international climate change-induced migration flows points to another way in which international decision-making is linked to a better understanding of the underlying phenomena. Not only is a sound understanding needed for decision-making, there is also some sort of a 'chicken-and-egg' problem: in the absence of an internationally agreed definition of environmental migrants, measuring quantities becomes troublesome (Afifi, Douma, Truong, 2011).

Realities on the ground: pastoral livelihoods and access

A better understanding of the links between climate change, water stress and migration also can be obtained from looking at more traditional types of migration in response to water stress. Water stress is expected to increase as a result of climate change, but it is not a completely new phenomenon. And also migration in response to water stress is not new. Pastoral livelihoods are a prime example of a livelihood that uses migration, or mobility, as a key element in a (rural) livelihood strategy. Although often mistaken for a primitive transitional livelihood activity, it is actually a "skilled and tailored way to produce food in environments where water is in deficit", (Nori, 2011).

If one takes a closer look at pastoral livelihoods and of the difficulties encountered by pastoralist groups, it becomes apparent that it is not the physical phenomenon of water scarcity or variability that is causing most problems. In fact, (seasonal) mobility has been developed as a strategy to respond to such variability and local scarcity. It is not resources scarcity, but *access* that poses problems for pastoralists. Access to water, (range)land, but also access to markets, to vaccines and to knowledge and information (Nori, Van Mierlo, 2011).

Access is difficult. This can be understood by realizing that pastoral activities are often practiced by groups at the margin of society, in effect marginalized groups. The marginal lands used by pastoralists are furthest from the capital cities that are typically located in the 'green' areas (Nori, 2011). Note that also here, the causality is not clear: were pastoralist gradually marginalized because of their distance from the power centers, or were they marginalized groups who turned to pastoralism as the only remaining option (Witsenburg, 2011)?

Sometimes access is modified by (new) national laws and regulations. Access to markets may be restricted by national regulations, such as in Ethiopia, where selling animal proteins to Saudi Arabia is not allowed, even if more lucrative (Nori, 2011). Traditional grazing grounds may be claimed for other uses, such as national parks or for the development of large irrigated farms. The state declares authority and then leases out land to private companies, either for growing food, bio-fuel crops such as jatropha, or because valuable minerals or oil resources have been found (Nori, Truong, 2011).

Note that such processes do not only affect pastoralists, but also other groups. For instance, the discovery of oil in the South China sea was a cause of conflict and migration, forcing fishermen out of their traditional fishing grounds (Truong, 2011). In these cases, physical resource scarcity is not the issue, but access and barriers to access are.

Access is not only modified by state institutions and regulations, but also by traditional culture within the pastoral groups themselves. For instance, only in recent years a new market in Puntland has developed in camel milk. This was first taboo, but is now becoming booming activity. Due to this Somali women have been able to change their role in society to become more powerful (Nori, 2011). This points also to another aspect: although referred to sometimes as 'traditional', rural livelihoods such as pastoralism are dynamic and subject to change, also without climate change as a driver (Truong, 2011).

Access can not only be restricted, it can also be enhanced. For instance, access to knowledge can be addressed by setting up Pastoral Field Schools. Rooted in a belief in indigenous knowledge, Pastoral Field Schools have been established following the example of the Farmer Field School concept promoted by FAO in past years. These field schools are community-based schools under a tree, where the local participants lead practical research, tests and solve their own problems, with a little help from outside facilitators. Pastoral Field Schools have led for instance to the establishment of participatory early warning systems based on local knowledge with a little input from satellites works. What is missing however, is a capacity to respond to such early warnings (Van Mierlo, 2011).

Understanding migration in relation to barriers, borders and boundaries

Access and barriers to access provide a critical link, not only for understanding migration in the context of pastoral livelihood strategies, but also for migration more general. Migration also has to do with barriers, at a fundamental level. Migration is used first in relation to human migration in the 16th century and this use clearly has to do with the existence of borders (Truong, 2011). Migration is more than simply moving around, migration is, originally, related to borders, and borders pose barriers to migrants. These borders, or barriers, may be national, regional or local borders, and they may have been in existence for a long time, or they may have been established recently. Finally, it is important not to forget that not only humans migrate, but that nature itself does not recognize the boundaries defined by societies. Wildlife migration, but also the connection of countries through river flows, is an essential part of the preservation of the ecosystems on which much of human livelihoods depend (Kappelle, 2011).

As cross-border issue, migration poses challenges to the traditional governance systems, as it needs to be addressed at all levels, from local, to national, to international.

Stock-taking: what we know about climate change, water stress and migration

When we look at the realities on the ground, the policy responses and our current knowledge and understanding of climate change, water stress, conflict and migration, we are clearly dealing with complex issues.

- *Realities on the ground* suggest that migration or mobility is an important and growing phenomenon. It may be induced, forced or voluntarily. It may be due to climate change,

natural hazards or scarcity of land and water resources, but it may also be caused by other factors, or, typically, a complex of different factors.

- *Policy responses* are needed, but difficult. There is a clear need to address the legal rights and responsibilities of environmental migrants in international decision-making. However, the issue of climate change induced migration also has to be addressed at other level. Migration has to do with boundaries and with crossing boundaries. This makes it impossible to address migration issues at one predefined level of government.

- *Understanding* of these realities is required for sound policy responses, but is difficult and currently it is limited. We do not know how large the problems are in relation to climate change induced migration: the size of environmental migration is unknown, there are no internationally comparable data available on the subject, and the causal linkages between climate change and migration are unclear and highly diverse and location-specific.

In the second part of the paper, we will explore if there are certain theoretical and analytical perspectives that might act as organizing frameworks to develop a better understanding of the realities related to climate change-induced migration and water stress. Following this more theoretical exploration, we will then return to the policy implications, which should help to cope and respond to the realities on the ground.

PART 2: EXPLORING A VULNERABILITY LENS TO ORGANIZE UNDERSTANDING OF CLIMATE CHANGE, WATER STRESS, CONFLICT AND MIGRATION

Making sense of climate change induced migration: choosing a perspective for learning

Faced with a complex, wicked problem such as climate change induced migration in relation to water stress, problem framing becomes a critical issue (Enserink et al., 2010). How do we look at climate change induced migration? Do we frame it as a problem of international migration flows? As a pastoral livelihood issue? As a water security problem? As a 'hard' security issue? A legal issue? A wildlife conservation problem? It will be clear that looking at any one of these problems can provide useful insights. But it will be difficult, perhaps sometimes even impossible, to connect and reconcile the insights that emerge from these very different ways of framing the problem.

At the Symposium, different contributions were made, illuminating different problems in relation to climate change, water stress, conflict and migration. If we want to make sense of the relations between these problems and issues, we need to choose a perspective, an angle from which we will connect different problems at different scales. During the Symposium, a suggestion was done to further explore these issues by using a 'disaster' perspective (Borel, 2011):

"Processes of disaster can serve as a proxy or model for approaches that will be needed to anticipate and respond to impacts of climate change, and its variability and impact on people. Right now disaster provides us with a good model. Some of the common elements are:

- *Need for preventive action – prevention is cheaper than response. In principle states have an obligation to cover the whole cycle of protection, not only the response side. But most governments emphasize flashy side of response rather than prevention*

- *Need to understand better the whole package of risks that vulnerable people are exposed to. Overcrowded, local violence, domestic violence, policy violence, landlessness, joblessness, political and .. exclusion, etc etc. This is the risk in which most of the human population lives today. And it is the reason why the risk of climate changes doesn't come to forefront very high in priorities.*

- *Difficulty of challenge to monitor, detect, account for many small events. In case of disasters, large disasters (earthquakes, tsunamis) call international attention, but many small events account for most part of total of suffering. Difficult to account for all these small elements, but are very important to understand what's going on." (Borel, 2011)*

Looking at disasters through a vulnerability lens

Taking 'disasters' as a starting point, we see that also the literature on disaster management, risk management and vulnerability is diverse. However, there are also some clear overlaps. From a cursory reading of this literature in relation to water stress and climate change, especially the ongoing discourse on vulnerability, adaptation and resilience is relevant. Vulnerability requires an adaptation strategy or coping mechanism. Groups that are vulnerable to certain pressures, such as climate change induced water stress, may choose to migrate in response. Or, if there are no other options, they may be forced to (temporarily) migrate as a coping mechanism. And, often, the most vulnerable groups have no options for dealing with disaster: neither for adaptation, nor for coping. If disaster hits them, they are left to the mercy of nature and society. Therefore, in the following sections of this article, we will explore the meaning and potential of using a vulnerability perspective to understand climate change, water stress, conflict and migration.

Research on vulnerability has evolved from different traditions. The point that vulnerability does not necessarily have to do with a physical scarcity of resources, but with *access* to those resources, is directly in line with the key notions in one of these traditions: the entitlement approach (see Adger, 2006). In this tradition, entitlements explain such things as food insecurity and conflict. This entitlement approach has been put forward by Amartya Sen in the 1980s, whereby entitlements are "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen, 1984, p.497, as cited in Adger, 2006, p. 270).

Other important traditions, as posited by Neil Adger, are the approaches rooted in the physical sciences and engineering, whereby risks of natural hazards are conceived as 'probability x impact'. This tradition often interacts with a human/political ecology tradition through for instance Pressure-and-Release models whereby the focus is on why the poor and marginalized groups in a society are most at risk from natural hazards (Adger, 2006, p.271; Turner II et al., 2003, p.8074).

Vulnerability of human-environment systems

Rooted in these and related traditions, current thinking converges on notions of vulnerability as a property of a system. Vulnerability is related to the way in which a coupled human-environment system responds to outside pressures such as perturbations or stressors (Turner et al., 2003). Vulnerability is thought to consist of three main elements of a coupled human-environment system: exposure, sensitivity and response (Turner et al., 2003):

- Exposure refers to the components of a system that are exposed to shocks and stresses. Often such shocks and stresses come from outside a system, but they may also originate (partly) from within a certain system. This points to the distinction between external and internal sides in relation to a system's vulnerability Fussel (2007). Furthermore, often vulnerability results not from a single shock or stressor, but as a result from an interaction among multiple pressures.

- Sensitivity refers to how sensitive a system is to a certain external pressure. For instance, a pastoral system will be highly sensitive to hazards that affect the availability of land or water resources, as these are critical to the livelihood strategy. Also the sensitivity of a system often depends not on a single system characteristic, but on a multitude of factors and their interactions.

- Responses refer to the way in which a coupled human-environmental system then responds to the pressures and their impacts on the system. Do pastoralists move to other areas, temporarily or more permanently, do they change the size of their herds, do they diversify into other livelihoods strategies to better absorb variability in water availability, or do they migrate?

These three elements of vulnerability are now widely accepted as a basis for vulnerability analysis, sometimes with minor modifications. For instance, in the Millennium Ecosystem Assessment, reference is made to Exposure, Sensitivity and Resilience, whereby immediate and short-term coping mechanisms are considered to belong under 'Sensitivity', while Resilience covers the more fundamental adaptive response strategies (Kasperson, Dow et al., 2005). Marchand (2009) uses the framework as a basis to model vulnerability in coastal areas in India and Vietnam. Furthermore, these three parts are mirrored in disaster management, which often speaks of a multi-layer approach that should include prevention, event management, and post-flood measures (Deltares, 2010)

Understanding vulnerability of systems

Given the above conception of vulnerability, it is no wonder that vulnerability is difficult to measure (Adger, 2006). One can identify several indicators that may contribute to vulnerability. One could combine these indicators to compose a vulnerability index (e.g. Brooks et al., 2005), but ultimately the role of the underlying factors in causing vulnerability is highly site and time specific. The human-environment systems for which the vulnerability is investigated are dynamic. This means that vulnerability, as a characteristic of those systems, is also a dynamic phenomenon that is difficult to capture with static measurements (Adger, 2006). Furthermore, vulnerability results from an interplay of factors, whereby the exact nature of the causal relations is difficult to establish due to delays, threshold effects and feedback mechanisms.

Thus, the initial insights from vulnerability literature confirm the complexity encountered when looking at climate change, water stress and migration. There are many factors, many relations, and it is difficult to single out one specific cause, or to predict one specific outcome resulting from specific pressures. Dealing with vulnerability requires a systems approach. Vulnerability is a characteristic of a system, not easily pinned down to one specific part of this system. Systems are generally valued for the outcomes, outputs or the goods and services they produce. This means that systems perform a

function – even if these functions can change over time. Hence, we can work with the following understanding of vulnerability: "Vulnerability refers to the extent to which a system is at risk of no longer being able to perform its primary functions". Thus, understanding vulnerability requires understanding the 'functioning' of a certain system.

In elaborating further on this systems approach, it is important to realize that any system that we chose to focus on will be part of a nested 'system-of-systems'. Our system of choice will be one layer, one aspect. It may have smaller sub-systems within, it may be part of a larger system, and it will have systems that are external to the system but that nevertheless interact with the system. Understanding such systems ultimately requires unpacking the systems until one reaches the level of the smallest unit. Where systems feature an important human component, the smallest unit is often that where the individuals and their decisions come insight (e.g. Ostrom, 2005). Without resorting to psychological frameworks, the closest we can get in understanding local systems that inform decisions of migration in underdeveloped areas, is a sustainable livelihoods framework, which takes the household as its prime unit of analysis.

Vulnerability in local livelihood systems

A sustainable livelihoods framework can be used to analyze at the household level how people provide for their livelihoods in a given environment. The dominant framework is explained by Ellis (2000), and adapted and used for a more specific focus on the link between water and livelihoods for instance by Nicol (2000) and FAO (2005). In a sustainable livelihood framework the purpose of a local livelihood system is to provide a secure livelihood and healthy environment. These outcomes are defined in terms of income level, stability, seasonality and degrees of risk for livelihoods, and to the quality of various characteristics such as land quality, water, biodiversity for the environment (Ellis, 2000). Outcomes are influenced by the decisions that households make regarding the livelihood strategies. These decisions are based on the opportunities they have based on their access to assets, in the context of trends and shocks. This view of livelihoods systems is illustrated in Figure 1.

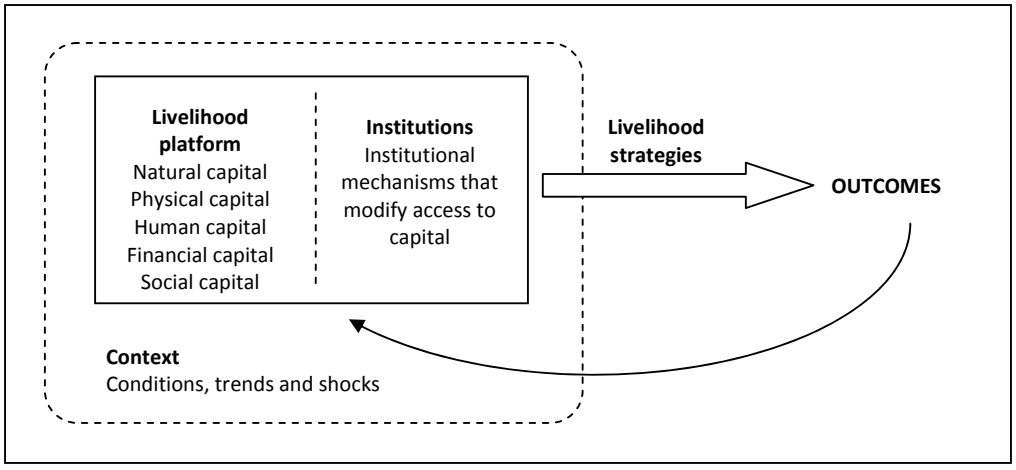

Figure 1 Sustainable livelihoods framework (FAO, 2005, Fig.2, adapted from Ellis, 2000 and Nicol, 2000)

The sustainable livelihoods framework is not perfect, especially in its discussion of the role of information, but it helps to recognize many of the factors mentioned before. It easily translates to the vulnerability framework and its three elementary concepts. The livelihood context defines the exposure to (mainly) external stressors and perturbations – but also opportunities. The sensitivity of the system can be assessed by looking at the way these external pressures influence access to assets that are critical for obtaining secure livelihoods and sustainable environments. Responses are the options that households have to cope with these pressures and to change their livelihoods. Migration can be part of such a response strategy (Ellis, 2000).

Migration and mobility as strategies to deal with vulnerabilities in a livelihood system

In relation to vulnerability, the question is: how long can a local livelihood system function while exposed to stressors and shocks? When might migration become a serious option to consider in response to pressures on the livelihood basis? Part of the answer can be found by looking at this livelihoods basis, which is formed by a household's access to assets, to capital. In order to produce secure livelihoods, a household needs a certain amount of capital, certain assets, to work with. Typically natural, physical, human, financial and social capital is distinguished, which is considered to form the livelihood platform. Social capital has close linkages with the institutions that can modify access to the assets.

The assets in a livelihood platform can, to a certain extent, be substituted and/or converted. Financial capital can be converted into physical capital, when equipment is purchased. But also, in case of conflict or land-grabbing, access to land may be acquired at the expense of social capital in the form of trust and good relationships with other parties in the area. A loss of assets can also be addressed by changes in livelihood strategies. Loss of access to land or water resources may be dealt with by moving to other (range)lands, or by changing livelihood strategies: growing less water-dependent crops or diversifying livelihood strategies to include other activities. For the well-educated farmer, another use of the human capital in the form of formal education, can help in such a diversification strategy. Loss of any one particular asset can be disastrous, but that depends to the extent to which this loss can be addressed by the reliance on other assets. Hence, there is a sort of 'networked vulnerability' as part of the robustness of a system, to reduce its sensitivity to external shocks.

In some cases, migration or mobility may be the chosen response. In terms of migration and mobility, one can then propose a certain distinction between these two terms. Mobility can be seen as moving around *within* the existing boundaries of the livelihood system. This would apply to pastoralists moving around in their traditional territories. They exchange access to one type of land for access to better lands elsewhere, at the expense of labour and some social capital; Social capital tends to erode when communities maintain less frequent contact.[1]

[1] Also, it may well be this social capital that means they are underrepresented (marginalized) in decision-making and governance. In essence, these decision-making arrangements are social and dynamic constructs. The institutional mechanisms not only modify access to social capital, they are also the product of the (use) of social capital in the past.

Migration can be seen as moving *across* system boundaries. It is a much more fundamental change in livelihood strategy. Households, or members of households, move elsewhere. They do not only move 'out of' their prior system, but also 'into' another system. Migrants are in this way themselves a context factor, a pressure, on the systems at the place of their destination. If they stay at those destination sites they will, eventually, be incorporated within the system. Initially as a marginalized group, not well represented in the institutions that modify access to capital, but later, hopefully, as more accepted members of the system.

Migration and institutions

As migrants move into other systems, where current institutions are not equipped to address the claims of these new entrants to environmental resources such as land and water in those systems, tensions and conflicts may arise. This is illustrated for instance in cases where pastoralists move into 'new' areas that are dominated by crop-based agriculture. See e.g. FAO (2005) for a case in Tanzania, using the livelihoods framework as basis for vulnerability analysis.

Thus, understanding some of the responses to migration is served by understanding the evolution of institutions. Whereas most of the literature on the livelihoods approaches focuses on the use of capital, other literature focuses on the development of institutions. Here, it is key to realize that trust is a critical term, and that trust develops over time. New entrants into a system are not yet part of the trusted clique, and the inclusion of their interests requires time to develop. Having certain rights asserted through higher level institutions is helpful, but in addition, time is needed for full acceptance locally. This means that, even with international laws and conventions in place, also local institutions need to adapt, which takes time and trust-building; essential but difficult challenges.

CONCLUSIONS

The links between climate change, water stress, conflict and migration are uncertain and there is insufficient understanding of those links to support well-informed policy responses. Yet, the reality on the ground shows that we cannot put decision-making on hold until everything is clear. Problems exist, are likely to worsen, and policy-makers need to act. What could they do? And how does this review of Symposium results and this further exploration of a vulnerability perspective help to progress towards actionable knowledge?

One consequence of the complexity sketched here, including the insights from vulnerability literature that various interactions and combination of factors produce certain outcomes, is that, at the level of the system, probabilities are unknown. It is not meaningful to predict certain consequences tied to individual factors in the context or within a system, not even within margins of error or with probability distributions. There are too many unknown variables and too many possible combinations with different effects, including delays and threshold effects. This makes 'classic' risk assessments of the type "risk = probability x impact" problematic.

Rather, we need to move towards a more adaptive policy-making approach (Walker et al., 2001). We do not know the exact relations in our systems, but we do know some of the factors that play a role and some of the relations at work. And for some of these factors and relations, we can assess probabilities, or predict future developments, even if we cannot do this for the system as a whole.

Based on our current knowledge and 'best guesstimates', we can formulate policies and decisions, and we can anticipate certain future risks and uncertainties. For these, we can think, in advance, of mitigating measures or hedging actions, to make our policies more robust. For instance, by ensuring that environmental migrants and climate change induced migration gain international recognition and rights, through inputs in the text discussed at UN-FCCC forums.

Given the fundamental nature of the systemic uncertainties, such 'robust' policy decisions will need to be accompanied by continuous learning efforts. For such learning, it is useful to signal the assumptions we have made in coming to decisions (Walker et al., 2001). Can we monitor certain indicators to obtain feedback on the accuracy of these assumptions, while implementing our policies? Thus, making assumptions explicit, as was done at the symposium, becomes a hallmark of future learning. This seems one of the most promising ways to make progress towards sensible and fair decisions, at all the relevant levels, on the way to address the multi-faceted and multi-level linkages between climate change, water stress, conflict and migration.

REFERENCES

Adger, W.N. (2006). Vulnerability. *Global Environmental Change* **16**: 268 – 281.

Afifi, T. (2011). Environment, Climate Change and Human Displacement: From empirical evidence to action. Keynote speech and Closing Remarks. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Borel, R. (2011). Introduction to the Symposium and Closing Remarks. Keynote speech. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Deltares (2010). Flood Risk Management. Deltares, Delft.

Douma, W. (2011). Introduction of first draft Symposium Recommendations. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press, Oxford.

Enserink, B., L. Hermans, J. Kwakkel, W. Thissen, J. Koppenjan & P. Bots (2010). *Policy Analysis of Multi-Actor Systems.* Boom/Lemma Publishers, The Hague

FAO. (2005). *Water productivity and vulnerable groups in the Mkoji sub-catchment*. Final Project Report. SWMRG Sokoine University of Agriculture and Food and Agriculture Organization of the UN, Rome.

Flavell, A. (2011). Climate Change, Migration, Security. Policy Implications. Introductory Presentation. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

IOM. (2008). *Migration and Climate Change*. IOM Migration Research Series 31. Prepared by Oli Brown. International Organization for Migration, Geneva.

Institute for Environmental Security (2011). Background Paper. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Kappelle, M. (2011). Panel: Perspectives on Climate Change, Water Stress, Conflict and Migration. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Kasperson, R.E., K. Dow, with E.R.M. Archer, D. Ca´ceres, T.E. Downing, T. Elmqvist, S. Eriksen, C. Folke, G. Han, K. Iyengar, C. Vogel, K.A. Wilson, G. Ziervogel. (2005). *Vulnerable Peoples and Places*. Chapter 6 in the Millennium Ecosystem Assessment Report, Part 1: Current State & Trends Assessment.

Laczko, F. & C. Aghazarm, Eds. (2009). *Migration, Environment and Climate Change: Assessing the Evidence*. International Organization for Migration, Geneva.

Maniruzzaman, A.N.M. (2011). Security Implications of Climate Change. Water Stress, Conflict and Migration in Bangladesh. Keynote speech. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Marchand, M. (2009). Modelling Coastal Vulnerability. Design and evaluation of a vulnerability model for tropical storms and floods. IOS Press, Amsterdam.

Mierlo, J. van (2011). Panel: Perspectives on Climate Change, Water Stress, Conflict and Migration. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Nicol, A. (2000). *Adopting a sustainable livelihoods approach to water projects: Implications for policy and practice*. Working Paper 133, Overseas Development Institute, London.

Nori, M. (2011). Panel: Perspectives on Climate Change, Water Stress, Conflict and Migration. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Turner, B.L. II, R.E. Kasperson, P.A. Matsone, James J. McCarthyf, Robert W. Corellg, Lindsey Christensene, Noelle Eckleyg, Jeanne X. Kasperson, Amy Luerse, Marybeth L. Martello, Colin Polsky, Alexander Pulsipher, and Andrew Schiller. (2003). A framework for vulnerability analysis in sustainability science. *PNAS* **100** (14): 8074 – 8079.

Truong, Thanh-Dam (2011). Panel: Perspectives on Climate Change, Water Stress, Conflict and Migration. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.

Walker, W. E., Rahman, S. A., & Cave, J. (2001). Adaptive policies, policy analysis, and policymaking. *European Journal of Operational Research* **128**(2), 282-289.

Witsenburg, Karen (2011). Panel: Perspectives on Climate Change, Water Stress, Conflict and Migration. *Symposium on Climate Change, Water Stress, Conflict and Migration*. UPEACE/IES/ISS/UNESCO, 21 September 2011, The Hague.