Climate Change & Vulnerability: Challenges for Spatial Planning and Civil Protection

Jörn Birkmann

UNITED NATIONS UNIVERSITY Institute for Environment and Human Security,
UN Campus, Hermann-Ehlers-Str. 10, 53113 Bonn, Germany, E-Mail:birkmann@ehs.unu.edu, phone: +49-0228-815-0209

1 Introduction

The scientific evidence is overwhelming: climate change is real. It is a global challenge which threatens human security today, and will continue to do so for the foreseeable future. Although the various climate change scenarios differ quite substantially, the alarming facts are well documented in recent reports, particularly from the IPCC (2007) and the Stern Review (2007) regarding the potential economic impacts of climate change. If we succeed in cutting our greenhouse emissions dramatically, we can reduce the magnitude of future change. But our climate has already changed, and thus we will still have to deal with the consequences as documented in the new Green Paper of the European Commission (EC, 2007). These consequences are still vague and regional climate scenarios are often not available. Nevertheless, strategic planning such as spatial and urban planning as well as disaster management and civil protection, which are focused on reducing the risks posed by actual and potential hazards (Alexander, 2002), will have to deal with climate change related implications and hazards. Due to the degree of uncertainties of the climate change predictions (IPCC, 2007: 600-601) as well as of the socio-economic scenarios (Arnell et al., 2004: 18-19), it will be important not only to focus on the exact hazard quantification, but rather also examine different vulnerabilities linked to climate change.

2 Climate Change a Complex Phenomena

2.1 Potential impacts and trends

According to the latest report of the Intergovernmental Panel on Climate Change (IPCC, 2007), eleven of the last twelve years (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (IPCC, 2007: 4). However, global climate change does not only mean that the global mean temperature is increasing. An even more significant threat for human security is the fact that the slow shifts in average conditions over a long period will cause an intensification of extreme weather events (IPCC, 2007). Heavy precipitation, floods and tropical cyclones are very likely to appear more often and with more intensity, particularly in coastal regions around the world. In contrast, mid-continental areas will generally become hotter and dryer, which is likely to increase the risk of summer droughts and wildfires (van Aalst, 2006: 8). Alone the European heat wave of 2003 killed between 22,000 and 35,000 people (IFRC, 2005). Already in the past decade, weather-related natural hazards have been the cause of 90% of disasters triggered by natural hazards (IFRC, 2005). Table 1 shows the recent trends and projection of different phenomena under conditions of climate change.

2.2 Multi-hazards and permanent environmental changes

In contrast to well-known single hazard events (e.g. floods, earthquakes), climate change is a multi-hazard phenomenon. Addressing climate change and its consequences therefore requires a multi-hazard approach, which implies focusing on different hazards and on different vulnerabilities simultaneously. The likelihood that a flood will follow a heat wave and that extreme weather events and other natural hazards might interact and overlap is a new quality of the risks posed by climate change. The occurrence of very different hazards of natural origin in Europe in summer 2007, such as the flooding in England, the heat wave in the east and south of Europe provide examples of what a multi-hazard phenomena might imply. While on the one hand, climate change will bring about a higher frequency and intensity of sudden-onset hazards such as floods, tropical cyclones and heavy

precipitation (see Table 1), on the other it will generate creeping hazards and permanent environmental changes such as a rise in sea level.

2.3 Regional consequences still fuzzy

A major difficulty for spatial and urban planning as well as disaster management is the lack of regional and local climate impact scenarios. Current climate scenarios show a high variation among each other (IPCC, 2007), due to different assumptions on future development trends. Moreover, another constraint for disaster management and spatial planning is the lack of regionalisation of climate change scenarios. Most climate change scenarios have a too coarse spatial resolution from impact and adaptation assessment (Arnell et al., 2004: 14).

Table 1: Phenomena and its trends under conditions of climate change

Phenomena and direction of trend	Likelihood that trend occurred in late 20th century	Likelihood of human contribution to observed trend	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and night over most land areas	Very Likely	Likely	Virtually Certain
Warmer and more frequent hot days and nights over most land areas	Very Likely	Likely (nights)	Virtually certain
Warm spells/heat waves. Frequency increases over most land areas	Likely	More likely than not	Very likely
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	Likely	More likely than not	Very Likely
Area affected by drought increases	Likely in many regions since 1970s	More likely than not	Likely
Intense tropical cyclone activity increases	Likely in many regions since 1970s	More likely than not	Likely
Increased incidence of extreme high sea level (excludes tsunamis)	More likely than not	More likely than not	Likely

Source: IPCC, 2007: 9

For land use planning and appropriate development strategies for city climate change information needs to be available at regional or local resolution. Most climate change models do not allow a down-scaling to regional and local scales. Even at the EU or national level, climate change scenarios do have a relatively coarse resolution. The Green Paper of the European Commission (EC, 2007) for example includes various figures and maps on temperature and precipitation changes likely to occur by the end of this century (EC, 2007: 7-8); however, these projections mainly allow a comparison of country profiles rather than an in-depth overview of sub-national or local level consequences. Thus, it is still a challenge to develop more precise scenarios about climate change at local and sub-national level.

3 Vulnerability as a starting point

3.1 Shifting the focus

Climate change and impact scenarios have been developed for some world regions (Latin America, Europe etc.) and some selected countries, often expressed in terms of time scales of 50-100 years. Although hazard assessment is an important prerequisite for risk assessment, one has to acknowledge that disasters triggered by natural hazards are not solely influenced by the magnitude and frequency of the hazard event (wave height, drought intensity etc.), but are also rather heavily determined by the vulnerability of the affected society and its natural environment (Birkmann, 2006; Bogardi/Birkmann, 2004; UN/ISDR, 2004). In this regard, Helmer and Hilhorst (2006) argue that the core insight that disaster studies can bring to climate-related research is that vulnerability is critical to discerning the nature of disasters (Helmer/Hilhorst, 2006: 2). The complex interactions between social, economic and environmental factors and the underlying causes of vulnerability have not been sufficiently captured yet (Thomalla et al., 2006: 43). Thus rather than focusing solely on hazards and their magnitude,

future concepts of human security to climate change also need to address the vulnerabilities of people, economic sectors, environmental goods and critical infrastructures as their starting point (see Birkmann, 2006; Bogardi/Brauch, 2005; and Bohle, 2001).

3.2 From impact to an integrative vulnerability assessment

Although there is a general agreement that vulnerability mainly describes the 'internal side of risk', thus the fragility of humans or elements exposed to hazards and their coping capacity or unusual difficulties in recovering, the climate change literature often encompasses a different understanding of vulnerability. The EC Green Paper 'Adapting to climate change in Europe – options for EU action' (EC, 2007) for example and the study of e.g. Zebisch et al. (2005) mainly define vulnerability assessments to climate change as exposure or impact assessments. Regions identified as most vulnerable - in Europe for example - are those which will probably experience major biophysical changes due to climate change, such as mountain areas, and regions in southern Europe or even Scandinavia (EC, 2007: 5). The assumption that the physical exposure to biophysical changes equals vulnerability is misleading, since the fragility and coping capacity of people and elements exposed will determine the overall vulnerability. For example, if farmers in mountain regions are able to adapt and cope with the various biophysical changes of climate change, e.g. by shifting economic activities or production patterns, the region will not be as vulnerable as a region experiencing only a slight shift in the biophysical conditions, but where its communities do have very limited coping and adaptive capacities. Therefore, a simple impact and exposure assessment needs to be enhanced to real vulnerability assessments which capture fragility, coping and adaptive capacities.

4 New Challenges for Civil Protection and Spatial Planning

4.1 Slow onset hazards require new modes of operation

Within the last few decades, civil protection has expanded beyond its original military context. Today, civil protection encompasses an integrated management, protection, rescue and relief system focusing on various hazards, including hazards of natural origin (see e.g. Swiss Federal Department of Defence and Civil Protection, 2001). A major challenge for civil protection is the fact that the response, preparedness and interventions for reducing climate change related disaster risk cannot be based on traditional mechanisms of managing emergencies during disasters and the recovery process. This is particularly the case with regard to creeping and slow-onset hazards, which are associated with permanent changes such as the rise in sea level. These emerging risks require new modes of operation and different monitoring and assessment tools. These slow-onset hazards and the medium and long-term impacts of climate change as well as the necessity to take into account vulnerability mean that civil protection must shift their focus from short-term disaster response and recovery towards a long-term strategy. Among other measures, this implies that awareness-raising, preparedness, and risk reduction have to be seen as priorities. Disaster policy response to climate change is also dependent on a number of factors, such as the readiness to accept the reality of climate change, the development of institutions and capacities, as well as the willingness to embed climate change risk assessment and management inside development strategies (O'Brien et al., 2006: 64-80).

4.2 Challenges for Spatial Planning

Spatial planning also requires new strategies and methodologies to incorporate climate change as a challenge for future development. For example the well known 'Environmental Impact Assessment' (EIA) for projects and plans encompasses a category 'climate'. However, its major focus is on the impacts of the project assessed on the climate. That means alternative projects/plans (e.g. a factory) are being evaluated with regard to their impact on the local, regional and global climate. Still missing and underdeveloped is the methodology on how to take into account a changing local and regional climate within the project assessment. That means current EIA focuses primarily on the project-environmental impact chain, rather than on the consequences of environmental change for the project. Therefore, a major task for the future is to define how climate change projections can be taken into account. Climate proofing is a catchy word but scientifically still not sufficiently developed. Climate change will require more adaptive structures and land use practices. This means more knowledge is needed on how to enhance adaptive capacities of communities and regions. This also requires a critical

review of the limitations of adaptation, such as physical limits, financial limits, feasibility limits and capacity limits (Arnell, 2007).

Literature:

Alexander, D. (2002) Principles of Emergency Planning and Management. Terra Publishing, Harpenden.

Arnell (2007) Characterising Dangerous Climate Change. Presentation at Human Dimensions of Global Environmental Change Post Graduate Workshop, Leeds. Available at <http://www.geog.leeds.ac.uk/projects/ccrg/events/leeds/NArnell.pdf>

Arnell, N.W.; Livermore, M.J.L.; Kovats, S.; Levy, P.E.; Nicholls R.; Parry, M.L.; Gaffin, S.R. (2004) Climate and Socio-Economic Scenarios for Global-Scale Climate Change Impacts Assessments: Characterizing the SRES Storylines. Global Environment Change 14, 3-20.

Birkmann, J. (Ed.) (2006) Measuring Vulnerability to Natural Hazards. United Nations University Press, Tokyo, New York, Paris.

Bogardi, J.; Birkmann, J. (2004) Vulnerability Assessment: The First Step Towards Sustainable Risk Reduction. In: Malzahn, D.; Plapp, T. (Eds.), Disaster and Society – From Hazard Assessment to Risk Reduction. Logos Verlag Berlin, Berlin, 75–82.

Bogardi, J.; Brauch, H.-G. (2005) Global Environmental Change: A Challenge for Human Security – Defining and conceptualising the environmental dimension of human security. In: Rechkemmer, A. (Ed.), UNEO – Towards an International Environment Organization – Approaches to a sustainable reform of global environmental governance, Nomos, Baden-Baden, 85–109.

Bohle, H.-G. (2001) Vulnerability and Criticality: Perspectives from Social Geography. IHDP Update 2/2001. Newsletter of the International Human Dimensions Programme on Global Environmental Change, 1–7.

EC (Committee of the European Communities) (2007) Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Adapting to climate change in Europe – options for EU action, Brussel.

Helmer, M.; Hilhorst, D. (2006): Natural disasters and climate change, in: Disasters 2006, 30 (1): 1-4

IFRC (International Federation of the Red Cross) (2005) World Disasters Report 2005: Focus on information in disasters. IFRC, Geneva.

IPCC (Intergovernmental Panel on Climate Change) (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 10th Session of WG I of the IPCC, Paris.

O'Brien, G.; O'Keefe, P.; Rose, J.; Wisner, B. (2006) Climate change and disaster management. Disasters 30 (1), 64-80.

Stern, N. (2007) The economics of climate change: the Stern Review. Cambridge University Press.

Swiss Federal Office for Civil Protection (2001) Civil Protection Concept, Report of the Federal Council to the Federal Assembly concerning the new Civil Protection Concept. Federal Office for Civil Protection, Bern, Switzerland. Available at <http://www.bevoelkerungsschutz.admin.ch/internet/bs/en/home/themen/Verbundsystem.ContentPar.0002.DownloadFile.tmp/cp-concept-e.pdf>

Thomalla, F.; Downing, T.; Spanger-Siegfried, E.; Han, G.; Rockström, J. (2006) Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation. Disasters 30 (1), 39-48

UN/ISDR (United Nations International Strategy for Disaster Reduction) (2004) Living with Risk: A Global Review of Disaster Reduction Initiatives. 2004 Version, UN Publications, Geneva.

Van Aalst, M. (2006) The impacts of climate change on the risk of natural disasters. Disasters 30 (1), 5-18.

Zebisch, M.; Schröter, D.; Grothmann, T. (2005) Climate Change in Germany - Vulnerability and Adaptation of Climate-Sensitive Sectors. Research report, commissioned by the Federal Environmental Agency, Berlin, Germany.