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Vulnerability and Human Well-being

Report of a workshop in preparation of GEO-4

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CEMEDE Universidad Nacional

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Rapport in het kort

Kwetsbaarheid en welzijn

In dit rapport worden verschillende concepten van kwetsbaarheid (‘vulnerability’) in relatie tot milieu veranderingen en welzijn verkend. Dit is het resultaat van een driedaagse workshop over kwetsbaarheid en welzijn, georganiseerd in januari 2005. De workshop was erop gericht om de ontwikkeling van het hoofdstuk ‘Challenges and Opportunities’ in de ‘Global Environment Outlook 4’ (GEO-4) [1] van UNEP te ondersteunen. Verschillende concepten van kwetsbaarheid en regionale case studies zijn gepresenteerd samen met presentaties over armoede, gezondheid, bestuur, wetenschap & technologie en handel (onderwerpen die UNEP belangrijk vindt voor dit hoofdstuk).

Trefwoorden: Milieu, ‘Global Environment Outlook,’ Kwetsbaarheid, welzijn, ontwikkeling

[1] De GEO serie is de prominentste milieu assessment serie van de United Nations Environmental Programme (UNEP). Begin 2005 was het vierde rapport (GEO-4) in ontwikkeling. Dit zal gepubliceerd worden in 2007.

Abstract

Vulnerability and Human Well-being

This report explores different concepts of human vulnerability in relation to global environmental change and human well-being. It presents the results of a three day workshop on 'Vulnerability and Human Well-Being' organised in January 2005. The meeting facilitated the development of a chapter on 'Challenges and Opportunities' in UNEPs Global Environment Outlook 4 (GEO-4).[2] Different concepts of vulnerability and regional case studies were presented and also the issues of poverty, health, governance, science & technology and trade (issues UNEP considers important for inclusion in this chapter) were elaborated on.

Keywords: Environment, Global Environment Outlook, vulnerability, human well-being, development

[2] The GEO is the United Nations Environmental Programme's (UNEP) flagship assessment report series. Early 2005 the fourth report (GEO-4) was in the making, to be published in 2007.

Preface and Acknowledgements

Between 31 January and 2 February 2005 a workshop on vulnerability and human well-being took place to support the development of the 'Challenges and Opportunities' chapter in the Global Environment Outlook 4 of UNEP. The workshop was held in Nicoya, Costa Rica, and organised by the Mesoamerican Center for Sustainable Development of the Dry Tropic (CEMEDE) in Costa Rica and the Netherlands Environmental Assessment Agency (MNP-RIVM) in the Netherlands. It was organised in close cooperation with, and support of UNEP's Division of Early Warning and Assessment (DEWA)[3], and endorsed by the Global Environmental Change and Human Security project (GECHS) of the International Human Dimensions Programme on Global Environmental Change (IHDP)[4].

We like to thank all the participants for taking part in this workshop. Their active contribution has been of great importance in starting the work on the 'Challenges and Opportunity' chapter. We also like to thank Alexander Lopéz for taking care of the organisation of the workshop in Costa Rica and for letting us use of the facilities of CEMEDE in Nicoya. Finally we like to thank Jill Jäger for her comments on the draft version of this report

[3] http://www.unep.org/dewa/
[4] http://www.gechs.org/index.htm

Contents

1. Introduction

In recent years, several concepts of vulnerability have been developed within the field of environmental assessment and sustainability science. Although attempts have been made, so far few assessment frameworks have been able to go well beyond environmental impact assessment and look at the vulnerability of human-environment systems to multiple stresses on multiple scales. The benefit of doing this is however evident as environment stress is usually only one of various stressors causing systems to be vulnerable. For the Global Environment Outlook 4 (GEO-4), to be published in 2007, the United Nations Environmental Programme (UNEP) wants to apply the concept of vulnerability for the assessment of cross-cutting issues relevant for achieving transitions to sustainable development. This will be done in a chapter titled 'Challenges and Opportunities'. The cross-cutting issues, i.e. issues transcending the single domains of sustainability, which will be covered are poverty, health, governance, science and technology, and trade.
Human well-being will also be a point of focus in this chapter. It is increasingly recognised that safeguarding or enhancing human well-being, now and in the future, is an important aspect of sustainability. Therefore, human well-being needs to be a central element of vulnerability analysis.

To explore the vulnerability framework for the analysis of cross-cutting issues within the context of GEO-4, a scientific meeting was organised. The workshop looked in depth at:
- the various concepts and frameworks that currently exist in the field of vulnerability research;
- the relation between vulnerability and human well-being;
- the applicability of the vulnerability framework for the analysis of the selected cross-cutting issues.

The final aim of the meeting was to come up with a consistent approach to assess the cross-cutting issues that will be used in GEO-4. Points of attention were the quantitative assessment of vulnerability, regional analysis and implications for the global scale, and assessment of past and future trends.

This workshop report is structured as follows. First some general information on GEO will be provided. Next in chapter 3 – 5 concepts to analyse vulnerability, regional case studies and the five cross-cutting issues that are prioritised for GEO-4 will be covered. Chapter 6 concludes this report with a summary of the main discussions and conclusions of the meeting.

2. Global Environment Outlook (GEO)

During 2004 the design of GEO-4 was getting shape. From early on it was clear that GEO-4 would take a broad view on environmental problems, and also look at socio-economical and institutional aspects. This is clearly illustrated by the theme of the fourth report: 'Environment for Development'. One chapter in particular would elaborate on this in more detail, the 'Challenges and Opportunities' chapter. The GEO-4 Design Meeting in November 2004 was in effect the starting point for a number of groups to start the development of the different chapters. The workshop in Nicoya was organised to contribute to the further development of the 'Challenges and Opportunities' chapter, from a scientific perspective. Attended by scientist with different fields of expertise, the aim was to come up with recommendations for the most appropriate manner to assess the topics in this chapter.

Many of the participants were not yet familiar with GEO and the progress made on GEO-4 at this stage. To explain the context of this chapter in more detail, an introduction was given on GEO. This section of the report provides more information on the Global Environment Outlook (GEO)[5] and the work done on vulnerability so far.

2.1. Background information on GEO and the *'Challenges and Opportunities'* Chapter

In short, UNEP's mandate is to keep the environmental situation under review, by assessing and reporting on the state of the world's environment. The GEO process was started in 1995 at the request of the UNEP Governing Council. With three reports published to date, it is UNEP's key report on the state of the world's environment. For GEO-4, UNEP's Governing Council recommended to emphasise the importance of addressing sustainable development more clearly through the assessment of cross-cutting issues, issues that transcend the single domains of sustainable development (economic, environmental, institutional and social). Poverty, governance and trade are issues at the core of the sustainable development debate, and therefore need to be included in environmental assessments.
The GEO process itself is a participatory bottom-up process, which aims at facilitating the interaction between science and policymaking. A global network of collaborating centres, NGOs, institutes and governments are involved in this process. The consultation of all these constituencies leads to the decisions on what environmental issues to look at in the report. Additionally, an important aspect of the GEO process is the capacity building element. This workshop can contribute to the GEO process by highlighting what the scientific community expects GEO to look at.

Marion Cheatle from UNEP HQ and project leader of GEO-3 presented some lessons learned from the preparations of a chapter on vulnerability in GEO-3. This chapter focused on human vulnerability to environmental change [6]. In GEO-3, Chapter 3 came as a logical follow up on Chapter 2. Chapter 2 dealt with the state of the environment, highlighting the most pressing environmental issues. These issues were meant to set the stage for Chapter 3, which should build upon the environmental problems, through explicitly considering the social and economic domains. An attempt was also made to develop a Human Vulnerability Index, comparable to the Human Development Index of the UNDP. However the chapter did not achieve its initial goal, and did not go very far beyond a review of concepts, issues, methods and case studies.

5 http://www.unep.org/geo/
6 http://www.unep.org/geo/geo3/english/pdfs/chapter3_vulnerability.pdf

The cumbersome process for developing this chapter was the main reason why in GEO-3 the vulnerability chapter didn't achieve its goals. The main lessons learned from GEO-3 can be summarised as followed:

- plan from the start, as an integral part of the assessment;
- ensure clear definitions and a common understanding of purpose and goals;
- define the scope and boundaries;
- define the key questions;
- develop a clear conceptual and analytical framework;
- get the best possible experts.

Lessons which could very well prove valuable in the current development process of the Challenges and Opportunities chapter.

Jill Jäger and Marcel Kok explained that the work (together with Vishal Narain who was unable to attend) on the Challenges and Opportunities chapter had started in November 2004 with discussions during a GEO-IV design meeting held in Nanyuki, Kenya. The idea is that the focus of this chapter will be on human-environment interactions, using a vulnerability lens to analyse the five cross-cutting issues to be covered in this chapter (poverty, health, institutions, science & technology and trade). These five were selected on the basis of a number of regional consultations, which took place before the workshop that prioritised issues at a global or regional level. A first-draft storyline was developed and was input for this meeting. Based on this meeting the storyline will be revised and then turned into an annotated outline.

3. Concepts of vulnerability

The Challenges and Opportunities chapter has a broad scope compared to the other chapters in GEO-4. It will cover a wide range of topics related to socio-economic, institutional and environmental aspects, as was explained in section 2. This requires an analytical concept that enables the assessment in a consistent and integral manner. Aimed at establishing a firm analytical base for this chapter, the Nicoya meeting was attended by many experts in the field of sustainability and vulnerability research. They presented their work related to vulnerability and elaborated on the possible applicability for GEO-4. This section gives a summary of the different concepts of vulnerability that were presented at the meeting.

3.1. Vulnerability approach (Roger Kasperson[7])

In this presentation the vulnerability framework developed by the Stockholm Environmental Institute (SEI) and Clark University was presented. It is a comprehensive conceptual framework, incorporating socio-economic factors that shape vulnerability and it takes into account that vulnerability is to a large extent scale specific. The framework was published in PNAS (Turner et al., 2003a).
However, no practitioner can do a full vulnerability analysis, and therefore a simpler version of the conceptual framework was produced. This was applied on three cases studies, which were also published in PNAS (Turner et al., 2003b). The conceptual framework describes vulnerability as a combination of exposure – sensitivity – resilience (See Figure 1).

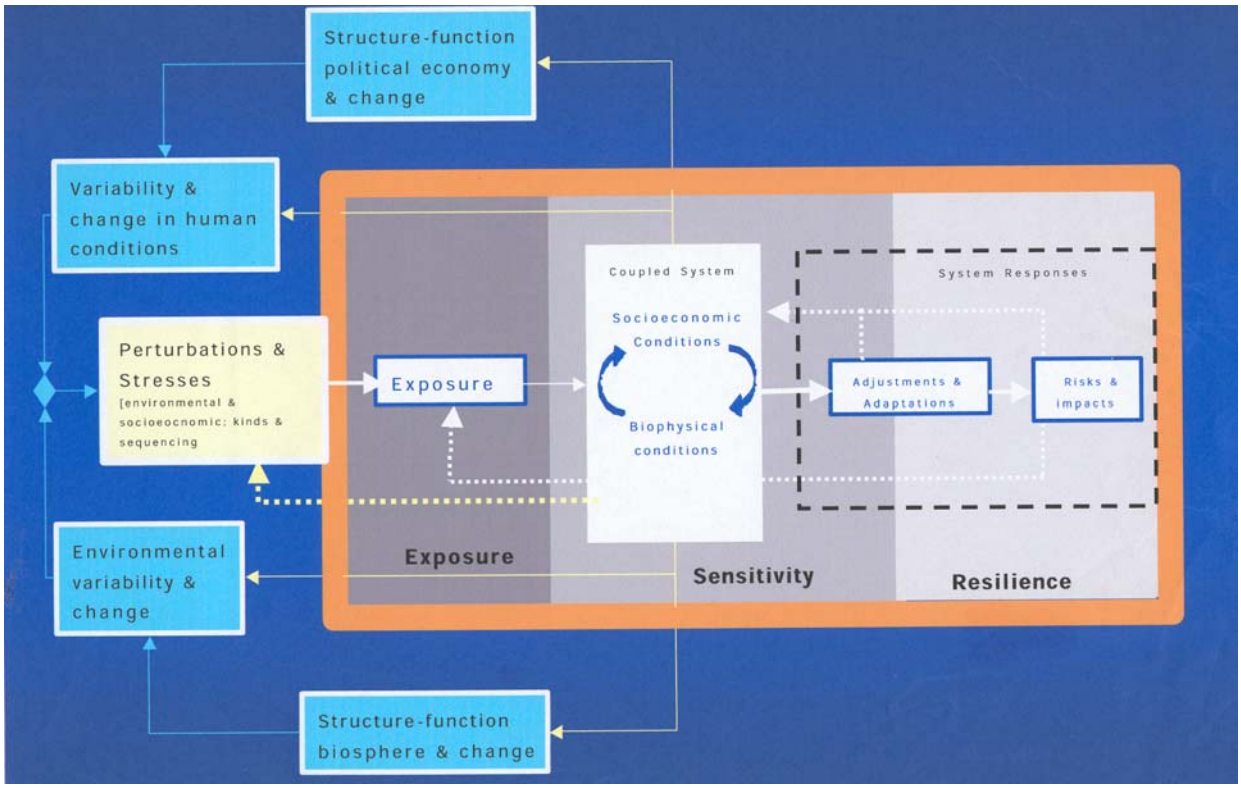

Figure 1: The simplified vulnerability framework- Coupled Human – Environment System & Linkages (taken from Roger Kaspersons' presentation).

Foremost, vulnerability assessment is not an end in itself. The main reason to use it is for integrated risk assessment of regional environmental change. Is the problem one of stresses or of vulnerability, e.g. with volcano risk you can't do much about the stress so concentrate on vulnerability.

[7] Clark University

Elaborating in detail on the concept, different problems surround the assessment of vulnerability were highlighted:
- Multiple stresses – complex of stresses from human driving forces and natural variability;
- Human driving forces might also be a cause of socio-economic vulnerability;
- What is the unit of analysis - coupled human – environment systems are basic unit of analysis;
- Iterative and cumulative effects – co-evolution of system;
- Cross-scale dynamics – stacked spatial and temporal interactions.

In the last two decades or so a large set of research has been undertaken, but this has not resulted in cumulative build up of knowledge with regard to the assessment of vulnerability. Lots of case studies have been done but with many different conceptual frameworks. In this respect Kasperson emphasised the need to find a common conceptual framework to enable a further increase of knowledge.

Considering most of the vulnerability assessments that have been done, the following can be said:
- Few analyse across human and ecological systems;
- Multiple stresses are rarely treated;
- Vulnerability not explicitly analysed;
- Indicators and indexes are unvalidated;
- Analysis usually largely static;
- Scale interactions are not captured;
- Causal structure remains opaque or unassessed;
- Cumulative effects are not included;
- As yet little linkage to management options.

Concluding with the notion that all conceptual frameworks need to be rooted in theory, the presentation ended with some guiding statements about research strategies for the GEO process itself:
- Open systems approaches;
- Natural experiments;
- Reanalysis of case studies using new conceptual frameworks;
- Best practices success stories;
- Learning from extreme cases;
- Inverse approaches;
- What kind of science: mandated, consensual, adversarial (advocacy) – some people don't want to know about vulnerability.

3.2. Syndrome approach (Gerhard Petschel-Held[8])

The Syndrome Approach was developed by the German Advisory Council on Global Change (WBGU) and the Potsdam Institute for Climate Impact Research (PIK).
Gerhard Petschel-Held described the general idea and methodology of the approach and some examples based on a set of syndromes proposed by the WBGU. The presentation was concluded with some final remarks about the potential use of the concept for GEO.

In short, the main challenge of the assessment is dealing with global and plural aspects of Human-Environmental Systems. Environmental changes are caused by a plurality of factors and their interactions vary widely across the globe. Differences in the economy, the socio-political regimes, but also in the natural environment bring about a plurality of human-environment systems. Within the Syndrome Approach a typology of these systems is pursued with an emphasis on non-sustainable patterns.
Using case studies to define the topology of the human-environment systems, a global picture of Syndromes can be created to get some ideas about this at the global level. Traditional geography would

[8] Potsdam Institute for Climate Impact Research

call them landscapes. This catalogue of syndromes can help identify areas where there is a strong sense of unsustainability.

The process can be described by the following steps:
- *Catalogue of Syndromes*; formulate patterns by qualitative analysis of case studies, expert elicitation, and communication;
- *Network of Interrelations*; processes and mechanisms within a syndrome in a systems analysis approach;
- *Intensity*; assess and indicate where a syndrome takes place in the recent past;
- *Disposition*; under which slowly changing conditions can a syndrome take place (e.g. Climate, Culture, Economic structures, etc.).

The table below gives an overview of the syndromes that have been identified.

Table 1: The syndromes and their basic characteristics (Lüdeke et al., 2004).

Syndrome name	Short description of the mechanism
Utilisation syndromes	
Sahel Syndrome (*)	Overcultivation of marginal land.
Overexploitation Syndrome (*)	Overexploitation of natural ecosystems.
Rural Exodus Syndrome	Environmental degradation due to abandonment of traditional agricultural practices.
Dust Bowl Syndrome (*)	Non-sustainable agro-industrial use of soils and water.
Katanga Syndrome	Environmental degradation due to depletion of non-renewable resources.
Mass Tourism Syndrome	Development and destruction of nature for recreational ends.
Scorched Earth Syndrome	Environmental destruction due to war and military action.
Development syndromes	
Aral Sea Syndrome (*)	Environmental damage to natural landscapes as a result of large-scale projects.
Green Revolution Syndrome (*)	Environmental degradation due to un-adapted farming methods.
Asian Tiger Syndrome (*)	Disregard for environmental standards in the context of rapid economic growth.
Favela Syndrome (*)	Environmental degradation due to uncontrolled urban growth.
Urban Sprawl Syndrome	Destruction of landscapes due to planned expansion of urban infrastructure.
Disaster Syndrome	Singular anthropogenic environmental disasters with long-term impact.
Sink syndromes	
High Stack Syndrome	Environmental degradation as a result of large-scale dispersion of emissions.
Waste Dumping Syndrome	Environmental degradation due to controlled and uncontrolled waste disposal.
Contaminated Land Syndrome	Local contamination of the environment at industrial locations.

During the presentation some of these Syndromes were discussed in more detail, to explain the dynamics behind it. The map below shows the distribution of the different syndromes over the world. Syndromes can overlap, which can be seen for example in Asia.

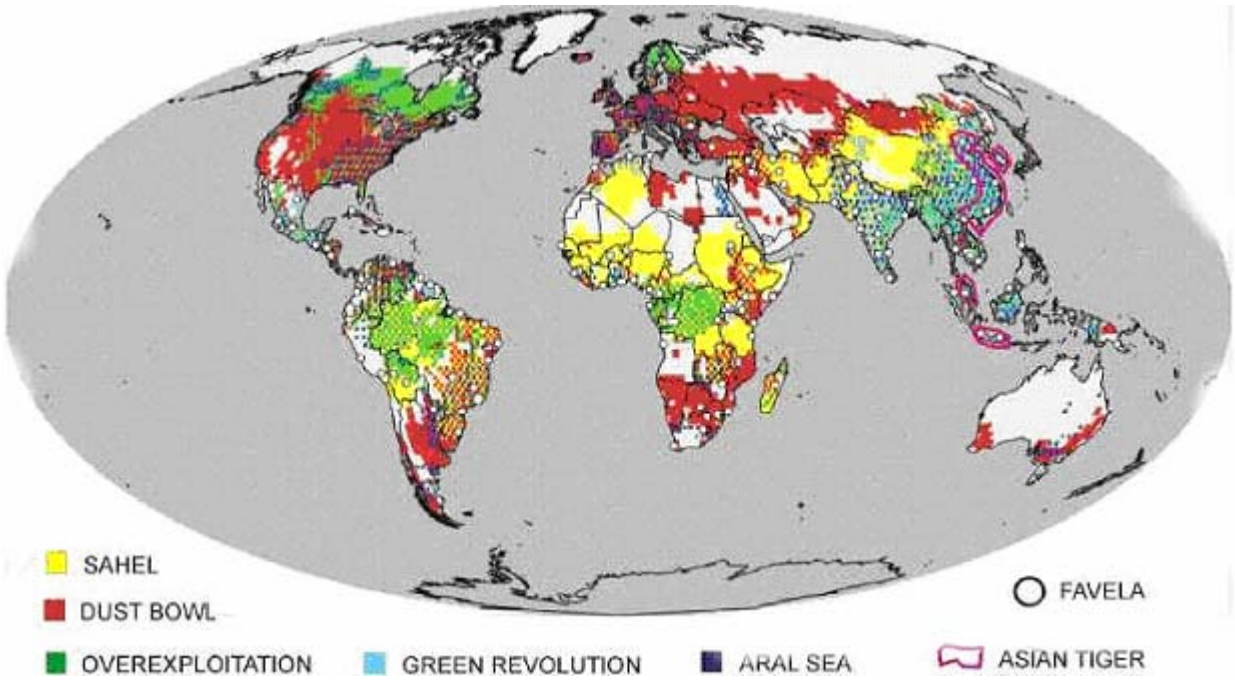

Figure 2: Global distribution of 7 Syndromes (taken from Gerhard Petschel-Held's presentation).

When considering the different syndromes it became clear that the dynamics of a syndrome is usually caused by 4-6 core processes. It is therefore important to define conditional indicators and look for the basic processes that drive these dynamics.

Some points for improvement of the Syndrome Approach:
- Have more expert-stakeholder dialogues (regional) like ECLAC has done;
- Move from more scientific analysis to stakeholder dialogues – learning between regions (e.g. urban sprawl syndrome in Europe);
- The need to accompany diagnosis with prescription of treatment; Syndrome as a term leads to the response that if you know what the problem is, you also know the solutions, which is often not the case;
- The names of the syndromes do not always give the right impression, such as calling a problem in Latin America a Sahel Syndrome;
- The location of the syndrome in the map may not be the location of the causes and stresses of this syndrome; Responsibility for driving forces is often elsewhere – e.g. where does the overexploitation really come from; Two maps may be necessary, with the syndrome and the causes separately.

3.3. Resilience approach (Emma Tompkins[9])

The resilience approach was developed by individuals who have come to be collectively known as the Resilience Alliance. The Resilience Alliance was established in 1999 and brings together understanding of both social and ecological resilience. The notion of 'Resilience' as the capacity of a system to absorb disturbance, undergo change and still retain essentially the same function, structure, identity, and feedbacks was presented by Emma Tompkins.

The definition of resilience distinguishes between ecological and social resilience. Ecological resilience is defined as: *Stability of an ecosystem to enable it to absorb changing levels of environmental perturbations before it changes state.* Social resilience depends on: *i) Ability to deal with shocks; ii) Capability to self-organise; iii) Capacity for learning and adapting.*

[9] University of East Anglia

Determinants of resilience are widely thought to be:
- self-efficacy;
- knowledge (and skills to process it);
- technology;
- institutions (political, social…);
- infrastructure.

Her experience with the application of the resilience approach has given her doubts about the way it is often being used. The presentation elaborated on those aspects, highlighting that the assessment of resilience is not as straightforward as often assumed.

Regardless of the determinants, there are limits to resilience to hazards. This can be demonstrated by our inability to cope with extreme events e.g. Hurricane Ivan in the Caribbean, the tsunami in Southeast Asia, even with advanced preparedness there would have been damage.

Three problems are important with regard to the application of the resilience approach:

i) *scale*. The concept of social resilience was developed at the community level, and refers to the ability of a social group to co-exist with an ecosystem that benefits are generated for the social group and the ecosystem. There has been little or no work looking at resilience at different scales. If the scale level is too high most of the details determining resilience are lost and the results are trivial. Therefore it is not well applicable at a meta-level. The question remains; what do we know at different scales?

At what scale?	*Determinants*
Resilient individuals	Psychological/physiological
Resilient communities	Self-efficacy vs. wealth
Resilient nations	Institutions, governance and economy
Resilient planet?	GAIA?

ii) *Resilience to small environmental changes versus resilience to extreme events and significant change.* Resilience is often applied as a generic term, meaning generally resilient, without any consideration of 'resilience to what?' A community that is resilient to localised flooding may not be resilient to extreme heat stress or to a change in the growing seasons. Resilience to large changes could be different to small changes. There is a clear difference between coping with small changes (such as changed frequency of storms) and adapting to large changes (significant shifts in growing seasons or rainfall patterns). Coping is a one-off change in behaviour. Adaptation is a permanent change in behaviour, and also implies a change in values.

iii) *Anomalies in the theory*. The discrepancy between vulnerability and resilience. Poor isolated communities already exposed to risk are clearly vulnerable, (e.g. Orkney Islands) however they exhibit all the characteristics of resilience i.e. high social cohesion, high degrees of self efficacy. Wealthy communities with previous low exposure are clearly not vulnerable, yet because they have low levels of social cohesion they are also not resilient e.g. Christchurch Bay, expats, French heat wave?

In understanding and building resilience a number of points are important for the assessment of resilience:
- One size fits all does not work;
- Clarify meaning of resilience at all scales;
- Resilience to what - differentiate between coping and adapting;
- Focus on measurability;
- Explore anomalies;
- Focus on the enabling and constraining institutional environment;
- Macro-economic resilience – what do we know?
- Planetary resilience – role of international regimes?

4. Case studies from different regions

In the field vulnerability, related concepts have been used in various locations throughout the world. These case studies give valuable information about practical aspect related to the assessment and the results can also show the applicability of different approaches with respect to GEO-4. During the meeting five case studies where presented from different regions, of which the summaries can be found below.

4.1. Southern African Vulnerability Initiative (SAVI) (Mike Brklacich[10])

The Southern African Vulnerability Initiative (SAVI) began in 2003 as a pilot project with an overall vision of enhancing human security amongst populations most vulnerable to social, economic and environmental stresses within the southern Africa region. The specific goals of the initiative are to develop an integrated framework for understanding vulnerability to multiple stressors in southern Africa, to develop a proposal for a longer-term applied research initiative, and to build partnerships between practitioners and scientists in the region in order to implement a comprehensive vulnerability research program. SAVI was initiated by the Global Environmental Change and Human Security (GECHS) project and is funded by the International Council for Science (ICSU) and the International Human Dimensions Programme (IHDP). In 2003-04, the project brought diverse practitioner and academic communities together for two international workshops: SAVI-1 in Maputo, Mozambique (June 19-21, 2003) and SAVI-2 in Cape Town, South Africa (Oct 11-12, 2004). Findings from these 2 workshops are summarized below.

In southern Africa, environmental stresses are linked in complex ways with multiple processes of change taking place at multiple temporal and spatial scales. These processes include HIV/AIDS epidemics, conflicts, economic globalization, urbanization, and institutional changes. Studies of human vulnerability to environmental stress, however, have focused predominantly on single stressors, accounting for neither simultaneous societal transition nor human capacity for response. Nevertheless, practitioners working in the region have long been aware of the interactions and intersections among stressors, and agreed that human vulnerability is generated as societal and environmental stressors converge and shape the uneven outcomes and response capacities of different individuals and groups. It was emphasized repeatedly that vulnerability is a highly contextualized concept that must be framed within political, social, economic, and historical realities of specific locations, and that 'depoliticizing' vulnerability risks ignoring the social relations and political structures that support and feed it. It was also recognized that both societal and environmental transformations are ongoing processes, and that vulnerability is therefore inherently dynamic and related to unequal distribution of both power and entitlements within communities, nations, regions, and the global system. A key challenge for SAVI is to integrate vulnerability research with policy formulation, and building and reinforcing a partnership between the science and practitioner communities (See Figure 3).

[10] Carleton University

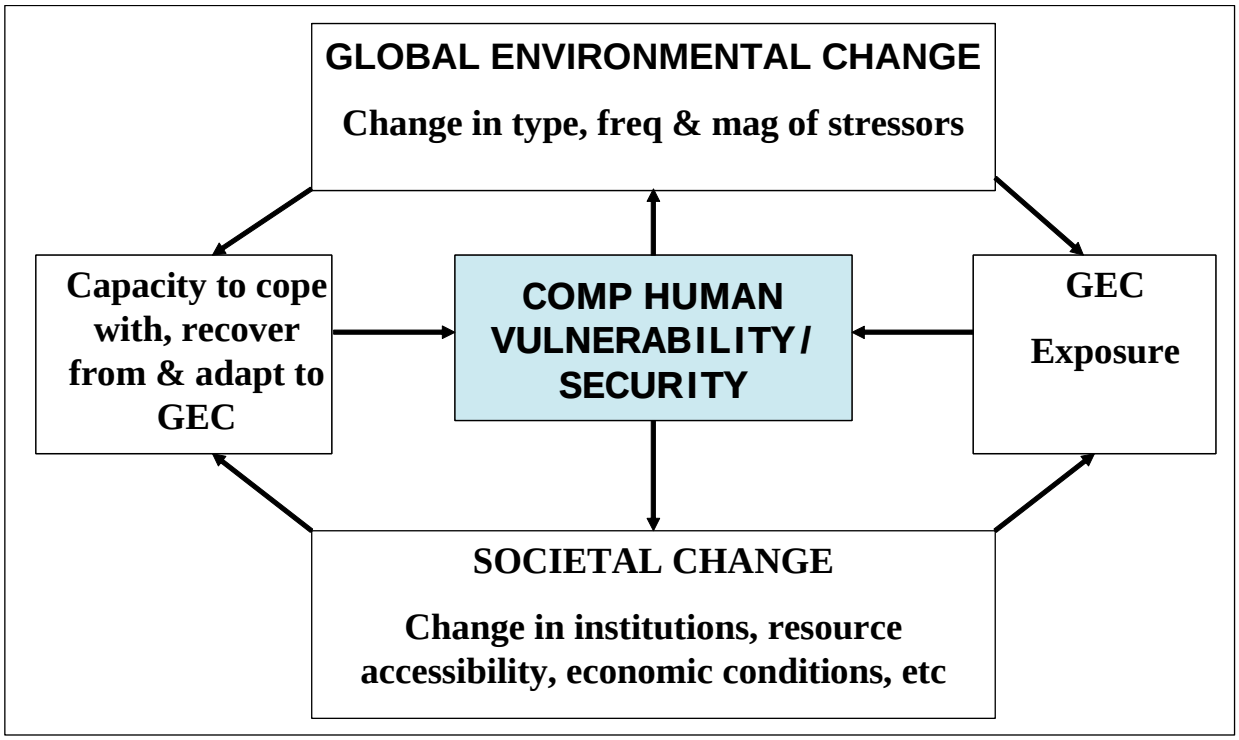

Figure 3: Building a framework to link Global Environmental Change and Vulnerability Research (taken from the presentation of Mike Brklacich).

Many initiatives are in place in southern Africa to understand human vulnerability and it is crucial that SAVI build upon this work through applied research that contextualizes vulnerability within multiple and ongoing processes of change. To this end, the following guidelines have been developed to assist with understanding vulnerability to multiple stressors, to enable communication between and amongst scientists, practitioners and wider communities, and to contribute to the development of vulnerability sciences.

The SAVI framework needs to:
- be driven by a theoretical model of change, where disequilibrium and change are regarded as the norm rather than as an anomaly;
- focus on how multiple stressors intersect and interact to influence both outcomes and responses to change;
- address the dynamism of vulnerability; it should incorporate how responses to current processes of change will influence vulnerability to future stressors;
- facilitate communication between scientists and individuals or organizations responsible for practical interventions (i.e., practitioners), to produce scientific and strategic knowledge;
- to build capacity within institutions and communities in the region to assess and address vulnerability;
- enable methodological development in order to produce comparable results from detailed, empirical, place-based research.

Additional lessons learned and reinforced
Shift vulnerability assessments away from focusing on mapping vulnerability toward understanding why vulnerabilities are generated and mechanisms for enhancing human security.

Vulnerability initiatives are not embraced by the policy community for a variety of reasons, making it hard to find points of entry into policy community. One of the root causes is the negative message it conveys. Furthermore, one person's vulnerability is another person's security, e.g. the slum dweller vs. the landlord. It is not possible to depoliticize vulnerability.

The complexity of understanding vulnerability is in contrast to the need for transparency and understandable explanations. This emphasises the need to move towards a comprehensive vulnerability – security framework.

For capacity building it is best to move the project into the regions. Who are the practitioners to include: be careful not to include overloaded people.

GEO-4 and SAVI have a common ground:
- Human well-being;
- Multiple stresses;
- Current and future stresses;
- Human vulnerability – security continuum.

However, SAVI is not going to deliver in time for GEO-4

4.2. Adaptation to Climate Change in the Drylands of West Africa[11] (Ton Dietz[12])

Based on climate analysis for the 1960-1994 period variability was shown to be high, and between 1970 and 1985 with a major downward trend in the Sahel, but after 1985 an upward trend again. Comparing 1930-1960 and 1960-1994 a major shift in aridity zones southward could be proven. Based on climate predictions for 1990-2030: increased drought risk and further aridity shift southward.
The social impact study of this variability and negative trend was based on intensification theory, with attention to the portfolio of options: direct food intensification, indirect food intensification (via external markets, using positive caloric and other terms of trade), marketing of non-agricultural products, and services, selling labour (sending remittances), social security arrangements, improved food storage, stealing food, and lowering food demands). It could be seen that as a trend, and during drought years in particular, the first two options become less important, and all others become more important.
It is important to differentiate risks of climate change. Climate change means a gradual change to higher temperatures and hence higher evapotranspiration; changing rainfall regimes; change of ecozones, agro-ecozones, and biodiversity and crop niches, with impact on livelihood options; and higher chances of extreme weather events (droughts, floods, storms). Types of risks: species extinction; human and animal death; damage to property and physical infrastructure; threatened livelihoods; lower resilience; lower innovative capability, and lower (insurance) buffers.
The Sahel has always been a vulnerable agricultural, livestock and now increasingly mixed agricultural area, with increasing drought-prone conditions. People have developed 'normal' seasonal and general coping mechanisms, and an adaptation capability, with 'normal' support networks. The major challenging research and policy question is: what happens during more extreme conditions? Attention should also be given to the social differentiation of the impact of drought: increased vulnerability hits the poor more than the rich, but the poor are more risk-averse, and have less taboos with regard to extreme coping behaviour. Extreme shocks/disasters can devastate the rich as well as the poor. But the rich are generally better protected physically, socially and economically. Diversification is a key strategy. However, the poor have a poverty-driven diversification profile and the rich an opportunity driven diversification profile. Both the rich and the poor have multi-spatial and multi-sector livelihoods, but middle-level wealth groups are most vulnerable to shocks. Particularly vulnerable are one-place, economic specialists, dependent on external markets, and with relatively low buffers. To study these trends a vulnerability framework was used and a pathway analysis was made (See Figure 4).

[11] Based on the results of the ICCD Project, funded by the Netherlands Research Programme on Global Air Pollution and Climate Change; a collaboration between CERES, Wageningen UP, RIVM, and West African scholars, coordinated by Ton Dietz, Ruerd Ruben and Jan Verhagen, with as its major result a book, *The impact of climate change on drylands, with a focus on West Africa*; Kluwer academic publishers 2004. Also submitted to Disasters.
[12] University of Amsterdam

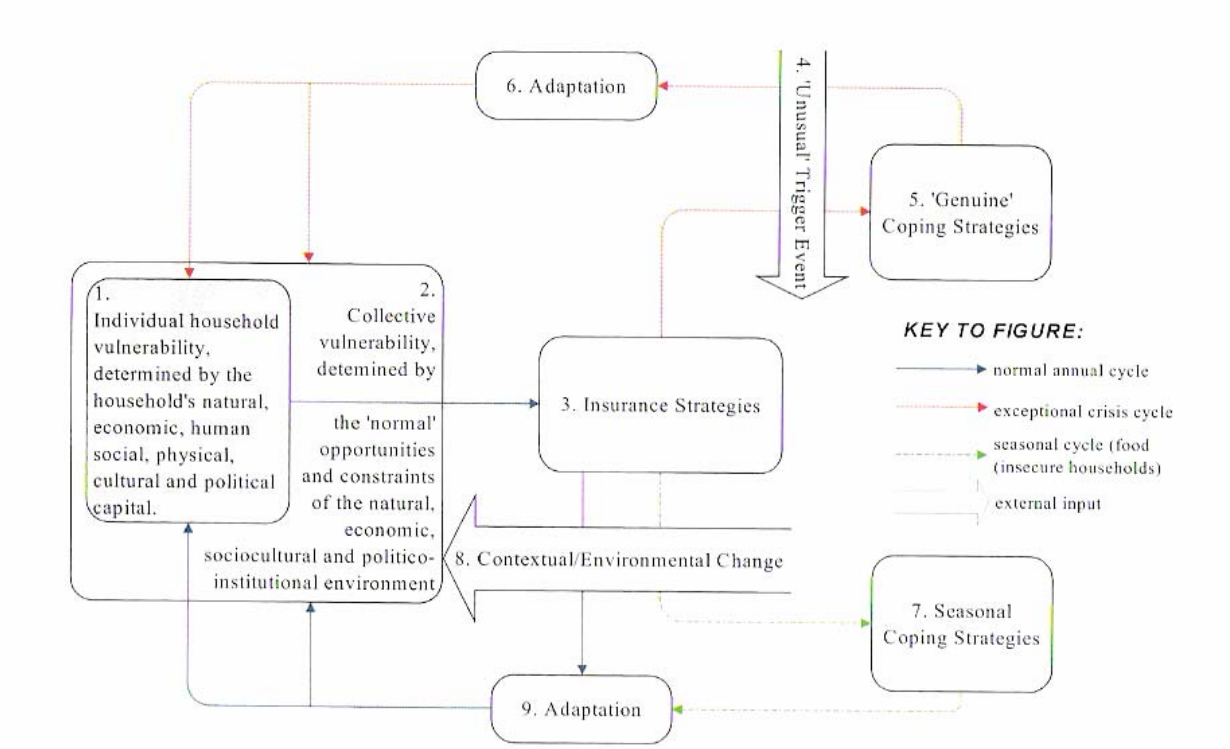

Figure 4: Conceptual framework: Farm household vulnerabilities and responses to normal opportunities and constraints, unusual events and changing conditions (Taken from the presentation of Ton Dietz).

As an example northern Ghana was presented. Indeed, there are strong signs of climate deterioration and changing behaviour there. The evidence given was: dryer natural environment: more ´northern´ species, traditional species disappear (including some important economic trees); lower reliability of the seasons; shift towards later start of the planting season; more dry weeks during the agricultural season; more sudden floods; more early-maturing, drought tolerant varieties, shift to riverine fields and fields in former marsh lands; more diversified portfolio of fields; more seasonal rivers; earlier stagnant water pools (malaria!); more salty water sources; growing importance of goats; higher reliance on irrigation and on niche crops (onions, tomatoes); shifts to other water-harvesting methods; southern shift of the cotton belt; and water table in wells lower. There is a strongly increased farmers' willingness to invest in soil and water enhancing environmental management and on-farm tree planting, higher labour input and during bad seasons a shift from cereals to legumes. There is much higher dependence on remittances from elsewhere; a much higher migration (seasonal and casual, but also permanent) to 'down south', even during the cropping season at home ('hunger trips') and much more emphasis on social networks and social security arrangements, as well as a more powerful position of rich families.
Attention should be given to the massive redistribution of people in West Africa (and in Africa as a whole), with very fast urbanisation, emptying of problem areas, and >400% increase of the population of most of the coastal area since the 1960s. Many of the poverty and vulnerability problems are also urban now, and directly and indirectly linked to the problems of drought, and climate change in the drylands of the continent. Understanding migration is very important as part of studying people's adaptations.

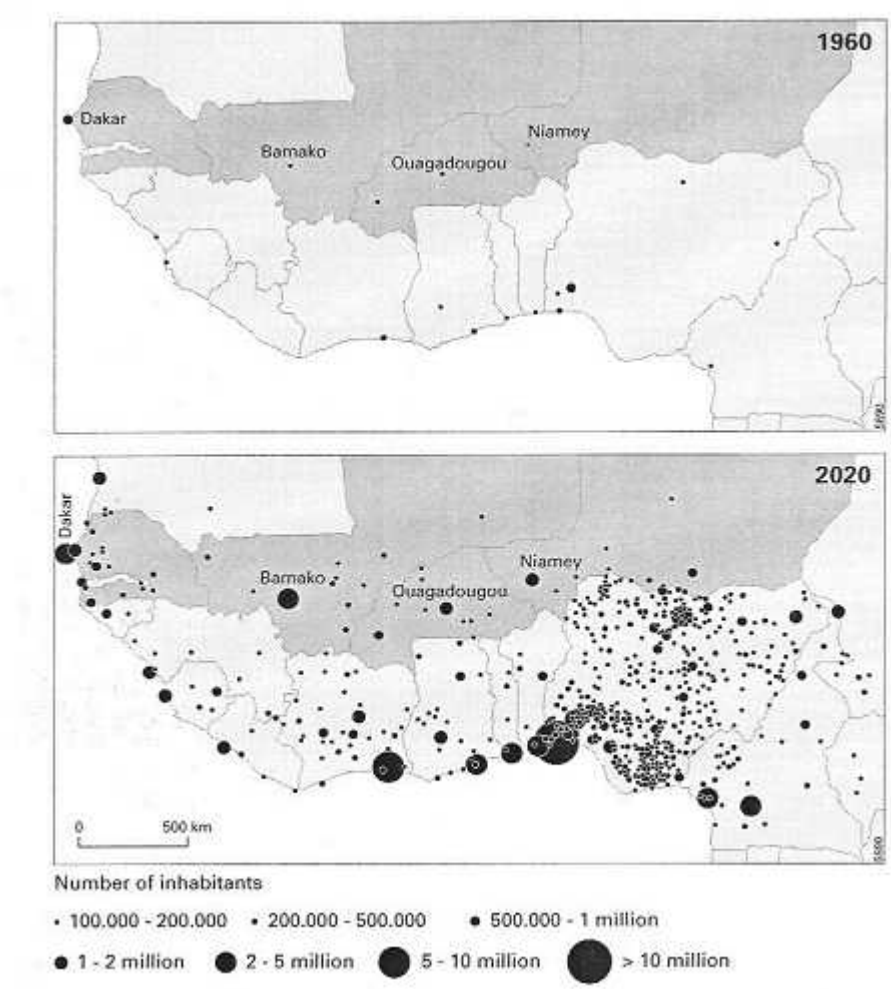

Figure 5: Urbanisation in Western Africa, 1960 and 2020 (taken from the presentation of Ton Dietz).

Urbanisation prospects until 2020 are alarming. The worrying thing is the speed of urbanisation and the weak economic basis, rural poverty becomes extreme urban poverty. Population with general education who can't get any job use their intellect to join the problematic informal sector. Due to this massive urbanisation, the problems will be urban not rural in 2020 (See Figure 5).

Finally the results of a prioritisation exercise were summarised, Sahelian scholars played a key role, in this exercise, which was done as part of the ICCD project.
Policy priorities, according to a West African expert panel:

- Better early warning systems and better communication;
- Integrate knowledge about changing nature and changing behaviour;
- Develop more adaptive agricultural, pastoral, sylvicultural and horticultural practices (and support 'northern nature and crops' moving south);
- More attention to and support for social security networks and for diversified livelihood profiles;
- More attention to migration and to the role of remittances;
- More attention to entitlement changes (e.g. land, water and forest rights) and to conflict prevention between groups with different identities (e.g. cultivators vs. herders).

4.3. Re-distributing Risks and Altering Vulnerabilities to Floods (Jesse Manuta[13])

Human vulnerability to floods is first and foremost political. Systems of governance help create as well as reduce risks. Why do some groups of people have to bear the burden of much larger involuntary risks from floods than others? Why are some households much more vulnerable than others?

Vulnerability to floods arises out of the social, economic and ecological circumstances of everyday living that result form social power relations (Blaikie et al., 1994; Adger, 1999; Bohle, 2001). Social relations, structures and processes can influence the vulnerability of households, communities and businesses to floods through several pathways (See Figure 6). For instance, the socio-economic and political mechanisms that translate global and national pressures into unsafe environmental and socio-economic conditions reduce the adaptive capacities of vulnerable peoples to hazards such as floods. Social, economic, political, cultural and historical processes influence how flood hazards affect people in varying degrees and differing intensities.

Conventionally, the overall extent and probability of loss of lives, persons injured, property damaged and disruption of economic activity and livelihood (flood disaster risk[14]) is seen as depending on the interaction of flood hazards (FH), vulnerability context of the population (VC) and the level of management (governance) exercised over both the hazards and the vulnerable elements (ADPC, 1998; Shook, 1997; Blaikie et al., 1994). Attempts to reduce risks and improve the management of flood disasters often attempt to de-politicize the enterprise by treating it as a technical issue of better engineering and institutional designs. This is often unfair and may also be ineffective.
Should we be protecting people's lives and livelihoods or the profits and property of firms? Is the aim to reduce net economic damage or the severity of impacts on those parts of the population least able to cope with an additional challenge?

Whether a certain evolving institutional arrangement helps reduce or just shift risks and vulnerabilities depends a lot on underlying qualities of governance, like transparency, accountability, representativeness and, ultimately, its sense of social justice and fairness. We need to ask: How and by whom are decisions about flood prevention, acceptable risks, and disaster-relief made and institutionalized? Do the processes and platforms provide opportunities for all stakeholders to be involved in negotiations that may result in learning and effective collective actions?

This case study is multi-level, examining both the national and the more local institutional arrangements that come into play in particular places. The aim is to improve understanding of the interplay among institutions responsible for and responding to the risks and damage caused by floods, surrounding several discrete flood events in Thailand. Ultimately this project hopes to get a better understanding of *how* institutions, policies and programmes for floods risk reduction are negotiated and designed and move to forward-looking analyses of ways to build institutional capacities that would make all communities more resilient to flood hazards in the coming years.

[13] Unit for Social and Environmental Research, Chiang Mai University, Chiang Mai 50200, Thailand, Paper prepared together with Louis Lebel, Supaporn Khrutmuang & Darika Huaisai.

[14] A concept used to describe the overall extent and probability of loss of lives, persons injured, property damaged, and economic activity disrupted.

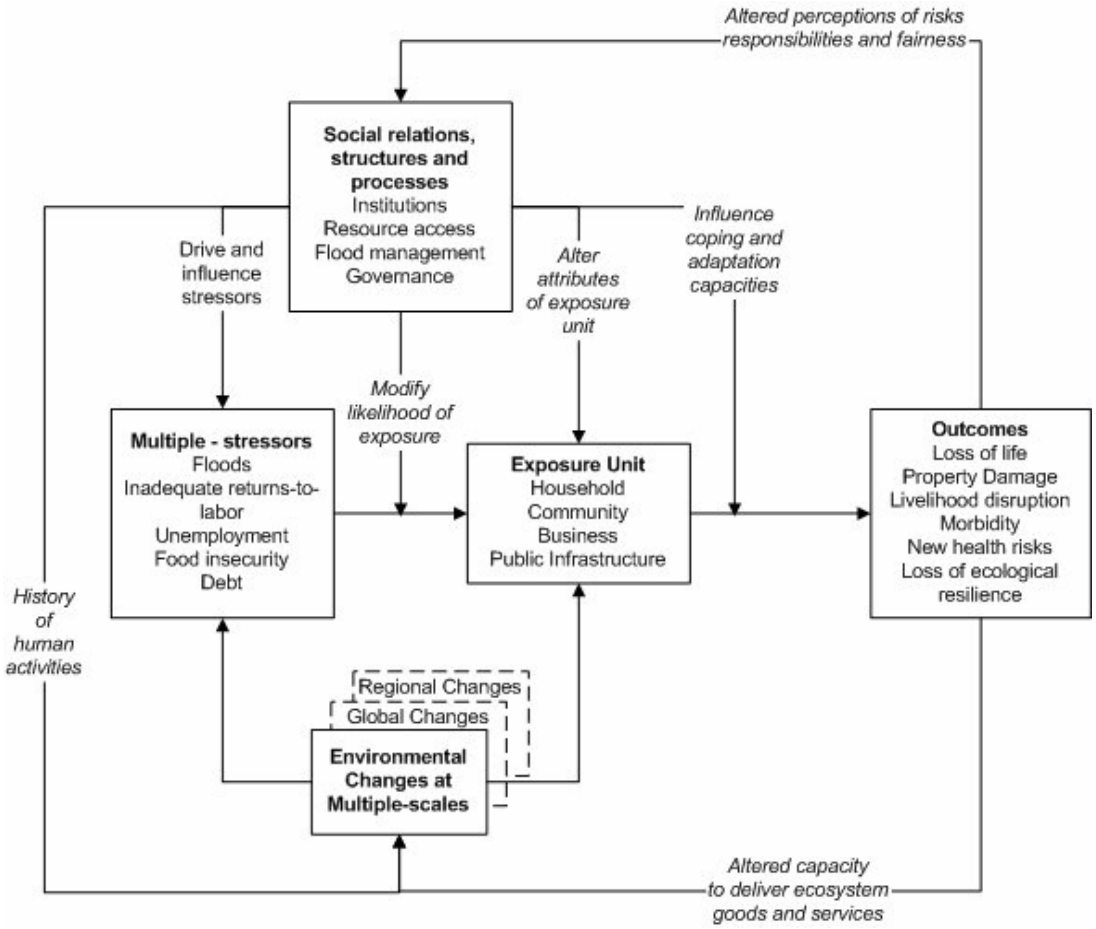

Figure 6: Vulnerability to Floods Conceptual Framework. Source: Modified from Turner et al. (2003a).

Initial Findings: Enhancing Institutional Capacities

Connect people and agencies

As in many other countries there are major problems of coordination and disconnects among agencies. These are particularly acute between agencies responsible for reducing vulnerabilities and preventing disasters on the one hand, and other organizations oriented towards relief and emergency measures. Agencies even purportedly on the same 'side of the issue' often appear to be in direct bureaucratic competition for funds if not responsibilities. There also major disconnects across administrative scales.

Look beyond the state

How institutional arrangements to deal with flood disasters emerge may matter almost as much as the arrangements in place. With poor attention to issues of governance, interests of entire groups may be left out of consideration, and opportunities for cooperation and clarifying lines of responsibility and communication lost. There is, in particular, a profound need to look beyond the state. Creating opportunities for meaningful participation in disaster preparedness, relief and recovery activities is likely to be most crucial for the poor and minorities, who would otherwise be left out of consideration because they don't have high visibility on damage report balance sheets.

Foster institutional learning

The distribution of vulnerabilities and involuntary risks is very dynamic. Institutional rigidities that prevent learning are thus a major barrier to overcome. Research could play a much larger role in improving institutional arrangements. This will require, however, much closer partnerships between academic and administrative, policy-making and civil society organizations in an area where such cooperation has been limited.

Work with not against nature
Floods disasters are human-caused. Development that works against rather than with nature often places people at ultimately higher rather than lower risks. A certain level of humbleness is needed about our capacities to control and cope with natural variability in climate.

Conclusions
This study of flood disaster risks in Thailand began with a strong emphasis on describing and understanding the institutional arrangements. During the course of the research it became clear that at least as important as niceties of institutional design were issues of *how and why* these institutions were evolving the way they were. In short, the politics of disaster preparedness, relief and recovery are important. It also became apparent that large differences in vulnerability among people were in part being created and reproduced through institutional apparatus designed to reduce risks to certain subsets of the population. The need to take swift action in emergency situations may have left people 'blind' to the longer-term needs of effective mechanisms of governance for reducing risks and vulnerabilities to floods in the first place.

4.4. Stakeholder consultations in the Mekong Delta (Vikrom Mathur[15])

On the 21st of January 2005 the Sustainable Mekong Research Network (Sumernet) meeting took place in Bangkok. Though not directly a case study, the meeting paid special attention to GEO-4, looking at it from a Mekong delta perspective. In his presentation Vikrom Mathur highlighted the main recommendations from Sumernet and introduced the main questions coming out of the meeting. The text below is a section of the Sumernet meeting report[16] containing the main findings of the meeting.

An extensive discussion took place on the overall structure of the Challenges and Opportunities Chapter, as well as the overview paper by the organizers of the Costa Rica Scientific Meeting. In particular, there was considerable discussion of the vulnerability and livelihoods frameworks and their use by the Sumernet partners.
These comments can be divided into three themes: (a) comments on the structure of the Chapter (especially the issues that are important from the perspective of Sumernet partners, but appear to have been ignored in the chapter design); (b) comments on the use vulnerability and livelihoods frameworks as means for integrating across the cross-cutting themes; and (c) specific comments on key terms or ideas in the framing paper.

Structure of the Challenges and Opportunities Chapter
The meeting participants agreed with the overall structure of the Chapter, namely to start with drivers of change and ultimate goals in order to comprehend the impact on and the consequences of changes in natural resources. However, especially from the perspective of the Mekong region, several key areas appeared to have been omitted or at least relegated in importance. A brief list of the key drivers of change from a Mekong region perspective would include:

– *Financial Crises:* The impact of the Asian Financial Crisis of 1997 was both deep and wide. It led to massive unemployment in the short run (though the recovery was mercifully rapid), and loss of the value of assets by millions of households. This shock also affected natural resources in significant ways. While governments have undertaken reforms for avoiding future shocks, these cannot be ruled out altogether. The cross-cutting chapter would be incomplete without examining the possible impact of financial flows and financial crises. This is particularly important because GEO-3 did not contain any reference to the financial crisis. Considerable literature was produced in the Mekong region on the impact of the Asian Financial Crisis on variables of interest; and this may be helpful for the GEO-4 writing teams. However, the link between financial crises and the environment cannot be explored solely through the prism of existing section headings in the Chapter outline (e.g. poverty or trade). It needs to be considered independently.

[15] Stockholm Environment Institute Bangkok
[16] Sustainable Mekong Research Network (Sumernet); Draft Statement on GEO4

- *Large human-caused disasters (natural hazards, terrorism):* The tsunami of December 26, 2004 caused unprecedented devastation in several countries in South and Southeast Asia. Its impacts are still being investigated. The corresponding chapter in GEO-3 looked at vulnerability more generically. A redesigned Chapter, by shifting the focus to 'challenges and opportunities,' may lose this information unless it is reinserted consciously. On this issue also, a debate is raging within the tsunami-affected region on the relative merits of technology-driven and community-based responses to the disasters. While both are necessary, an explicit focus on community resilience may be needed to ensure that this issue gets attention. Again, the emerging literature from the region would be particularly relevant to the chapter.
- *China's economic growth footprint:* Throughout the world, and especially in Southeast Asia, there are discussions about the challenges and opportunities created by the footprint of China's dramatic economic growth trajectory. The demand for raw materials (including mineral as well as biological resources) is being driven by the growth process, as is external investment, economic collaboration, and growth. There is deep interest in Chinese policies not only in the national context, but more generally for the region. Again, a simple focus on globalization or trade or national growth misses this dimension of change and response. The emerging literature in the Southeast Asian region would be helpful in fleshing out these concerns.
- *Regional Cooperation:* The Mekong region is characterized by a significant drive towards regional cooperation and integration. This is not entirely unique, since there are examples both of integration (Europe) and cooperation (especially through trade agreements). However, the degree of change is quite unique for a developing region. It creates new challenges for environmental governance. Again, the literature from the region would be helpful.
- *Corporate control and the vulnerability of local communities:* The corporate responsibility movement has begun to receive a high level of attention, especially in the wake of UN Secretary General Kofi Annan's call for a global compact between business and society for upholding core 'developmental' values: environment, human rights, labour rights, and transparency. A lot of the empirical work on the successes as well as failures of this movement has been undertaken in Southeast Asia. The movement as well as the investment trajectory constitutes an independent driver of change, for which the literature from the region would be most illustrative.

The Conceptual Framework

Initially, the question was raised over why Poverty, Livelihoods and Equity had been put together as a single issue, especially as the livelihoods perspective is an alternative framework (with considerable sympathy but not an exact identity) with the vulnerability framework. Furthermore, Equity might be a more appropriate to link to Governance. When it comes to Institutions and Governance, Sumernet raised the issue from the perspective of a research network of the importance of the quality of the information upon which decision and policy making is based.

There was an intense exchange on the overlap and divergence between the two frameworks. One view was that the two approaches were simply different ways of attracting attention to the issues of risk and vulnerability; in particular, although the vulnerability approach had evolved out of an ecosystems interest and the livelihoods approach from an interest in poverty, both had moved towards each other. Several vulnerability researchers have placed centrality in their work on communities and resilience; and a considerable proportion of vulnerability research has been carried out through participatory methods first popularized by the livelihoods approach. Likewise, many pro-poor researchers had sought to integrate environmental issues directly into their analyses of poverty.

However, there was an alternative view, that while both groups of researchers had moved closer in terms of their commonality of ultimate goals (which now include poverty eradication as well as ecosystem conservation), they did bring two somewhat different and complementary ways of pursuing research. A significant proportion of livelihoods research is rooted in the community, namely through the analysis of institutions and knowledge that enable communities to undertake collective action despite conflicting interests and hierarchies. This is not true of all poverty research, and not even of everything that is classified under the rubric of livelihoods. In contrast, a significant volume of vulnerability research, despite its participatory nature, was still oriented around individualistic conceptions of human action. In the vulnerability community one still hears criticism of livelihoods research on the grounds that it assumes a harmonious and conflict-free community.

Sumernet did not reach any agreement on this issue. However, there was agreement that the vulnerability and livelihoods approaches be given equal weight as framing mechanisms for the GEO-4 chapter on Challenges and Opportunities.

Some of the topics to be consider in the discussion:

- how many case studies are we looking for to be linked with the cross-cutting issues, and are they illustrative or material for analysis?
- the selection process for the cross-cutting issues should be explained and justified – result of the consultative process?
- who is the audience?
- is vulnerability analysis really driving policy?
- how to reconcile the mandate to be positive (bright spots vs. hot spots)?
- what are the scope and boundaries of GEO-4 – an assessments of assessments – policy advice?
- is vulnerability an appropriate framework or lens ?

5. Cross-cutting issues

A central aspect of the Challenges and Opportunities chapter is the assessment of cross-cutting issues in relation to vulnerability and human well-being. These by UNEP selected cross-cutting issues for this chapter, i.e. issues transcending the single domains of sustainable development, are: poverty, health, institutions and governance, science and technology, and trade. Experts in the field related to these topics presented some of their work during the meeting. This section provides a summary of their presentations on the five cross-cutting issues. The focus was on their incorporation in GEO-4 and the link with the vulnerability framework.

5.1. Human well-being (Des Gasper[17])

This part of the meeting started with a presentation on human well-being. Although not a cross-cutting issue specifically, the purpose of this presentation was to set the wider frame for the issues of poverty and health, which are closely related to human well-being. It also gave some guidelines for the whole chapter, where human well-being is one of the central aspects to be addressed. More information on human well-being can be found in a paper written for this workshop by Des Gasper.[18]

Well-being seems to have intuitive plausibility as a concept, but in practice we encounter an extremely diverse family of concepts and approaches, partly reflecting different contexts, purposes, and foci of attention. Economic measures of income ignore large areas of human well-being and are poor measures of well-being in the areas in which they are used. Yet 'GNP per capita continues to be regarded as the quintessential indicator of a country's living standard' (Dasgupta, 2001). Is there a unifying framework that respects the complexity and diversity of well-being?

Human well-being can be divided into three levels (See Table 2). The highest level (III) deals with the feelings about life, topics related to philosophy and sociology. The intermediate level (II) is about the quality of life comprising issues such as health, education and human development. It is a consequence of the effects of material inputs. The lowest level (I) is about the material inputs, and related to economic aspects. Many determinants of well-being don't fit into the economics framework of well-being (e.g. culture, religion, family, friends). People are concerned with more things than their own convenience only.

[17] Institute of Social Studies, The Hague
[18] Concepts of Human Well-being; Some Issues Arising for Sustainable Consumption

Table 2: Alternative levels of focus in studies of well-being

PUTATIVE NARRATIVE SEQUENCE (from bottom to top)	WHO HAS STUDIED THE CATEGORY?
III. FULFILMENT / SATISFACTION INFORMATION	
HUMAN FULFILMENT as value fulfilment	Studied by humanistic psychologists and philosophers
Utility – as SATISFACTION (this is not necessarily a unitary category; different aspects can be distinguished)	Traditionally not measured by economics (instead presumed unitary and imputed via long chains of assumptions). Studied empirically in psychology, especially in SWB research, and by others.
'Utility' – as DESIRE FULFILMENT	Imputed from choice, in much economics; i.e. (choice → desire fulfilment) is presumed. Studied directly by some others.
II. NON-FULFILMENT NON-MONEY-METRIC INFORMATION	
FUNCTIONINGS (other than satisfaction)	Little studied by economics (health economics may be one exception). Studied by functional specialisms, sociology, social statistics, psychology: in work on social indicators and objective QOL.
O-CAPABILITY (the range of lives which people could attain)	Hard to measure; often functionings are taken as the proxy. But see e.g. medical measures of (dis)ability.
S-CAPABILITIES (people's skill and capacities); and other characteristics of people (Culyer)	Measured by functional specialisms, see e.g. various psychological and health indicators.
CHARACTERISTICS OF GOODS, which are acquired through consumption.	Not much researched by economics, except in some basic needs work. Investigated by functional specialisms, such as in nutrition, health, education, transport, fashion, and in psychology.
CONSUMPTION proper – viz., actual *use* of purchases / acquisitions.	Not much researched by economics, except in some basic needs work. Left to psychology, anthropology, medicine, cultural studies, etc.
I. INFORMATION ON INPUTS; MONEY-METRIC FOCUS	
PURCHASES and other acquisitions	More researched by marketing, psychology, anthropology, sociology; less intensively by economics.
'Utility' as CHOICE, which is assumed to reflect preference, and (as the base case) is weighted according to purchasing power.	These assumptions have been normal in economics; including 'revealed preference' as an *axiom*.
INCOME AND RESOURCES / POWER TO ACQUIRE GOODS/ COMMODITIES	Researched by economics; not the power to acquire many other basic goods: political freedom, dignity, rewarding personal relations, satisfying meanings, ..

Although there are lots of different disciplinary traditions; the second level would be the most appropriate level for the Challenges and Opportunities Chapter, as it is about the issues related to quality of life.

It is easiest to connect the discussion about human well-being to an available framework; otherwise there is the danger of drowning in thousands of definitions. For example take the MDGs or the human security framework as a framework to focus on which aspects of well-being to discuss. Another simplifying focus would be health – mental and physical, or infant mortality etc. It operationalises the concept of human well-being, gives an agreed focus, and locates UNEP's work in a bigger family of UN goals. Foremost it has to be clear which elements of human well-being have to be taken into account.

However, there is some worry that the human security framework is politicised – some of that language has creped into specific political language of right wings on immigration – and that peace and conflict are missing as cross-cutting issues.

The unit of analysis is also important as resilience at community level cannot be assumed at the individual level.

5.2. World poverty (Ton Dietz[19])

According to OECD's Guidelines for Poverty Reduction the conceptualisation of poverty has become rather complex: from an emphasis on consumption and assets until the 1970s, to an addition of human development issues in the 1970s, socio-cultural issues in the 1980s, political issues ('good governance', 'human rights') in the 1990s and protective issues ('human security') more recently. It is connected to the Rights approach propagated by OXFAM: the right to well being is seen as a human right, and it is to be enforced globally, if necessary countering national policies by interventions of international aid agencies and NGOs, or even by the imposition of (UN) police/army forces.
The Department for International Development (DFID) has taken the lead to connect it with the livelihoods approach, and by an influential publication in World Development (Bebbington, 1999) it has gained popularity among scientists as well. Poverty reduction is possible by improving individual people's capabilities, seen as capitals: better access to and more secure entitlements to *natural resources* (productive land, water, seed/gene banks and common property products from forest and fields); improved *physical capital* (production tools, energy supply, housing, drinking water, transportation and communication infrastructure, defence tools against natural and human threats to life and assets (dikes, dams, weapons); improved *human capital* (better health, education, entrepreneurial skills); improved *economic/financial capital*: stocks of money, assets, banking facilities (saving, credit); improved *social capital*: social networks (kin, ethnic, religious, friends), power to mobilise support, access to politics and politicians, some would add: cultural capital and even spiritual capital.
Robert Chambers 'Voices of the Poor' project of the World Bank resulted in a massive participation of the poor in defining poverty and its impact, stressing a holistic approach, with 'respect' as a key word. Emphasis on the fact that the really poor are often hidden, sick, handicapped, oppressed, silent or silenced, shaming, criminalised, penalised for what the majority regard as unaccepted behaviour or personality weaknesses ('drunkards', 'drug addicts', 'stupid people', people who are or have been in jail, people who should not have been born (e.g. China's uncounted children as a result of the one-child policy). Many of the poor are indeed 'out of sight': in isolated places, in very problematic living environments, in no-go areas or avoidance zones (also in urban areas).
Against this increasing complexity, the UN formulated the eight Millennium Development Goals (MDGs) of which the first states that between 1990 and 2015 world poverty has to be halved (from 30 to 15%), and also the proportion of hungry people (malnourished children) has to be halved. Five other MDGs are related to health and education goals, one to environmental goals (with emphasis on safe drinking water, sanitation and slum improvement) and one on better access to aid and markets. In a recent UN report (August 2004, Secr. General on the Implementation of the UN Millennium Declaration, see http://daccessdds.un.org) the current state of affairs was presented and for the poverty goal a rather rosy picture was given: this is one of the MDGs that can be achieved, even long before 2015 (See Table 3).

Table 3: World Poverty 1990 and 2001, percentage and numbers of people below 1 $/day in PPP (source World Bank, 2004)

	1990	2001	2015	1990	2001	2015
Region	In million persons			Percentage		
East Asia and Pacific	472	271	19	29.6	14.9	0.9
China	375	212	16	33.0	16.6	1.2
Rest of East Asia and Pacific	97	60	2	21.1	10.8	0.4
Europe and Central Asia	2	17	2	0.5	3.6	0.4
Latin America and the Caribbean	49	50	43	11.3	9.5	6.9
Middle East and North Africa	6	7	4	2.3	2.4	0.9
South Asia	462	431	216	41.3	31.3	12.8
Sub-Saharan Africa	227	313	340	44.6	46.4	38.4
Total	1218	1089	622	27.9	21.1	10.2
Total excl China	844	877	606	26.1	22.5	12.9

[19] University of Amsterdam

Indeed, the numbers of 1$/d poor have gone down, and the proportion is going down too (but has not yet reached 15% of world population, and certainly not yet 15% of the population in low and middle income countries). However: in numbers the poor are increasing in SSA, LA-Car, West Asia, CIS, and Southeast Europe, and most of the gains come from China. It is also important to stress that almost 40% of the world's poor live in South Asia, despite the hype about India's growth rates. And methodological care should also be given to the measurements: e.g. what 'income' is measured, how is PPP calculated, what about corrections for green or sustainability adjustments of GNI, and how does it relate to the other, non-income elements of well being.

The income improvements are important, though, and linked to the second element of MDG 1 (halving world hunger): the percentage of underweight children (< 5 years) is decreasing everywhere since 1990: in South Asia from 53% to 47% in 2001, in Sub-Saharan Africa from 32 to 31%, in Southeast Asia from 38 to 29%, in Latin America and the Caribbean from 11 to 8%, in East Asia from 19 to 10%, in West Asia and North Africa from 11 to 10%.

The UN needs a success here, because most other MDGs lag behind, and will not be reached at all by 2015 (with the exception of access to drinking water, one of the environmental MDGs; but not sanitation or slum improvement goals).[20]

The global attention to poverty has given a boost to scientific poverty research. It is important to differentiate between chronic poverty (as highlighted in the MDGs) and transient poverty (e.g. the work of Collier and Gunning). There are many more people who in a ten-year period are poor in some years but not in others. Using a vulnerability approach means: a dynamic approach to poverty, and much more attention to transient poverty and to the impact of shocks on poverty levels and trends. It is useful to differentiate between endowment poverty (with most attention to chronic poverty), shock-induced poverty (with most attention to transient poverty), and entitlement poverty (with attention to both chronic and transient poverty). *Endowment poverty* has to do with low tangible and intangible assets (poor land quality, poor tools, poor gene pool; and poor knowledge, poor health, weak body, lack of motivation, weak networks, lack of respect). This gives low rewards for labour because of a low output, low wages and low prices. *Shock-induced poverty* is a result of asset destruction and recovery problems, in which idiosyncratic risks should be separated from collective risk, and in which attention should be given to insurance potential, cost of prevention, cost of destruction and cost of recovery. Risks are many: natural disasters, disease epidemics, cost of health care, death and funeral expenses, theft and violence (war and other causes), super-inflation, bankrupt saving banks, job loss, not getting paid for work done. *Entitlement poverty* has to do with a lack of access to the more rewarding options (including fall-back options during and after a crisis), but it is also linked to exploitation of labour: lack of entitlements to job protection, to minimum wage arrangements, to markets for produce and labour (many of the world's poor are casual labourers, without ownership of productive assets), it is linked to lack of access to solidarity networks, and a weak representation in buffer networks ('the poor have no friends'), and it is linked to lack of equity in distribution options for income and other support. In the world's value chains the beginning and the end of value chains (primary producers and waste disposal workers) are often least rewarded for their labour, and have very weak bargaining positions. Much more attention is needed for long-term dynamics of poverty profiles, and for the link between reduction of chronic and transient poverty and vulnerability, of which environmentally-related vulnerability is an important, and in some areas dominant part of causes of shock-induced poverty.

Additional remarks:

- Poverty is related both to health and governance; An example of this link could be HIV/AIDS, though it remains to be seen how to link this with poverty;
- The inter-linkages between environment and poverty need to be tied in, and the complexity must be stressed; There is a link between those that are poor and those living in poor conditions; The connections between ecosystem resilience and human resilience must be highlighted;
- It is an untested assumption that if we resolve all poverty problems we will see an improvement of the environment;

[20] See UNDP (2004), p. 33.

– When making policy advice and intervention, it is necessary to spell out how spending money on one affects the other;
– It is not poverty that matters most; it is more a question of equity.

5.3. Health (Henk Hilderink[21])

In the last 50 years, substantial improvements in health outcomes could be observed. Improved conditions like education, health services and female autonomy have brought countries on the way to low mortality levels. Especially the death toll of several infectious diseases has decreased drastically, but has partly been substituted by chronic diseases. The Disability-adjusted Life Years (DALY) is a measure which takes both mortality and morbidity levels into account. Looking at the most important health risk factors attributable for loss of DALYs, undernutrition ranks high at the global level, followed by other diet-related diseases and physical inactivity. Unsafe sex, a major factor for the spreading of HIV/AIDS, is particularly relevant in Africa where it hold the second position (See Figure 7).

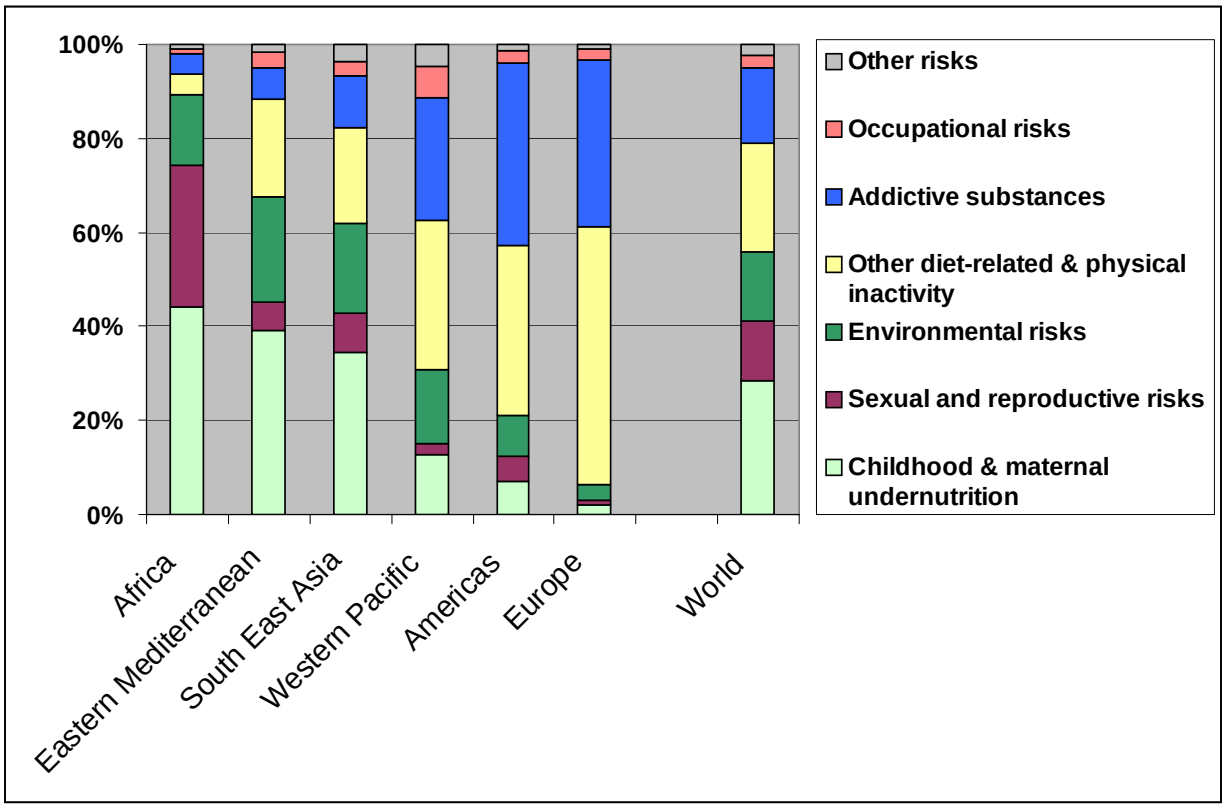

Figure 7: Attributable DALYs by risk factor

The risks classified as purely environmental (water supply, air pollution, climate change, lead exposure) are relatively small (See Figure 8). The regional patterns in these risk factors show great variations. Developing countries show a high DALY due to undernutrition and other environmental-oriented condition while in developed regions these more environmentally-oriented risks have been substituted by lifestyle-oriented risks, such as inactivity and diet. Undernutrition, water supply and sanitation, and climate change are environmental health risk factors which were also prioritized in the Millennium Development Goals.

[21] The Netherlands Environmental Assessment Agency

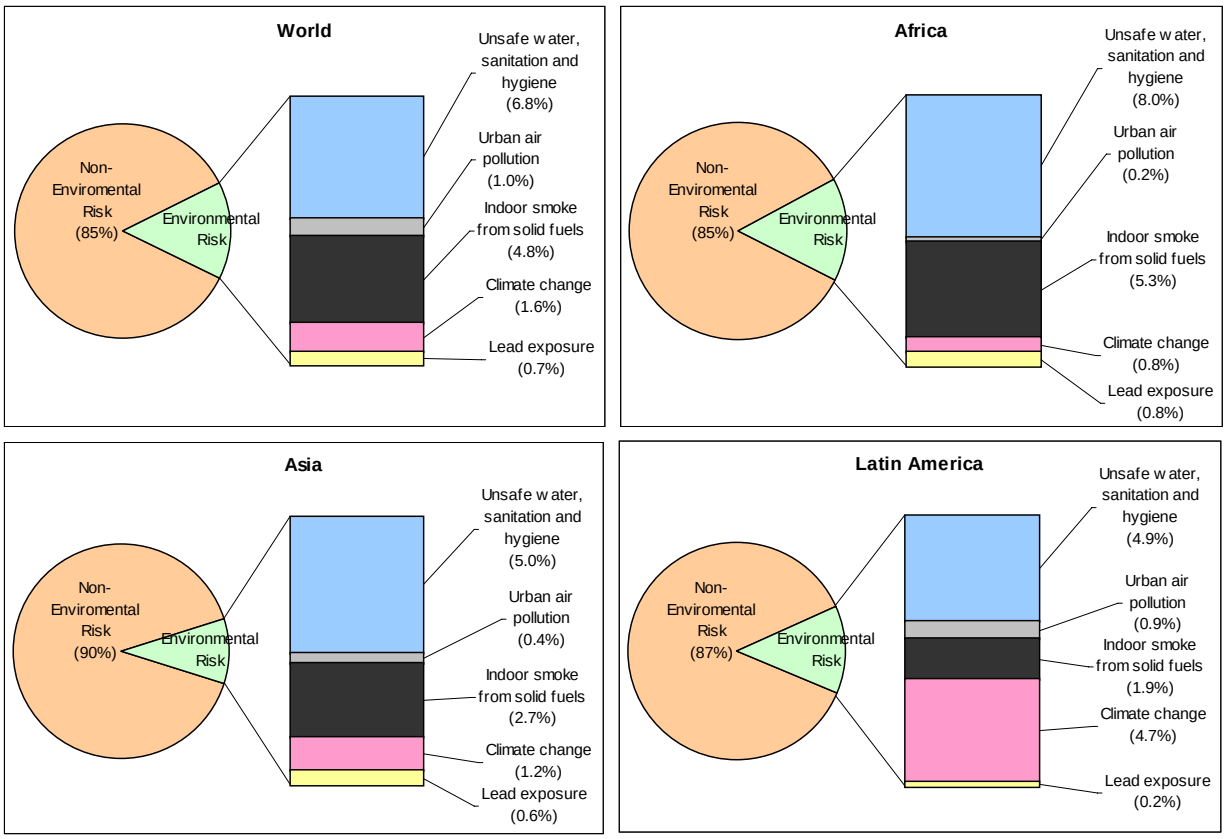

Figure 8: Environmental risk factors for different regions

To explore how these and other factors will develop over time and have their effect on health outcomes, the vulnerability concept has proved to be useful. One of the applications shows that food security can be assessed making use of the three basic elements of vulnerability, namely exposure, sensitivity and coping capacity. Identifying the most important pressures on human vulnerability, in combination with the sensitivity of populations, possible threats to health can be identified, and with that, insights are provided on how and where policies could be brought into action to avoid the possible loss of health due to undernutrition.

Other important aspects of health:

- Health and poverty are closely interlinked. Poor people show, in general, lower levels of health, while, on the other hand, people suffering from diseases are less productive and have less possibilities to escape from poverty;
- Pressure due to population growth and health outcomes (through mortality levels) should be looked at in an integrated way;
- Urbanization is becoming more and more relevant as a process to be considered in relation to poverty and health issues; It depends on the urban characteristics, such as growth and access to resources, whether this induces lower levels of health;
- Globalisation is another issue that implies possible health effects; Spreading of infectious diseases (SARS), movement of people but also spreading of medical technology are important factors for the globalization-health connection;
- The role and impact of HIV/AIDS is not only significant on health outcomes but also for society as a whole; Missing generations, private savings being used for funerals etc. but also the pressure and possible congestion of the public health system should be taken into account; The functioning of health services could be regarded as another cross-cutting issue, for example with governance and technology.

5.4. Governance (Emma Tompkins[22])

There is a lot of demand for 'good governance', it appears that is this is achieved it will solve many problems.

The first question is what is governance? Governance refers to the institutions that exercise power at different scales and can be defined in different ways:
- governance is a set of ideas about how direction is provided to human activity;
- governance is the process whereby societies or organizations make important decisions, determine whom they involve and how they render account.

Governance matters because we need to make decisions about how we allocate our resources for sustainable futures. We do not appear to have done this very well so far. What is a sustainable or 'good' decision about climate change for example?

The next question is how to define good governance? How do we measure success. We propose 4 criteria (EEEL): equitable process and outcomes; effective in achieving objectives; efficient (at least cost); legitimate system (trust in the institutions).

Using two examples, one of hurricane preparedness in the Caribbean, the other of coastal planning in the UK, subjective assessments of the 4 success criteria were applied to consider whether the process and outcome of decision making (i.e. the governance) were 'successful'.

Based on this analysis it was concluded that disasters and climate change pose problems for resource management:
- many conflicting objectives;
- many resource-use conflicts;
- diverse and conflicting interests at all scales;
- too many layers of society affected to be included/integrated?

'Good governance' is being demanded but what is really meant?
Good results to date: EEEL allows us to review the success of different governance approaches but reveals incompatibilities and the need to find trade-offs.
How to manage the trade-offs? No agreement on best process nor on outcome
Is top-down best? Or smaller decision-making units?

5.5. Connecting Scientific and Technical Expertise to Governance (Stacy VanDeveer[23])

The last decade has seen a dramatic growth in analysts' interest in understanding the conditions under which various types of expertise that can inform and engender more effective and efficient governance. This presentation drew lessons from these recent 'assessments of assessment', paying special attention to lessons gleaned from the activities within the Rio process and the 2004 accession of ten countries to membership in the European Union. These two experiences can offer appropriate lessons for the GEO-4 process, as they seek to substantially transform both the available scientific and technical expertise about sustainable development (and its environmental components) and governance of human activities.

So called 'capacity building' activities are common within international programs related to sustainable development, environmental protection and economic and social development (and the scholarship about these activities). In addition, research on the effectiveness of scientific and technical assessment processes also focuses on the importance of actors' varying capacities to produce, communicate and

[22] University of East Anglia
[23] University of New Hampshire

interpret knowledge for policymaking. Yet, too little attention has been paid to the complexities and limits of capacity building. If one asks what capacities are actually needed for global sustainable development, then the answers often challenge the conventional wisdom and practices within international cooperation. It is clear that much more is needed than the usual focus of international capacity development programs on the capacity of southern countries (usually state actors) to implement agreements largely influenced by Northern actors.

A number of serious limits with contemporary capacity building programs include the lack of focus on Northern incapacity, the assumption that only southern actors need capacity development, and often explicit notion that Northern institutional models and bodies of knowledge, if transferred to the South, will produce more sustainable development. Two exemplary experiences can be mined for lessons in this regard: the 2004 enlargement of the European Union and many of the agreements emerging from the 2002 WSSD in Johannesburg. These cases demonstrate that many Northern actors actively transfer institutional models across borders that simultaneously produce more and less sustainable outcomes. Both illustrate that the sustainable development agenda cannot be conceptualized as primarily a task of 'transforming' the South in certain ways. Rather, it must engender learning and dialogue across North South divides.

5.6. Trade (Indra De Soysa[24])

The different aspects of trade, globalisation and capital stocks were addressed in the last presentation of the workshop, given by Indra De Soysa. Taking a large array of economic data his research looked at the quantitative relation between economic globalisation (measured by trade and FDI) and economic freedom and (weak) sustainability (measured by genuine savings). The results can be found in a recent publication[25], summarised below:
While many herald globalization—the increasing interconnectedness of national economies—to be associated with rising standards of living across the globe, others fear its effects on sustainability. Anti-globalization forces and environmentalists view these developments as a threat to the welfare of future generations because of profligate and excessive current consumption. This study is the first to estimate the effects of dependence on trade, foreign direct investment (FDI), and an index of economic freedom on the World Bank's measure of sustainability (the genuine savings rate), which measures the rate at which investment in the total stock of manufactured, human, and natural capital exceeds its depreciation. Contrary to pessimists' fears, our indicators of economic openness show positive effects on sustainability, results that are robust to sample size, testing procedure, and several alternative specifications. The results support those who suggest that distorted economies tend to be both inefficient and damaging to future generations. If increasing trade, foreign direct investment, and economic freedom are hallmarks of globalization, then worries about its effects on future well-being are misplaced.

The presentation paid attention to the relationship between (weak) sustainability and the genuine savings, comprising physical, human and natural capital. Some of the main points were:

- What is sustainability? Seattle, in the 1840 had a bleak future due to a decline of beaver population; At that time it was hard to imagine what Seattle would become;
- The natural capital in the total capital stock of a country is relatively small; But there is a difference, for poor countries this share is more than 60% larger than for rich countries; Additionally, resource wealthy countries are really poor converters of wealth;
- Take out as little physical capacity as possible – genuine saving rate – relates to consumption e.g. education is an investment in the future;
- The ecological footprint explains 80% of a country's wealth;
- Trade and FDI have a positive and significant impact on the genuine savings rate.

[24] Norwegian University of Science and Technology
[25] False Prophet, or Genuine Savior? Assessing the Effects of Economic Openness on Sustainable Development, 1980–1999, Indra de Soysa and Eric Neumayer. Forthcoming in International Organization.

Remarks and questions that were made:

- What is the role of free movement of labour?
- Savings depend most on levels of trade;
- The size of the ecological footprint depends on wealth but also on the development path of a country;
- Globalisation is a process and in that sense requires data over a 20 – 30 year period with a careful analysis;
- Is genuine savings a real measure for sustainability? At least weak sustainability is needed to get to strong sustainability, but the accumulation of wealth has to be done with a minimum damage to natural resources; Genuine savings can be used as a measure for a more friendly development process, but the question remains: can we create wealth without consuming our natural assets?
- Well-being cannot be measured by GDP (Dasgupta, 2001). Quality of life and GDP are not coupled anymore above US$8000.

6. Discussions, conclusions and recommendations

This last chapter presents the discussions, conclusions, main challenges and recommendations that resulted from the workshop. It starts with a section summarising the specific GEO-4 related discussions that took place over the course of the three days of the workshop. To keep this section concise and comprehensible it is not written down in chronological order but instead divided in a number of topics that featured most prominently in the discussions. The suggestions for the further development of the Challenges and Opportunities chapter are summarised in the concluding section. The conclusions and recommendations paragraph reflects on the most important points from the different discussion that took place during the meeting. They will be used for the further development of the Chapter in GEO-4.

6.1. Main topics discussed

A number of topics related to GEO-4 were discussed extensively during the three days of the workshop. This section gives a concise overview of these topics, especially focusing on topics relevant for further developing the chapter.

Audience
In general the environment ministries are the primary target policy audience of GEO-4. The aim of the report is to help the environment ministries strengthening their negotiating position with respect to other ministries. However, the Challenges and Opportunities chapter is also aimed at a broader audience, with a special focus on other non-environmental ministers, concerned with the topics that the chapter addresses. In this way the environmental aspects would receive attention by other relevant actors.

A key question is how to actually influence and help the ministries of environment. This can be done by giving them more ammunition about the broad environmental issues, directly as well as indirectly. However, GEO-4 has to prove itself to be useful. In a particular year countries get many publications such as the Human Development Report, a report from UNCTAD on trade or the World Bank series of reports. All have something on the environment. Therefore, the added value of GEO-4 has to be clear in order to help the ministries of environment.
In addition to environment ministries, the Challenges and Opportunities Chapter should be of interest to ministries of health, development cooperation, economic affairs and science and education. However, it is more difficult to make the link between the Chapter and the ministries of agriculture. It is also less clear how to address the institutions, such as the World Bank or the IMF.

Messages
The general issues that will be emphasized through-out GEO-4 as a whole are: mainstreaming the environment, compliance and enforcement of existing policies and green accounting. It is also clear that GEO reports are used in three main ways: enabling policy makers to position themselves within a regional/global context and recognize themselves within that picture; help policy makers to position themselves in national and international fora, in a broader context like CSD; learn from lessons in other parts of the world (case studies and policy success stories). A lesson that can be learned from GEO is that it shouldn't give negative messages (as perhaps signalled by vulnerability or syndrome), regardless of the concepts to frame the approach – come out with a hopeful message. For example, what can be done to reduce vulnerability and increase resilience, what are the opportunities? However, it remains to be seen how to satisfy the mandate to be positive when considering hot spots.

Getting the right messages across to the GEO audience will only be possible if the right issues are being addressed. In order to support the ministries of environment in this way, it will be necessary to known what issues they face and the corresponding messages GEO wants to give about this.
The question in this respect is the function of the cross-cutting issues in the arguments this chapter want to develop. In essence they are 5 global policy agendas, but are these indeed the 5 most important issues

(for example peace/democracy is missing, but this could be included in governance). Central will be the likely environmental consequences of the 5 policy agendas.

Given that the main objective would be to make policy recommendations without becoming policy prescriptive, there is concern that a vulnerability assessment might not be the most appropriate approach. The key question is whether vulnerability analysis and scientific assessment really drive policy. For example, if development ministries are the prime audience then the policy discussion should be structured around a budgetary, technological, institutional, etc. framework. However, the goal is not to do a vulnerability assessment for its own sake, it needs to be part of a broader analysis, looking at what changes pose a major threat to human security. Vulnerability is central to that. It can tell who is bearing the burden. Lessons can be learned from the Millennium Ecosystem Assessment that has framed its questions in a similar manner.

Cross-cutting issues
Painting the bigger threats to human security requires the selection of the right topics and cross-cutting issues, issues that also connect to the audience of GEO. It is important to get them right, as these issues change over time and issues most relevant differ amongst countries.
To many participants it was not clear why these five issues were selected and on which basis. They were perceived as a mixed bag of apples and oranges (pressures and impacts) and some important issues where missing, such as urbanisation, economic growth and consumption. In many countries, issues such as jobs and national security feature prominently on the agenda. This raises questions such as, how to provide materials on these issues and how to frame issues that are more comprehensive, like poverty alleviation? Furthermore, the private sector will play a role and this is currently not included in the chapter.

In addition, the label of ‘cross-cutting issues’ is not very powerful, and it also needs to be acknowledged that they are interlinked.

MDGs
In addition to the cross-cutting issues the Millennium Development Goals (MDGs) are central to the work and activities of GEO-4 – analysing where we stand today.
Because the MDGs have no clearly defined environmental targets, it is for GEO-4 to point to the need for clear targets and to identify where they are lacking. The Outlook chapter will take stock of where we stand with regard to achieving the MDGs. In the Challenges and Opportunities Chapter MDGs could be included by looking at the options for meeting goals and the role the cross-cutting issues have in this. For the cross-cutting issues health and poverty the relation is clear as they are identified as MDG targets but the other 3, which are drivers or modifiers of change it is not.
Other goals are also important to look at. What are the visions, goals and targets set since Brundtland, where do we stand in meeting those goals, what is the unfinished business and where are the deficiencies in international response.
Important to bear in mind are the possibilities and impossibilities of giving policy advice, where can policy intervention help (political economy questions).

Assessment framework
GEO is an assessment of assessments. The difference with the Millennium Ecosystem Assessment (MA) is that GEO deals with a broader range of environmental issues and that it is a different kind of process. Although many things are to an extent related to the MA, GEO goes beyond the ecosystems to a broader perspective on the environmental issues, which will be the case for the Challenges and Opportunities chapter in particularly.

The syndrome approach is seen as an interesting way to categorise some of the key problems related to the environment and vulnerability. Multiple stresses, which are most important for vulnerability, are incorporated in the syndromes. Through this approach it is possible to go into more detail for specific vulnerabilities and for specific regions and illustrate this with different cases, preferably with some success stories.

Case studies will be very important, but only case-studies that can be trusted, not selected simply because they fit the story best (myths). However, the chapter can't only be based on case studies. It also has to draw from the literature on the cross-cutting issues.
With regard to human well-being, the easiest link is with poverty and health. The difficulties are how to narrow it down for our analysis and what aspects of human well-being to incorporate.

Questions
The meeting favoured the selection of a number of key questions for this chapter, instead of using the cross-cutting issue terminology, to give a more clear idea of what this chapter wants to achieve. These could be the main entry point for the audience (See Section 6). In relation to those questions some additional remarks are made, that should be kept in mind while developing the chapter:

- what level of institutions or interventions is the right level to deal with?
- highlight information we need, what we don't know, what we need more on;
- focus on policy recommendations;
- thinking about institutions, what are the barriers for implementation and new opportunities? What changes of institutional arrangements are necessary and who will be main actors for these recommendations;
- institutions and governance – break vulnerability into three distinct areas: exposure, sensitivity and resilience – need to develop resilience on the long term;
- also consider lifestyles and livelihoods;
- natural disasters work –still have tsunami disasters – what types of technology are we interested in, not just technical fixes;
- Section 2 in GEO-4 is catalogue of problems; the Challenges and Opportunities Chapter should focus on mitigative and adaptive capacity and how that is influenced by the cross-cutting issues; How do health problems undermine the adaptive capacity, or more positively, how does improved health improve adaptive capacity;
- it is not possible to cover all issues for all regions and the chapter must also be attractive to ICs;
- what about access to technology and property rights;
- affirm the moral value of a philosophy of commitment to future generations;
- keep critique (with citations) of mantras like globalisation;
- kill/omit the business about redundant institutions;
- pick case studies strategically;
- environment conditions and trends affect our ability to meet poverty reduction targets;
- to be effective in reducing poverty we need to develop sustainably;
- different forms of governance are appropriate at different scales and in different contexts – illustrated by case studies e.g. Caribbean hurricane preparedness.

6.2. Conclusions and recommendations

General conclusions
For the Challenges and Opportunities chapter, it was concluded that the vulnerability approach could indeed be a valuable and useful lens to assess the selected cross-cutting issues. With respect to methodological frameworks it was suggested to keep it as simple as possible. No single framework will be able to cover all elements from any comprehensive assessment. However, the more complex frameworks could be used 'in the back' to ensure that all relevant elements of vulnerability are included in the analysis, but they don't need to be part of the storyline for the chapter.

One of the aims of GEO-4 is to influence decision-making. This raised an issue of concern about where the links are between vulnerability analysis and policy recommendations. Therefore a better understanding will be required of which questions to address and how to frame the chapter, in order to influence environmental policy makers, as well as help mainstreaming environment in other policy areas.

Well-being is seen as central to sustainable development and the overarching goal of reducing vulnerability. Vulnerability of the human-environment systems, whether from economic, social or environmental processes, constitutes a threat to human well-being. The concept would however need further operationalisation, given the many different interpretations that exist for it. The link between vulnerability and human well-being could for example be made through health, the MDG-framework and the concept of human security.

The selected cross-cutting issues (health, poverty, governance, science & technology and trade) were considered relevant although one could also think of other issues to be included. It was accepted that for practical reasons only a limited number of issues can be covered in the chapter. The terminology 'cross-cutting issues' was not thought to be an appealing one for the target audience. Furthermore, within a vulnerability framework the selected cross-cutting issues 'play a different role'. It was therefore suggested to drop the use of the phrase 'cross-cutting issues' and rephrase them as questions to be addressed as 'Challenges and Opportunities' for sustainable development.
For the further development of the Challenges and Opportunities chapter it is important to know which environmental problems are identified as priorities for the regions. The outcome of the State of the Environment chapter, in relation to vulnerabilities in the regions, needs to be the starting point for the Chapter. The questions addressed in this chapter could also be used in the Outlook chapter, to explore their future development and in the Policy response chapter.

The development of the chapter faces a number of challenges:
- reconciliation of the bottom-up approach of selected 'cross-cutting issues' with the top-down need for scientific rigour in an assessment on the basis of a conceptual framework and clear selection criteria. There is need for an introductory explanation of the bottom-up process;
- include both global perspectives (archetypes of vulnerability) as well as local/sub-national detailed studies, showing the dynamics of vulnerable places and people;
- a typology of 'cross cutting issues' – as stressors, as modifiers of adaptive capacity, as outcomes (e.g. health), as part of responses – has to be developed to show the different character of these issues;
- building on GEO-3 and other assessment processes (esp. IPCC and MA) the added value of this assessment should be shown, explicitly considering the human-environment system, framed in the context of sustainable development (and existing goals and strategies) and addresses missed opportunities;
- trade-offs between multiple goals will be important to show; The view was that the goal of policy for vulnerability reduction helps define acceptable balances of risk and benefit based on improved assessment of the patterns of exposure, sensitivity, and resilience; To better deal with trade-offs, it might be useful to introduce this role for vulnerability analysis in the beginning of the chapter;
- make the chapter interesting for developing, industrialised and transition countries and ensure that messages are brought in a positive manner (what are the opportunities for intervention, bright spots not only hotspots).

While building on the vulnerability approach it has become clear during the workshop that the Challenges and Opportunities chapter must take into account:
- multiple stresses on the human-environment system;
- different units of analysis;
- the time dimension (cumulative effects, dynamic vulnerability);
- cross-scale effects (e.g. multi-level governance);
- available case studies, but the chapter shouldn't just build on case studies; there is also a need for a strong assessment of the literature;
- interests of stakeholders (including private sector);
- points of intervention.

Towards the chapter outline

Abstract of the Challenges and Opportunities chapter
The chapter identifies a number of archetypes of vulnerability of the human-environment system that occur throughout the world and their impact on human well-being. These vulnerability patterns are the result of environmental and non-environmental stressors. If no further measures are taken, they will have an increasingly negative impact on quality of life and human well-being. For these archetypes the main challenges and opportunities for realising environmental goals through policies addressing production and consumption, poverty reduction, development, health, science and technology, trade and human security are identified. Improving environmental sustainability cannot be achieved through environment policies alone. Environmental governance has to take into account social and economic concerns. At the same time further integration of environment into other domains of policy making is also required. Therefore the chapter, which is based on vulnerability analysis, concludes with strategic messages to the respective non-environmental policy domains and indicates what the implications for environmental governance would be.

Questions to be addressed
In order to state clearly to the audience what this chapter is about, a long list of questions was identified for this chapter (See Annex 3 for an overview). These can be summarized by the following concise set of key questions:

Within the context of overall goals and strategies for sustainable development, how do the environmental state, variability, hazards and trends described in Chapter 2 affect human well-being and what factors shape the vulnerability of human-environment systems to multiple and interacting stresses?

The specific sub-questions that this chapter seeks to answer – while making a distinction between rural and urban dimensions where relevant – are as follows:
- how do the environmental state, variability, hazards and trends described in Chapter 2 influence human health and human well-being?
- how do patterns of poverty shape the vulnerability of the human-environment system to environmental stressors?
- what role do institutions, international trade, production and consumption and science and technology play in shaping vulnerability and adaptation of human-environment systems?
- what policy options or approaches have been taken or are available to increase the capacity of human-environment system to respond to multiple and interacting stresses and to mitigate environmental change?
- what are the challenges of and opportunities for realising environmental goals through poverty reduction and development policies, health policies, science and technology and trade policies?

Structure and content storyline
The chapter could get shaped using the following structure and by addressing the questions below:

Introductory material for the chapter needs to:
- highlight environmental conditions, trends and hazards from Chapter 2;
- explain the analytical perspective on people and environment as a coupled system;
- explain and justify the use of the vulnerability approach, discuss how and why environmental conditions and trends create vulnerability;
- explain from a vulnerability perspective the linkages between human-environment systems and focus on key environmental problems and driving forces identified in Chapter 2;
- discus other key stressors, drivers (e.g. regional integration, financing...) and their relation to environmental conditions and trends of chapter 2 and how they together create vulnerability; Which changes pose an overall threat to SD/human security/human well-being (Who is bearing the burden of changes?);

- point out that the review in the State of the Environment Chapter is clearly linked to key trends and vulnerability and well-being through the concept of ecosystem services;
- express how these vulnerabilities are related to other problems, the broader policy contexts (e.g. National security, jobs) and other UN agendas (including MDGs);
- note the connections between the vulnerability framework and UN agendas including Millennium Development Goals.

The next section could show why (different types of) vulnerability is a concern? What are its outcomes in terms of health, poverty and well-being?

- impacts on mortality, assets, livelihoods, well-being, nature/biodiversity and ecosystem functioning;
- connections of environmental vulnerability to health and poverty;
- provide a global overview, illustrated with case studies (It was suggested to identify a number of archetype vulnerabilities to provide a global overview, inspired by the syndrome approach developed at PIK-Germany; see Annex 4 for the results of the breakout group in identifying possible archetypes).

After having addressed specific archetypes of vulnerability the subsequent section can address which institutions/mechanisms exist to reduce vulnerability thru mitigation and adaptation.
This section would take on a variety of models for governance – of resource use, of trade, of S&T development, of knowledge application etc

In the last section challenges and opportunities can be addressed. Here one can look at trade-offs and choices and explore how policy options ‘fit’ with other policies designed to address vulnerability.

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Annex 1: Workshop programme

Day 1: (31 January 2005) Concepts and case studies

Chair: Mr. Langeweg

09:00 – 09:30	Welcome and brief introduction by Mr. Lopez, Mr. Langeweg and Ms. Cheatle	

General introduction and background of the workshop

09:30 – 10:30	Introduction about the aim and context of the workshop	*Mr. Kok*
	Presentation of the draft Chapter 3 Storyline, cross-cutting issues and tentative assessment concept	*Ms. Jäger*
	Vulnerability in GEO-3, lessons learned	*Ms. Cheatle*
10:30 – 11:00	*Morning break*	

Presentation of existing concepts and case studies on vulnerability and resilience

11:00 – 12:30	**Concepts of vulnerability and resilience**	
	Vulnerability approach	*Mr. Kasperson*
	Syndrome approach	*Mr. Petschel-Held*
	Resilience approach	*Ms. Tompkins*
12:30 – 13:30	*Lunch break*	
13:30 – 15:30	**Case studies from different regions**	
	Southern African Vulnerability Initiative (SAVI)	*Mr. Brklacich*
	Impact of Climate Change on Drylands (ICCD), West-Africa	*Mr. Dietz*
	Vulnerability and risk in Central America	*Mr. Giro*
	Flood Risk Governance in Thailand	*Mr. Manuta*
	Stakeholder consultations in the Mekong Delta	*Mr. Mathur*
15:30 – 16:00	*Afternoon break*	

Discussion about the application of vulnerability concepts and lessons learned from case studies

16:00 – 17:30

- The aim of this discussion is to elaborate on the possible conceptual basis for chapter 3.
- The possibilities and limitations of different concepts of vulnerability
- Lessons learned from case studies that have used the concept of vulnerability
- What should future practical application of the concept of vulnerability pay attention to
- The implications of this in relation to the goals of GEO-4, especially chapter 3: Opportunities and Challenges

17:30 – 18:00

Voices from the Sahel; mobility in response to ecological insecurity
A short film about the practical dilemmas of people living in a harsh environment.

19:30

Dinner, hosted by CEMEDE and MNP-RIVM

Day 2: (1 February 2005) Cross-cutting issues

Chair: Mr. Brklacich and Ms. Cheatle

09:00 – 09:30	Recap of day 1 – summary of the discussions	*Ms. Jäger*

Presentations on cross-cutting issues relating to human well-being

09:30 – 11:00	Human well-being	*Mr. Gasper*
	Poverty	*Mr. Narain*
	Health	*Mr. Hilderink*
11:00 – 11:30	*Morning break*	

11:30 – 12:15 Discussion about human well-being, health and poverty in relation to the assessment of vulnerability
- Is the vulnerability approach a good basis for the analysis of these issues
- What are key issues and questions to be addressed in the analysis
- What type of recommendations the chapter could make

Presentations on cross-cutting issues relating to stresses and responses

12:15 – 13:15	Governance	*Ms. Tompkins*
		Mr. Narain
13:15 – 14:15	*Lunch break*	
14:15 – 16:00	Science and Technology	*Mr. VanDeveer*
	Trade	*Mr. De Soysa*
16:00 – 16:30	*Afternoon break*	

16:30 – 17:15 Discussion about the stresses and responses in relation to the assessment of vulnerability
- Is the vulnerability approach a good basis for the analysis of these issues
- What are key issues and questions to be addressed in the analysis
- What type of recommendations the chapter could make

Discussion about analysis of these cross-cutting issues in a vulnerability framework

17:15 – 18:00 The aim of the discussion is relating day 1 (concepts) and day 2 (cross-cutting issues)
- Can the cross-cutting issues be analysed in a coherent manner within the conceptual bases as defined during day 1?
- Which modifications or additions are necessary in the framework
- On what aspects should be the main focus in GEO-4

Day 3: (2 February 2005) Assessment of cross-cutting issues in GEO-4

Chair: Ms. Jager

09:00 – 09:30	Introduction to GEO-4	*Ms. Cheatle*

Discussion about results from day 1 and day 2

09:30 – 10:30	Conclusions and Improved storyline Including application of the concept of vulnerability – In general – Analysing the specific cross-cutting issues – Synthesis and type of conclusions the chapter should draw	*Ms. Jäger, Mr. Kok, Mr. Narain*
10:30 – 11:00	*Morning break*	

Discussions about practical aspects of the assessment of cross-cutting issues for GEO-4

11:00 – 12:30	Scales of assessment Time horizon in the assessment framework Response mechanisms in the assessment framework Synthesising cross-cutting issues

Organisational aspects of the assessment

12:30 – 13:30	Revisiting the draft work plan for the assessment of cross-cutting issues in GEO-4 First discussion to define the Terms of Reference for the background papers

Concluding the workshop

13:30 – 14:00	Looking back at the results of the workshop
14:00	Field trip

Annex 2: List of Participants

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Annex 3: Possible questions to be included in the Chapter

FROM UNEP, key questions to be considered:
- From the higher-level reference point (Brundtland, Agenda 21, etc), what was our vision?
  - Where did we want to be?
  - Are we moving in the right direction?
  - How far have we got?
  - How did we get here?
- What unfinished business remains?
- Has our perspective on the long term challenges changed?
- What are the new challenges?
- To what extent have environmental issues been mainstreamed in overall and sector specific governance i.a. since Brundtland?
- What are the opportunities?

UNEP Priorities for GEO-4 (throughout the report)
- Mainstreaming the environment
- Implementation and compliance
- Green accounting

1. The Challenges and Opportunities Chapter answers the following key question:

1.1 How do the environmental trends described in Chapter 2 influence the quality of human life and what factors shape the vulnerability and adaptation of people to environmental change as represented by these trends?

2. The specific sub-questions that this chapter seeks to answer are as follows:

2.1 How do the environmental trends described in Chapter 2 influence human health and well-being?

2.2 How do patterns of poverty, inequity, production and consumption (including trade) shape the vulnerability of people to environmental change?

2.3 What role do institutions, international trade, and science and technology play in shaping vulnerability and adaptation to environmental change?

2.4 What policy options are available to increase the capacity of the human-environment system to respond to multiple and interacting stresses?

3. Other general questions

3.1 What critical changes in human environment systems will contribute most importantly to achievement of the MDGs (in particular health and poverty goals)?

3.2 How does spending money on one or more issues affect(s) the other(s)?

3.3 What are the rural/urban dimensions of policy responses to vulnerability to environmental change?

3.4 There appear to be recurring problem complexes. How we represent plurality of situations around the world?

3.5 What role can regional cooperation play in responses to these recurring problem complexes (e.g. success stories in dealing with problem of aridification)? Where are opportunities for joint learning?

3.6 How is mitigative and adaptive capacity in the face of environmental change influenced by policy areas dealing with poverty, health, trade etc? What options are available to manage environmental change? What is the optimal timing of intervention (i.e. focus on mitigation/preparedness vs. adaptation/recovery)? What is the scale of intervention (i.e. individual action, community action, national, regional, international)?

4. Poverty

How is poverty defined and do we really understand the relations between poverty and vulnerability?

4.1 What goals and strategies are in place to deal with poverty?

4.2 How will achieving these goals affect the rate and magnitude of environmental changes (identified in Chapter 2)?

4.3 How will achieving these goals affect the ability of particular exposure units (village, region, women, children...) to respond more effectively to environmental change?

4.4 Why do we need to mainstream environment into actions to deal with poverty?

4.5 What are the main challenges to implementing policies to achieve policy goals?

4.6 How do environmental hazards create transient and chronic poverty? How does poverty undermine the environment? (Note: there is an untested assumption that eliminating poverty would improve the environment)

4.7 What will be the major implications of confirmed global inequalities in wealth for patterns of environmental degradation?

5. Health

5.1 How does policy response to HIV compete for resources with environmental risks?

5.2 What role do governance issues play in policy responses to health issues?

5.3 What are the major health threats associated with likely global changes in ecosystems and ecosystems services over the next several decades?

6. Governance and Institutions

6.1 To what extent are existing institutions and governance systems capable of altering current trends in global unsustainability?

6.2. How can we link the discussion of these important policy agendas (e.g. poverty, health, trade) to other policy agendas (peace, democracy)?
Investment schemes / CBA Lomborg's Copenhagen consensus / Sachs
Conflict as one of the problems / state failure task force – peace & environment

7. Science and Technology
7.1 How may the scientific and technological capacities of developing countries most effectively be enhanced over the next several decades?

7.2 How can S&T (including indigenous knowledge) be used more effectively in order to meet sustainable development goals?

7.3 How can S&T be harnessed in order to enhance the capacity of village, community, region etc to respond to environmental change? (What examples do we have of effective processes and what lessons can be learned?)

8. Trade (consumption)

8.1 What major changes are required in existing trade patterns and institutions to address adverse environmental effects?

8.2 What kinds of case studies could be included? Suggestions made are:
- negative externalities (cases EU ban on fruits from Africa)
- trade ties lead to cooperation and then lead to environmental conservation / peace; countries that trade and can fight because of borders tends to fight less; look at benefits of regional cooperation
- the chapter is now to much looking at countries, but trade as one multiple stressors on local level is missing
- indigenous production
- economic integration and trade issues (Mekong)
- economic growth footprint of China
- connectivity to global markets (coffee farmers)
- financial shocks (Asian tiger syndrome)
- the generic issue of economic growth and relation to consumption (but does it fit here)
- equitable protection of property rights
- ‘ equitable’ / ‘ sustainable’ distribution of trade benefits/negative effects
- should we consider tourism (opportunities/new vulnerabilities)
- different messages with respect to trade (positive or negative – openness vs. closedness)
- impacts of trade on different groups, who would be most affected

Annex 4: Breakout group on archetypes of vulnerability

By: Gerhard Petschel-Held, Jesse Manuta and Frank Thomalla

Instructions: Provide examples of archetypes of problems taking into account industrial, transformation and developing countries and a regional perspective.

1. Industrial countries:

In industrial countries a situation of multiple stresses that could be presented as an archetype is increasing flood risk. Whilst the primary hazard is damage from flood water, the phenomenon is likely to be a result of a number of other interlinked factors such as land use changes for agricultural production and infrastructure development, and settlement patterns. Land use changes reduce the ability of the land surface to absorb and store water. Modern settlement patterns (suburban sprawl) are caused by increased mobility. Through the sealing of increasing parts of the land surface, urban sprawl contributes to high surface water runoff and flash flooding at times of high precipitation volumes. Mobility is related to a high dependence on the use of cars which contribute to air pollution, ozone, the emission of green house gases and ultimately to climate change. Climate change in turn leads to increased precipitation (in terms of both frequency and volume) in certain regions and therefore to increased flood potential. High surface water runoff also creates secondary hazards such as water pollution. The protection of certain highly valued property and infrastructure through flood protection measures frequently shifts the risk to other less valued areas creating new vulnerabilities in those areas. In addition, the protection of property through structural measure is likely to increase the impact of rare but potentially catastrophic larger events if the flood defences are breached or overtopped. The potential impacts of a rare extreme event are also increased as more and more property is placed in areas that are considered safe because of the presence of flood protection measures.

2. Developing countries:

An archetypal situation for a developing country is vulnerability to extreme climate variability as manifested by frequent floods and droughts. Several countries in the Greater Mekong Region are affected by such variability and therefore the region could serve as a good example. In addition to high climatic variability, there are a number of other factors that contribute to high levels of vulnerability to this phenomenon. These include changes in land use and specialisation. Land use changes are associated with the change from agro-forestry to cash crops. The growing of cash crops in turn increases the risk of pests and diseases and the dependence on market prices. With specialisation we mean the shift from traditionally more diverse food crops to mono cultures of cash crops. This loss of diversity (or the diversification) has two effects: a) it reduces ecosystem resilience and affects the water balance through increased soil erosion and reduced storage of water; and b) it increases dependence on the market for food and material such as seed, fertiliser, and pesticides. Large scale infrastructure developments such as irrigation schemes and dams occurring in the region have implications for water availability, access rights, and water quality.

Another archetype is water scarcity (desertification) in dry lands (e.g. Sahel). This was documented in the movie. Contributing factors include climate variability, soil degradation, and wind erosion. The film described in much detail the migration of people from the dry lands to the coastal urban centres as a coping mechanism.

3. Transition countries:

This archetype applies to countries in Eastern Europe that used to be part of the former Soviet Union, as well as Vietnam and China. After the collapse of the communist regimes and in the process of liberalisation many transition countries experienced a breakdown of political structures, institutions and traditional security networks, as well as a depreciation of industrial infrastructure. The lack of

environmental legislation led to a highly degraded environment and the decay of industrial installations such as factories, chemical plants and pipelines pose a significant pollution hazard to water, soil and air. The loss of livelihoods and social security has led to subsistence farming (even in cities), migration, and exploitation (e.g. human trafficking, prostitution). Because of a lack of investment in institutions, infrastructure and environment these countries have no economic basis to compete in global market and are highly sensitive to shocks.