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Background

The 3rd PhD Block course took place from 31 March till 5 April 2008 at the *Centre for Development Research* (ZEF) in Bonn, Germany. *United Nations University Institute for Environment and Human Security* (UNU-EHS) organised this course within the framework of the joint UNU-EHS and University of Bonn, (ZEF) PhD programme. Participants of the interdisciplinary block course were PhD candidates starting their studies. The course entitled "The Role of Vulnerability in (Disaster) Risk Management" focused mainly on water-related hazards (floods, tsunamis, storm surges) highlighting vulnerabilities and associated risks.

Eighteen students of 11 nationalities (Vietnamese, Serbian, German, Australian, Chinese, Ghanaian, Indonesian, Tanzania, Indian, Seychellois, Austrian) from eight institutions actively participated in the 3rd PhD Block course. The students had different backgrounds such as engineering, geography, social sciences, economy and anthropology.

The main goal of the PhD Block course was to provide students a platform for sharing ideas, collaborating with each other, discussing and getting a broader overview of

- concepts of vulnerability, risk management and hazard
- diverse perspectives of relevant concepts
- possibility for active discussions and networking with experts

18 external experts with 22 presentations introduced their expertise related to the framework "Role of Vulnerability in Risk Management" (Program of the course and List of Participants, Annex 1, 2).

The course was divided into six main thematic sessions:

1. Disaster risk management and vulnerability framework
2. The diversity of vulnerability
3. Risk-causes and consequences
4. Hazards and risk
5. The different tools of risk management
6. Risk and media

Each thematic area was presented by experts and concluded with a discussion.

Furthermore Learning Café (Summary of Learning Café, Annex 3) challenged students with discussion on different institutional issues related to disaster risk management. During the learning cafe there were introduced four different scientific areas, where students were asked to provide a solution for presented problem.

Objectives

Following were the objectives of the 3rd PhD Block course:

To stimulate scientific exchange between M.SC. students, Ph.D. researches, external experts and UNU-EHS experts

To tap more comprehensive approach to disaster risk management and vulnerabilitie's role in risk management

To amend the knowledge and skills of participating students and practicing professionals

To discuss and organize effective methods of data sharing

To forster understanding between different research disciplines within the framework of the course

To identify possible linkages of the different concepts of risk management and vulnerability

To provide PhD scholars with platform to discuss their research outlines, to share their knowledge and ideas in an early phase of their theses

To explore the linkages between hazards, risks and vulnerability

To improve the development of the networks with universities, research institutes, scientific associations and affected communities

To build capacity among PhDs researching risk management and vulnerability issues including cultural, social and economical aspects of vulnerability

To augment the scientific literature on risk management, vulnerability, and vulnerabilities role in risk management

To overcome gaps in communication among the PhD scholars and to strengthen the cooperation between them

Summary of Expectations

At the beginning of the course all participants indicated their expectations. They expected from the PhD Block Course to gain understanding, especially regarding theoretical concepts and definitions within the framework of 'The Role of Vulnerability in (disaster) Risk management'.

They hoped to get to know new concepts and new perspectives, so that they could get a more general idea of their special topics and understandings in relation to risk management or vulnerability. Especially, most of them were interested in combining different perspectives of "The Role of Vulnerability in Risk Management".
All in all, the majority expected to learn more about underlining theories as well as concepts and to be able to use them for their own thinking.

Some exclusive expectations were also to learn more about drought prediction techniques, to understand the link between nature and migration and to get to know more about water related conflicts. Though the expectations were slightly different, everybody emphasized the necessity of such an interdisciplinary Block Course.

Outcomes of the Block course

General

This report provides outcomes of the block course as main findings of discussions of four working groups in form posters, summary of learning cafe and summary of experts presentations.

The workshop had two main components. The first component consisted of formal presentations of the participants presenting thematic areas, describing concepts and introducing relevant activities and/or case studies. A brief summary of the presentations is provided in Annex 8. The second component consisted of brainstorming activities on four themes: (1) vulnerability - it's concept, link to disaster risk management and role in it; (2) hazard – definitions, specific activities to be recognised in each case study areas and relation to the topic of the course ; (3) disaster management - methodology, concepts and activities linked to vulnerability; (4) (disaster) risk management - framework and role of vulnerability.

According to the four main topics the PhD researchers presented during the workshop developed posters (Annex 4,5,6,7) including objectives and possible outputs of their research work working together in four groups. Their presentations showed how interactions and discussions with regard to risk management and reflecting the various backgrounds and different perspectives could be implemented, particularly concerning data requirements and output. Summary of the different topics and suggestions from information exchange is summarised below.

Specific results of the working groups

Based on the presentations and discussions during the week, the working groups focused on ideas how to capture vulnerability, hazard, disaster management and disaster risk management. The main purpose of the working groups was to intensify the discussion and develop posters showing understanding and recommendations on the development of the concepts, taking into account existing definitions and approaches. The following is a brief summary of the findings of the working groups and the aspects discussed.

Working Group– Disaster Risk Management

Students discussed general problems, definitions related to the topic and made one definition:

Disaster Risk Management (DRM) *is an encompassing term for pre-, during and post-disaster risk reduction planning measures. It is a systematic integrated process, and should be part of development processes in everyday level. DRM is has emerged as an complex both interactions and interplays of pre, during, and after activities that are cyclically clockwise and counter clockwise*

After the explanationof the definition they visualised disaster risk management in circle approach as following:

Circle ikopijuos

Various mechanismus as micro-insurance, remote sensing, coastal engineering or mangrove planting were used to indentify different risks and their analysis. Based on presented examples of disaster risk management instruments and tools, the group discussed whether the difference ….. was more related or applicable for identification of different risks and their assessment.

Discussions led to a conclusion on following challenges and drivers:

Global change

Demographic changes, climate change, land use & land cover changes, increasing material wealth, long-term risks, the rise of disaster risks

Knowledge management/sharing

Inter-, multi- & transdisciplinary, action- orientated, with broad participation, understanding of complex systems

Risk perceptions

Risk perceptions and priorities are not always guided by rational choice

Governance issues – dev. countries

Poor policy, poverty trap, debt trap

Additional the group derived first ideas of disaster risk management system on national level regarding the technology knowledge, education and awareness, private sector and economy, organisational structures.

The group came to the conclusion that risk management requires the closing of gaps of

science & policy disciplines,
cultures of risks,
causes and effects of disaster

Working Group – Hazard

Group discussed the framework of hazard as a

A Constant companion hard to Grasp

and its relation to disaster risk management.

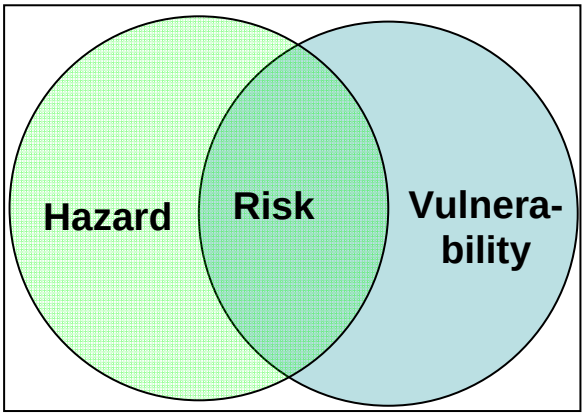
Based on discussions in the brainstorming sessions there were outlined following main elements constituting hazards:

- Intensity
- Probability of failure
- Probability of occurrence
- Place of occurrence
- Perception
- Time-frame
- Cause (natural and/or human

Considering this the group pointed out the importance to focus on the relation of

Hazard – Vulnerability – Risk

and declared that without hazard, no risk exist, and if there is no hazard, there is no vulnerability.



The working group came to the conclusion that Hazard is

"A threatening event, which is probable to occur and may lead to destruction of things important to man. It may occur suddenly or evolve slowly"

and closed the discussion with the open question:

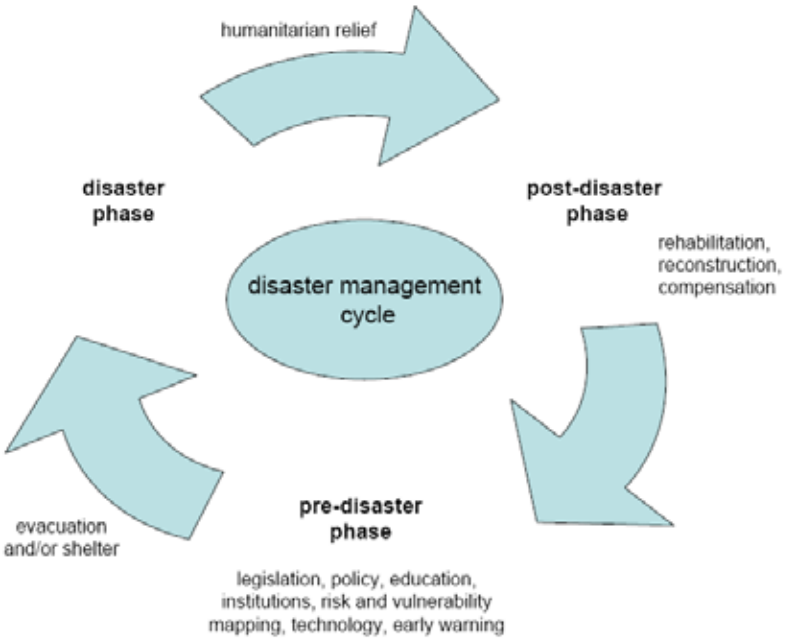
<u>Is a hazard necessarily linked to its actual occurrence? (Event / Threat)</u>

Working Group - Disaster Management

Participants focused mainly on the framework of Disaster Management, the key questions and general problems regarding the development of the cycle of disaster management.

It was expressed that the disaster management is a continuous process of decision making that comprises measures and actions, which are aiming to reduce the adverse impact of an hazardous event.

Moreover, the group analysed the structure of disaster management and revealed that critical links exist in spatial, temporal and organizational dimensions. They indicated that planning and action have to be integrated and coordinated amongst actors at different (horizontal and vertical) spheres and throughout all phases of the disaster management cycle.



The figure shows the three phases of the disaster management cycle. Before an event strikes it is important to clarify responsibilities and get necessary structures (organisational as well as physical) in place. Additionally manpower has to be trained and maintained equipment. During the disaster communication (fast and short) and decision flows play a crucial role in order to foster an effective coordination of measures and actions. After the direct impact of the disaster, system functions should be (re-) installed through the placement of social and economical infrastructures.

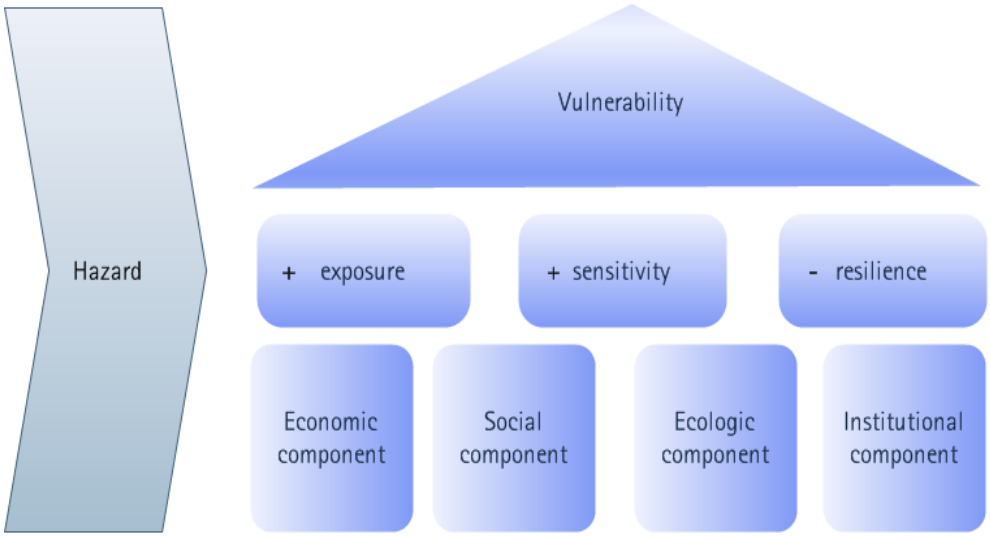
Working Group – Vulnerability

Working group aimed to clarify understanding of the vulnerability concept and discussed variety of vulnerabilities definitions (e.g. Component of risk, Comparative Glossary, Source, UNU-EHS). Pursuing the group explicitly underlined an availability of 31 definitions of vulnerability leaving this finding as an open question.

Although the group highlighted vulnerability in relation to different following aspects:

- Risk f (Hazards, Vulnerability) ➔ Vulnerability measured as recovering time
- Vulnerability is a socially-constructed condition which makes a society prone to suffer damages
- Economic vulnerability is the degree to which a natural hazard endangers an economy`s productive capacity.

The working group argued for a hazard and risk -specific vulnerability framework approach referring basic aspects and synthesised in the scheme below.



Besides that students came up the conclusion stating that researchers necessarily require knowledge of interdisciplinary perspective to approach vulnerability. Finally the group indicated that possible intervention has to be interdisciplinary as well as encompassing all involved institutions.

Conclusions and Recommendations

Alltogether presentations and discussions on the course topics provided a good basis for the future work of students and UNU-EHS; and the all in all results met all the expectations.
The participation of students and experts from different institutions led to concrete personal and institutional co-operation initiatives, which could and should be extended in the future. Based on various presentations as well as discussion after the course, there were made many recommendations for new understanding and approaches of disaster risk management. Moreover, the workshop showed the complexity of disaster risk management.
The four specific discussion areas offered a diversity of socio-cultural and economic aspects, geographical and climatic conditions and different problematic with respect to (disaster) risk management. This diversity gave the opportunity to develop a robust concepts on vulnerability, hazard and risk management.
Taking into consideration comments and evaluation of the participants of the course following are suggestions for future courses:

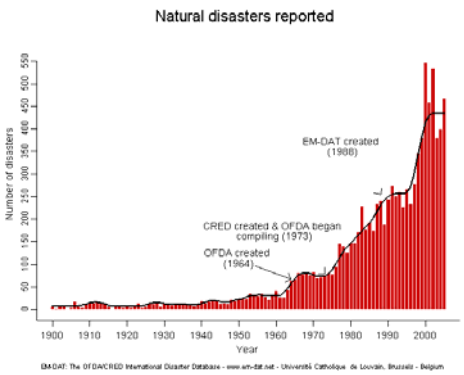
- To explore the linkages between hazards, risks, vulnerability, and risk management as coping strategy measures
- To improve an education of a new generation of scientists by involving them in training on risk management tools, e.g. simulation programs, assessment programs(AKNZ, BBK), applied risk management tools
- Involve policy makers, urban planners, lawyers, drought scientists and practitioners into the programme
- To make research how content materials on disaster risk management can be modularized in such way that they can be used by other organizations for different purpose like disaster risk preparedness (to produce a publication)
- To prepare the guidelines on risk management, possible methodologies and tools as a part of water related hazard risk management
- To improve a conflict component among different institutions which acticities are related to risk management
- To ensure the generation and dissemination of new knowledge and information especially with regards to the case studies.

Summary of presentations

The Framework I:
Disaster Risk Management and Vulnerability Framework

Where is this world going to?
- Historical disasters, frequency and magnitude, spatial and temporal distribution;
- Human and economical impact and consequences;
- Recent disasters, importance of the 'collective memory'

*Presented by **Dusan Sakulski , UNU-ViE***

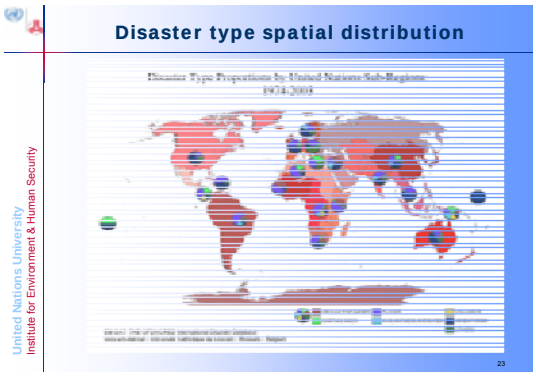


Many disasters faced the world in the period 1900-2005 and 1975-2005.In average of more 255 million people were affected by natural disaster globally each year on average between 1994 and 2003, with a range of 68 million to 618 million. During the same period, these disasters claimed an average of 58,000 lives annually, with range of 10,000 to 123,000. In 2003, 1 out of 25 people worldwide was affected by natural disasters.

The EM-DAT database is managed by the Centre for Research on the Epidemiology of Disasters (CRED), Department of Public Health, Universite catholique de Louvain, Brussels, Belgium.
It represents core data on the occurrence and effects of over 14,500 disasters from 1900 to present, including natural disasters and technological disasters. The database CRED EM-DAT provides numbers about damages, economic loses and killed/affected humans based on 6367 natural disasters for the time 1974 – 2003. For a disaster to be entered into the database at least one or a combination of the following criteria must be fulfilled:

- 10 or more people reported killed
- 100 or more people reported affected
- A declaration of a state of emergency
- A call for international assistance

TOP 10 disasters (droughts, floods, earthquaqes, cyclones, wind storms, volcanos, landslides, tsunamis) based on the numbers by countries and by effected/killed inhabitants are visualised in the map below



The occurrence of natural disasters is based on the convergence of two major factors: hazard factor and vulnerability factor. Physical, social, economic and environmental factors influence vulnerability and are closely linked to poverty.

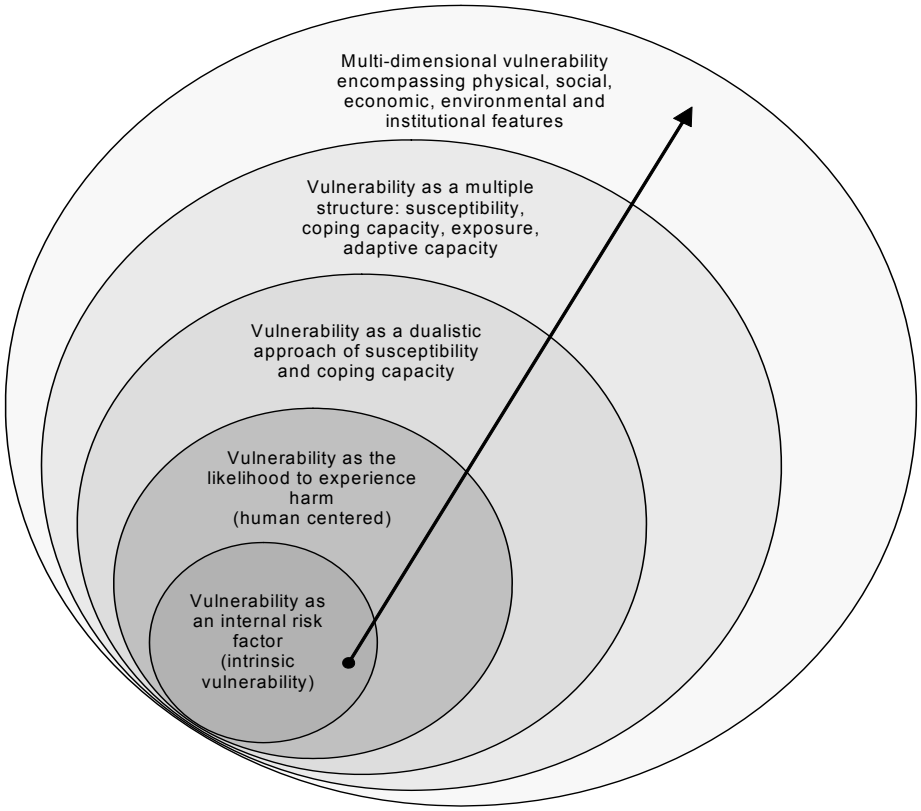
One of the primary factors linking poverty and vulnerability is the migration of poor populations into hazardous areas

Vulnerability Assessment – Concepts and Frameworks:
Empirical Results from Coastal Regions in Sri Lanka; and Floodplains in Germany
Presented by ***Jörn Birkmann, UNU-EHS***

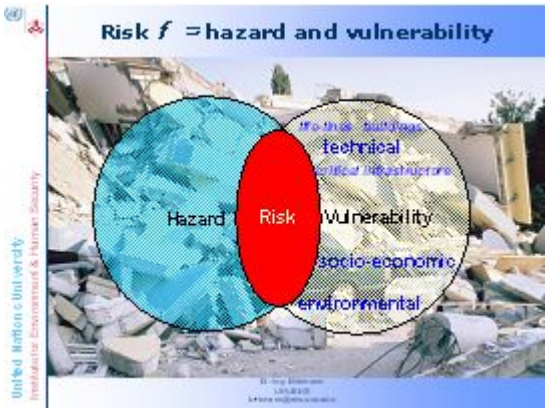
Environmental change implies major changes in bio-physical processes (e.g. climate change, sea level rise, extreme weather events, global warming), encompasses human activities, such as rapid urbanisation or resource exploiting. Four vulnerability dimensions are to consider:

Social Dimension - Vulnerability of different social groups, Role of social networks (coping)
Economic Dimension - Vulnerability of different economic sectors, such as fishery and hotel business in Sri Lanka
Environmental Dimension - Environmental fragility (groundwater, land) Dependency on environmental services
Institutional Dimension - Effectiveness and failure of structures and institutions

Key-spheres of the Concept of Vulnerability



The concept of vulnerability serves an important framework to understand and capture human insecurity. Particularly, following water hazards (referring to case studies Tsunami, Galle, Sri Lanka and Elbe flood, Müglitz, Germany) does pose a threat to the habitats and the ecosystem. Often it implies severe consequences for land-use in the region and human well-being. This dependency within a specific region describes part of the vulnerability of human-environmental interactions in the context of 'role of vulnerability in risk management related to water hazards.



The presentation gave an outline of different conceptual frameworks to capture and measure vulnerability. It is essential to acknowledge that vulnerability as a key element in a broader development chain (hazard-vulnerability-risk chain) and is intended to capture economic, social and environmental features of vulnerability in order

to link the discussion about sustainable development with vulnerability discourse. Risk is the outcome of the interaction between the physical event such as water related hazard and the vulnerability of the exposed community.

Thus measuring the socio-economic vulnerability of different exposed social groups capturing the vulnerability of human-environmental interactions is a key to examine human security in the context of risk management. There are tree important factors to consider:
Dynamic exposure -time-specific (daily, weekly, seasonal) population concentration based on activity patterns of different social groups, taking into consideration the age groups, sex, occupation, etc.
Susceptibility – (1)Risk perception and other factors that determine evacuation decision, (2) Mobility of the population or different social groups; (3) Factors that influence the people´s capability to conduct an effective and fast evacuation.
Coping Capacity – (1) Potential evacuation behaviour and capability; (2) Factors that determine the potential responses in emergency; (3) Accessibility and availability of emergency facilities (evacuation shelters, basic services) for an integrated, effective civil protection.

It is necessary to have slightly different understandings and definitions of vulnerability dealing with very different elements of risk. Vulnerability can measured as exposure to hazards or as the potential loss to gross domestic product. Dealing with local and sub-national case studies is important to focus on the vulnerability of communities, individuals, economic activities and sectors as well as critical infrastructures, which depend in one way or another on water. Consequently, there can be no single definition of vulnerability without consideration of the context in which the examination is taking place.

Although social vulnerability concept still needs to be developed. Therefore some general recommendations on how to capture vulnerability within the context of "Disaster risk management" can be formulated:

"Vulnerability (in contrast to poverty which is a measure of current status) should involve a predictive quality: it is supposedly a way of conceptualizing what may happen to an identifiable population under conditions of particular risk and hazards. Is the complex set of characteristics that include a person's- initial well-being (health, morale, etc.)- self-protection (asset pattern, income, qualifications, etc.)- social protection (hazard preparedness by society, building codes, shelters, etc.) - social and political networks and institutions (social capital, institutional environment, etc.)".(Cannon et al., 2004 in Birkmann: 26)

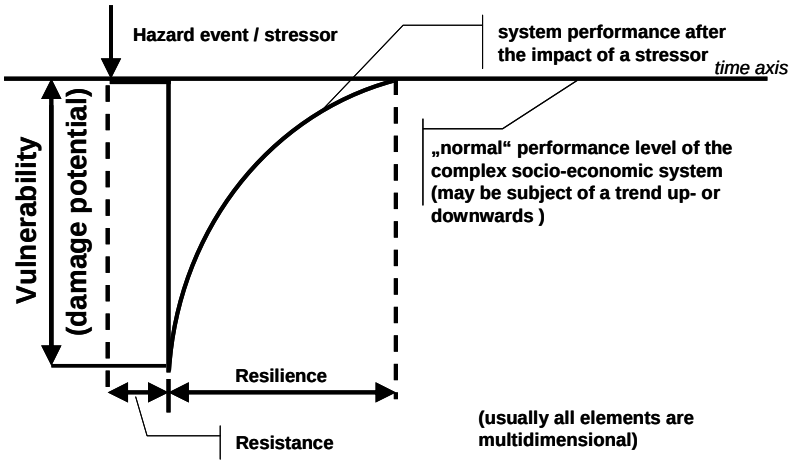
Resilience of Socio-Ecological Systems with an Emphasis on Environmental Components
*Presented by **Fabrice Renaud, UNU-EHS***

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystems vary enormously in size or refer to the collection of components and processes that comprise, and govern the behaviour of some defined subset of the biosphere.

- Resilience is a sub-component of vulnerability – system's capacity to bounce back or respond (Turner et al., 2003 in Renaud:12)
- Ecosystem resilience linked to livelihood security which is a component of vulnerability (Jäger et al., 2007 in Renaud:12)

System resilience can be seen from two opposing views: ability of the system to resist or recover and amount of disturbance an ecological system can absorb before shifting to another stability domain (Holling, 1973 in Renaud:12) – notion of thresholds and of speed of change of variables

Folke (2006) (in Renaud:12) adds to Holling's definition the capacity to self-organise and ability to increase capacity of learning and adaptation (socio-ecological systems)



Refering to vulnerability – resilience models that consider ecosystem services, direct and indirect global, regional, local changes the ecosystems state following:

1 We are living beyond our means
2 Intense vulnerability of the 2 billion people living in dry regions to the loss of ecosystem services, including water supply
3 Growing threat to ecosystems from climate change and nutrient pollution
4 Approx. 60% of the ecosystem services examined are being degraded or used unsustainably, including fresh water, capture fisheries, air and water purification, and the regulation of regional and local climate, natural hazards, and pests.
5 Impact on the achievement of the Millennium Development Goals

Discussion on a case study in Sri Lanka within the context of Tsunami plus examples on agriculture, groundwater and floods in Haiti lead to the question:
What is the role of ecosystems in terms of disaster avoidance / reduction?

Degraded ecosystem service provision affects other dimensions of vulnerability and coping capacity. Examples:

- Degraded soils is one of many factors affecting food security in rural areas
- Degraded freshwater resources affecting health
- Degraded coastal areas affecting the economy

High dependency on specific resources can affect coping capacity if resource itself is affected by an event.

Conclusions

1 Assessing fully resilience and/or vulnerability of coupled systems is very difficult:

- Many processes to consider, some of which are perhaps un-determined
- Quantifying threshold is complicated

1 Carrying out the assessment is necessary to inform decision-makers and actions
2 Ecosystems are almost never at equilibrium – what is important in this context is the provision of services
3 Severe degradation of ecosystems can limit the provision of essential services
4 Pre-impact ecosystem degradation may affect the nature, magnitude and/or frequency of hazard events, may increase the exposure of ecosystem biotic communities (incl. human beings) and may affect sensitivity and coping capacities
5 Components of the ecosystem have their own levels of sensitivity with respect to hazard events

Need to think along the lines of:

- Hazard concepts – how does ecosystems degradation because it increases the hazard side of the equation (magnitude & frequency) and increases exposure of communities
- "Sustainable development" concepts - natural capital in livelihood approach, interactions with other capitals, environmental services. Also look at the:
  - Status of the resources (quantitative, qualitative, seasonality)
  - Access & rights
  - Dependency on specific resources
  - Sensitivity of resource to external shocks (notion of thresholds)

6 Need to consider the multiple spatial and temporal scales (incl. for decision-making)

Framework II
The Diversity of Vulnerability

Biology of Vulnerability (movie)
Highlighting the role of human vulnerability and it relation to the environment especially decision makers and media.

Cumulative negative effects of a chemical hazardous stressors
*Presented by **Prof. Mirjana Vojinovic-Miloradov, University Novi Sad***

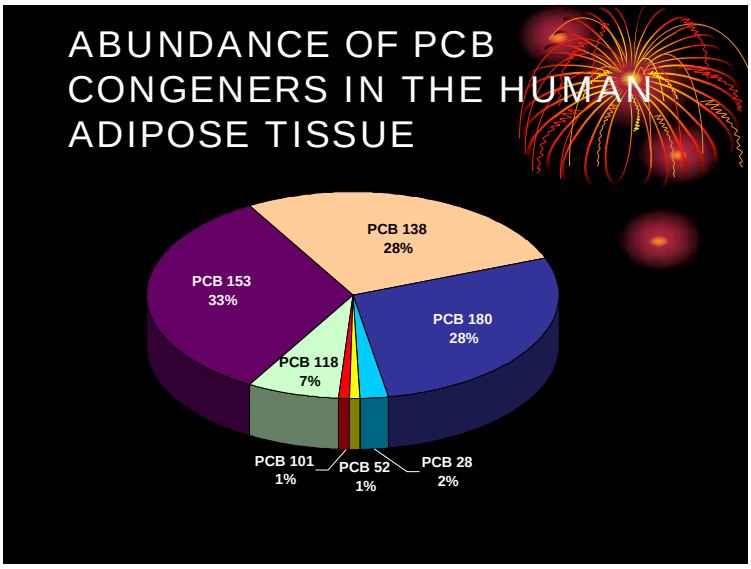
Complex multidisciplinary/interdisciplinary cumulative processes require research to focus on negative effects of chemical stressors on human's health, on biotic and nonbiotic systems, and working conditions. It affects as recognition of possible consequences and effects related to global climate change, temperature growth, warming, iceberg melting on poles, growth of the level of ocean, sea, water areas, flood waves; and factors, which can be fatal for human. Chemical hazardous stressors (POPs and PCBs) play very important role as persistant organic pollutants, which are mostly either intentionally or as byproducts created by humans in industrial processes. Those stressors have potebntial significant impacts on human health and the environment but paraleerly they are resistant to environmental degradation through chemical, biological and physical processes.

- The groups of compounds, that make up POPs are also classed as PBTs (**P**ersistent, **B**ioaccumulative and **T**oxic) or even TOMPs (**T**oxic **O**rganic **M**icro **P**ollutants.)

- Many POPs are currently or were in the past used as pesticides. Others are used in industrial processes and in the production of a range of goods such as solvents, polyvinyl chloride, and pharmaceuticals.

- Though, there are a few natural sources of POPs, most POPs are created by humans in industrial processes, either intentionally or as byproducts

Professor Miloradov with her team at the University of Novi Sad developed and conducted active (AAS) and passive (PAS) air sampling techniques. Both sampling gained very similar information about the congener distribution. Data of PAS is essential for model validation and for precess research. The APOPSBAL as assessment of stressors and sampling techniques have been tested and used for case studies in Serbia in Novi Sad, Pancevo, Kragujevac. Results on PCB visualised below



On the base of the present findings, it can be concluded that combined chemical-analytical and biological-histological results corespond well to each other.
Application of combined BioAs/GC is the optimal procedure for identification and detection of PCBs and other dioxin like compounds in abiotic and biotic matrix.

Environmental Migration between theory and evidence
*Prsented by **Tamer Afifi, UNU-EHS***

The debate about environmental migration:
Stephen Castles: Migration following environmental catastrophes is not the main strategy; they move within the same region and very rarely cross the borders.
Thomas Faist: The main causes are rather ethnic conflicts, economic and political mismanagement.
Gerald Traufetter: After the earthquake in the Japaneese Kobe, most of the displaced returned back in a few months.
Bimal Kanti Paul: empirical contra-evidence for environmental migration (2004 Tornado in Bangladesh).
Environmental migrants vs. Environmental refugees.

EnvironmentAl Change and FORced Migration Scenarios (EACH-FOR) develop forced migration scenarios and focus on environment, information about current and future triggers of forced migration. Therefore were applied two methodologies as data collection and 'economic gravity model' with 13 global environmental factors and 13 different indicators comparing 172 countries.
Case studies in Egypt and Niger: share a large part of the Sahara; are suffering from rapid population growth; rely to a great extent on environment; rely on rivers; and are transit countries for African migration to EU.

Egypt – impact on migration:

- Water shortage due to the increasing population as well as soil degradation in the Nile Valley is a cause for migration, as long as the migrants are hired in the land.
- People would be leaving their home and moving to another place only if there is absolutely no more livelihood possibilities for them.
- People would move only if they can financially afford migrating to another region/country, and/or if there are other social and economic reasons that would motivate them other than desertification

Niger – impact on migration:

- What used to be seasonal is getting permanent migration.
- What used to be regional is getting cross border migration.
- The vicious circle between migration and environmental degradation.

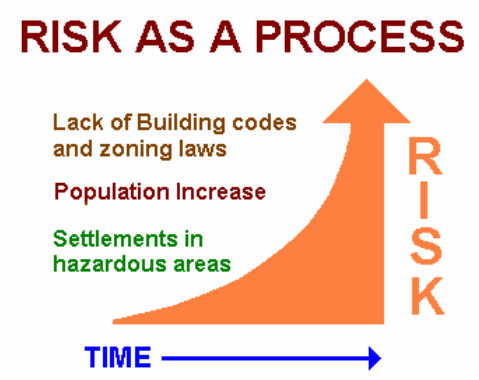
Conclusions

- **Even if there is a debate about 'Environmental migration' , the phenomenon shall not be neglected.**
- **Importance of re-considering the factors that lead to environmental migration, which in turn could lead to further environmental problems (vicious circle).**
- **Importance of recognizing the 'Environmental migrants' (no longer a matter of choice)**

Framework III
Risk - Causes and Consequences

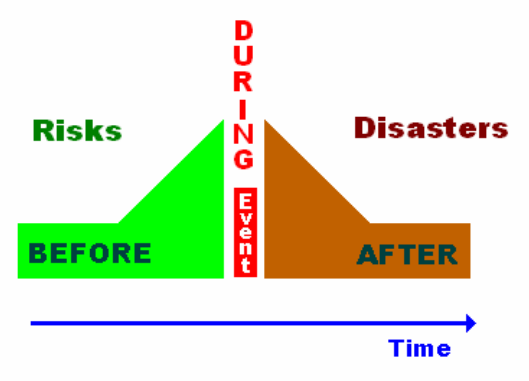
Disaster Risk Management
*Presented by **Juan Carlos Villagran de Leon , UNU-EHS***

A disaster is the manifestation of grave damages, losses, and problems which are triggered by a natural or a social event such as an earthquake or an explosion; which forces a given society or a community to request external assistance to cope with such problems and losses..



Considering the risk as a process, diagram leads to the result that: a disaster is the result of a long-term process related to the creation of risks; disasters are a reflection of the fact that some societies have not adapted their schemes of development to the environment which surrounds them.

As a basic notions of the conceptual framework of the risk it is to recognize in the temporal concept as follows:

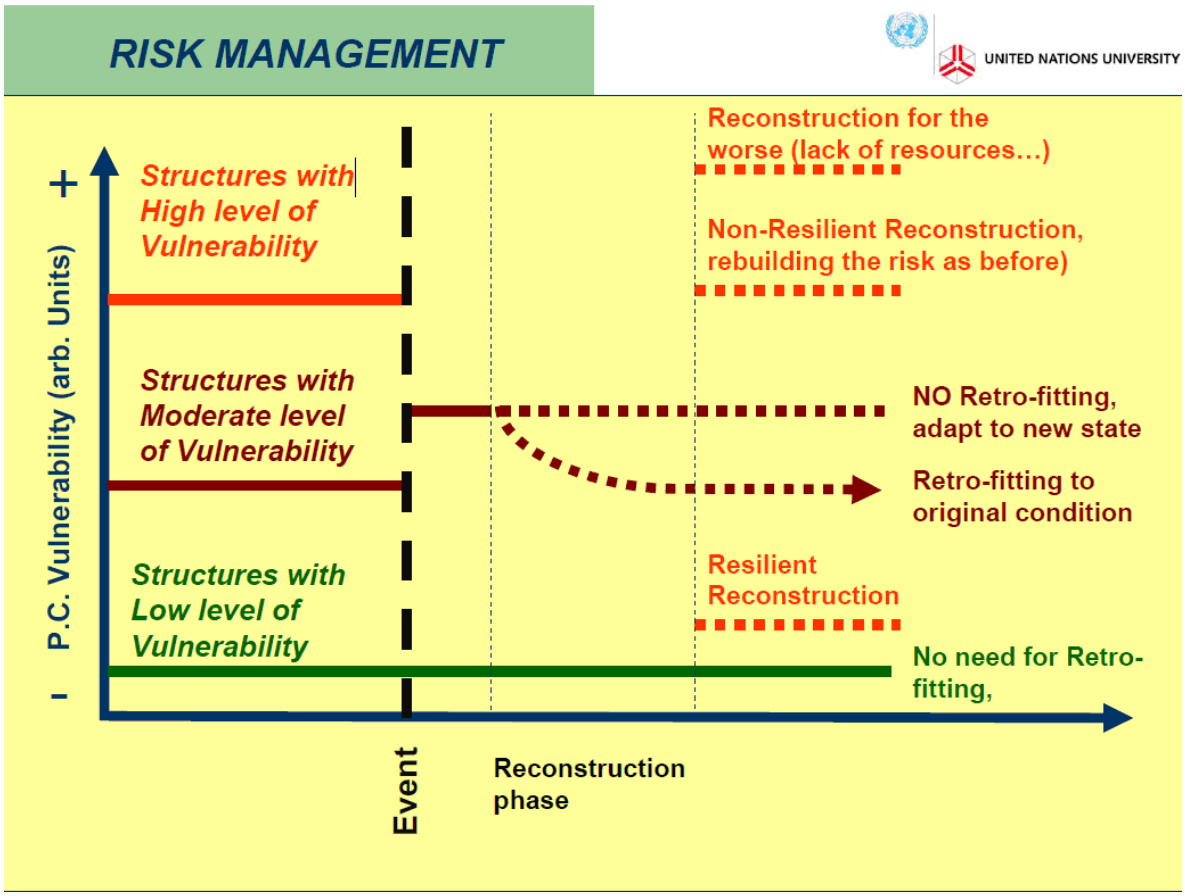


Following the main ideas indicating disaster risk management are:
- Theories about disaster say that the risk management are developed to explain experimentally observed processes or phenomena.
- New models introduce *at will*, sometimes to highlight "Ego" or "professional image of their proposers.
- Terminology of the risk management is very loosely handled and there is NO global consensus about terms used and their definition.
- Depending on who you talk to:
  - Hazard = Event or Hazard = Probability

- New "catchy" words introduced at will to replace previous ones

Considering evaluation methodologies for hazard, vulnerability and coping capacities is indicated that the factors allow for generation of risks.

AS synthesis of the analysis and discussion about different risk management frameworks regarding dealing with risks and measures on preparedness, prevention, mitigation is be shown in the graph below.



Economics and Social Vulnerability
*Presented by **Koko Warner, UNU-EHS***

The presentation concluded the perspectives and research agenda on social vulnerability and mechanisms and policy implications on economic and financial vulnerability.

Research on social vulnerability requires clear

Definitions, a sound theoretical founding, and consideration of the spatial, temporal, and socio-economic context. There exist many significant debates and research gaps today.

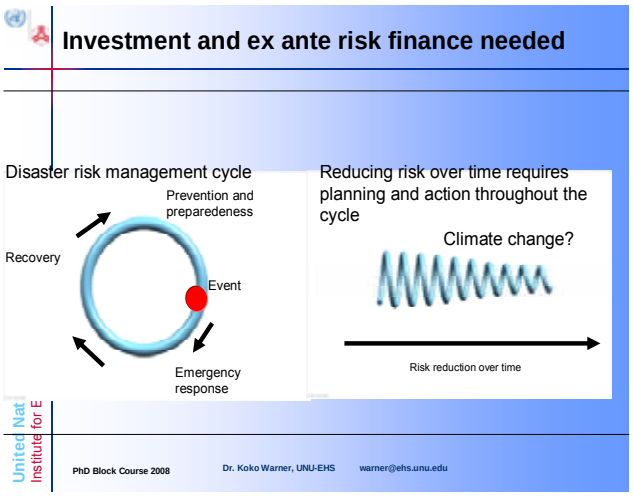
The public needs straightforward information and opportunities to learn about the roots and possible solutions of social vulnerability. Practical tools and knowledge can positively shape vulnerability-reducing behaviors and community action.

To strengthen ability of has to be increased sustainability by giving affected people tools they need to help themselves and shape their own resiliency-building approaches.

On the economic part of the presentation have been introduced different definitions and formula of economic and financial vulnerability, their mechanisms and policy implications. The framework of financial mechanisms refers to identification, measuring, and comparing vulnerability to natural hazards (using case studies in different countries) outlining initiated schemes of the federal and local governments, NGO, and micro finance initiated schemes. Those schemes comprehend expected rise in disaster losses related to climate change, the layerer public / private insurance system and an international reinsurance pool.

- Natural hazard and financial vulnerability affect how natural disasters interact with the economy
- Financial vulnerability of a government is defined by ex-ante and ex-post decisions
- Benefits of ex-ante and ex-post decisions depend on policy objectives maximization of returns, instability and variability
- Tools available to identify, measure, and compare financial vulnerability and to plan

"From the standpoint of macroeconomic policy, the key question is how much and how rapidly can the government afford to borrow to finance the reconstruction costs, while keeping fiscal policy on a sustainable path" (IMF/WB 2001, El Salvador Earthquake, Warner:21)



Currently, financial services and resources are implemented in the emergency response phase of the risk cycle. It to a limited degree in the recovery phase (depends on resource availability and insurance penetration). A longer-term risk reduction strategy can give a greater role to financial services, helping set incentives for risk reduction and prevention before an event occurs.

The governments and victims absorb the costs, that donor aid for humanitarian assistance and that marginal insurance are used in the developing world today.

To overcome shortfalls of current disaster finance approache and to address expected rise in disaster losses related to climate change is needed alternative finance mechanism.

Advantages of ex ante / risk reduction approaches

- **Dialogue about risk.** Insurance-related finance mechanisms require a conclusive dialogue about acceptable and unacceptable risks, values-at-risk, and specific risk reduction actions a country or area should or would be willing to take in order to lower expected risks from climate change. The focus on risk transparency, communication about acceptable risks, and possible actions to limit exposure to risk is superior to the current ex-post system of funding natural disasters.
- **Consistent funding.** Insurance-related finance mechanisms are not reliant on media attention to raise money. Money needed to repair and recover from disasters is released upon occurrence of a pre-defined event or when insured losses reach a threshold specified in an insurance contract .
- **Coverage guaranteed.** Insurance-related finance mechanisms do not depend on the uncertainties of competition for donor funds when multiple events occur in different locations in the same donor year.
- **(mostly) free from political considerations.** Insurance-related finance mechanisms depend on defined parameters of loss rather than the "fit" with political priorities of donor countries

Risk Perception

*Presented by **Xiaomeng Shen, UNU-EHS***

Human – nature relationship and culture as a driving factor for risk perception
Case studies: Cologne, Germany and Wuhan, China in comparison refer population, economics, flood risk perception, flood risk management strategies taken, content of spatial planning

Culture as a driving factor for risk perception

Culture is defined as a way of life by Cultural Theory. Way of life is a viable combination of cultural bias and social relations

Nature Begnign | Nature Ephemeral | Nature Capricious | Nature Perverse/Tolerant

Risk Portfolio of different cultural types

Cultural Types	Risk Portfolio	Attitude towards Risk
egalitarian culture	environmental risks	amplification of risks, precaution, criticising
hierarchical culture	war, terror jeopardizing their power, but tend to neglect future risks	reductionist, depoliticising, emphasis of measurability
individualistic culture	state control, limitation to freedom which may interrupt their free market activity	acceptance and deflection
fatalistic culture	natural disasters as punishment of superior power, hence unavoidable	neutral position

Integrated Approach: a Universal Concept?

Top-down vs. bottom-up

Hierarchy vs. participation

State responsibility vs. individual responsibility

Stakeholders vs. actors

Political and cultural change can only ideally take place from within – *Johnson, 1991*

Flood Protection – Mitigation of Risk?

Presented by ***Prof. Dr. H. Patt, University Duisburg-Essen***

Presented flood protection strategy of the University Duisburg Essen refers to the (1) water retention in catchment area – flood plain management - river catchment management, (2) technical flood protection measurements and (3) flood precautions.

There were indicated and explained technical side(and importance of constructions) of the undertaken measurements, flood plain management in the presentation. The presentation introduced to constructive precautions like dykes, walls or mobile/movable systems used upstream, downstream, within streams along the rivers in Germany. The table below shows relation of flooding, damage and risk presenting advantages and disadvantages for risk management.

	Flooding	Damage	Risk
Flooding	**There will be always flooding (Fortunately)**	**Flooding without damage is possible (Fortunately)**	**There are always risks !!!! (Unfortunately)**
Management of	**is a precaution;**	**reduce damage; no**	**can**

inundated areas close to the rivers	**especially the protection of inundation areas from uses will**	**uses in that areas avoid damage**	**mitigate risks; no uses in that areas will significantly reduce risk**
Technical Measurements	**Constructional flood protection; today essential**	**avoid damage up to the design flood**	**enlarge the risk of high damage; decrease risk of small damage**
Suitable Preparation of the people concerned	**reduce the damage significantl**	**reduce the damage significantly**	**reduce the risk significantly**

Framework IV
Hazards and Risks

The Use of Disutility Functions to Characterize overall Risk Perception
*Presented by **Janos J. Bogardi, UNU-ViE / UNU-EHS***

There was pointed out that ideal conditions do not exist in a multi-level world in the presentation. It was highlighted three conditions to satisfy at any one time. These are:

1. Production
2. Societal Needs
3. Nature Conservation

Therefore, it was inevitable that there needs to be a compromise between these three desired conditions to find the best solution. This concept was illustrated using dimensional spaces. The illustration explained how to obtain the best point on the dimensional surfaces. The discussion detailed the concept of (1) objective, (2) decision and (3) utility space, where the utility space can be considered as the extreme-best ideal point; however the challenge is that one does not really know the utility space. The methods of assessing utility were elaborated but it was explained to be characterised on the state of the risk involved and the risk seeker. The derivations of utility functions using the method of indifferent points and certainly equivalent was explained. The discussion elaborated on issues such as risk adverse, neutral and risk 'gambler" strategies. This lead to discussions on Von Neumann-Mergenstern Utility Hypothesis. The idea of the presentation was also to develop functions towards flooding decisions which were also constrained by other factors such as production, societal needs etc.

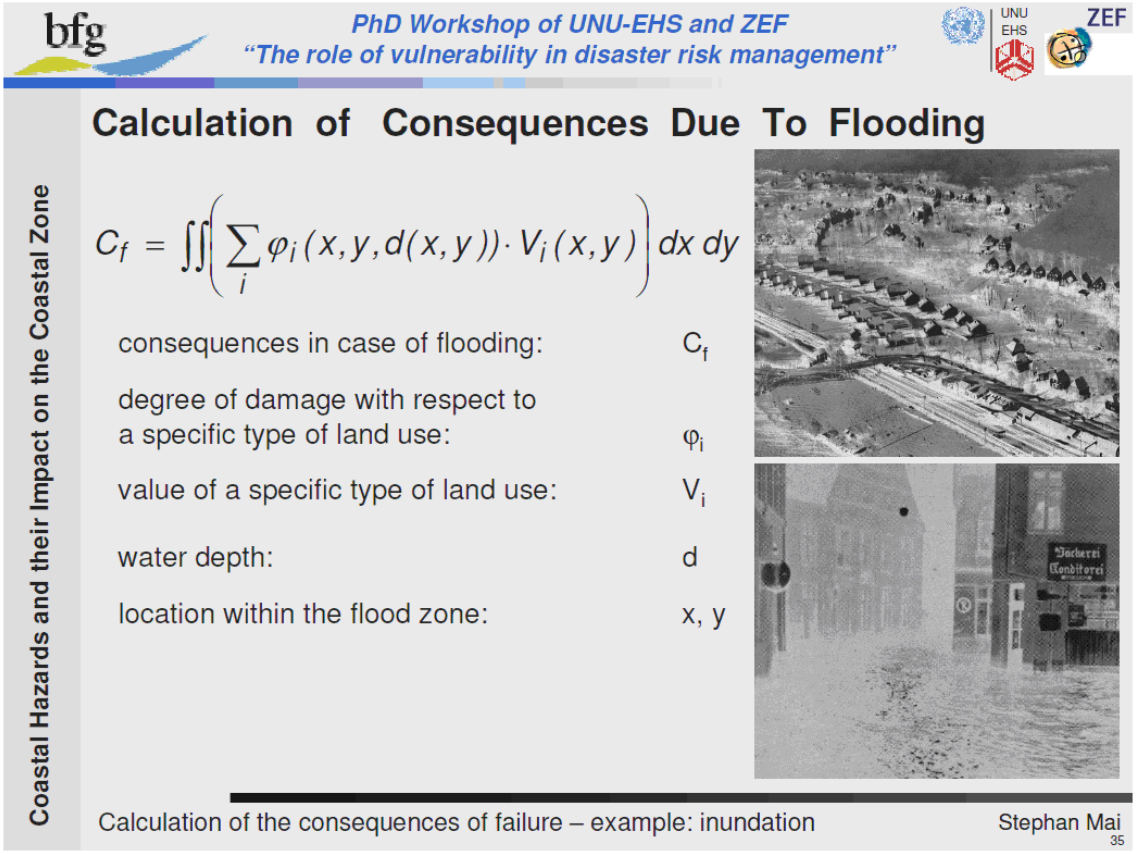
Coastal Hazards and Their Impact on the Coastal Zone
Presented by Stephan Mai, BFG

The presentation provided broad overview over coastal hazards highlighting extreme water levels and extreme wave loads.
There are astronomical and meteorological aspects to consider regarding tides and surges.
Statistical approach and analysis on storm surge water levels, mean tidal high water levels and

technical tools is a very important for measuring and calculations for surge prevention like dike. In this regards it was developed the fundamental equation of risk analysis:

*Riks=probability of failure (of coastal defences) * consequences (due to flooding).*

It was given introduction to the mathematical decription of the failures mechanism "Wave overtopping" and wave run-up visualization in diagrams. Further were explained mathematic formulas and calculation of the consequences due to the flooding.



Additionaly were presented technical measures for risk reduction as secondary dike's construction which were done by reducing the loss in case of flooding and limiting the area of inundation. Thus the technical measures for risk reduction based on storm surge barriers provides accordingly following pros and cons:

pros:

• reduction of the length of the defense line _ reduction of failure probability

• no need for dike heightening _ no need for additional space along existing dikes

_ no extra weight on the ground (marsh land)

cons:

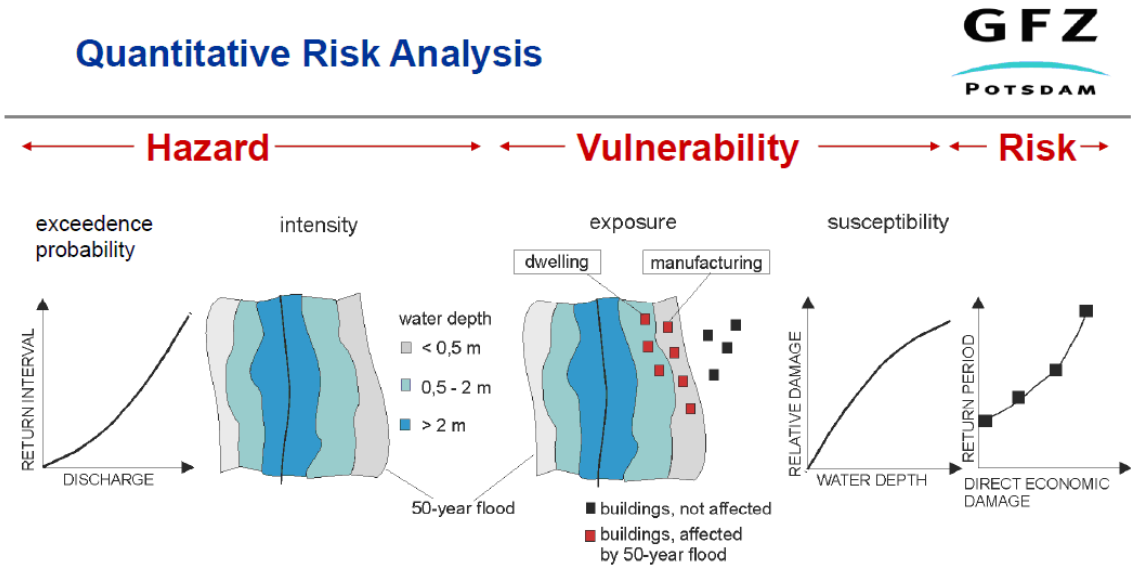
• increase in storm surge water levels infront of the barrier (range of this effect: up to 40 km even at the open coast)

• shipping is hindered

• long lasting closure of the barrier may effect ecological properties due to a shift of the zone of brackish water.

To consider are also Climate change effects:
increasing of failure probability /risk for the coastal zone referring to the rise in sea water level, increase in wind speed,
compensation by adaptation of coastal defenses.

Estimation and Mapping of Flood Risks in Germany
Presented by ***Heidi Kreibich, GFZ Potsdam***



Three important questions:
What can go wrong?
How likely is it that it will happen?
If it does happen, what are the consequences?

Sources: Merz & Thieken (2004) – ÖWAW 56 (3-4): 27-34

Main aspects of Quantitative risk analysis are hazard, vulnerability and risk. They refer to the data of flood risk estimation a, types of flood damages, scenarios and modeling systems. The simulation of modeling system for lower-Rheine river was developed using following modules: hydrological load, routing , levee failure&outflow, hydraulic transformation, damage estimation and aimed into risk curve. Probabilistic levee breach simulation, transfer and application at the rivers, consideration of upper bounds and development of realistic scenarios with varying probabilities along the rivers play a important role for further development of modeling systems. An exposition on assets can be developed considering databases, data analysis, spatial distributions of asset values and criteria of data collection and analysis, and analysed flood losses and influence factors.
Flood Loss Estimation MOdel FLEMO is mainly used for the modelling of extreme flood events, special hydraulic situations. For thorough modelling need to be taken into consideration following:

- Realistic large scale scenarios need to be developed for regional scale flood risk assessments

- Asset estimation and dasymetric mapping for the whole of Germany support a regional scale flood risk assessment
- Collection of detailed data about flood losses and thorough analysis reveals the main factors influencing flood losses
- The new flood loss estimation model FLEMO+ not only considers water level and building use/type, but also building quality, contamination and precaution
- A transparent scaling procedure for applications on the meso-scale was developed
- Model validation reveals that FLEMO+ outperforms stage-damage-functions and

therefore improves results of risk analyses

ATLAS

By Dusan Sakulski, UNU-ViE

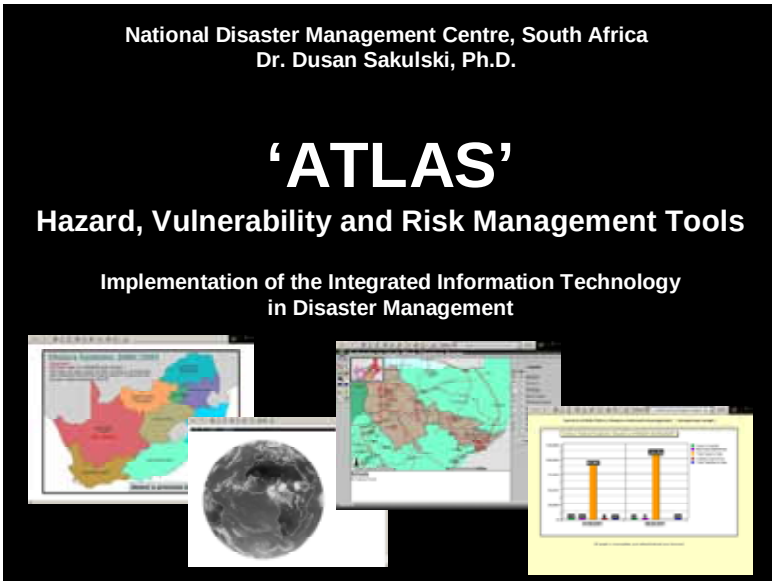
The increase in the frequency of disasters and their associated damages in the SADC region is part of a worldwide trend. It results from growing vulnerability and may reflect changing climate patterns.

National Disaster management centre in south Africa has initiated development of the National Disaster Hazard and vulnerability atlas, which is a database – driven , web-enablred interactive 'virtual book'highlighting various chapters , such as droughts, floods, cyclones, storms, severe weather, fire.

Key tasks of the Atlas:
- Development of a National disaster related hazard, vulnerability and risk assessment tools.
- Development of an integrated National disaster hazard and vulnerability information network.
- Augmentations of the comprehensive hazard and vulnerability specific programs.
- Contribution to the National disaster management curricula.

Atlas is:
- Hazard, Vulnerability and Risk Management Tools.
- Early Warning Tools.
- Single Hazard, Vulnerability and Risk Information Entry Point / Portal.

Main elements of the Atlas
- Developing a comprehensive database to identify and visualise hazard, vulnerability and risk-prone areas.
- Understanding and addressing risk.
- Assimilating and disseminating information.



Framework V

The Different Tools of Risk Management

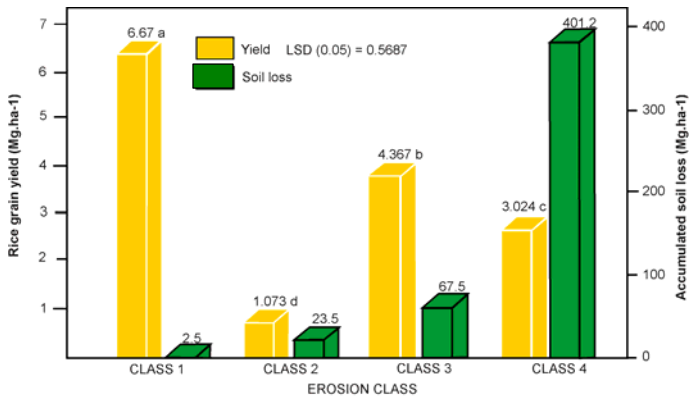
Erosive land degradation – processes, trends and physical impacts

*Presented by **Libor Jansky, UNU-ViE***

Referring to the environmental trends, cycles in the nature there are taking place various rainfall changes, air temperature prognosis, surface runoff changes and biomass distribution changes by 2080. Furthermore taking into account presented comparison of the forest 8000 years ago and today, and bringing up the globalization process of desertification, the "Millenim Declaration" indicates a main goal to ensure environmental sustainability. Thereby the main aspect is erosive degradation-destrucion of soil/land. Soil degradation is a process that describes human-induced phenomena which lower the current and/or future capacity of the soil to support human life. Considering on basic forms of soil degradation, different introduced illustrated field research methods as a synthesis there are important issues for humans and visualised in the diagramme below:

The soil degradation in practice is a very complex story.

Issues important to people …yield vs erosion



Values of grain yield followed by the same letter are not significantly different at P<0.05

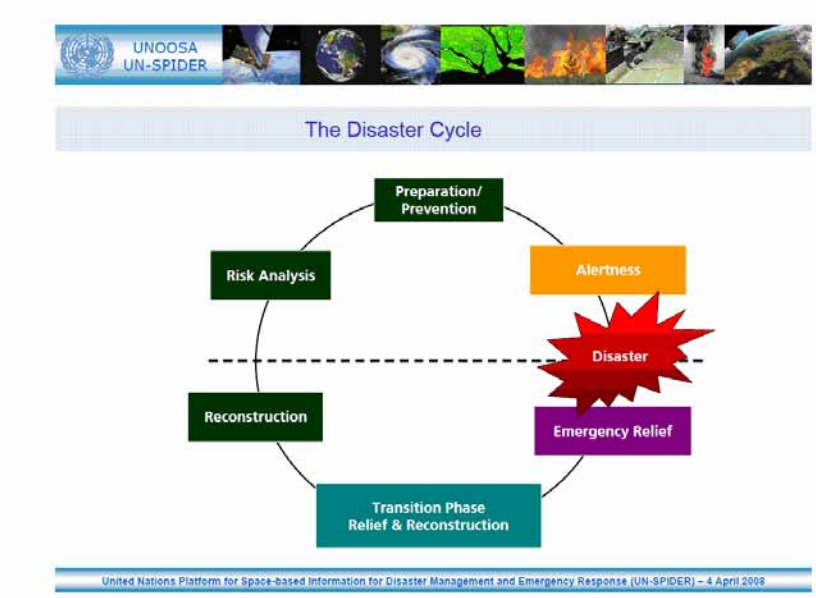
Y = 5.634 – 0.0068X R2 = 0.68* (n =9) (1)

Where Y is estimated rice grain yield in Mg.ha-1 and X is accumulated soil losses in Mg. ha-1.

Space-based Solutions for Disaster Management
*Presented by **Joerg Szarzynski, UN OOSA***

Space based solutions are

- Satelite communications – helping to warn people who are at the risk, especially in remote areas to connect a disaster zone to the outside world.
- Earth observing satellites – images from them help assess the damage caused by disasters like earthquakes, volcano eruptions, oil spills and floods.
- Global navigation satellite saystems – enable us to obtain positional information on events that jave to be mapped



Space – based solutions contribute to disaster management with:

1. Disaster prevention (risk reduction)
– Catalogues with spatial component
– Hazard assessment
– Elements at risk mapping
– Vulnerability assessment
– Risk assessment
– Spatial Decision Support Systems
Contribution of Space-based Solutions

2. Disaster preparedness
– Disaster plans
– Anomalies in a time series
- Forecasting & Early warning
-Monitoring of an ongoing situation
3 .Disaster response
– Mapping extent of disaster
– Damage assessment
– Relief coordination
– Evacuation
4. Disaster recovery
– Organisation of damage information
– Post-disaster census
– Identification of sites for reconstruction
- Update hazard, vulnerability and risk data bases

The United Nations General Assembly agreed on 14 December 2006 to establish the **"United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER)"** as a programme within the United Nations to provide universal access to all types of space-based information and services relevant to disaster management by:
• being **a gateway** to space information for disaster management support;
• serving as **a bridge** to connect the disaster management and space communities; and
• being **a facilitator** of capacity-building and institutional strengthening

Following those activities and objectives UN-SPIDER provides intergrative information Web portal for disaster management support based on for background information, communication, Meta-information and user training.

***"Data is not information - information is not knowledge - knowledge is not understanding - understanding is not wisdom." (*Cliff Stoll & Gary Schubert**

Natural Hazards and Global Change
Presented ***by Dr. J. Weichselgartner, LOICZ***

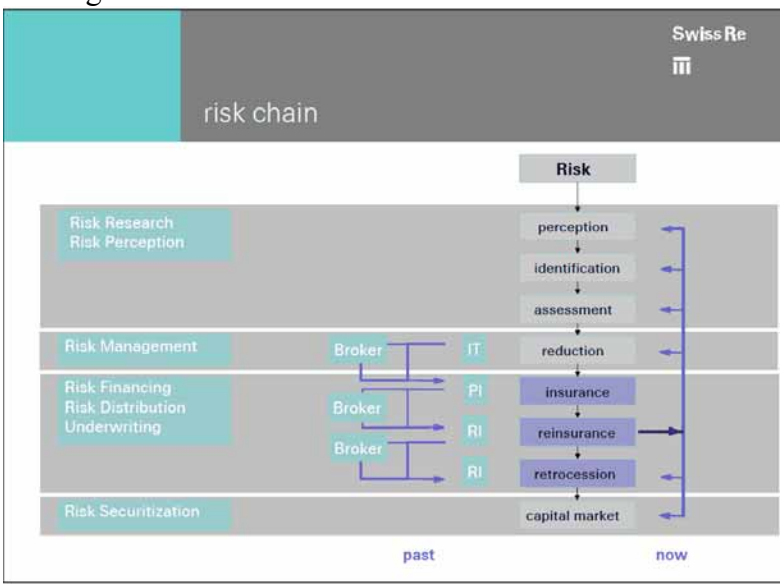
Four reasons – population increase in risk prone areas, increasing of material wealth, land use change and climate change - why losses are increasing have been pointed out and visualized it with number of disaster and victims in al over the world during the period 1974 – 2003 by presenter Dr. Weichselgartner. Global change in general is (transformation-) processes that modify social-ecological systems. Demographic change encompasses the study of the size, structure and distribution of populations, and spatial and/or temporal changes in them in response to birth, death, migration, and aging, i.e., processes such as increasing life expectation, decreasing rural population, invreasing urban population and etc. Further the consequences of global demographic change are: (1)Demographic processes differ between regions and, thus, have regionally different impacts; (2)Demographic changes have far-reaching societal consequences since they have impact on social security systems, economic & working environments, educational systems, food systems, water cycle and financial markets & flows etc., and therefore constantly modify risks and vulnerabilities. Considering key questions what science is doing and what has to be done , outlines the main question : what is needed:

In a whole taking into account highlighted difficulties the presentation concluded following:

- Global Change modifies social-ecological systemsand, thus, their vulnerability and resilience
- Global Change research has to study relationshippatterns in a multidisciplinary way
- Understanding and regulation of these patterns are crucial future challenges
- It requires a system-analytical, integrative andaction-orientedresearch

Natural Disasters: Insurance as a Tool for Risk Management
Presented by Ulrich Ebel, Swiss RE

Insurance is beheld as a toll for risk management related to the natural disasters. Referring to the numbers of insured losses related to natural catastrophes since 1970 there is strong upward trend due to : higher insurance penetration; growing property values; coastal value concentration; higher vulnerabilities and climate change/variability. In order to determine cat loss has been developed a Cat Perils Risk Model, which is based on four main elements as hazard, vulnerability, value distribution and cover conditions. This model helps to identify loss frequencies. Prinnciple of insurance says that the law of large number is 'with enough independent risks, results become predictable and volatility reduced', but parallelly there are open questions: what is enough? Are risks independent? Do we understand risk?. Therefore as an explanation for risk is using the risk chain:



An overall vision and strategy of risk is based on event set consisting of

- Risk Assessment (single contract, trad./non-trad.1)
- Risk Transfer (Swiss Re acceptance/conditions)
- Risk/Portfolio Management (Swiss Re book)

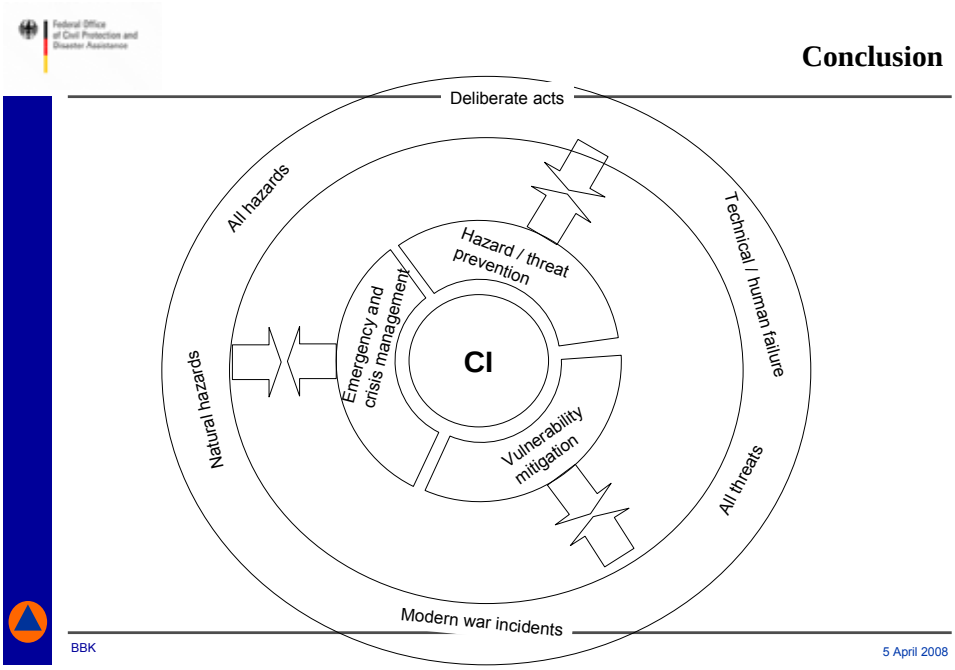
By sharing Nat Cat risk between pilcy holders, domestic insurance industry, capital markets and the State, even very extreme catastrophe losses become insurable.

Finally in pool solutions the natural catastrophe risk is pooled on domestic basis. The important aspect for risk management is public private partnership and that an insurance supports social stability and economic growth.

Framework VI
Risks and Media

Vulnerabilities of Critical Infrastructures
Presented by Peter Lauwe, BBK

The work of the federal office of civil protection and disaster assistance on the four main topics: emergency management, emergency planning, Critical infrastructure protection, CBRN research and civil protection education. *Critical infrastructures* (CI) include organizations and systems that have a **major importance** for the society and that, if disrupted, would comprehensively affect **supply chains**, **public safety** and could lead to **further dramatic consequences**. Analyzed six case studies in Germany the management of the CI leads to the graph



and follows with two persoectives of vulnerability in the risk concept:
Perspective: CI's relevance for society
Risk = f (Hazards/threats, vulnerability, internal and external operational coping capacity)
Vulnerability = f (system's susceptibility, system's coping capacity)
Perspective: Function of CI
Risk = f (Hazards/threats, vulnerability)
Vulnerability = f (system's susceptibility, system's coping capacity)

Risk assessment methodology considers to critical analysis, hazard/threat analysis and scenarios, vulnerability analysis, process elements, vulnerability criteria, risk analysis.
The Federal office for civil protection developed **Risk and Emergency Management Guideline "Critical Infrastructure Protection - Risk and Crisis Management Guideline for Companies and Public Offices", which objectives are mitigating risks, supporting emergency/crisis management and supporting bussines continuity.**

The guideline provides following messages:

1 Vulnerability is part of a risk concept
2 Vulnerability is hazard / threat related
3 Vulnerability is related to different CI levels
4 Vulnerability assessment needs to be down to earth
5 Vulnerability assessment needs to lead to protection options.

Annex I

PHD BLOCK COURSE WITHIN THE FRAMEWORK OF THE JOINT UNU-EHS/ ZEF PHD PROGRAMME

ROLE OF VULNERABILITY IN RISK MANAGEMENT

PROGRAMM

31 March – 5 April 2008, Bonn, Germany

Monday **31 March 2008**	**Disaster Risk Management and Vulnerability Framework** *moderated by Vilma Hossini, UNU-EHS*
09:00- 09:15	Welcome Note *Janos J.Bogardi UNU-ViE/ UNU-EHS*
09:15 – 09:30	Introduction of Participants
09:30 – 09:40	Presentation of the Concept of the Block Course *Vilma Hossini , UNU-EHS*
09:40 – 10.45	Introduction to Decision Making under Risk and Uncertainty *Janos J. Bogardi, UNU-ViE/ UNU-EHS*
10:45 – 11:00	Tee/Coffee break
11:00 – 12:15	Where is this world going to? - Historical disasters, frequency and magnitude, spatial and temporal distribution; - Human and economical impact and consequences; - Recent disasters, importance of the 'collective memory'. *Dusan Sakulski , UNU-ViE*
12:15 – 13:15	Lunch break
13:15 --14:30	Vulnerability Assessment – Concepts and Frameworks:

	Empirical Results from Coastal Regions in Sri Lanka; and Floodplains in Germany *Jörn Birkmann, UNU-EHS*
14:30 – 15:45	Tee/Coffee break
15:45 – 17:00	Resilience of Socio-Ecological Systems with an Emphasis on Environmental Components *Fabrice Renaud UNU-EHS*
17:00-17:30	Day 1 Wrap up session
Tuesday **1 April 2008**	**The Diversity of Vulnerability** *moderated by Vilma Hossini*
09:15- 10:30	Risk &Vulnerability from Social Geographic Perspective (TBC) *Frauke Kraas, University of Cologne*
10:30 – 11.00	Tee/Coffee break
11:00 – 12:15	Biology of Vulnerability (movie) *Dusan Sakulski , UNU-ViE*
12:15 – 13:30	Lunch break
13:30 – 14:45	Vulnerability TBC *Janos J. Bogardi, UNU-ViE / UNU-EHS*
14:45 -15:15	Tee/Coffee break
15:15 – 16:30	Environmental Migration *Tamer Afifi, UNU-EHS*
16:30 – 17:00	Day 2 Wrap up session
Wednesday **2 April 2008**	**Risk - Causes and Consequences** *moderated by Vilma Hossini*
09:15- 10:30	Disaster Risk Management *Juan Carlos Villagran , UNU-EHS*
10:30 – 11.00	Tee/Coffee
11:00 – 12:15	Economics and Social Vulnerability *Koko Warner, UNU-EHS*
12:15 – 13:30	Lunch
13:30 – 14:45	Risk Perception *Xiaomeng Shen, UNU-EHS*
14:45 -15:15	Tee/Coffee
15:15 – 16:30	Improving Flood Protection - Mitigating Risk? *Prof. Dr. H. Patt, University Duisburg-Essen*
16:30 – 17:00	Day 3 wrap up session

Thursday **3 April 2008**	**Hazards and Risks** *moderated by Vilma Hossini*
09:15- 10:30	The Use of Disutility Functions to Characterize overall Risk Perception *Janos J. Bogardi, UNU-ViE / UNU-EHS*
10:30 – 11.00	Tea/Coffee
11:00 – 12:15	Coastal Hazards and Their Impact on the Coastal Zone *Stephan Mai, BFG*
12:15 – 13:30	Lunch
13:30 – 14:45	Risk Management (TBC) *Heidi Kreibich, GFZ Potsdam*
14:45 -15:15	Tea/Coffee
15:15 – 16:30	Risk Management , Climate Change (TBC) *UNFCCC*
16:30 – 17:00	Day 4 Wrap up session
Friday **4 April 2008**	**The Different Tools of Risk Management** *moderated by Vilma Hossini*
09:15- 10:30	Titel TBC *Libor Jansky, UNU-ViE*
10:30 – 11.00	Tea/Coffee
11:00 – 12:15	Space-based Solutions for Disaster Management *Joerg Szarzynski, UN OOSA*
12:15 – 13:30	Lunch
13:30 – 14:45	Natural Hazards and Global Change *Prof. Dr. J. Weichselgartner, LOICZ*
14:45 -15:15	Tea/Coffee
15:15 – 16:30	Natural Disasters: Insurance as a Tool for Risk Management *Ulrich Ebel, Swiss RE*
16:30 – 17:00	Day 5 Wrap up session
Saturday **5 April 2008**	**Risks and Media** *moderated by Vilma Hossini*
09:15- 10:30	Vulnerabilities of Critical Infrastructures *Peter Lauwe, BBK*
10:30 – 11.00	Tea/Coffee
11:00 – 12:15	Media and Communication in Disaster Risk Management *Michael Krzeminski, FHS Bonn-Rhein-Sieg*
12:15 – 13:30	Lunch
13:30 – 14:45	Evaluation and Final Wrap-up Session

14:45 -15:15	Tea/Coffee
15:15 – 16:00	Student's feedback and course closure

Annex II

PhD Block Course

The Role of Vulnerability in Risk Management

31 March – 5 April 2008

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PhD Block Course

The Role of Vulnerability in Risk Management

31 March – 5 April 2008

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Annex III

Summary of Learning Café

Moderator Dr. V. Aimard, participating experts Dr. Juan Carlos Villagran UNU-EHS, Prof. Mirjana Vojinovic-Miloradov, University Novi Sad, Dr. Dusan Sakulski, UNU-ViE, Dr. Stefi Dannenmann ,UN/ISDR

Dr. S. Dannenmannn (ISDR)

Topic of discussion: early warning
Challenge: What are components of early warning?
Results:

1 hazard observation (forecasting, monitoring, data collection, wind measure, tsunami buoy)
2 risk and vulnerability assessment (measuring the threat, critical values)
3 technical systems (and false alarm)
4 dissemination tools (radio, police, cell phones, sirens, TV, speakers)
5 community (knowledge, norms, awareness, education, capacity building, traditional knowledge, participation)
6 Structures of societies for communication/ information dissemination (risk/security perception, social obstacles, participation in decision processes, drills, preparedness,)
7 institutions (incident command systems, standardised operational procedures)
8 legislation

Dr. J.C. Villagrán de León (UNU-EHS)

Topic of Discussion: physical component of vulnerability
Challenge: Draw a graph showing what happens to physical vulnerability during a disaster
Results:

8 Vulnerability: degree of damage (low: undamaged, medium: damaged, high: destroyed)
9 Different ideas were plotted in form from graphs
10 Discussion whether objects can be vulnerable or if vulnerability can only apply to humans
11 Result: Vulnerability consists of different components. One of them is the physical component.

Prof. M.V. Miloradov (University of Novi Sad)

Topic of Discussion: Global warming
Challenge:

12 Which (chemical) components contribute to global warming?
13 How can these be reduced?
14 Effects of global warming

Results:
<u>Components:</u>

15 aerosols, air pollution
16 carbon dioxide, burning of fossil fuels, increasing combustion: $C + O_2 = CO_2$
17 greenhouse gases

18 anthropogenic activities (industrialisation, traffic, resource exploitation)
19 acid rain

Reduction:

20 filter systems
21 efficiency of energy use (transportation, productivity)
22 substitution → renewable energy resources, green energy: solar, wind, tidal, geothermal, bio fuels, nuclear energy

Global warming effects

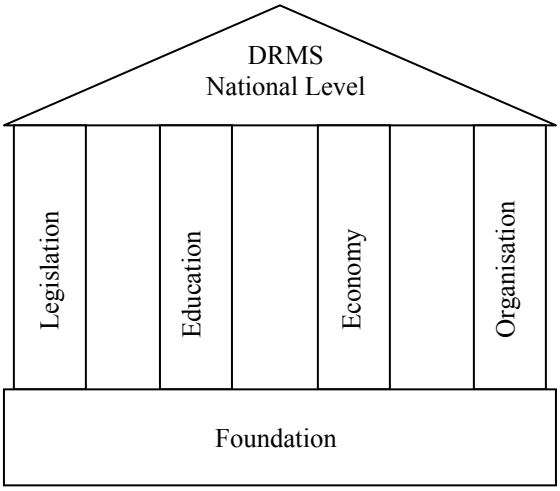
23 sea level rise
24 Extreme events (floods, droughts, storms…)
25 Forest fires
26 Loss of biodiversity
27 More infectious diseases

Dusan Sakulski (University of Novi Sad)

Topic of Discussion: Disaster Risk Management System

Challenge: What are the pillars of Disaster Risk Management Systems?

Results:



He introduced an approach aimed to assess the aggregate risk potential of a region by means of considering various spatially relevant risks, such as floods, earthquakes, major accident hazards etc., and combining them into a hazard mapping information system. The scale of the approach is the NUTS 3 level and the target group are politicians and administrative unities at the European level. The methodological basis of the approach defines risk as a function of the hazard potential and vulnerability, which consists of hazard exposure and coping capacity. Furthermore, he presented the composition of the hazard maps and stressed the fact that the hazard intensities are expressed by an ordinal scale instead of the often used relative scale. He showed that the integrated risk map as the

final product was derived by the integration of the hazard map and the vulnerability map. He stressed the fact that the integrated hazard map is based on various hazard indicators, such as river floods, forest fires, earthquakes etc., using different weighting factors and intensity scales. Additionally, four indicators were selected to develop a vulnerability map as a counterpart of the integrated hazard map. The vulnerability indicators which were used for this approach were the regional GDP/capita, population density, sensitive natural areas, and the national GDP/capita as a measure for coping capacity as part of the vulnerability map. Moreover, he presented selected results and stressed the fact that future activities should explore those areas which will be highly at risk in the future.

Annex IV

PhD Block Course 2008

Zentrum für Entwicklungsforschung
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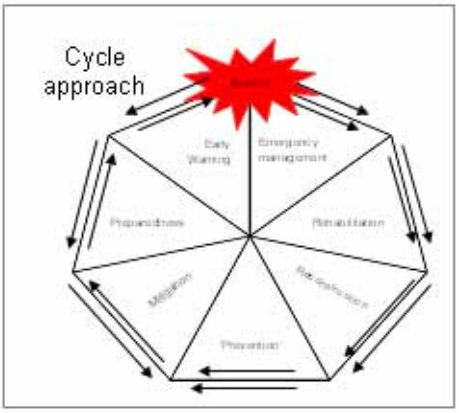
Role of Vulnerability in Risk Management

Disaster Risk Management

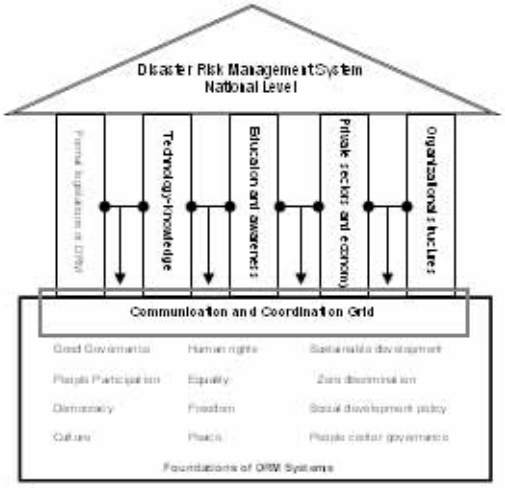
Definition

DRM is an encompassing term for pre-, during and post-disaster risk reduction planning measures. It is a systematic processes, integrated and should be part of development processes in everyday level. DRM is has emerged as an complex both interactions and interplays of pre, during, and after activities that are cyclically clockwise and counter clockwise.



Examples for Instruments/Tools

- Insurance mechanisms (i.e. flood risks)
- Micro-Insurance – developing countries
- Technologies (e.g. Remote Sensing, GIS)
- Structural approach (Civil/Coastal Engineering)
- Ecosystem services (e.g. Mangrove planting, forelands)
- Capacity building
- Analytical Tools for risk identification, risk assessment, loss scenarios (e.g. Disutility-function, loss calculation)



Challenges and drivers

- **Global change**
  Demographic changes, climate change, land use & land cover changes, increasing material wealth, long-term risks, the rise of disaster risks
- **Knowledge management/sharing**
  Inter-, multi- & transdisciplinary, action-orientated, with broad participation, understanding of complex systems
- **Risk perceptions**
  Risk perceptions and priorities are not always guided by rational choice
- **Governance issues – dev. countries**
  Poor policy, poverty trap, debt trap

Conclusion:

Risk Management requires the closing of gaps of ...

.... Science & policy, disciplines, cultures of risks, causes and effects of disasters...

DRM-Group: Maja Djogo, Jonatan Lassa, Loan Vo Phuong Hong, Cilli Sobiech

Annex V

PhD Block Course 2008

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Role of Vulnerability in Risk Management

- HAZARD -

A CONSTANT COMPANION HARD TO GRASP

Elements constituting Hazards:

- Intensity
- Probability of failure
- Probability of occurrence
- Place of occurrence
- Perception
- Time-frame
- Cause (natural and/or human)

Hazard-Vulnerability-Risk

Without Hazard, no risk exists. If there is no hazard, there is no vulnerability!

Open Question

Is a hazard necessarily linked to its actual occurrence? (Event / Threat)

Definition (among others):

A threatening event, which is probable to occur and may lead to destruction of things important to man. It may occur suddenly or evolve slowly.

Nicole Bendsen, Martin Lange, Dušan Milovanović, Sophia Schmidl, Chun Xia

Annex VI

PhD Block Course 2008

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Role of Vulnerability in Risk Management

31 definitions

VULNERABILITY

Vulnerability according to different experts:

- Risk f (Hazards, Vulnerability) → Vulnerability measured as recovering time
- Vulnerability is a socially-constructed condition which makes a society prone to suffer damages
- Economic vulnerability is the degree to which a natural hazard endangers an economy`s productive capacity

Researchers need an interdisciplinary perspective to approach vulnerability.

Intervention has to be interdisciplinary as well as encompassing all institutions involved.

Farhat Naz, Tuan Vo Van, Philipp Willroth and Anna Zorndt

Annex VII

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Role of Vulnerability in Risk Management

Disaster Management

Disaster Management is a continuous process of decision making that comprises measures and actions, activities which are aiming at reducing the adverse impact of an hazardous event.

Control room of a disaster management section (Source: Sakuteki)

The critical links in disaster management exist in spatial, temporal and organizational dimensions. Planning and action have to be integrated and coordinated amongst actors at different horizontal and vertical spheres and throughout all phases of the disaster management cycle.

The figure shows the three phases of the disaster management cycle. Before an event strikes it is important to clarify responsibilities and get necessary structures (organisational as well as physical) in place. Additionally manpower has to be trained and equipment organized and maintained. During the disaster, fast and short communication and decision flows play a crucial role in order to foster an effective coordination of measures and actions. After the direct impact of the disaster, system functions should be (re-) installed through the placement of social and economical infrastructures.

Helicopter rescuing flooded population

Sadoti Makwaruzi, Denis Chang-Seng, Emmanuel K. Derbile, Matthias Garschagen

List of Acronyms:

ZEF - Centre for Development Research

UNU-EHS - United Nations University Institute for Environment and Human Security

DRM - Disaster Risk Management

CRED - Centre for Research on the Epidemiology of Disasters

EACH-FOR - EnvironmentAl Change and FORced Migration Scenarios

EM-DAT – Emergency Events Database

PBT- Persistent, Bioaccumulative and Toxic

TOMP - Toxic Organic Micro Pollutants

POP - Persistant Organic Pollutants

PCB - Polychlorierte Biphenyle

AAS - Active Air Sampling

PAS - Passive Air Sampling

APOPSBAL - as assessment of stressors and sampling techniques

GDP – Gross Domestic Products

NGO – Non Government Organisation

FLEMO - Flood Loss Estimation MOdel

SADC – Southern African Development Community

CI - Critical Infrastructures

CBRN – Chemical, Biological, Radiological, Nuclear

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