

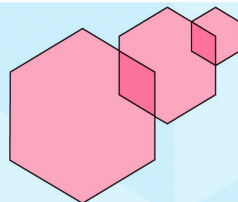


UNITED NATIONS  
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**UNU-EHS**

Institute for Environment  
and Human Security

IN COOPERATION  
WITH  
**ADRC**



# Measuring Vulnerability

## Expert Workshop in Kobe, Japan

by Joern Birkmann



**Working Paper No. 1**

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# REPORT ON THE 1<sup>ST</sup> MEETING OF THE EXPERT WORKING GROUP “MEASURING VULNERABILITY” OF THE UNITED NATIONS UNIVERSITY INSTITUTE FOR ENVIRONMENT AND HUMAN SECURITY (UNU-EHS) HELD JANUARY 23-24, 2005 KOBE, JAPAN

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## 1) PROGRAMME

### OF THE EXPERT WORKSHOP “MEASURING VULNERABILITY”

Time 23.01.2005	Topic	Expected outcome	Method
<b>INTRODUCTION</b>			
8.30 – 8.35	Welcome by ADRC <i>Mr. Kitamoto / Executive Director of ADRC</i>		Presentation
8.35 – 8.40	Introduction <i>Prof. Dr. van Ginkel / Rector of UNU</i>		Presentation
8.40 – 9.45	Intention of the workshop <i>Prof. Dr. Bogardi / Director of UNU-EHS</i>		Presentation
8.45 – 9.15	Round of introductions <i>All participants</i>	Breaking the ice	Presentation all
<b>I THE FRAMEWORK: THEORETICAL BASIS AND PRINCIPLES OF INDICATOR DEVELOPMENT</b>			
9.15 – 9.35	Setting the framework – Introduction to indicators, vulnerability, sustainable dev. <i>Dr. Birkmann / UNU-EHS</i>	Presentation of basic principles, outline of goals of the workshop	Presentation
9.35 – 10.00	Discussion		Open Discussion
Break	20 minutes		
10.20 – 10.40	The perspective of ADRC <i>Mr. Kitamoto / Executive Director of ADRC</i>		Presentation
10.40 – 11.00	Approaches and techniques of indicator development <i>Prof. Tamás / Director, Institute of Sociology of the Hungarian Academy of Sciences</i>		Presentation
11.00 – 11.20	UNEP – indicator experience <i>Dr. Norberto Fernandez / Division of Early Warning and Assessment, UNEP</i>		Presentation
11.20 – 12.00	Discussion and conclusions - Identification of standard criteria and specific criteria for vulnerability indicators	Standard criteria specific criteria for vulnerability indicators	Prepared discussion
12.00 – 13.00 Lunch			
<b>II CURRENT APPROACHES: STATE OF THE ART</b>			
13.00 – 13.20	Presentation of the findings of a review of Global Disaster Risk Indicators <i>Dr. Peduzzi / UNDP BCPR and Dr. Pelling / Kings College London</i>	Comparison among nations UNDP / BCPR experience	Presentation
13.20 – 13.40	Hazard and risk assessment <i>Dr. Vollmer / Joint Research Centre of the European Commission</i>	Approaches of the Joint Research Center	Presentation
13.40 – 14.00	Features of vulnerability - focussing on sectors – experience from Guatemala <i>Dr. Villagrán de León / UNU-EHS</i>	Addressing vulnerability through sectors	Presentation
14.00 – 14.20	Criteria to define and measure coping capacity <i>Dr. Wisner</i>	Criteria	Presentation
14.20 – 15.30	Discussion	Features and goals of vulnerability	Meta-Plan-Technique
Break	20 minutes		
15.50 – 18.00	Discussion of the framework for indicator development (goals, features, indicators)	Features of vulnerability and coping capacity	Working groups

<b>Second day 24.01.2005 II CURRENT APPROACHES: STATE OF THE ART</b>			
8.30 – 9.00	Introduction and reflection on the first day <i>Prof. Bogardi and Dr. Birkmann / UNU-EHS</i>		Presentation
9.00 – 9.20	Measuring vulnerability and coping capacity <i>Prof. Plate, University of Karlsruhe</i>	Critical index of vulnerability and coping capacity	Presentation
9.20 – 9.40	Multi risk assessment – with a special focus on vulnerability <i>Dr. Greiving, University of Dortmund</i>		
Break	10 minutes		
9.50 – 10.10	Community-based disaster risk index – experience from Indonesia <i>Dr. Bollin / GTZ</i>		
9.50 – 10.10	Measuring coping capacity <i>Mr. Billing / ECHO</i>	Discussion on how to measure coping capacity.	
10.10 – 11.00	Discussion + Findings + Reflection	Discussion of the working groups: vulnerabilities and coping capacities	Open Discussion
Break	20 minutes		
11.20 – 12.00	Summarizing future research questions What is missing?	Reflection	Working groups
12.00 – 13.00 Lunch			
<b>III THE FUTURE: SCOPE AND MANDATE OF THE EXPERT GROUP</b>			
13.00 – 14.30	Formulation of future activities in the short term (presentation of the next meeting in Bonn, Germany in October 2005)	Definition of future activities, next meeting	Discussion
14.30 – 15.30	Discussion of the structure and mission of the expert group Core working group, Members & membership Strategies for communications Formalities	Definition of the structure and mission of the expert group	Discussion
Break	30 minutes		
16.00 – 17.45	Identification of potential contributions from the different experts / institutions	Contributions from different experts	Meta-Plan-Technique
17.45 – 18.00	Closure EHS & ADRC		

## 2) GOALS OF THE WORKSHOP

In his introduction Prof. Bogardi pointed out four main goals of the workshop:

1. Exchange of information regarding current initiatives and research activities
2. Promoting future personal and institutional cooperations in the field of vulnerability analysis and vulnerability assessment, like the Expert Working Group (EWG) to be formed
3. gathering some recommendations with regard to the development of indicators of vulnerability for UNU-EHS research work
4. to encourage concrete project oriented co-operations in the field of vulnerability measurement and vulnerability assessment, e.g. joint research proposals, etc.

Moreover, he underlined that the Expert Working Group (EWG) should be a kind of network which, on the one hand, reflects the ideas of UNU-EHS and the work done and, on the other hand, should function as an expert network which meets on a regular basis (e.g. in workshops), but at the same time supports the work of the institute with joint research, for instance in case-study regions. This first workshop aimed to provide a forum to discuss jointly key questions with regard to indicators of vulnerability reflecting the various backgrounds and different perspectives. In this context UNU-EHS intends to review and test different methods and concepts for measuring vulnerability which have already been developed, but also to examine different features of vulnerability which have not yet been captured sufficiently in existing approaches. Furthermore, he outlined that UNU-EHS intends to document the workshop presentations, discussion and outcomes of the workshop in a proceedings.

## 3) EXPECTATIONS OF THE PARTICIPANTS

**Ben Wisner** Risk is the conjunction of Hazards and Vulnerabilities. However, there are different perspectives on risk and vulnerability emanating from different academic communities. The concept of vulnerability is being applied in many different ways. One must also dimension the different levels and scales (local, district, province, national, regional). In a way vulnerability can be seen as a fractal quantity, which manifests itself differently in different levels and scales. It is important to recognise that different issues emerge at different levels. In addition, there are ethnical issues to consider, as well as processes associated with public administration and daily work. In order to develop a relevant vulnerability assessment, it must be performed by those who are interested in it, or by those who will benefit from it. Assessments which the people carry out (self-assessment approaches) are in this context a method to ensure the relevance of the approach for the people.

**Norberto Fernandez** We must understand the extent of human vulnerability in relation to environmental change. It is important to develop indicators that display this issue well.

**Pascal Peduzzi** The work carried out by UNDP-BCPR in relation to vulnerabilities allows to assess them from different points of view. In addition, it is important to

introduce relevant issues which affect vulnerability, such as political and institutional aspects, including corruption, for example.

Angela  
Queste

BBK has an explicit interest in evaluating the vulnerability of life-lines and strategic infrastructure.

Gerald  
Vollmer

Vulnerability assessment should be carried out to support decision-makers. We expect to learn how other groups are measuring vulnerabilities. It is important to come up with vulnerability assessments at the global scale, but it is also important to do it at various levels and to promote networking.

Stefan  
Schneiderbauer

My expectation comprises the exchange of information considering ongoing research on vulnerability assessments and to agree with the other workshop participants on priority topics and future activities to address these topics. In particular I am interested in the variations of vulnerability measurements when looking at different scales. Decision-makers within international institutions such as the European Commission are relying on vulnerability assessments at a coarse scale and often of global coverage. Projects working on development issues and/or disaster risk reduction in the field require vulnerability assessments at a local scale. Are there differences in defining vulnerability? Where are there gaps and overlapping areas in approaching vulnerability assessments?

Christina  
Bollin

From the perspective of GTZ, projects in the field express the need to assess vulnerabilities, and also to evaluate the impacts that certain measures, once implemented, have on such vulnerabilities.

Jochen  
Zschau

The reduction of natural disasters, beginning with the reduction of risks, needs to start with a framework, a common understanding of the issues at stake. There are many factors which contribute to vulnerability which need to be related; perhaps we should consider the issue of an index composed of such factors.

Hans  
van Ginkel

We must include the historical dimension of disasters, the historical root causes that lead to vulnerabilities. One strategy might be to think in terms of people at risk and develop such indicators in relation to the people. If indicators are developed in this way, they may be employed. For example, coping capacity is a concept easy to understand because it is the people who have to cope with disasters and risks. We should look at the geographical picture; where are the people? Vulnerability and risk increase with increasing population density. In addition, we must address the issue of vulnerability to what.

Joanne  
Linnerooth-Bayer

There is still no commonly accepted definition of risk. The term is "contaminated" with values and processes. There seems to be confusion between risk and vulnerability. We must develop a model to assess vulnerability which takes into account the multiple stressors mentioned in the litera-

ture. However, it is important to recognise that it may be easy for an institution to develop indicators, but it will be difficult to do it at the global level. In addition, we must understand that the social dimension of vulnerability is so complex that we may not be able to evaluate social vulnerability comprehensively.

Maria  
Bilia

In Tanzania we seem to have a clear understanding of vulnerability. I am especially interested in the question: of how to develop and use such vulnerability indicators for pro-active planning.

Katharina  
Thywissen

There are different perceptions on vulnerability; therefore we need to identify aspects on how to reflect it and assess it through indicators.

Silvano  
Langa

We would like to have a common view on vulnerability and how to measure it. Mozambique is a vulnerable country especially with regard to floods and cyclones. We need to integrate disaster management into development planning; indicators could be an important instrument to enhance this link.

Mark  
Pelling

Vulnerability is also related to coping capacities. We need to reflect vulnerability through indicators. Besides measuring the state of vulnerability we must also look at the grassroots. To have an impact on policies we should link these indicators with development. We have to take into account that vulnerability is related to a process.

Jörn  
Birkmann

Vulnerability must be understood as a process embedded in a larger development process. The indicators should allow us to identify goals and provide guidance for strategies of vulnerability reduction. The vulnerability indicators should enable us to set more precise aims and quantitative targets for vulnerability reduction. Moreover, we need to define the functions the indicators should serve primarily, like monitoring or evaluation. These functions require different indicators.

Erich  
Plate

We must understand that there are quantities which can be dimensioned in a probabilistic fashion and some that are not. Hazard and risk can be expressed in probabilistic fashion, but not vulnerability. One strategy to look at urban vulnerabilities is to look at rural issues, understand the dynamics of the rural areas, for example the migration processes which are among the leading causes for vulnerability generation.



#### 4) BRIEF OVERVIEW OF THE INTRODUCTION AND PRESENTATIONS

##### Introduction

###### ***Kitamoto / Director ADRC***

Mr. Kitamoto welcomed all participants. Irrespective that the last days had been very stressful (WCDR), he appreciated the idea to have an expert workshop directly after the Conference focusing on the topic of measuring vulnerability. Moreover, he outlined key activities of the Asian Disaster Reduction Centre (ADRC).

###### ***van Ginkel / Rector UNU***

The rector underlined in his introduction the necessity to move from a culture of reaction to a culture of prevention. He stressed the fact that UNU-EHS has the mission to examine natural disasters, which can also be seen as “un-natural disasters”. In this context UNU-EHS focuses on prevention policies and preliminary strategies to mitigate risk and disasters. He outlined that we are far away from living with nature. In this context, vulnerability indicators should also measure and estimate how strong the society is to cope with these “un-natural” events. Furthermore, he declared that the development of indicators to measure vulnerability should be seen as a tool to strengthen the coping capacity of affected societies, rather than as a goal in itself.



###### ***Bogardi / Director UNU-EHS***

He underlined that the task to measure and quantify vulnerability, that is to develop indicators for analysing and assessing vulnerability, has already been formulated as an important international goal in the Yokohama Strategy and Plan for Action for a Safer World. Under important activities, the Yokohama Strategy formulated the aim of

*“Encouraging and supporting ongoing efforts aimed at developing appropriate indicators of vulnerability”  
(Yokohama Strategy and Plan for Action for a Safer World)*

Moreover, he pointed out that this workshop on “measuring vulnerability” is an important event for UNU-EHS since it should serve as a basis for the establishment of a longer co-operation between UNU-EHS and the colleagues present at the workshop. He outlined the intention to explore different features of vulnerability and coping capacity to hazards of natural origin. He formulated the main goals of the workshop from the perspective of UNU-EHS (see goals of the workshop).

## I THE FRAMEWORK:

### THEORETICAL BASIS AND PRINCIPLES OF INDICATOR DEVELOPMENT

#### ***Setting the Framework – Introduction to Indicators, Vulnerability and Sustainable Development***

*Jörn Birkmann / UNU-EHS*

In his presentation, he pointed out functions and criteria for quality indicators. Special attention was given to the relation between indicators, goals and data, showing that the development of indicators for vulnerability requires also a reflection of goals and the guiding vision behind it. Furthermore, he presented the main goals of the approach of UNU-EHS with regard to the development of indicators for vulnerability and coping capacity. In this context he outlined that UNU-EHS aims to identify vulnerability and coping capacity within the scope of urban agglomerations in flood plains and deltas. Moreover, he declared that UNU-EHS aims to compare and test existing approaches as well as to develop some tools of its own for measuring vulnerability and coping capacity. However, he underlined the fact that UNU-EHS intends to examine processes and structures of vulnerability, coping capacities and response mechanisms. It is also planned to explore “lessons learned”. Although specific areas and topics need to be defined more precisely, he stressed the point that the approach should integrate macro-trend indicators and specific indicators. The approach should also focus on actuation tools at the appropriate sub-national scales, in order to link the indicators with planning and decision-making tools.

#### ***The Perspective of the ADRC***

*Masayuki Kitamoto / ADRC*

Mr. Kitamoto and Mr. Arakida showed that with regard to the regional distribution of the number of people affected by natural disasters worldwide Asia stands at the top with an amount of almost 90% of the total number of people affected worldwide. Furthermore, they defined the economic losses measured as the monetary damage in relation to the GDP of the affected country as a key indicator for vulnerability and disaster risk. Additionally, the presentation provided examples of an earthquake-resilience check for dwellings and a questionnaire-based method to measure the capacity of communities to cope with a flood event. The results of the interviews and self-check were integrated and translated into an approach to assess the local capacity of emergency management. A matrix with indicators to examine the personal, community and country vulnerability was presented. Finally, they concluded that disaster indicators should be constructed according to the specific objective and disaster type they should focus on.



#### ***Approaches and Techniques of Indicator Development***

*Pál Tamás / Institute of Sociology of the Hungarian Academy of Sciences*

His presentation focused on different theoretical concepts to capture vulnerability. In this context he showed the model of vulnerability - developed by Bohle - which underlines the fact that vulnerability has a double structure consisting of an *external side* (exposure) and an *internal side* (coping). He presented a proposal for different elements of vulnerability research, stressing the fact that the scale has an important impact on the topics one should take into account. He showed that at the level of a “community”, themes like social participation as well as community support are relevant, while in contrast at the level of an



“individual” characteristics like the age, the income, the residence type etc. should be taken into account. Moreover, at the “national scale” the economic capacity (Total GDP), the GDP per capita and life expectancy at birth etc. are important indicators which should be taken into consideration. Finally he showed potential shortages the development of indicators has to deal with.

***Indicators for Environmental and Vulnerability Assessments: the UNEP Experience***  
*Norberto Fernandez / UNEP*

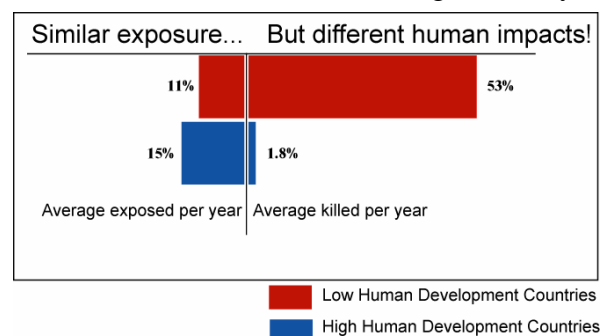
In his presentation Norberto Fernandez outlined the scope of UNEP with regard to global environmental and vulnerability assessment based on the Nairobi Declaration. He pointed out that integrated environmental and urban assessments are relevant issues for UNEP. One major reporting tool in this context is the Global Environmental Outlook, which exists for the global (international) level for regions like Latin America and selected urban agglomerations like, for example, Mexico City. The Global Environmental Outlook shows emerging environmental and urban emerging issues; it also includes vulnerability and risk assessment, early warning of emerging issues and policy options for action. Indicators are a major instrument in these reports. They are used to create scenarios and evaluate their performance. A goal of the regional reporting tools like the Latin American and Caribbean Initiative for Sustainable Development is the strengthening of regional co-operation mechanisms for risk management as well as the integration of vulnerability indicators in national development strategies and plans. Most reporting and assessment tools are linked to internationally agreed goals. For example, the GEO Yearbook addresses seven environmental thematic areas that cover eight issues measured by 15 indicators, out of which seven are directly linked to the MDGs. Furthermore, he outlined current problems of indicator development within the perspective of UNEP, like difficulties in terms of the availability and interpretation of data, the methodologies to aggregate data at different levels and the problem of the contextual interpretation of the results. He finished his presentation by underlining the interest to co-operate in the area of vulnerability assessment and indicator development in the future.

## II –CURRENT APPROACHES: STATE OF THE ART

***The Disaster Risk Index of UNDP***

*Pascal Peduzzi / UNDP*

The presentation underlined the link between disaster impacts and the development status of a country. He showed that although the exposure of people in developing and developed countries is quite similar, the impact of the hazards of natural origin is very different. While only 11 percent of the people exposed to natural hazards (worldwide per year) live in countries classified as low human development, they account for more than 50 percent of total recorded death (worldwide per year). Therefore risk reduction is also a challenge for development. Moreover, he gave an insight into the methodology of the Disaster Risk Index, especially regarding the calculation of physical exposure and the vulnerability measured by the fatalities due to hazards of natural origin divided by the exposure (frequency multiplied by population). Selected examples outlined the results of the Disaster Risk Index in particular with regard to the relative vulnerability. In the last part he outlined future developments to improve



the Disaster Risk Index and showed selected examples of the close correlation between the impact of tropical cyclones (fatalities) and the environmental quality of the country, e.g. deforestation.

### ***A Review of International Disaster Risk Indicators***

*Mark Pelling / King's College, University of London*

His presentation, based on the review of three international indexing projects to measure risk, showed key differences and similarities between the *Disaster Risk Index*, the *Hotspots project*, and the *Americas project*. He underlined the fact that, for example, the conception and overall idea of the Disaster Risk Index and the Hotspot index showed a lot of similarities (deductive approaches, data challenges), while the Americas project as an inductive approach has a different structure and a main challenge can be seen in the interpretation of the different indicators used. In contrast to the Hotspot and DRI approaches, the Americas project consists mainly of three different methodological indices: the Disaster Deficit Index, which deals with possible economic losses, the Prevalent Vulnerability Index, which focuses on exposure and susceptibility, socio-economic fragility and lack of resilience, and the Risk-Management Index, which examines the performance regarding risk-management practices within a county. The Disaster Risk Index, focuses primarily on aspects of mortality to hazards of natural origin (relative vulnerability), based on past events within a time period of 20 years. In addition to some critical remarks, he formulated conclusions with regard to aspects like policy relevance, benchmarking and stakeholder participation as well as future data acquisition.

### ***Hazard and Risk Assessment: the Perspective of the JRCs***

*Gerald Vollmer & Stefan Schneiderbauer / Joint Research Centre, European Commission*

The first part of the presentation showed the scope and mandate of the Joint Research Centre (JRC) of the European Commission as one of the Directorate-Generals (DGs). Thereafter Gerald Vollmer (speaking for both authors) indicated the areas of activities of the JRC, such as the preparedness and risk-reduction activities with regard to chemical plants and major accidents (Seveso-Directive) and the early-warning activities with regard to floods and forest fires as well as global alert systems and impact assessment for earthquakes and cyclones. In this context he pointed out the fact that the analysis and assessment of vulnerability is a key issue of research at the JRC. He presented a draft version of a hazard-independent global vulnerability map based on the analysis of indicators at country level as well as results of joint activities for mapping and assessing the impact of the tsunami in the Indian Ocean based on earth-observation data. Besides an insight into mapping and assessing different types of damage due to the tsunami with high-resolution satellite data, he pointed out that also lessons learned are also an important key area for the JRC. The research and activities in this field include lessons learned with regard to floods, forest fires, landslides, avalanches, industrial plants as well as storms and cyclones. Since the JRC concentrated in former years very much on critical industrial infrastructures, like chemical plants, the JRC has a strong data base on this subject. In the final part, he outlined future activities of the JRC with regard to natural and technical disasters, which also should be seen as a basis for future co-operation. These topics include tsunami zoning and impact assessment on mega cities, vulnerability of urban areas regarding different hazard types, assessment tools for technical and natural hazards and the Seveso directive.



### ***Features of Vulnerability – Focusing on Sectors***

*Juan Carlos Villagrán / UNU-EHS*

In his presentation he underlined the fact that vulnerability – understood as the predisposition of an element or system to be harmed by an external event – depends on the type of the event and its magnitude. With regard to the development of indicators he distinguished indicators which focus on vulnerability directly and those who measure it indirectly like e.g. GDP. Moreover, he presented a community based approach for measuring vulnerability through sectors. As important sectors he defined for example health, education, housing, environment, finance, trade etc. He illustrated the approach with selected examples. Furthermore, he underlined the fact that this approach can also be used to assess communities. In this context features like the number of roads leading to the community, the type of main access roads and the existence of a health centre are characteristics which are taken into account. The approach implies a weighting and results in an aggregated number which indicates the state of vulnerability of a specific sector. He concluded that the framework is easy to perform but requires a specific survey.

### ***Criteria to Define and Measure Coping Capacity – Self Assessment***

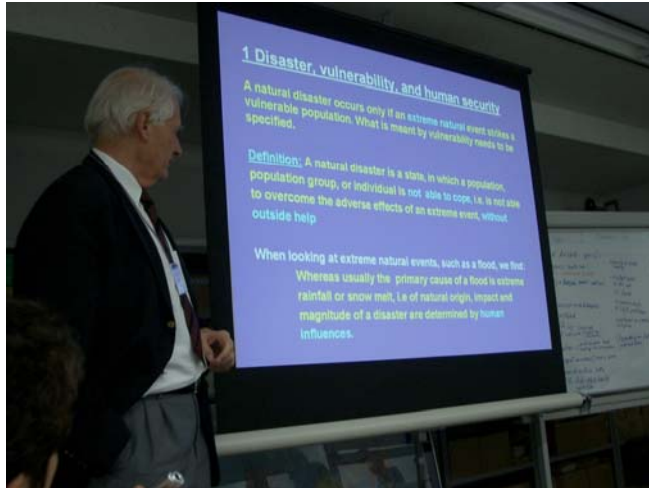
*Ben Wisner / London School of Economics*

He presented an approach to community-based disaster management based on a method of self assessment of coping capacity. The main goal of the approach is the empowerment of local people to understand their own vulnerabilities and daily situation in a way that enables them to increase their coping capacity and resilience. He underlined that the self-assessment approach is a dialogical approach in which a group of people utilise a variety of simple tools, like hazard mapping, problem trees and wealth ranking, etc., as well as key questions with regard to their strengths and weaknesses to assess their own capacities and vulnerabilities. He showed that the approach can be classified as situational, since it is place- and group-specific. He outlined the opportunities of the self-assessment approach with different examples, like the case of cyclones in Bangladesh, where the approach revealed the fact that the gender-specific cyclone mortality is caused by the fact that women do not climb trees, rather than that they do not learn to swim. Furthermore, he pointed out that self-assessment approaches are able to explore the large variety of capacities people use to cope in extreme events like floods and droughts. He reported that also his Ph.D. work on vulnerability to droughts in Kenya in the '70s showed that self assessment is a tool to analyse different patterns of indigenous coping capacities. The scale and scope of the self-assessment approaches is highly local and broad, that means these participative assessment tools can focus on various thematic areas including aspects of local economic, social, political, technological, ecological and geographic processes and their impacts for local vulnerability and coping capacity. Moreover, he presented some organisations that use these approaches, such as La Red in Columbia and Periperi in Cape Town. The main target groups are low-income, marginalised groups of people. The approaches aim to mobilise people. He pointed out that these approaches can be used in order to prepare urban neighbourhood plans for risk reduction. He underlined that self-assessment approaches can be focused on a single hazard or take a multi-hazard focus. Finally, he stressed the fact that complex applications of the self-assessment approach focus also on root causes of vulnerability and blockage of coping capacities. Poverty, corruption and landlessness are some keywords he mentioned in this context.

## ***Measuring Vulnerability and Coping Capacity – An Index for Human Security***

*Erich Plate / University of Karlsruhe*

He presented an index for human security based on income data. The concept itself is strongly related to the question of coping capacity. The proposed index consists of three elements a) the initial conditions before an extreme event strikes ( $V_s$  = the vulnerability for the “normal” state), the measurement of the effects of the extreme events ( $V_r$  = the change in vulnerability due to the extreme event), and a measure that focuses on the



resistance to overcome the impact of the extreme event expressed through the critical vulnerability ( $V_{cri}$  = individual investment needed to maintain his status quo regarding his living conditions). He illustrated his approach with an example, showing that for an individual household the annual income that is used for covering all living expenses can be seen as the normal vulnerability. In contrast the impact of the extreme event (e.g. a flood) monitored through the individual economic

losses captures  $V_r$  (the change in vulnerability). To replace and restore the former living conditions the household has to finance repairs and replacements. If the cost of the reconstruction of the household exceeds the part of the income required to cover basic living expenses, then the household faces a disaster and needs help from outside. Finally, he underlined that the reduction of vulnerability should focus on these three elements.

## ***Multi Risk Assessment – with a Special Focus on Vulnerability***

*Stefan Greiving / University of Dortmund*

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.



### ***Coping Capacity: Overcoming the Black Hole***

*Peter Billing & Ulrike Madengruber / European Commission: Directorate-General for Humanitarian Aid (ECHO)*

In his presentation Peter Billing (speaking for both authors) showed the paradox that although coping capacities of populations affected by natural disasters are widely seen as a key component for risk preparedness, only few systematic methodologies exist in this area to measure it. He outlined the overall goal of the Coping Capacity Index, which was to derive a tool for helping ECHO to better identify priority countries for natural disaster risk reduction. He stressed the fact that the measurement and assessment of coping capacity should take into account that coping capacity is determined by two spheres; the “individual coping capacity” and the “institutional coping capacity”.

He gave an insight into the methodology of the index and the data behind it. He showed that the Coping Capacity Index (CCI) is based on data from the Global Urban Indicators dataset of UN-Habitat, figures of Red Cross volunteers (IFRC) and mitigation projects of the World Bank complemented by ECHO’s disaster-risk index. He concluded that, although some outcomes were questionable (data inconsistencies), the overall result of the Index is a good basis to sort countries into four different categories regarding their coping capacity (very low, low, medium and high). High coping capacity was, for example, attributed to countries like the Philippines, Argentina, Peru, etc., while medium coping capacity countries include, for example Brazil, Mexico, China, etc.. Egypt, Chile, India etc. were classified as countries with low coping capacity. Lowest coping capacities were indicated for countries like Haiti, Bolivia, Bangladesh, Guatemala, etc. Besides this approach, he showed that ECHO had also undertaken an assessment of coping capacity based on expert judgement. Interestingly almost 70% of the classification was identical. In the final part, the presentation dealt with the limitations of the approach and some recommendations were given on how to proceed. He finally concluded that the coping capacity index of ECHO does not replace an in-depth assessment, but it can be used as a supportive tool for assessing the general needs of a country.

## **5) DISCUSSION OF CRITERIA AND FUNCTIONS OF VULNERABILITY-INDICATORS**



A “straw poll” on important criteria and functions of vulnerability indicators allowed a first impression of what the general perceptions are. For the selection of “good and appropriate” indicators, special importance seems to be given especially to the criteria of understandability, policy relevance, data availability and ability to capture root causes of vulnerability. Classical scientific criteria like statistical reproducibility and representativity are also considered important. With regard to the functions, priority-setting and awarenessraising are seen as the most important. This correlates with the relevance given to the criteria of “understandable” indicators and policy relevance.

### *Criteria*

- *which criteria should the indicators meet primarily?*

The indicators should (be)

- 1) Understandable (12)
- 2) Policy-relevant (10)
- 3) Available data (9)
- 4) Capture root causes of vulnerability (6)
- 5) Reproducible (6)
- 6) Representative data (4)
- 7) Appropriate scope (4)
- 8) Statistically sound (3)
- 9) Cost-effective and easy to collect (2)
- 10) Set priorities (2)
- 11) Key-elements (2)
- 12) Sensitive (1)



### *Functions*

- *which functions should the indicator approach primarily serve?*

- 1) Set priorities (12)
- 2) Background for action (9)
- 3) Awareness rising (8)
- 4) Analyse Trends (8)
- 5) Empowerment (7)
- 6) Evaluation (4)
- 7) Specify targets (4)
- 8) Compare situations and trends (3)
- 9) Consensus on a definition (2)





## 6) FINDINGS OF THE WORKING GROUPS

### Working Groups

Based on the presentations and discussion in the morning and afternoon of the first day, the working groups focused on first ideas on how to capture vulnerability for the economic, social and institutional/political dimension. The main purpose of the working groups was to intensify the discussion and develop first recommendations on how to proceed with regard the development of tools to measure vulnerability, taking existing initiatives and approaches into account. While some working groups already end up with a proposal for potential indicators others discussed the potential frame for developing tools to measure vulnerability and coping capacity. The following is a brief summary of the findings of the working groups and the aspects discussed; it does not intend to be comprehensive.

### Working Group A

Working Group A discussed, on the one hand, general problems with regard to measuring vulnerability; on the other hand, the discussion resulted in a first proposal of a brief list of economic indicators to measure vulnerability. Based on these indicators, the group discussed whether the various indicators are more related to vulnerability or coping capacity. It turned out that the different understandings of these expressions influence the selection of proposed indicators and complicated the discussion. The outcome shows, for example, that very frequently used indicators on the national level, like GDP and GINI Index, can not be assigned solely to one category, but capture both vulnerability as well as coping capacity.

<i>First proposal of indicators for the economic dimension</i>		
Brief indicators and topics	Category Vulnerability or Coping Capacity	Trend/Goal
GDP (purchasing power parity)	Vulnerability + Coping Capacity	Higher, but...
GINI Index (equality)	Vulnerability + Coping Capacity	Lower (trend)
Environmental dependance	Vulnerability	
Corruption Perception Index	Coping Capacity	
Debt ratio (current accounts)	Vulnerability	
Tax base		
Inhabitants per usable km <sup>2</sup>		
Terms of trade		

Additionally the group derived first ideas regarding the goal and trend the indicators should relate to, in order to indicate a reduction of vulnerability and an increase in coping capacity. The group came to the conclusion that the decision often has to take the specific socio-economic context into account. Beside these aspects, Working Group A also developed first indicators with regard to specific features of the vulnerability of urban agglomerations. Based on a first brainstorming session the group

#### *Features Urban Agglomerations*

Hazardous industries  
Topography (geographical features)  
Quality of infrastructure  
Building codes  
Emergency services  
Contingency plans (evacuation plans)  
Early warning systems

recommended to focusing specifically on hazardous industries, geographical features, quality of infrastructure, building codes, emergency services, evacuation plans and early-warning systems. Although the group explicitly underlined that these findings should only be seen as results of a first brainstorming session, the group pointed out that focusing on urban agglomerations and their vulnerability also means taking into account the specific features of urban areas, such as their concentration of industry, infrastructure etc.

### **Working Group B**

In contrast to Working Group A, Working Group B concentrated its discussion mainly on the framework, the procedure and general problems regarding the development of indicators to measure and assess vulnerability and coping capacity to hazards of natural origin. The discussion revealed that the development of indicators is confronted with a limited set of appropriate data for the indicators, especially on the sub-national and local level, as well as with the lack of precisely defined goals for risk and vulnerability reduction, which could serve as a basis to derive the relevant indicators. Moreover, the group discussed aspects of the structure and the general objective of a new indicator approach for measuring vulnerability at the local and sub-national scale as well as the problems with regard to the aggregation and the setting of priorities between the various potential indicators. The main findings can be summarised as follows:

#### ***Recommendations with regard of the intended work of UNU-EHS***

##### *Focus and purpose of the approach*

- The indicators should be linked to goals; a first basis can be seen in the MDGs, that means the indicators of vulnerability should be linked to the MDGs (ensure political feedback)
- UNU-EHS should develop a planning tool (methodology) instead of giving priority to the comparison of nations.
- The approach should not be limited to mega cities. Small cities have different capacities and vulnerabilities regarding hazards of natural origin than mega cities, these differences should be explored.

##### *Structure*

- The approach should take into account a systems approach, that means focusing on the whole development chain and the different steps of the process (root causes, current state of vulnerability, feedback and response features, like emergency evaluation)
- Two-level approach
  - 1) generic character and features (e.g. poverty, GDP etc.)
  - 2) hazard-specific vulnerability indicators (taking into account the specific socio-economic context, local conditions of danger)

##### *Aggregation and weighting*

- In order to develop an approach which indicates priority subjects of vulnerability and coping capacity, the indicators should be weighted. The weighting could be based, for example, on expert judgement using the Delphi method.

##### *How to proceed*

- Create synergy with other existing indicator initiatives, like the ProVention Consortium (Vulnerability and Coping Capacity Assessment)
- Australia developed an interesting methodology, especially regarding the use of the Delphi method

Finally, the group also discussed features of specific urban vulnerability in least developed countries. Transport, mobility and hazardous waste and sanitation were mentioned as important aspects in this context.

### Working Group C

The findings of the Working Group C are also focused primarily on the framework and on basic aspects like the question, as to whether it is more appropriate to measure vulnerability to hazards of natural origin with a hazard-specific approach or a multi-hazard assessment. The main findings of the discussion can be summarised in the following bullet points:

#### Recommendations Working Group C:

- Vulnerability should be seen independently of the intensity of the hazard event
- Approaches for measuring vulnerability should take into account short-term and long-term changes as well as show the difference between them
- Vulnerability should be captured hazard-specific in order to give a precise answer to the question:  
Vulnerability to what?  
(floods, droughts, windstorms, volcanic eruptions, earthquakes, man-made technological hazards)
- In the context of measuring vulnerability of urban areas, the approach should also include indicators which show the “production of risk and vulnerability”, like a specific urban lifestyle (root causes)
- Regarding the “urban lifestyle” and “urban vulnerabilities”, the dependency of the population on the highly developed infrastructure should be examined, since it leads to an increase of vulnerability in developed countries

While, for example, the presentation by Stefan Greiving showed the opportunities of a



multi-hazard risk assessment, Working Group C argues for a hazard-specific vulnerability-assessment approach.

Moreover, the Group underlined that not only poverty is a key feature which increases vulnerability, especially in least developed countries, but also the dependency of wealthy societies on technical and critical infrastructure (electricity supply) must be seen as a driving force for enhanced vulnerability.

## 7) FINDINGS AND OPEN QUESTIONS

Altogether the presentations, the discussion and the concrete offers of co-operation in research provide a good basis for the future work of the EWG and the related research of UNU-EHS. Although we will reflect on how to improve the discussion methods used in the workshop, the overall results met all the expectations. In this context the workshop held directly after the World Conference on Disaster Reduction provided an excellent basis for the exchange of information with regard to current concepts and research activities. The meeting – especially on the second day - led to concrete personal and institutional co-operation initiatives, which can and should be extended in the future. Based on the various presentations as well as the discussion thereafter, many recommendations for measuring vulnerability and coping capacity were formulated. They provide an interesting input for the future work of both UNU-EHS and the EWG. Moreover, the workshop showed that more research is needed; the complex of vulnerability and coping capacity is a broad field and only the “tip of the iceberg” is already sufficiently explored. More analysis of the various elements of vulnerability as well as the development of an appropriate and applicable information tool for decision-making processes are necessary. The open questions will be taken into account in the work of the EWG and the related research of UNU-EHS.

The following overview outlines the main findings; it is not intended to be comprehensive. The structure reflects key aspects of the discussion.

### *Type and structure*

The approaches presented can be classified in two main categories:

1. expert approaches (e.g. Disaster Risk Index) and
  2. participatory approaches (e.g. self assessment)
- The majority of the experts supported the idea of UNU-EHS to test different methods and approaches in order to enhance current concepts and to examine the opportunities and limitations of these.
  - Moreover, UNU-EHS should develop its own approach, which combines elements of existing approaches and also deals with aspects which have not been sufficiently explored using current concepts, e.g. the institutional and political dimension of vulnerability.
  - The findings of the working groups, especially Working Group B, underlined the fact that the indicator approach should be constructed as a planning tool rather than giving the priority to the comparison of nations.
  - The approach could distinguish at least two levels of indicators:
    - a) focus on generic characteristics of vulnerability and
    - b) focus on specific aspects of vulnerability in the specific region.
  - Moreover, Working Group A recommended that UNU-EHS should also take into account specific aspects of urban areas when focusing on vulnerability of cities.

### *Scale: Bird's eye view versus frog's eye view*

While the “bird's eye view” was used to describe approaches which focus on the national and international scale (DRI, Hotspot approach) – often representing an expert judgement approach to vulnerability assessment - the term “frog's eye view” characterises approaches focusing on the vulnerability of individuals and local communities.

- It was recommended that UNU-EHS should try to develop a “squirrel eye’s view” in order to combine elements of the national and local perspective for a sub-national approach. In contrast to this recommendation, some experts came to the conclusion that it is questionable whether it is possible to up- and down-scale vulnerability indicators at all.
- Furthermore, it was proposed to define the appropriate scale for the indicators in relation to the hazard type one is focusing on.

#### *Goals as a basis for indicator development*

The discussion during the workshop, especially in the working groups, revealed the lack of appropriate and precisely defined goals which could serve as a basis to derive indicators for vulnerability of urban areas to water-related hazards.

- As a first step to overcome this lack, one should use the Millennium Development Goals.

#### *Framework*

The discussion revealed that we could optimise the framework (BBC-Frame) and define the objectives of our approach in more depth. The framework underlines the fact that UNU-EHS defines 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. However, more clarification is needed with regard to the general objectives of the approach, the target group and the level it should be designed for.

- It was proposed to take into account the following target groups:
  - a) decision-makers,
  - b) development community,
  - c) general public (e.g. affected people) and
  - d) urban planners

#### *Root causes*

Two working groups (WG B and C) strongly suggested that a concept for measuring vulnerability should also display the root causes of vulnerability.

- Therefore approaches to measure vulnerability should focus, on the one hand, on the current state and on trends of vulnerability and, on the other hand, additional indicators should be taken into account to explore the root causes of vulnerability.

#### *Institutional and political dimension*

Since only a few concepts take the political and institutional dimension of vulnerability into account, different experts mentioned the necessity of examining features with regard to the political and institutional vulnerability within the EWG. The lack of appropriate institutional capacities to cope with the impact of the extreme event is an important aspect of the manifestation of a disaster.

Furthermore, the following open questions were mentioned or implicit in the discussion and presentations:

- Which techniques and concepts of measuring vulnerability are appropriate for which tasks, objectives and levels?
- Is it possible to down-scale current indicators of vulnerability on the national level to the local level or to urban agglomerations?



- How to assess and improve concepts for measuring coping capacity? How to quantify individual and institutional coping capacity?
- What are the spatially-specific aspects and features of vulnerability in contrast to the generic characteristics?
- How to measure institutional and political vulnerability?

*Practical problems and limitations:*

Although many ideas and recommendations came out of the workshop, we should take into account the practical problems and limitations. In this context the following points were mentioned:

- Data availability
- Benchmarking
- Weighting of different aspects and indicators
- Time (the data acquisition and the testing is very time-consuming)
- Limitation of quantitative approaches (which often exclude qualitative aspects)



## 8) FUTURE ACTIVITIES

The first meeting of the Expert Working Group produced an overview of current approaches and made important recommendations for the future activities of the Expert Working Group and the work of UNU-EHS. Nevertheless, many questions still have to be answered. Therefore, the exchange of information will be promoted; the setting-up of case studies to test different concepts and the establishment of project oriented co-operation as well as meetings to discuss specific aspects of vulnerability. The main activities until the next meeting of the Expert Working Group (EWG) in October 2005 can be briefly summarised as follows:

1. Documentation of the workshop (UNU-Press publication of the full proceedings)
2. Discussion with different experts on specific aspects of vulnerability (e.g. institutional dimension, environmental aspects, etc.)
3. Promoting the exchange of information within the EWG
4. Setting up of case studies to test different methods in co-operation with partners (EWG)
5. Setting up of project-oriented co-operation (joint research)
6. Preparation of the next meeting in October 2005 in Bonn, Germany



### *Documentation: Workshop Publication – UNU-Press*

In order to ensure that the fruitful discussion and the various presentations will be available also for a bigger audience, the proceedings of the workshop will be published as a book in the UNU-Press series. The presentations at the workshop will serve as a basis for this publication, but additionally we invite other participants of the workshop to contribute to this publication. Soon we will send you an overview of the structure of the intended publication and additional information on your solicited inputs. The publication should present different methods of measuring vulnerability and coping capacity. It should serve as a background document for the EWG as well as to disseminate the concepts and the discussion to a broader audience (scientific community worldwide, risk management and human security community, donors and development agencies (e.g. ECHO), UN-System and politicians involved in risk reduction).

### *Discussion with different experts on specific aspects of vulnerability*

Beside the mission to optimise the framework, it is intended to set up some case studies in order to explore different existing approaches and also to develop some key elements for a new approach. In this context, it is planned to ask different experts for contributions or a discussion on a specific subject, such as, for example, the institutional and political dimension of vulnerability. As a first basis we will use the list of co-operation interests, but at the same time, UNU-EHS would like to invite all others who were present to contribute to the overall discussion on measuring vulnerability. The following is a brief overview of co-operation interests (bullet points) already declared. Additional comments and offers are most welcome.

### *Co-operation Interest*

#### *Srikantha Herath - UNU-Headquarters – Division of Sustainable Development*

- Catastrophic Flood Risk management
- Hanoi / Vietnam
- Bangkok / Thailand
- e.g. house-to-house questionnaire – loss function

#### *Gerald Vollmer, Elisabeth Krausmann & Stefan Schneiderbauer (Joint Research Center)*

- Interest in a closer co-operation and joint research activities.
- Stefan Schneiderbauer would like to study vulnerability and risk with a special focus on land cover and use based on remote sensing technology analysis.

#### *Jochen Zschau (GFZ – Potsdam)*

- Risk mapping
- Social vulnerability
- Mega-Cities – Research activities
- Scenario technique

#### *Christina Bollin (GTZ)*

- Co-operation in the field – e.g. in Sri Lanka, Indonesia, Africa (Mozambique)
- Community-based risk and vulnerability estimation
- Integration of indicators in urban and environmental planning

*Angela Queste (BBK)*

- Critical infrastructure and vulnerability
- Case Study Germany

*Joanne Bayer / IIASA*

- Economic Vulnerability

*Stefan Greiving / University of Dortmund*

- Institutional and political dimension of vulnerability
- Indicators as a Planning Tool

*Erich Plate / University of Karlsruhe*

- Measuring vulnerability with an index (income-based)

*Norberto Fernandez / UNEP*

- Interest in long-term co-operation UNEP – UNU-EHS
- Environmental indicators and vulnerability

*Pascal Peduzzi / UNDP*

- Environmental degradation and vulnerability
- Intuitional and political dimension of vulnerability

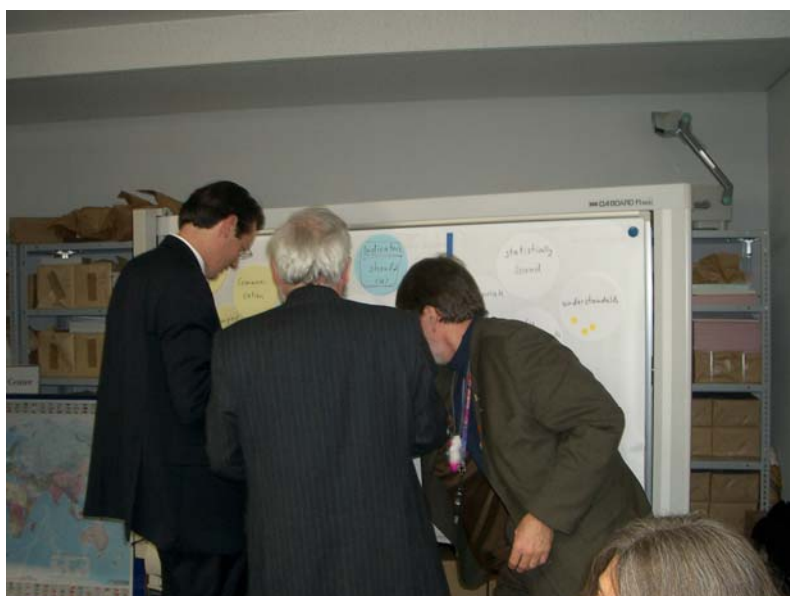
## 9) NEXT MEETING

The next meeting will take place from

**12 through 14 October 2005**

**(including the 14<sup>th</sup> as a full day; Wednesday, Thursday and Friday).**

The meeting will be held in the frame of the Open Meeting of the Human Dimension of Global Environmental Change Research Community. The international Conference of the Open Meeting will start on October 9<sup>th</sup> 2005.



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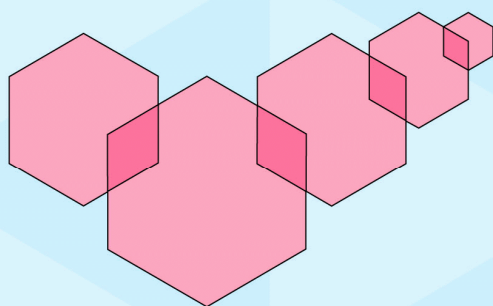
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