

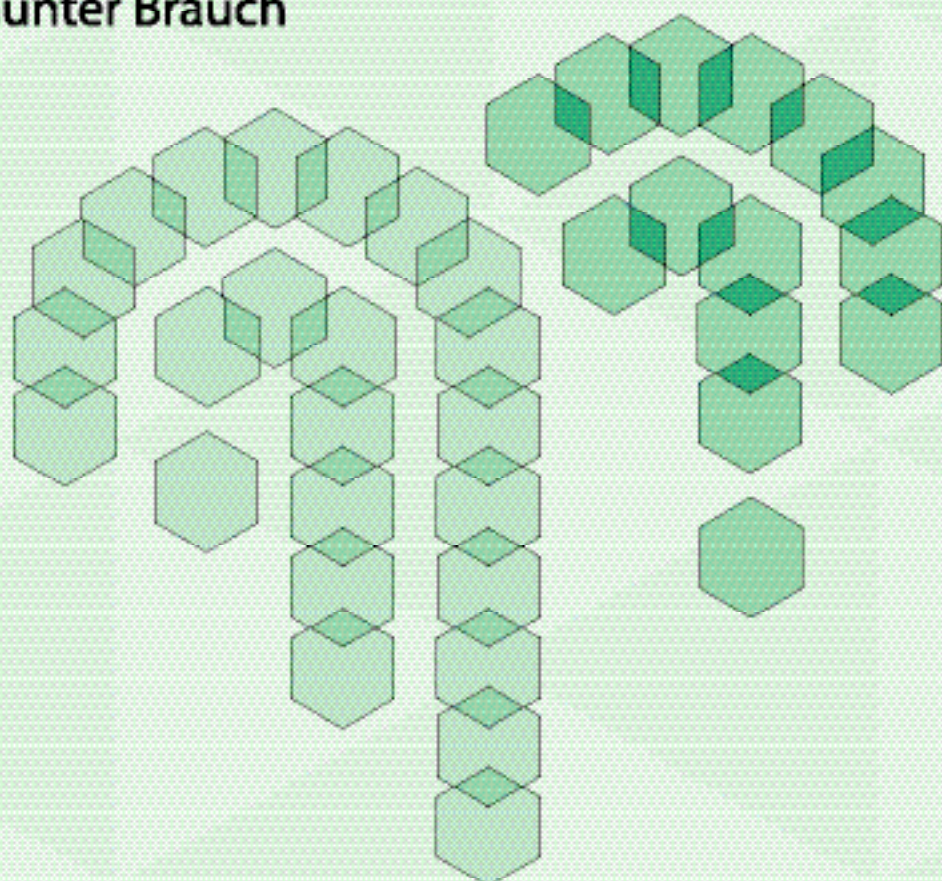


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University
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Institute for Environment
and Human Security

Threats, Challenges, Vulnerabilities and Risks in Environmental and Human Security

Hans Günter Brauch



SOURCE

'Studies Of the University: Research, Counsel,
Education' - Publication Series of UNU-EHS

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Foreword

The mandate of the United Nations University to generate policy relevant knowledge implies that its "products" should address a broader audience than the regular target groups of universities and research institutions. Policy makers, professionals, scholars, students, and the interested public can not all be addressed optimally with one and the same publication. Therefore, after the release of our first series *InterSecTions: Interdisciplinary Security ConnecTions*, targeting primarily policy makers, professionals and the public audience, the present series, *SOURCE: Studies Of the University: Research, Counsel, Education*, launched with this first issue, aims at students, scholars, and professionals seeking more details and in depth background information on the respective subjects. *SOURCE* has the purpose to publish research reports, dissertations, but also educational texts prepared at UNU-EHS. An interdisciplinary approach and versatility will characterise *SOURCE* as much as they are the trademarks of UNU itself.

The present issue, written by Dr Hans Günter Brauch is an adequate start to underline the above outlined aims. The author analyses and summarises the drivers and components of the unfolding process of defining and conceptualising human security in the environmental context. Next to the intellectual and scientific dimension, this publication analyses also the intergovernmental and political evolution of the environmental aspects of the human security concept. This fascinating narrative is an essential background reading for those interested in the details, intricacies, but also conceptual problems of the "securisation" of the environment.



Janos J. Bogardi
Director UNU-EHS

About the Author

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1. Introduction¹

This publication contributes conceptually to the UNU-EHS task of ‘Mapping the Environmental Threats to Human Security’ (UNU-EHS 2005) by developing the ‘environmental dimension of human security’ and its third pillar of ‘freedom from hazard impacts’. In the second issue of *InterSecTions* a ‘widened’ security concept has been introduced and the shift of the referent of securitisation efforts from the nation state (*national security*) to the individual human being or humankind (*human security*) has been introduced (Brauch 2005).

The goal of this publication is fourfold:

- to refer to the three factors that have contributed to a reconceptualisation of security and especially the incorporation of an environmental security dimension since 1990: a) the change of the international security order since the global turn of 1989/1990; b) the theory guided changes in the conceptualisation of security within the social sciences; and c) the impact of the new debates on *Global Environmental Change* (GEC) since the 1980s (parts 2-3);
- to review the four security dangers often referred to as security ‘threats’, ‘challenges’, ‘vulnerabilities’ and ‘risks’ and the use of these basic concepts in different scientific research communities, especially those working on global environmental change, climate change, and hazards and disasters (parts 4-7);
- to discuss the relevance of these four concepts for both ‘environmental’ and ‘human security’ approaches dealing primarily with hydro-meteorological natural hazards (storms, floods and drought) (part 8-9); and
- to draw conclusions for both future conceptual research needs and for policy making to enhance the early warning of hazards and conflicts, and to improve the coping capacities by reducing the vulnerability of those most exposed to hazards, thus reducing the risks increased by hazards like the trends toward urbanisation and the pressure of forced and distressed migration (part 10).

The goal of these conceptual efforts is to contribute to a debate across disciplinary boundaries to enhance synergies and to mainstream related efforts (e.g. of disaster preparedness and climate change adaptation and mitigation with the goal to strengthen proactive policy initiatives).

2. Security Concepts and Reconceptualising of ‘Security’

Security (Lat.: ‘securus’, ‘securitas’, ‘se cura’; It.: ‘sicurezza’; Fr.: ‘sécurité’; Sp.: ‘seguridad’; Port.: ‘segurança’; Ger.: ‘Sicherheit’) was introduced by Cicero and Lucretius referring to a philosophical and psychological state of mind, or the subjective feeling of freedom from sorrow. It was used as a political concept in the context of ‘Pax Romana’ by referring to political stability in the era of Augustus. In the Western philosophical and political thinking the term and concept ‘security’ is often used synonymously with ‘certitudo’ (Eng.: ‘certainty’; Sp.: ‘certeza’; Ger.: ‘Gewißheit’). In the theological Christian discussion, ‘securitas’ was used subjectively, being in a continuous tension with ‘certitudo’. Since the Augustan period, and in the Middle Ages,

¹ The author would like to thank the following colleagues for constructive comments and suggestions: Janos Bogardi, director of UNU-EHS; Jörn Birkmann, academic officer of UNU-EHS; Úrsula Oswald Spring, UNAM-CRIM, Cuenavaca, Morelos, Mexico. I am very grateful to the editorial team of UNU-EHS for language- and copy-editing, especially to Carlota Schneider and Ilona Roberts.

‘securitas’ became a positive political concept that was closely linked with ‘pax’ and ‘libertas’, sometimes also associated with ‘quietness’.

Since the 16th century security was used with regard to the ‘securitas publica’ pointing to the protection of the ruled provided by the rulers in peace time while the ruled are obliged to support the prince during conflict and war. For Hobbes (1658), security of the people required “not only their consent, but also the subjection of their wills in such things as were necessary to peace and defence; and in that union and subjection the nature of a city consisted ... for security is the end wherefore men submit themselves to others”. The task of the ruler is not only to provide “safety” to be understood as “not the sole preservation of life ... but in order to its happiness”. For Locke security became a major goal of the power of society: “peace, safety, and public good of the people”. During the 18th century, security as common welfare became both a goal but also a key criterion for social steering. During the 19th century, the ‘state’ is seen as the key security institution that is governed by the law. During the 20th century, security becomes closely associated with preventing both internal and external dangers with the means of the police and the courts (*justice and home affairs*) and other political, economic and especially military measures (*security and defence*).²

From a historical vantage point, Conze (1984; 1995: 831-862) has reviewed the evolution of the concepts of ‘security and protection’ as a political term and as a basic concept and value since the Middle Ages, influenced by the concepts of ‘Pax Romana’ and ‘Pax Christiana’. Security has emerged since the 17th century as a normative concept that applies to the security of the individual with the development of ‘social security’ (Kaufmann 1970), to the internal security of the state (police) and the external security of states (armed forces, military alliances) that refers to both a psychological and subjective feeling of being secure and safe and an objective situation and legally defined status of being protected. This duality has also influenced the contemporary debate on security in the social sciences.

From a philosophical perspective, in the contemporary security discussion the “dual moment of prevention and compensation of genuinely social and technical uncertainties” becomes decisive for Makropoulos (1995: 745-750). These new uncertainties are no manifest or latent dangers emerging from individuals and societal groups that can be prevented by police and political measures but ‘social risks’. This implies that security is no longer a situation free of dangers, but rather an ‘insurance’ as a ‘technology of risks’ which becomes a disposition of the social steering of modern societies. In this context, ‘social security’ has become a key concept of the modern welfare state. The right for social security and welfare has been adopted in 1948 as a general human right. With the shift of focus from protection against concrete dangers towards insurance in the context of abstract risks, security has become, according to Makropoulos (1995: 749), “a general ‘societal idea of value’ (*Wertidee*) and a universally employed ‘normative concept’, that is used with different meanings in an affirmative manner.”

Today ‘security’ as a political value, in Western thinking and in the social sciences³, has no independent meaning and is related to individual or societal value systems (Brauch 2003, 2005; Bogardi/Brauch 2005). As a social science concept, “*security* is ambiguous and elastic in its meaning” (Art 1993: 820-22). Wolfers (1962) pointed to two sides of the security concept: “Security, in an *objective* sense, measures the absence of threats to acquired values, in a *subjective* sense, the absence of fear that such values will be attacked”. From the perspective of

2 This section is based on Makropoulos (1995: 745-750) who focuses exclusively on the Western European and Christian tradition. For a discussion of the role of security concepts in other religions (Hinduism, Buddhism, Jewish, Christianity, Islam), philosophical and ethical traditions in East Asia, Africa and Latin America see: Brauch/Grin/Mesjasz et al. 2006.

3 For a review of the contemporary thinking on security in different disciplines, see: Brauch/Grin/Mesjasz et al. 2006.

social constructivist approaches in international relations⁴ (Adler 1997; Fearon/Wendt 2002; Risse 2003b; Wendt 1992, 1999) 'security' is conceived as an outcome of a process of social and political interaction in which social values and norms, collective identities and cultural traditions are essential. From this perspective, security is always *intersubjective* or "security is what actors make of it" (Wendt 1992; Hintermeier 2005).

The "securitisation approach" of the so-called Copenhagen school (Buzan/Wæver/de Wilde 1998; Buzan 1997, 2006; Wæver 2000, 2006; Wæver/Buzan/de Wilde 2006) conceives security as a "speech act", "where a securitising actor designates a threat to a specified reference object and declares an existential threat implying a right to use extraordinary means to fend it off" (Wæver 2000: 251). Such a process of 'securitisation' is successful when the construction of an 'existential threat' by a policy maker is socially accepted and where 'survival' against existential threats is crucial. But both definitions of security and of security issues are themselves objects of actor's specific constructions that must be an object of analysis (Ciuta 2004; Hintermeier 2006).

From a minimalist definition of security as "low probability of damage to acquired values", David A. Baldwin (1997: 12-18) raised seven questions to be addressed by each security concept: "Security for whom? Security for which values? How much security? From which threats? By what means? At what cost? In what time?" Møller (2003: 277) argued that Wolfer's definition ignores: Whose values might be threatened? Which are these values? Who might threaten them? By which means? Whose fears should count? How might one distinguish between sincere fears and faked ones? Stimulated by Baldwin and Møller, Hintermeier (2006) has focused on four conceptual questions: Security for whom and what? Security for which values? Security from whom or what? Security by what means and strategies?

For Wolfers, security, in its double meaning, refers to an *absence of objective dangers*, i.e. of security 'threats', 'challenges', 'vulnerabilities' and 'risks', and of *subjective fears*, and subjectively to the *perception thereof*. From a realist perspective, objective security is achieved if the dangers posed by manifold threats, challenges, vulnerabilities and risks are avoided, prevented, managed, coped with, mitigated and adapted to by individuals, societal groups, the state or regional or global international organisations. From a social constructivist approach, security is achieved once the perception and fears of security 'threats', 'challenges', 'vulnerabilities' and 'risks' are allayed and overcome.

According to Art (1993): "to be secure is to feel free from threats, anxiety or danger. Security is therefore a state of the mind in which an individual ... feels safe from harm by others." While objective factors in the security perception are necessary, they are not sufficient. Subjective factors influence security perceptions. Due to the anarchic nature of international relations, "a concern for survival breeds a preoccupation for security". Security also involves "protection of the environment from irreversible degradation by combating among other things, acid rain, desertification, forest destruction, ozone pollution, and global warming" (Art 1993: 821).

The *perception* of security threats, challenges, vulnerabilities and risks (Brauch 2003, 2005) depends on the worldviews or traditions of the analyst and on the mind-set of policy-makers. Three basic views have been distinguished by the English school (Bull 1977, Wight 1991):

4 In the social sciences, for the constructivists 'ideas matter': They argue that the reality, in this case 'security concepts', is socially constructed. According to Adler (2002: 95) and Guzzini (2000: 149) all constructivists agree on "the social construction of knowledge and the construction of social reality." Snyder (2004) distinguished in contemporary international relations three macro theories of realism, liberalism and idealism. He associates idealism with constructivism, and claims as its core beliefs that "international politics is shaped by persuasive ideas, collective values, culture, and social identities."

- a) *Hobbesian* pessimism (realism) where power is the key category;
- b) *Kantian* optimism (idealism) where *international law* and *human rights* are crucial; and
- c) *Grotian* pragmatism where *cooperation* is vital (Brauch 2003, 2005).

From an American perspective, Snyder (2004) distinguished among three rival theories of realism, liberalism, and idealism (constructivism).

Booth (1979, 1987: 39-66) argued that “old mind-sets” often have distorted the assessment of “new challenges”. These mind-sets include “ethnocentrism, realism, ideological fundamentalism, and strategic reductionism”, and they “freeze international relations into crude images, portray its processes as mechanistic responses of power and characterize other nations as stereotypes” (1987: 44). Many mind-sets have survived the global contextual change of 1989/1990 (Booth 1998: 28).

Influenced by these worldviews and mind-sets, security is a key concept of competing schools of a) *war, military, strategic* or *security studies* from a Hobbesian perspective; and b) *peace and conflict research* that has focused on conflict prevention from a Grotian and/or Kantian view. Since 1990 the distance between both schools has narrowed. New approaches and inter-paradigm debates relevant for security have emerged between traditional approaches, critical security studies, and constructivist approaches.

3. Impact of Global Contextual Change since 1990 and of Scientific Innovations on Security

For a rethinking of security concepts and of the concepts and objects of security ‘threats’, ‘challenges’, ‘vulnerabilities’ and ‘risks’ three factors have been crucial:

- 1) the change of the *international order* and the *security agenda* triggered by the fall of the Berlin wall (9 November 1989), by the terrorist attacks on the U.S. centres of power (11 September 2001), on a train in Madrid (11 March 2002), on the subway and a bus in London (7 July 2005), and by the so-called ‘war on terror’ (since 2001);
- 2) a paradigmatic shift in the social sciences from positivism⁵ to constructivism⁶ and towards concepts of a (world) risk society (Beck 1986, 1998)⁷;

5 Philosophical positivism was introduced by Auguste Comte who called for a new scientific sociology using empirical methods for verification. Alexander (1996: 649-650) pointed to three major postulates of the positivist persuasion: “First, a radical break exists between empirical observations and non-empirical statements. ... Second, ... it is widely believed that more general intellectual issues ... are not fundamentally significant for the practice of an empirically oriented discipline. Third, ... it is believed that any objective study of society must assume a natural scientific self-consciousness.” Almond (1996: 81-83) noted in contemporary political science developments towards a ‘post-positivist, post-scientific, post-behavioral’ stage, and thus a “demise of positivism and the demands for verification as the only philosophic stance for the human sciences, with the rejuvenation of normative discourse in a society concerned with the dangers of an unleashed science. ... [P]olitical scientists in general and political theorists in particular are no longer willing to adopt uncritically the distinction of fact and value that controlled the social sciences for several generations...” (Saxonhouse 1993: 9). In international relations Lapid (1989: 236) noted a “demise of the empiricist, positivist promise”. Tickner (1996: 450) pointed to a “shift from a relatively exclusive focus on mechanistic, causal explanations to a greater interest in historically contingent interpretative theories”.

6 According to Adler (2002: 95) “constructivism sees the world as a project under construction, as becoming rather than being”. He distinguished three aspects of constructivism in international relations: “(1) the common ground (in ontology, epistemology and methods), (2) conceptual contributions to IR [international relations] theory (added value) and (3) substantive empirical contributions.” In his interpretation constructivism “describes the dynamic, contingent and culturally based condition of the social world” (2002: 96). In the view of some experts, constructivism was a result of the third debate on IR theory that became popular with the end of the Cold War due to the disenchantment with

- 3) the emergence of '*global environmental change*' (GEC) as a new topic in the natural and social sciences since the 1970s and 1980s, and of scientific and political efforts to address global environmental challenges as security issues, and thus to securitise 'global environmental challenges' (environmental security) but also efforts to broaden the scope of the thinking on security from the 'state' as the major referent of security to 'society' (societal security), the 'individual' or 'humankind' (human security) as well as to 'regions' (regional security) and the 'globe' (global security).

These three trends have contributed since the early 1990s to a 'reconceptualisation of security', and also to the emergence of the new concepts of 'environmental security' and 'human security', both crucial for the work of the United Nations, of UNU (2000, 2002, 2003) and also of UNU-EHS (Bogardi 2005; Bogardi/Brauch 2005, Brauch 2005).

3.1. Impact of Global Contextual Change and of the International Order since 1990

The international political reality and the threats, challenges, vulnerabilities and risks for peace and security we perceive depend not only on our *worldview*, our *conceptual models* and *theoretical concepts*, but also on our *mind-sets* that are influenced by our traditions, experience, and by the media that select the facts and interpret the images of the world that constitute reality for us. The scientific concepts we use and the reality we perceive with our models and theories are socially constructed.

With the end of the Cold War (Herrmann/Ned Lebow 2004), the global turn of 1989-1991 overcame the bipolar world order based on nuclear deterrence concepts of mutual assured destruction. It ended the division of the world into two rival camps and thus unleashed a process of economic, political and cultural globalisation. With the end of the Cold War, the division of Germany was overcome, and a process of reunification of Europe and of an expansion of the European Union became possible.

For Abdus Sabur (2003) from Bangladesh, "the end of the Cold War and the accompanying structural changes of monumental proportion introduced a revolutionary change in security thinking" that resulted both in a dramatic decline in traditional security threats and to a series of intra-state conflicts, large-scale atrocities and genocide. The new security agenda included

intra-state conflict, ethnic-religious violence, landmines, terrorism, democracy, human rights, gender, crime, poverty, hunger, deprivation, inequality, diseases and health hazards, human development, economic security, markets, water, energy, migration, environmental degradation and so on.

Contrary to neo-Malthusian claims, for de Soysa (2006), "organised armed violence is declining rapidly since the end of the Cold War", and "globalisation promises security and development". In his view, "natural resource abundance, not its scarcity, hampers both good policymaking and civil peace required for ensuring long-term development and human security."

The terrorist attack of 11 September 2001 did not change the post-Cold War order, but it created a new awareness that non-state actors could exploit the 'vulnerability' of highly developed countries with non-military means afflicting major damage against civilians during peacetime.

positivist and materialist views and their failure to predict the end of the Cold War. While this is correct, Adler (2002: 98) also refers to a few other changes to which IR has responded to: "the decline of sovereignty, the growing social and economic importance of knowledge, globalization, the Internet, and changes in the natural environment."

7 The concept of a 'risk society' was introduced by Beck (1986, 1992, 1999) and will be discussed later in detail.

This global turn only temporarily resulted in reduction of military capabilities between 1900 and 1996. Since 1999, global military expenditures have once again been rising and exceeded in 2004 one trillion US\$ of which 47 per cent were spent by the U.S., the only remaining super power. In 2004, global military expenditures were only 6 per cent below the peak during the second Cold War (1985-1987). In 2004, world military expenditure accounted for US\$ 162 per person or 2.6 per cent of global Gross National product (GNP). The average annual increase from 1994-2004 was 2.4 per cent, and over the years 2002-2004 was 6 per cent (SIPRI 2005).

3.2. Scientific Changes in the Social Sciences: Reflexive Modernity and Risk Society

The reconceptualising of security is also a result of developments in the social sciences due to the emergence of constructivist approaches (ideas matter, reality and knowledge are socially constructed) and ‘reflexive modernity’ in sociology (Beck 1992, 1999; Giddens 1990). However, these shifts may not qualify as a ‘scientific revolution’ (Kuhn 1962)⁸.

The combination of the impact of the change of international order on the object of security analysis, and of the new theoretical approaches in the social sciences have amalgamated in new concepts and theoretical approaches on security threats, challenges, vulnerabilities and risks. These developments have resulted in a new scientific diversity.

3.3. Global Environmental Change as Issue Areas for Environmental Security

During the Cold War, environmental concerns have rarely been perceived as security problems. ‘Environment’ and ‘ecology’ as key *concepts* in the natural and social sciences have been used in different traditions and schools, in conceptual frameworks and approaches, and as guiding concepts. The *Encyclopaedia Britannica* (EB 1998, IV: 512) defined environment as: “the complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival.” Ecology refers to the “study of the relationship between organisms and their environment” (EB 1998, IV: 354).

The environmental debate has gradually evolved since the 1950s, and since the 1970s global environmental change has focused on “human-induced perturbations in the environment” that encompass “a full range of globally significant issues relating to both natural and human-induced changes in the Earth’s environment, as well as their socio-economic drivers”. According to Munn (2002: xi) “changes greater than humankind has experienced in its history are in progress and are likely to accelerate”. Dealing with future environmental trajectories requires more than a prediction of a single future path. It requires to “map a broad range of future environmental trajectories” that may confirm “that the changes of the 21st century could be far greater than experienced in the last several millennia” (Munn 2000: xii). Scientists, but also decision makers and administrators are being challenged to think the unthinkable, to minimise “surprise” should nature manifest itself like in the 2004 Indian Ocean Tsunami.

Since the 1990s, besides the International Geosphere-Biosphere Programme (IGBP), also the International Human Dimensions Programme (IHDP), the World Climate Research Programme (WCRP), and DIVERSITAS were instrumental for rallying a global environmental change research community around coordinated scientific projects, and for sensitising both policy-makers and the public alike.

⁸ Kuhn (1962: xi) argued “that each scientific revolution in the natural sciences alters the historical perspective of the community that experiences it.” Such scientific revolutions are often associated with scholars like Copernicus, Galilei and Einstein “who with their theories fundamentally changed the worldview and led to fundamental changes in scientific paradigms.”

The human dimension of global environmental change covers both the contribution and the adaptation of societies to these changes. These processes pose many questions relating to social, cultural, economic, ethical, and even spiritual issues, e.g. our motivation for saving, but also our role and responsibility with regard to the environment. Wilson (1998) noted a growing *consilience* (the interlocking of causal explanations across disciplines) in which the “interfaces between disciplines become as important as the disciplines themselves” that would “touch the borders of the social sciences and humanities”.

Global (environmental) change deals with changes in nature and society that have affected humankind as a whole and will increasingly affect human beings who are both the cause of this change and often also its victims. However, those who have caused it and those who are most vulnerable to and affected by it are not always identical.

Global change affects and combines the ecosphere and the anthroposphere. The *ecosphere* comprises the *atmosphere* (climate system), the *hydrosphere* (water), the *lithosphere* (earth crust, fossil fuels), the *pedosphere* (soil), and the *biosphere* (life), while the *anthroposphere* deals with populations, social organisations (including political systems, norms and laws), knowledge, culture, economy and transport and other human-related systems (WBGU 1993).

More recently, Steffen et al. (2004: 1) have argued that a global perspective on the interactions between environmental change and human societies has evolved. This led to an awareness of two aspects of Earth System functioning: “that the Earth is a single system within which the biosphere is an active, essential component; that human activities are now so pervasive and profound in their consequences that they affect the Earth at a global scale in complex, interactive and apparently accelerating ways”. They have further argued “that humans now have the capacity to alter the Earth System in ways that threaten the very processes and components, both biotic and abiotic, upon which the human species depends”.

In the social sciences, the analysis of global environmental change and of the human-nature relationship is polarised between epistemological idealism and realism (Glaeser 2002: 11-24), or between *social constructivism* and *neo-realism*. The *neo-idealist orientation* has highlighted two aspects: a) the uncertainty of scientific knowledge and claims; and b) the attempt to explain the scientific and public recognition of environmental change influenced by political and historical forces (Rosa/Dietz 1998). At least three standpoints exist on environmental issues:

- a *pessimist* or *Neo-Malthusian view* stimulated by Malthus’ Essay on Population (1798) that stressed the limited carrying-capacity of the Earth to feed the growing population;
- an *optimist* or *Cornucopian view* that believed an increase in knowledge, human progress and breakthroughs in science and technology could cope with these challenges (Table 1).

These two opposite positions have dominated the environmental debate since the Club of Rome’s *Limits of Growth* (Meadows 1972), and Lomborg’s (2001) *Skeptical Environmentalist*. Homer-Dixon (1999: 28-46) distinguished among *neo-Malthusians* (biologists, ecologists); *economic optimists* (economic historians, neoclassic economists, agricultural economists) and *distributionists* (poverty, inequality, misdistribution of resources). Brauch (2002, 2003) opted for a third perspective of an *equity-oriented pragmatist*. Table 1 combines

- the three worldviews on security of the English school with
- three ideal-type standpoints on the environment.

This leads to nine combined ideal type positions on security and environmental issues. The one of the United Nations system (position V) may be described as one of Grotian pragmatism in security terms and as an equity oriented pragmatic environmental perspective where ‘cooperation matters’ and is needed to solve problems.

The complex interaction between processes in the ecosphere and anthroposphere have been visualised by Brauch (2002, 2003) in a ‘survival hexagon’ (Figure 1) of three resource challenges: *air* (climate change), *land* (soil, ecosystem degradation) and *water* (scarcity, degradation, floods), and three social challenges: *human population* (growth, changes of its value systems), *urban systems* (services, industries, pollution, health), and rural systems (securing food and fibre).

Table: 1: Worldviews and Standpoints on Security and Environmental Issues

Worldviews/Traditions on security (→)	Hobbes, Morgenthau, Waltz (neo)realist (pessimist) <i>Power matters</i>	Grotius liberal pragmatist <i>Cooperation matters</i>	Kant (neo)liberal institutionalist (optimist) <i>International law matters and prevails</i>
Standpoints on environmental issues (↓)			
Neomalthusian pessimist <i>Resource scarcity</i>	I	II	III
Equity-oriented pragmatist <i>Cooperation will solve problems</i>	IV	V International organisations and regimes	VI
Cornucopian neo-liberal optimist. <i>Technological ingenuity will solve problems</i>	VII	VIII	IX

These six factors may interact in different ways and contribute to environmental scarcity of soil, water and food that in turn intensify environmental degradation and result, taking the specific national and international context into account, in environmental stress that may lead – under certain socio-economic conditions and specific national and international contexts – to conflictual outcomes nearly exclusively at the national level. Only in rare cases may they affect neighbouring countries. These may be resolved, prevented or avoided primarily by national political decisions and supported in some cases by diplomatic efforts. Whether environmental stress results in extreme and potentially violent outcomes depends on the national *political process* (interaction between state, society and economy but also how knowledge is used for adaptation and mitigation purposes), and on the structures of governance.

Both official development assistance and the international processes of economic globalisation have contributed little so far to poverty reduction, as the report by Jeffrey Sachs on the implementation of the *Millennium Development Goals* of January 2005 has stated.⁹ Without additional efforts the affluence in the North and poverty in the South may not be overcome until 2015.

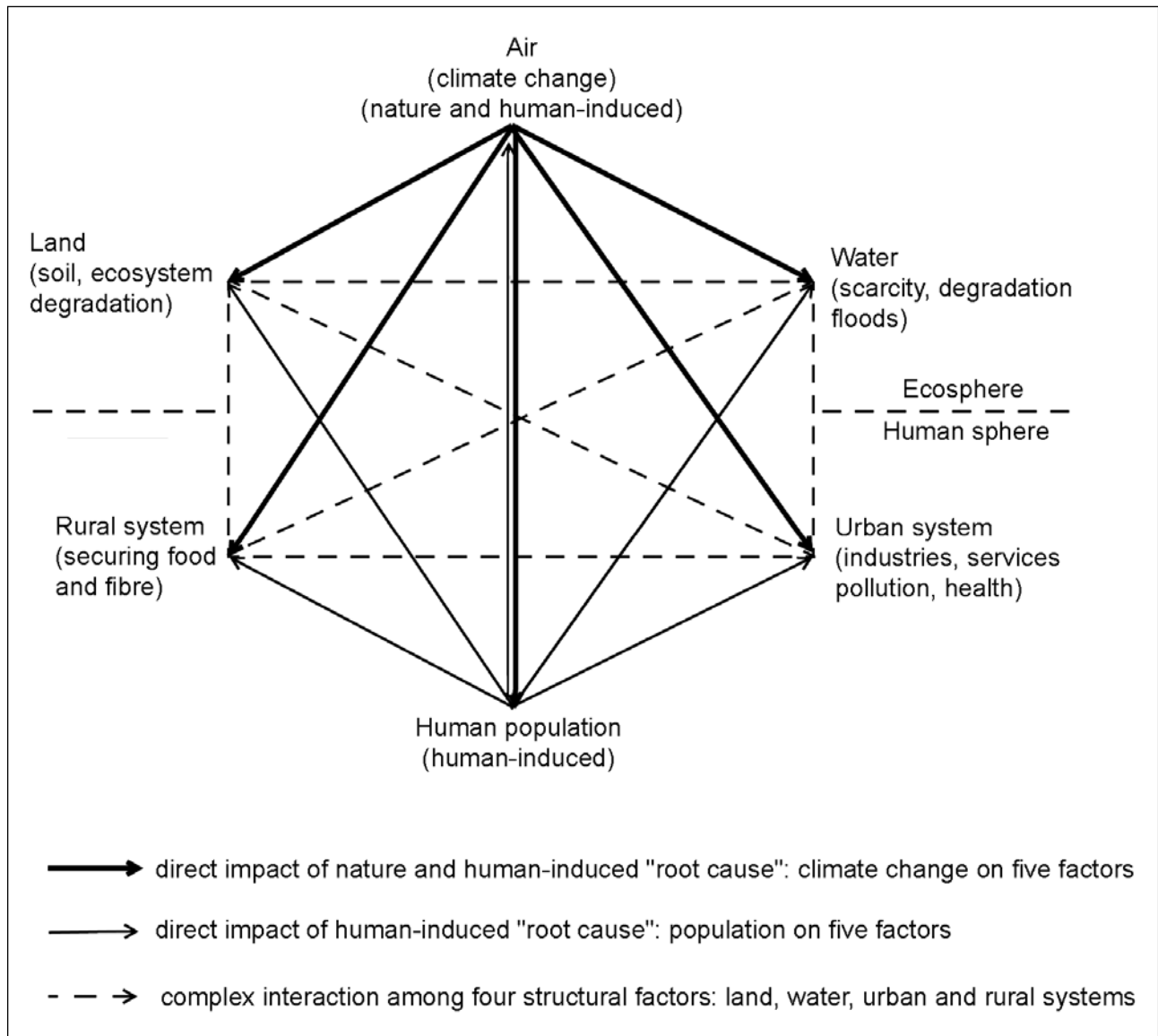
The political process on the inter- and transnational level has contributed to these outcomes:

- increased human mobility (internally displaced persons) within the South and migration from the South to the North (due to pull or push factors) that may and have resulted in some cases in tensions and internal or regional crises that may lead either to

⁹ “Whatever it takes”, in: *Economist online*, 18.1. 2005; Millennium Project, Report to the UN Secretary General: *Investing in Development. A Practical Plan to Achieve the Millennium Development Goals* (New York: UN – London-Sterling, Va.: Earthscan, 2005).

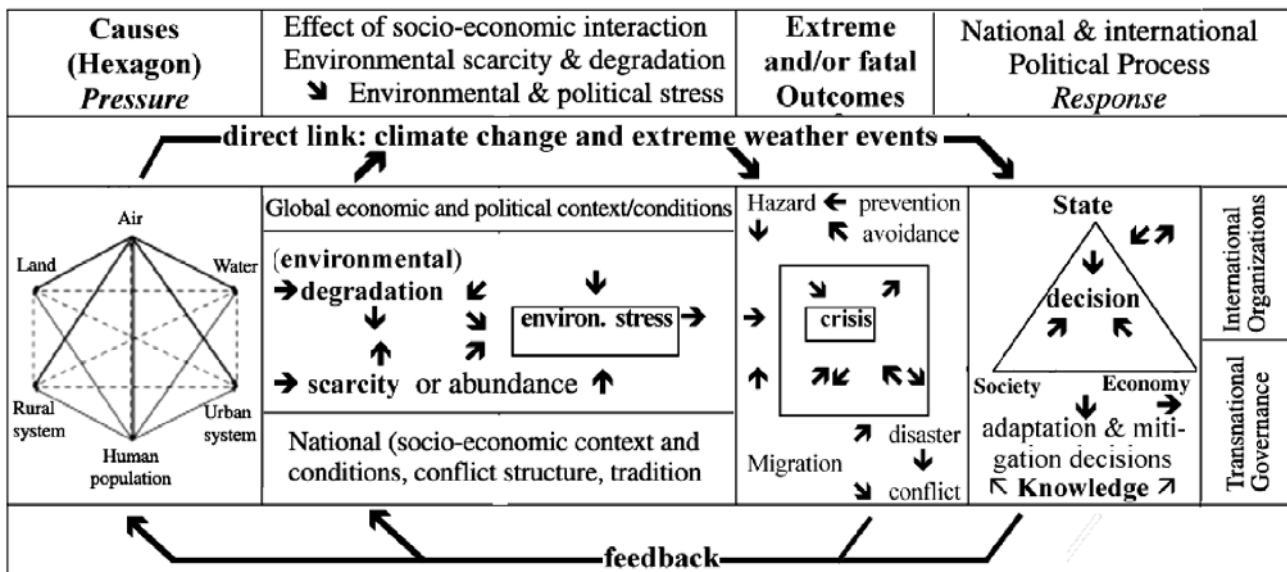
- a successful resolution by cooperation, or in the worst case possibly also to
- conflict at an internal (protest, skirmishes, civil strife, civil war) or international (bilateral, regional, interregional or global) level caused by the complex interaction of structural inputs, political processes, and constellations of mobility, conflict and cooperation (Figure 2).

Figure 1: Survival Hexagon of Six Resource and Social Factors after Brauch
(2003: 126; 2005: 15)



Depending on the system of rule and on the level of economic development, the interaction between the state, the economy and society differs, as will the role of knowledge due to scientific innovation to enhance the national coping capacities for adaptation and mitigation.

Figure 2: Causes and Outcomes of Environmental Stress and Extreme Outcomes after Brauch (2003: 126; 2005: 16)



The IPCC (2001) has pointed to a direct causal connection between climate change and an increase in number and intensity of hydro-meteorological hazards (storms, floods, drought) and disasters. Climate change may increase the probability and intensity of extreme weather events and thus increase internal displacements, transboundary, and even intercontinental migration.

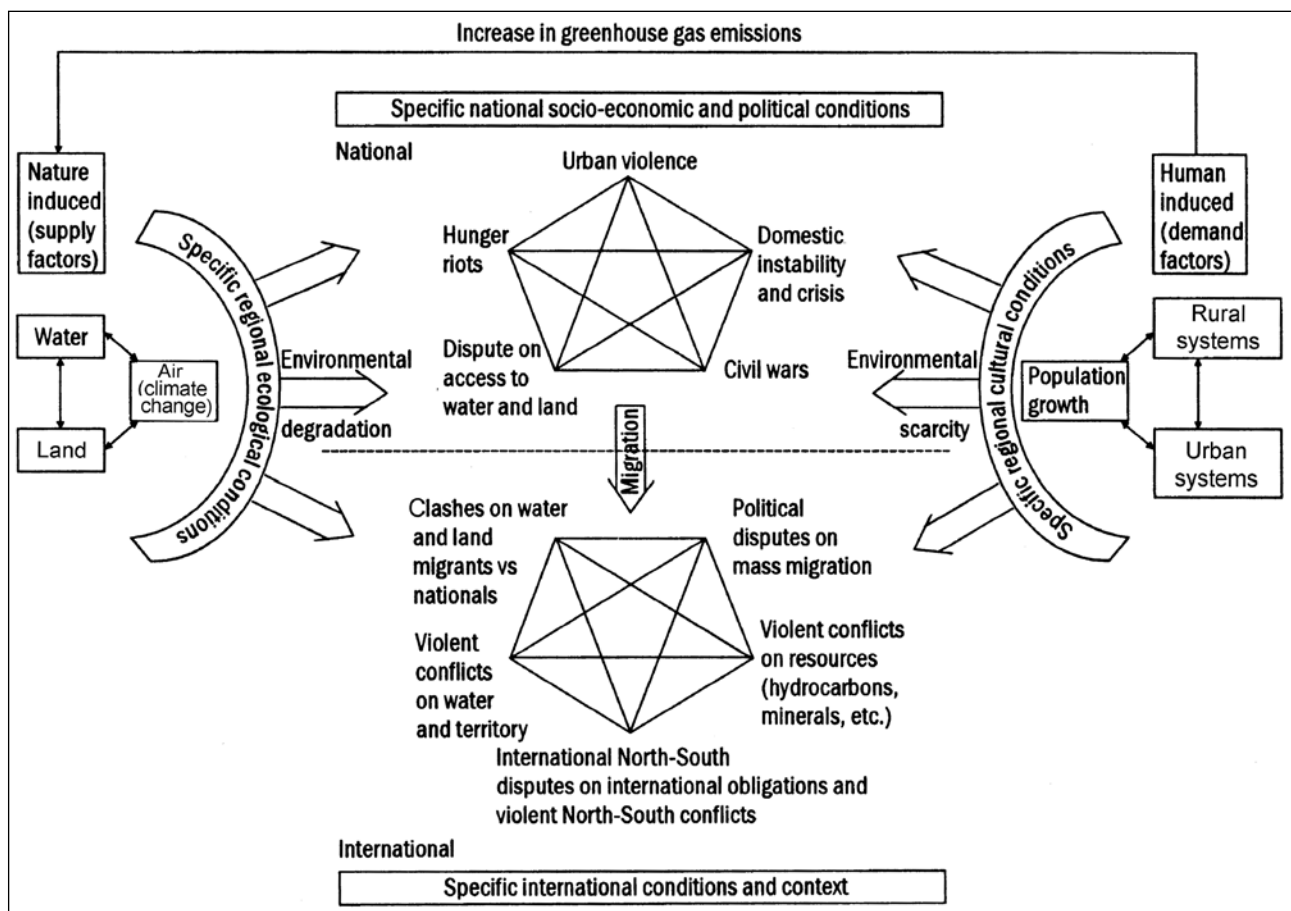
Again both factors (hazards and migration) interact and may contribute, trigger or cause domestic crises that may escalate to different forms of low-level violence. The nature- and human-induced factors of Global Environmental Change (GEC) may contribute, trigger or intensify ethnic, religious or political conflicts and may lead to violence or raise the need for peacemaking. Four different socio-economic scenarios of the complex interplay of these structural causes have occurred (Figure 3):

- a) domestic societal conflicts;
- b) resource and border conflicts (Klare 2001);
- c) regional violence with implications for different security perceptions in the South and of the North; and
- d) militarisation of non-military causes of conflicts.

In many developing countries, internal displacement has often been a first step towards transboundary migration, e.g. from Bangladesh to India or from Sahel countries to countries in North or West Africa, and in a few cases also overseas to Europe and North America.

No violent domestic and international conflict has been caused so far by environmental degradation and population growth alone. The key question is how these highly complex processes of Global Environmental Change (GEC) affect humankind and individuals. Do they pose new threats, challenges, vulnerabilities and risks for security and survival for the human species (Brauch 2005), and how should these challenges be addressed proactively to reduce the *vulnerability* to and *impact* of extreme events, and to contain a potential escalation of violence?

Figure 3: 'Pentagon' of Conflict Constellations for the Domestic and International Level after Brauch (2003: 130; 2005: 17)



At the Rio (1992) and Johannesburg (2002) summits problems of climate change, biodiversity and desertification were added to the policy agenda. But the implementation strategies for sustainable development fell well behind the declaratory policy statements, such as the Agenda 21 or the Millennium goals, and the Johannesburg Plan of Action. Both the increasing hydro-meteorological hazards – partly due to climate change impacts – and of costs of insured damages (IPCC 2001), have increasingly focused attention of policy makers on new ‘environmental security threats, challenges, vulnerabilities and risks’ but also of UN officials and of analysts on new ‘human security threats, challenges, vulnerabilities and risks’. Against many of these non-military soft security challenges, vulnerabilities and risks no military defence is possible, but the military infrastructure can assist in the early warning to face some challenges, and in a speedy and well-organised disaster response. Many security challenges or megacatastrophes (e.g. the tsunami of 26 December 2004) do not distinguish between powerful and poor countries, although rich countries have better means to insure against damages, to adapt, to mitigate against, and to enhance their own resilience.

The end of the Cold War stimulated a reconceptualisation of the key concept of ‘security’. The fundamental changes in the *international political order* and the emergence of ‘new wars’ (Kaldor/Vashee 1997; Kaldor 1999; Münkler 2002, 2005) resulted in new hard security ‘threats’, soft (environmental) security ‘challenges’, in new economic, societal and political ‘vulnerabilities’ and ‘risks’ that are perceived and interpreted differently depending on the mind-set of policy makers and the models of the analyst.

The increasing perception of new ‘global challenges’ triggered by Global Environmental Change (GEC) and processes of globalisation have led to a progressing ‘securitisation’ of global and regional environmental security issues that may result in extreme or even fatal outcomes (hazards, migration) and that may force affected people to move and escalate into political crises and violent conflicts. ‘Environmental’ and ‘ecological’ security has added new dangers to the national, regional and global security agenda that legitimate new military missions and political tasks.

3.4. Reconceptualisation of Security

During World War II, a new doctrine of ‘national security’ was developed in the United States “to explain America’s relationship to the rest of the world” (Yergin 1977: 193). During the Cold War the concepts of internal and national, alliance and international security were used for a bipolar international order in which deterrence doctrines played a major role to prevent a nuclear war. ‘National’ and ‘alliance’ security focused on military and political threats posed by the rival system.

Many authors (Buzan/Wæver/de Wilde 1998) have observed a recent widening and a deepening of the security concept in OECD countries, while in some countries a narrow military security concept has further prevailed (Brauch 2000, 2003; Aydin 2003; Kam 2003; Selim 2003). Within the UN and NATO as well as among EU member states, different security concepts coexist, namely a Hobbesian state-centred political and military security concept and an extended Grotian concept that includes economic, societal and environmental security dimensions (Table 2).

Table 2: Vertical Levels and Horizontal Dimensions of Security in North and South
(Brauch 2003; 2005: 10)

Security dimension Level of interaction	Military	Political	Economic	Environmental ↓	Social
Human →			energy, food , health, livelihood threats, challenges and risks may pose a <i>survival dilemma</i> in areas with high vulnerability		
Societal/Community				↓↑	
National	“ <i>Security dilemma of competing states</i> ” (National Security Concept)		“Securing energy, food, health, livelihood etc.” (Human Security Concept) that combines all levels of analysis & interaction		
International/Regional				↓↑	
Global/Planetary →					

Since 1990, not only the scope of ‘securitisation’ (Wæver 1997) has changed, but also the referent object from a ‘national’ to a ‘human-centred’ security concept, both within the UN system (UNDP 1994; UNESCO 1997, 1998, 1999, 2001, 2003; UNU 2002; UNU-EHS 2004) and in the academic (peace focused) security community. While ‘security studies’ have returned to a narrow concept of national military security, specialists in environmental change and in peace research have used the concepts of ‘environmental’ and ‘human’ security and their linkages.

From a realist *Hobbesian* worldview environmental and human security challenges are not perceived as threats, and often non-existing. From a pragmatic *Grotian* perspective environmental security challenges expose the societal vulnerability what may lead to a ‘survival

dilemma' (Brauch 2004) for those with a high degree of societal vulnerability that may be most seriously affected by natural (or human-induced) environmental hazards. From a Kantian, liberal or constructivist perspective international environmental treaties and regimes pose obligations for governments and peoples. Since 1990, a fundamental reconceptualisation of security has gradually emerged (Buzan/Wæver/de Wilde 1998; Abdus Sabur 2003; Brauch 2005; Brauch/Grin/Mesjasz et. al. 2006).

In European security discourses an expanded security concept has been used by both governments and in scientific debates (Buzan/Wæver/de Wilde 1998). Møller (2003) distinguished a 'national' and three expanded security concepts of 'social' or 'societal', 'human' and 'environmental' security. Oswald (2001) added gender security and introduced a 'Human, Gender and Environmental Security' (HUGE) concept (Table 3). Ullman (1983), Mathews (1989) and Myers (1989, 1994) put environmental concerns on the U.S. 'national security' agenda.

While *national security* has the state as the major referent, *human security* has human beings and humankind as the referent. The answers to the questions of security for whom, from whom, by whom, of what values, from what threats and by what means differ fundamentally between both concepts (Abdus Sabur 2003: 41). Bogardi (2004) and Brauch (2003, 2005) suggested to focus the human security discourse on the environmental dimension especially on interactions between the individual or humankind as the cause and victim of factors of global environmental change both in anthropogenic and natural variability contexts (Bogardi/ Brauch 2005). This can be illustrated for climate change where the human consumption of fossil fuel has significantly increased global warming since the beginning of the industrial age. Major victims of this consumption pattern – due to an increase in extreme weather events – are often the poorest and most vulnerable people in developing countries.

Table 3: Expanded Concepts of Security (Møller 2001, 2003; Oswald 2001)

	Reference object (security of whom?)	Value at risk (security of what?)	Source(s) of threat (security from whom or what?)
National Security [political, military dimension]	The State	Sovereignty, territorial integrity	Other states, terrorism (sub-state actors)
Societal security	Nations, societal groups	National unity, identity	(States) Nations, migrants, alien cultures
Human security	Individuals humankind	Survival, quality of life	State, globalisation, GEC, nature, terrorism
Environmental security	Ecosystem	Sustainability	Humankind
Gender security	Gender relations, indigenous people, minorities	Equality, identity, solidarity	Patriarchy, totalitarian institutions (governments, religions, elites, culture), intolerance

This publication reviews four security dangers posed to the environmental security dimension and to human security by objective and subjective security threats, challenges, vulnerabilities, and risks. What do we mean with security 'threats', 'challenges', 'vulnerabilities' and risks' that pose dangers for environmental and human security? How have these terms been used in common English and as scientific concepts in the social and natural sciences that are relevant for the hazard and disaster as well as the human security community?

3.5. Concepts of Environmental Security

Research on linkages between the environment and security and on environmental security has gradually evolved since the end of the Cold War. Since the 1970s global environmental change has become a new research field in both the natural and social sciences. The claims on causal linkages between global environmental change, environmental stress and extreme outcomes have stimulated extensive research. According to Dalby (2002) and Brauch (2003) the research on environmental security evolved in three stages:

- *Phase I:* The research in the 1970s and 1980s, resulting from the cooperation first between UNEP and SIPRI and later between UNEP and PRIO on the environmental impact of wars, is closely linked to the pioneering work of Arthur H. Westing and the conceptual contributions of Osborn, Brown, Galtung, as well as the policy oriented proposals of Ullman, Mathews and Myers, often with a normative orientation.
- *Phase II:* During the 1990s two comprehensive empirical environmental conflict research projects were conducted by the *Toronto Group* (Homer-Dixon 1999, 2000; Homer-Dixon/Blitt 1999) and by the *Bern-Zürich Group* (Bächler et al. 1996, 1996a, 1996b, 2002).
- *Phase III:* Since the mid 1990s, partly in reaction to and modification of the work of both research teams, comparative studies and conceptual deepening by other groups of researchers, partly relying on modelling, on management efforts and focusing on the conflict potential of resource use, on state failures, and on syndromes of global change, were launched.

According to Dalby (2002a: 96) “environmental security discussions can now move to a fourth stage of synthesis and reconceptualisation”. Brauch (2003, 2005) suggested a fourth phase of research on *Human and Environmental Security and Peace* (HESP) that should combine structural factors from the natural (climate change, water, soil) and human dimensions (population growth, urbanisation, pollution, agriculture and food) based on the expertise from the natural and social sciences with outcomes and conflict constellations.

Former Soviet President Gorbachev (1988) “proposed ecological security as a top priority that *de facto* would serve as a forum for international confidence building.” The Brandt-Report (1980) noted that “few threats to peace and survival of the human community are greater than those posed by the prospects of cumulative and irreversible degradation of the biosphere on which human life depends.” The Brundtland Commission (1987) argued that the security concept “must be expanded to include the growing impacts of environmental stress – locally, nationally, regionally, and globally.” The Commission on Global Governance (1995) called for a broader concept of global security for states, people and the planet. It claimed a linkage between environmental deterioration, poverty and underdevelopment as causes of conflict. These reports put the linkage between environmental stress and conflicts and conflict resolution on the political agenda of international organisations.

During the first three phases of research on environment and security issues related to global environmental change, environmental scarcity, degradation and stress as well as their possible socio-political consequences were put on the scientific research agenda both in the social sciences and in the natural sciences, but also on the political agenda of governments and international organisations.

Since the 1990s, the widening of the security concept has progressed and concepts of ‘environmental security’ (UNEP, OSCE, OECD, UNU, EU), ‘food security’ (FAO), ‘health security’ (WHO), ‘energy security’ (World Bank, IEA), and ‘livelihood security’ (OECD) have been used. The Millennium Report of the UN Secretary General (Annan 2000) mentioned several international organisations that have addressed the linkages between environmental stress and conflicts.

The World Summit on Sustainable Development in Johannesburg (2002) in its political declaration and plan of implementation referred to 'food security' but 'environmental' or 'human security' were not included. Kofi Annan (2003) pointed out to the potential threats posed by environmental problems and he suggested that the UN system should "build additional capacity to analyze and address potential threats of conflicts emanating from international natural resource disparities".

In this regard, UNEP has been active in three areas: a) Disaster Management Branch (DEPI); b) UNEP's Ozone Action Program (DTIE); and c) UNEP's Post Conflict Assessment Unit (Haavisto 2003). In January 2004 UNEP identified a "need for scientific assessments of the link between environment and conflict to promote conflict prevention and peace building". UNEP's Division of Early Warning and Assessment (DEWA) launched an "Environment and Conflict Prevention" initiative to stimulate "international efforts to promote conflict prevention, peace, and cooperation through activities, policies, and actions related to environmental protection, restoration, and resources (UNEP 2004).

The Organization for Security and Cooperation in Europe (OSCE) has dealt with security risks from environmental stress. Among the non-traditional security risks confronting OSCE countries in Central, Eastern and South-Eastern Europe, in the Caucasus, in Central Asia and other parts of the former Soviet Union are trans-boundary pollution, shortage of drinking water, disposal of radioactive waste, reduction of human losses in human-made disasters and natural catastrophes, among them several 'hotspots' in the Baltic Sea region, the Balkans, Central Asia, in the Black and Caspian Sea as well as in the Caucasus. The OSCE Economic Forum has organised several meetings on environmental security issues (Brauch 2003).

In late 2002, OSCE, UNEP and UNDP launched a joint initiative to promote the use of environmental management as a strategy for reducing insecurity in South-Eastern Europe and in the Caucasus. The results were presented at the 5th ministerial conference in Kiev in May 2003 which adopted an environmental strategy for the countries of Eastern Europe, the Caucasus and Central Asia. After Kiev, this ENVSEC (environmental security) Initiative has focused on:

- 1) vulnerability assessment and monitoring environment and security linkages;
- 2) policy development and implementation; and
- 3) institutional development, capacity building and advocacy.¹⁰

The Organization for Economic Co-operation and Development (OECD) has also addressed the linkages between development, environment and conflicts in several policy statements, such as "Development Assistance, Peace and Development Co-operation of the 21st Century" (OECD/DAC 1997) and in a scoping paper on the economic dimension of environmental security. These linkages are reflected in the "Guidelines on Conflict, Peace and Development Co-operation" (OECD/DAC 2001).

The European Union has pursued two strategies for 'environmental security': a) integrating environmental goals into all sectoral policies (*Cardiff process*), including those related to development, foreign and security policies; and b) stressing conflict prevention and management in its activities in international organisations (UN, OSCE) and for specific regions.

10 In October 2004 a report on cooperation over environmental risks in the South Caucasus was released that focused on a) environmental degradation and access to natural resources in areas of conflict; b) cross-border water resources, natural hazards and industrial and military legacies; and c) population growth and rapid development in major cities. For additional comments see page 73.

At the Barcelona European Council in March 2002, a sustainable development strategy was adopted that emphasised the integration of environmental concerns into sectoral policies. The European Council in Seville (June 2002) approved a conflict prevention programme that aimed both at short-term prevention and at the root causes of conflict, in its development cooperation with poverty reduction, and in its strategy against terrorism. The European Council meeting in Thessaloniki in June 2003 approved a 'green strategy' for the EU.

However, many studies in the environmental security debate since 1990 have ignored or failed to integrate the contributions of the global environmental change community in the natural sciences. To a large extent the latter have also failed to integrate the results of this debate. In the first three assessments of the Intergovernmental Panel on Climate Change (IPPC) the past and potential future socio-economic and political impacts of climate change have not been reviewed (BMU 2002; NRC 2002, Schwartz/Randall 2003).

Thus, there is now a need for moving towards a fourth phase of research on environment and security linkages that builds on the evidence available and tries to overcome the shortcomings. The ultimate goal of a fourth phase of research on human and environmental security and peace (HESP) is to induce policy-makers to anticipatory learning by accepting new paradigms leading to pro-active environmental initiatives and behaviour. They should recognise and address the root causes of the fatal outcomes of environmental stress before they result in severe crises that may – in extreme cases – escalate into violent strife. The specific strategies to be launched will differ from case to case and they must take the specific context, history and conflict-proneness of each case into account (Brauch 2002, 2003, 2003a, 2005).

3.6. Concepts of Human Security

While the academic debate on environmental security influenced the policy agenda of several international organisations, the human security concept used by UNDP (1994) triggered a global and ongoing scientific debate. Since then, *human security* has been referred to as: a) a level of analysis; b) as a human-centred perspective (Annan 2001); and c) as an encompassing concept (UNDP 1994). For the first approach, the *individual human beings* or the persons affected by environmental stress and its outcomes (hazards, migration, crises, conflicts) are the referent object; for the second a *normative orientation* is essential while the third is a combination of all five dimensions and five levels of a widened security concept (Tables 2,3).

The first approach is too narrow to become politically relevant, while the third is too wide for analytical research (Mack 2004). The second position of a *people-centred* human security concept comes closest to Kofi Annan's (2001) political perspective and the constructivist approach of GECHS (1999) that encompasses a) *development* (poverty eradication); b) *freedom* (human rights and system of rule); and c) *equity* on the international and *justice* on the national level.

On several occasions UN Secretary General Kofi Annan (2001) has referred to the need for a human-centred approach to security. For him "human security can no longer be understood in purely military terms, rather, it must encompass economic development, social justice, environmental protection, democratization, disarmament, and respect for human rights and the rule of law". In his view, "large-scale displacement of civilian populations, ... environmental disasters present a direct threat to human security" that "embraces far more than the absence of violent conflict". He pointed to three building-blocks of the human security concept: "freedom from want, freedom from fear, and the freedom of future generations to inherit a healthy environment – these are the interrelated building blocks of human – and therefore – national security".

Krause (2004) distinguished among two visions of human security as ‘freedom from want’, represented by the comprehensive UNDP (1994) concept and the Commission on Human Security (CHS 2003), and the ‘freedom from fear’, represented by the Human Security Network (HSN). For the second vision promoting human security requires from the states “to provide security – in order that individuals can pursue their lives in peace” (Krause 2004).

For the security studies community, the state remains the major referent object that is to be secured while both human security visions deal with the protection of the individual or citizen. Mack (2004) pointed to a major shortcoming of the state-centred security paradigm showing that it cannot deal with threats to the individual emanating from the state, and that it can hardly explain state collapse. The first *Human Security Report* (2004) adopted “a narrowly focused definition of human security in which the threat is the relatively conventional one of political and criminal violence” (Mack 2004). Bogardi and Brauch (2005) argued that human security should rest on three conceptual pillars:

- ‘Freedom from want’ by reducing societal vulnerability through poverty eradication programmes (UNDP 1994; CHS 2003);
- ‘freedom from hazard impact’ by reducing vulnerability and enhancing coping capabilities of societies confronted with natural and human-induced hazards (UNU-EHS 2004); and
- ‘freedom from fear’ by reducing the probability that hazards may pose a survival dilemma for the people most affected by extreme weather events (UNESCO, HSN).

The policy debate on human security, triggered by UNDP (1994), the HSN (1999) and the CHS (2003), had a direct impact on the academic debate where after 10 years no common definition on human security has emerged. Alkire (2004: 359) noted more than 30 definitions:

Some focus mainly on threats from wars and internal conflicts, sometimes including a focus on criminal and domestic violence; others focus on threats from preventable disease, economic hardship, or financial crisis – the threats of poverty and want; while a third group considers both types of threats – often described as ‘fear’ and ‘want’ ... as well as the processes by which people protect themselves and are protected. ... Human security shifts the focus away from the protection of the state borders to the protection of individual lives within them. Thus, the key struggle for human security is to identify priority issues without becoming dissipated.

Within the social sciences and in international relations, the human security concept has remained controversial. While many Hobbesian pessimists, neo- or structural realists and the strategic studies community (Paris 2001), as well as state-centred peace researchers (Buzan 2000, 2002; Müller 2002) have rejected the human security concept, authors with Grotian or Kantian as well as liberal and constructivist perspectives and from peace research have rallied behind this concept. Some proponents are critical of a wide concept as ‘freedom from want’ (Krause 2004; Mack 2004) and have argued instead for “pragmatism, conceptual clarity, and analytic rigor” (Owen 2004: 375). Many authors of a forum in *Security Dialogue* (2004) supported a wide agenda that includes ‘freedom from fear’ (violence) and ‘freedom from want’ (development).

Human security as an analytical and theoretical tool differs from human security as a political mandate. Uvin (2004) uses the concept as a “conceptual bridge between the ... fields of humanitarian relief, development assistance, human rights advocacy, and conflict resolution” (Owen 2004). For Hampson (2004) human security gives voice to the politically marginalised, while Acharya (2004) interpreted it as a response to the globalising of international policy, while for others human security is a response to genocide and limits of sovereignty justifying humanitarian interventions.

Newman (2001) distinguished four interpretations of human security referring to basic human needs, an assertive or interventionist focus, social welfare or a development focus, and new or non-traditional security issues like drugs, terrorism, small arms and inhumane weapons. The victims of *human security challenges* have been: “1) victims of war and internal conflict; 2) persons who barely subsist and are thus courting ‘socio-economic disaster’; and 3) victims of natural disasters (Suhrke 1999) that create severe humanitarian emergencies. Thomas and Tow (2002, 2002a) distinguished general human security ‘threats’ such as hunger and disease, and specific ones, such as “single actions that have an immediate effect on the safety or welfare of victims and demand immediate remedy”, to which ‘peacekeeping’ emerges as a major response along with peace-enforcement measures. For humanitarian interventions human security and traditional responses to crises overlap. They conclude that human security could be considered “a valid paradigm for identifying, prioritizing and resolving emerging transnational security problems”, and that the model offers ways to respond to these challenges by “safeguarding and improving the quality of life” for individuals and groups.

Bellamy and McDonald (2002) argued that this effort to make human security policy relevant “risks losing its emancipatory potential.” They preferred the approach suggested by Thomas (1999) that human security should stress “the security of the individual and that security is achieved only when basic material needs are met.” They suggest that the focus of human security should be humans (basic human needs) and their ability to “participate in collective endeavours” and the state “as the primary agent of human insecurity.” Thomas and Tow (2002) argued that “state security and human security are interlinked” and that “state security is a means of providing human security”, but that “outwardly aggressive and inwardly repressive regimes can be a major source of human insecurity.” Mack (2002) observed that “it is impossible to explore causal relationships between violence, on the one hand, and indicators of underdevelopment, on the other, if all are subsumed under the rubric of human insecurity.”

To overcome the dispute between the proponents of a narrow and a wide human security concept, Owen (2004) suggested combining the wide definition of UNDP (1994) with a threshold-based approach “that limits threats by their severity rather than their cause.” He suggested that each category of threats should be “treated separately for the purpose of analysis.” For Owen (2004) “human security is the protection of the vital core of all human lives from critical and pervasive environmental, economic, food, health, personal and political threats” regardless whether people are affected by floods, communicable disease or war, but all those threats would be included “that surpass a threshold of severity would be labelled threats to human security” (2004). After ten years of debates in the social sciences the conceptual debate on human security remains inconclusive and the human security definition depends on the approach, preferences and agenda of the respective author.

Barnett (2001) considered a “human-centred environmental security concept” as justified on moral and pragmatic grounds “because addressing the welfare of the most disadvantaged means addressing many of the future sources of environmental degradation” by protecting the rights of the most vulnerable members of society (Sachs 1996) and by enhancing “welfare, peace and justice” required “for human and environmental security” (Conca 1994) on which legitimate institutions should be built. Barnett (2001) argued that a human-centred environmental security concept should stress the “need for cooperation and inclusion to manage the environment for the equal benefit of all people and future generations”.

For Barnett (2001: 129) “environmental security is the process of minimizing environmental insecurity”, having humans as the major referent of security. With this definition, he “seeks to treat the underlying causes that create environmental degradation.” He defines environmental security also as an adaptive process “which is sensitive to change and seeks to manage change

peacefully.” In his view environmental security requires nation states to “act domestically and in concert to curb global, regional and local processes that generate environmental degradation and human insecurity.” It addresses the impact of environmental degradation on the individual and the people from malnutrition, lack of energy and clean water. His concept draws on ecology and hazard theory with the key notions of risk, vulnerability and resilience.

A major conceptual and policy task for UNU-EHS (2004) is to develop a third pillar of the human security concept as ‘freedom from hazard impact’ and to contribute to the implementation of this goal in international, regional and local efforts contributing to capacity-building for early warning, developing vulnerability indicators and vulnerability mapping to reduce the fatalities as well as disaster frequency and magnitude in flood-prone and highly vulnerable urban areas primarily in developing countries. ‘Freedom from hazard impact’ would imply that people can mobilise their resources to address sustainable development goals rather than remain in the vicious cycle of the ‘survival dilemma’ (Brauch 2004). Human security as freedom from hazard impact is achieved when people who are vulnerable both to societal threats (poverty, improper housing, insufficient food), and environmental hazards (floods, landslides, and drought) are better protected against these impacts and are empowered to effectively prepare themselves to cope with the survival dilemma. Such extreme events often pose three alternatives for the most vulnerable: to die, to move, or to struggle for their own survival and that of their families, village or tribal community.

A lot of conceptual work on the linkages between ‘environmental’ and ‘human’ security or on the environmental dimension of human security is still needed. Efforts at mainstreaming are necessary on the scientific and political tracks with regard to: a) the environmental dimension of human security, i.e. the conceptualisation and debate within the scientific community; and b) the paradigm shift within the UN system from ‘national’ towards a ‘human’ security perspective on environmental threats, challenges, vulnerabilities and risks (Brauch 2005).

With regard to the work of international organisations a dual mainstreaming may be needed:

- to incorporate a ‘human security’ perspective into ‘environmental security initiatives’, such as the Kiev process of OSCE, UNEP, UNDP and NATO, and into the ‘green diplomacy’ of the European Union launched at the European Council in Thessalonica in June 2003; and
- to include an ‘environmental security dimension’ into the work of the Human Security Network (HSN) focusing primarily on ‘freedom from fear’ and to elaborate it further also in the context of the report of the Commission on Human Security (CHS 2003) that has focused on ‘freedom from fear and want’.

UNU-EHS can enhance the mainstreaming efforts within the UN system through its scientific forum function and through human capacity building activities with regard to ‘freedom from hazard impact’. However, the introduction and support of states to adopt vulnerability concerns in the human security concept in their respective environmental management plans and actions require the active involvement of other UN agencies and programmes.

4. Reconceptualising ‘Security Threats’ after the Cold War

The English term ‘threat’, or ‘menace’ (Lat: ‘trudere’ or to push, thrust; Fr.: ‘menace’; It.: ‘minaccia’; Sp.: ‘amenaza’ or: ‘conminación’; Port: ‘ameaça’; Ger.: ‘Drohung’ or ‘Bedrohung’) refers to “a communication of a disagreeable alternative to an individual or group by one in authority or who pretends to be” (Koschnik 1992: 210). According to *Webster’s Dictionary* a *threat* is “1. a statement or expression of intention to hurt, destroy, punish, etc. in retaliation or

intimidation”, and 2. “an indication of imminent danger, harm, evil etc.; as, the threat of war”. *Longman* defines threat as: “1. a statement that you will cause someone pain, unhappiness, or trouble...; 2. the possibility that something very bad will happen (famine, attack etc.)...; 3. someone or something that is regarded as a possible danger”. For the *Compact Oxford English Dictionary* threat means: “1. a stated intention to inflict injury, damage, or other hostile action on someone; 2. a person or thing likely to cause damage or danger; 3. the possibility of trouble or danger”.

In security policy and studies ‘threat’ is used as a ‘political term’ and as a ‘scientific concept’ that remains undefined in many social science dictionaries. Robertson (1987: 304-305) used the concept ‘threat assessment’ as an analysis of “the reasons behind an opponent’s armament programmes” that was often made during the Cold War “on a worst case basis”, where “besides personnel and hardware totals” the opponent’s strategic doctrine had also to be taken into account.

During the Cold War, for *national security*, Buzan (1983: 57) pointed to a dual threat to state institutions by force (capabilities) and ideas (ideology). The state’s territory “can be threatened by seizure or damage, and the threats can come from within and outside of the state”. For Buzan different components of the state are vulnerable to different types of threats where strong states are primarily threatened by outside forces while weak states may be challenged both from within and outside. From a national security perspective, Buzan (1983: 75-83) distinguished between *military threats* (seizure of territory, invasion, occupation, change of government, manipulation of policy), *economic threats* (export practices, import restrictions, price manipulations, default on debt, currency controls etc., and those to domestic stability), ecological threats (damaging the physical base of the state). These threats, Buzan (1983: 88) argued, “define [the state’s] insecurity, and set the agenda for national security as a security problem”. Understanding the threats requires to understand the state’s vulnerabilities. Weapons development as a combination of capabilities and intentions has been semi-independent from threats. Dealing with specific threats, an international security strategy focuses on “the sources and causes of threats, the purpose being not to block or offset the threats, but to reduce or eliminate them by political action” (Buzan 1983: 218).

This type of ‘threat’ has disappeared with the end of the East-West conflict in 1990, and thus the threat perception has fundamentally changed. Already during the first (1969-1975) and second *détente* (1986-1989) the classic threat concept lost its importance. Since 1990, threat is also defined as referring to the dangers the planet earth is confronted with due to the manifold destructive potentials of the environment and its global consequences. Steiner (2001) pointed to the fundamental change in the risks, dangers and threats since 1990, which has increased the dangers of violent domestic wars and has reduced the effectiveness of arms control regimes. The increase in asymmetric forms of warfare (Kaldor 1999; Münkler 2005), and of the increasing role of more sophisticated and brutal non-state actors (terrorist networks) have made the security challenges more complex and complicated, and the security risks less calculable and predictable.

Several countries reacted in their national defence white papers and national strategic documents to the fundamental change in the nature of threats with an extended security concept that included many new non-military soft security threats such as: economic vulnerabilities, environmental challenges, political and societal instabilities (e.g. German Defence White Paper 1994: 25-26) pointing to a “multitude of risk factors of a different nature with widely varying regional manifestations.” The official German Defence White Paper suggested that “risk analysis of future developments must be based on a broad concept of security ... They

must include social, economic, and ecological trends and view them in relation to the security of Germany and its allies.”

In the United States, several national security strategy papers of the Clinton administration have pointed to the fundamental change in security threats. With the election of George W. Bush, the worldview of neo-conservatives fundamentally shifted the focus of U.S. national security policy, especially after the events of 11 September 2001. Defense Secretary Rumsfeld launched a fundamental reassessment of U.S. military strategy and force posture that resulted in two key documents: the *Quadrennial Defense Review Report* (QDR) and the Nuclear Posture Statement that were released after 11 September 2001. On 30 September 2001, the QDR outlined the defence strategy of the Bush Administration. As the central objective, Secretary Rumsfeld noted in his foreword: “to shift the basis of defence planning from a ‘threat-based’ model that has dominated thinking in the past to a ‘capabilities-based’ model in the future [that] ... focuses more on how an adversary might fight rather than specifically who the adversary might be or where a war might occur” (for sources see: Brauch 2003b).

The threat concept as the basis for military planning and legitimating military programmes has fundamentally changed after 1990. With the widening of the security concept from the traditional military and diplomatic, to the new economic, societal and environmental dimensions, the threat concept has also widened and been applied to a series of new threats not only to the ‘state’ but also to the other referents of new security concepts: from human to global security.

The early proponents of environmental security have extended ‘threats’ from the military to the environmental realm. Ullman (1983: 133) defined a national security *threat* as “an action or sequence of events that: 1) threatens drastically and over a relatively brief span of time to degrade the quality of life for the inhabitants of a state; or 2) threatens significantly to narrow the range of policy choices available to the government of a state or to private non-governmental entities (persons, groups, corporations) within the state.” For Mathews (1989) and Myers (1989) the *new security threats* of the future included population growth, resource scarcity, and environmental degradation.

The Brundtland Commission (1987) also referred to two great threats facing humankind: “The first is that of nuclear exchange. ... The second is that of environmental ruin worldwide.” It also established the principle of intra- and intergenerational justice as a key component of sustainable development. In 1988 President Gorbachev stressed: “The relationship between man and the environment has become menacing. ... The threat from the sky is no longer missiles but global warming.” For Myers “the principal threat to security and peace stems from environmental breakdown, plus the need for access to natural resources.” Brundtland (1993: 189-194) pointed to the new ‘threats’ to security that “may be caused by social unrest caused by poverty and inequality, by environmental degradation, by internal conflicts leading to new flows of refugees.” She noted that “the pressure on the environment from a rapidly growing world population will increase the likelihood of such conflicts. Climate change, desertification, deforestation, massive loss of species and biological diversity, depletion of freshwater resources and soil erosion are global trends that are not sustainable.” As most serious she saw “the threats to the world’s atmosphere.”

In 1992, Senator Al Gore referred to several environmental threats from the local (tactical) to the global (strategic) level such as global warming and ozone depletion. In 1997, Eilen Claussen defined as global environmental threats those “which are human-caused and have, or can be expected to have serious economic, health, environmental, and quality of life implications for the United States”. Irrespective of the application of this concept to environmental problems, this author suggests to limit the threat concept to hardware related military problems, and to

describe dangers posed by the environment as “environmental security challenges, vulnerabilities and risks” (for sources, see: Brauch 2003).¹¹

The guarantee of “international peace and international security” was emphasised in the Covenant of the League of Nations (28 April 1919) and in the United Nations Charter (26 June 1945) “to maintain international peace and security.” But in 1919 and in 1945, ‘development’ and ‘environment’ were not yet political concepts. The UN Charter distinguished among three security systems: a universal system of *collective security* (Chap. VI: Art. 33-38; Chap. VII: Art. 39-50); “*regional arrangements or agencies*” (Chap. VIII: Art. 52 to 54); and a right of “*individual or collective self defence*” (WEU, NATO) in Art. 51.

While the first two systems deal with “threats to peace and international security” from within, among member states the third is oriented against an outside threat. They perform three functions: peaceful settlement of disputes, peace enforcement and peacekeeping. Art. 1.1 of the UN Charter calls on its members “to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace”, “to develop friendly relations among nations” and “to achieve international cooperation in solving international problems of an economic, social, cultural, or humanitarian nature.” The UN Charter relies on a narrow ‘nation’-centred concept of ‘international security’ and on a concept of ‘negative peace’, though Art. 1.1, 1.2, and Art. 1.3 “indicate that peace is more than the absence of war” (Wolfrum 1994: 50).

During the Cold War, collective self-defence prevailed while collective security was paralysed (Brauch/Mesjasz/Møller 1998). After 1990, collective security was temporarily strengthened, but with the failure to solve the Gulf War (1990-1991) and to cope with the post-Yugoslav conflicts (1991-1999) within the framework of the UN, NATO and the EU emerged as key security institutions.

Since 1990 the UN Security Council decisions on humanitarian interventions and the debate on ‘environmental’ and ‘human’ security have moved beyond these constraints. The Report of the Secretary General’s High-level Panel on Threats, Challenges and Change (2 December 2004) – denoted below as ‘High-level Panel’ – reflects this widening of the ‘security’ concept pointing to new tasks for the UN system in the 21st century. In the new emerging security consensus, collective security rests on three basic pillars (Synopsis of the Report):

Today’s threats recognize no national boundaries, are connected, and must be addressed at the global and regional as well as the national levels. No State, no matter how powerful, can by its own efforts alone make itself invulnerable to today’s threats. And it cannot be assumed that every State will always be able, or willing, to meet its responsibility to protect its own peoples and not to harm its neighbours. ... Differences of power, wealth and geography do determine what we perceive as the gravest threats to our survival and well-being. ... Without mutual recognition of threats there can be no collective security. ... What is needed is nothing less than a new consensus. ... The essence of that consensus is simple: we all share responsibility for each other’s security.¹²

The High-level Panel distinguished among six clusters of threats, ranging from economic and social threats (including poverty, infectious disease and *environmental degradation*, inter-state and internal conflict, weapons of mass destruction, terrorism and transnational organised

11 Slaughter (2004: 16-17) noted that the traditional national security community “is actively hostile to the idea of expanding the notion of ‘threats to security’ to include concerns about disease, poverty, illiteracy, and private violence. Except for private violence, it is argued, these are not ‘threats’ at all, but rather long-standing social ills that cannot be combated through the apparatus of national and international security structures. Further, they so dilute the meaning of ‘threat’ that it becomes impossible to focus on the ‘real threats’ of terrorism, WMD, failed states, ethnic conflict, etc.”

12 See for download of the complete report and press releases at: <<http://www.un.org/secureworld/>>.

crime. Thus, for the first time ‘environmental degradation’ is listed among the threats confronting the UN that require preventive action “which addresses all these threats”. Development “helps combat the poverty, infectious disease and environmental degradation that kill millions and threaten human security.” The High-level Panel (§ 53) claims:

Environmental degradation has enhanced the destructive potential of natural disasters and in some cases hastened their occurrence. The dramatic increase in major disasters witnessed in the last 50 years provides worrying evidence of this trend. More than two billion people were affected by such disasters in the last decade, and in the same period, the economic toll surpassed that of the previous four decades combined. If climate change produces more flooding, heat waves, droughts and storms, this pace may accelerate.

The High-level Panel notes that “rarely are environmental concerns factored into security, development or humanitarian strategies” and it points to the lack of effective governance structures to deal with climate change, deforestation and desertification, as well as to the inadequate “implementation and enforcement” of regional and global treaties. In the discussion of the legitimacy of the use of military force, the High-level Panel distinguishes between “harm to state or human security”. Two of the 101 recommendations of the High-level Panel deal with environmental issues, with renewable energy sources and with the Kyoto Protocol. The High-level Panel mentioned ‘human security’ several times, but its main focus remained on the ‘state’ as the cause and as a key actor in dealing primarily with military and societal threats.

On 21 March 2005, in his own report: “*In larger freedom: towards development, security and human rights for all*”, Kofi Annan (2005) drew both on the High-level panel and on the assessment of the *Millennium project*. He analysed the three key goals of development as ‘freedom from want’, of security as ‘freedom from fear’, and human rights as ‘freedom to live in dignity’. With regard to security, Annan (2005: 24) noted a lack of a basic consensus on the assessment of the threat. He has listed among the threats to peace and security in the 21st century:

International war and conflict ..., civil violence, organized crime, terrorism and weapons of mass destruction. They also include poverty, deadly infectious disease and environmental degradation since these can have equally catastrophic consequences. All of these threats can cause death or lessen life chances on a large scale. All of them can undermine States as the basic unit of the international system. ... In our globalised world, the threats we face are interconnected. The rich are vulnerable to the threats that attack the poor and the strong are vulnerable to the weak, as well as vice versa. A nuclear terrorist attack on the United States or Europe would have devastating effects on the whole world.

Following the High-level Panel, Annan discussed four threats in detail: a) preventing catastrophic terrorism; b) organised crime; c) nuclear, biological and chemical weapons; and d) reducing the risk and prevalence of war. With regard to the EU, the *European Union Security Strategy*, adopted by the Council on 12 December 2003, also referred to five key threats: “terrorism, weapons of mass destruction, regional conflicts, state failure, and organized crime.” But this so-called Solana strategy also pointed to new global challenges and vulnerabilities confronting the European Union.

5. Reconceptualising ‘Security Challenges’ after the Cold War

For ‘challenge’ (Lat.: ‘calumniā’, false accusation; Fr.: ‘défi’; Sp.: ‘desafío’, ‘reto’; Port.: ‘desafio’; It.: ‘sfida’; Ger.: ‘Herausforderung’) the synonyms are “confrontation, defiance, interrogation, provocation, question, summons to contest, test, trial, ultimatum”, as well as “questioning, dispute, stand opposition; difficult task, test trial”. *British* English dictionaries offered these

meanings of the term challenge: “1. something difficult ... that tests strength, skill, or ability...; 2. questioning rightness: a refusal to accept that something is right and legal; 3. invitation to compete: a suggestion to someone that they should try to defeat you in a fight, game etc.; 4. a demand to stop: a demand from someone such as a guard to stop and give proof who you are, and an explanation of what you are doing”; or: “a demanding task or situation”; as well as: “call to try one’s skill or strength; demand to respond or identify oneself; formal objection”; or: “a call to engage in a fight, argument or contest; a questioning of a statement or fact; a demanding or stimulating situation, career, etc.”.

The term ‘challenge’ has often been used for security and global issues but it has hardly been defined, and in many cases it is used synonymously with ‘threat’. Dodds and Schnabel (2001: 42-43) pointed to ‘new’ and ‘non-traditional’ security challenges as a major concern in the post-cold war security environment. They argued “that the general public’s conception of the security environment has altered so dramatically as we enter the new millennium is an indicator of how significantly this environment may have actually changed.” They see as major forces for the reconceptualisation of security “the increasing level of globalisation” that “has engendered a growing sense of vulnerability to ... remote threats, such as distant conflicts, contagions, crop failures and currency fluctuations.” Van Ginkel and Velasquez (2001: 58-70) pointed to these environmental challenges: a) ozone depletion; b) impact of toxic chemicals on the global ecosystem; and c) increasing greenhouse emissions and their negative reinforcements as well as to “uncertainty about the future and an element of surprise”, especially if associated with natural and man-made environmental disasters. They stressed eight sub-themes: “global environmental governance, water, urbanization, industry and sustainability, global food security, energy requirements for the next millennium, global governance of biological diversity, land degradation, and the atmosphere.”

In a report of the Trilateral Commission, Slaughter, Bildt and Ogura (2004) tried “to integrate traditional understandings of state security ... with an appreciation of the magnitude and importance of ‘global security issues’: terrorism, environmental degradation, international crime, infectious diseases and refugees.” They organised the many ideas and proposals in five basic dichotomies: “State security versus human security; hard versus soft interventions; legality versus legitimacy; preemption versus prevention; and states versus non-state actors.”

The director of the Stockholm International Peace Research Institute (SIPRI), Amb. Alyson J.K. Bailes, in a talk on “New Security Challenges for the EU” noted several human security challenges confronting Europe: “such as the collapse of the environment, pollution of food and natural resources, human and animal disease and genetic manipulation, employment, health care and social security in general.” These are not just subjective but also scientific perceptions. She referred to many non-military, non-intentional threats, such as:

greenhouse effect, depletion of ozone, badly-handled migration, ageing of the population, and an energy crisis as well as the ... case of a nuclear accident. ...The lesson is that many aspects of life in the EU which do fall within the Union’s competence but are not normally thought of as security matters are indeed highly relevant to the survival and welfare of our populations, and the more so precisely because of the high level of development and interdependence we have attained. The ... harmonized approaches ... should ... be extended ... to deal e.g. with climatic damage (drought, heat, storm and flood), major cases of pollution, and the interruption of any type of energy supplies.

This comprehensive list of security challenges for the EU in the post-cold war period indicates a basic shift since 1990 away from primarily military threats from the rival superpower to a broad range of manifold challenges from all dimensions of a widened security concept. Security challenges may refer to less urgent and sometimes non-violent *soft security* problems, such as migration, human and drug trafficking. These issues are less on the external and primarily on

the internal security agenda, and thus a topic for the home and justice ministries and agencies, such as national and international police organisations and of the courts but also of non-governmental societal groups. Migration may be a consequence of domestic conflicts emerging from environmental degradation and resource depletion but it will remain difficult to distinguish *push* and *pull* factors.

6. Reconceptualising ‘Security Vulnerabilities’ after the Cold War

English dictionaries refer to these synonyms ‘vulnerability’ (Lat.: ‘vulnus’ or: ‘vulnerabilis’; Fr.: ‘vulnérabilité’; It.: ‘vulnerabile’; Sp.: ‘vulnerabilidad’; Port.: ‘vulnerável’; Ger.: ‘Verwundbarkeit’) or ‘vulnerable’ as: “accessible, assailable, defenceless, exposed, open to attack, sensitive, susceptible, tender, thin-skinned, unprotected, weak, wide open”; and: “1. in danger: in peril, in jeopardy, at risk, endangered, unsafe, unprotected, unguarded; wide open; undefended, unfortified, unarmed, helpless, pregnable; 2. exposed to: open to, liable to, prone to, prey to, susceptible to, subject to, an easy target for; as well as: “non-immunity, susceptibility, danger of, insecurity, exposure, nakedness, helplessness.”

According to *Webster’s* ‘vulnerability’ is “the state or property of being vulnerable” where vulnerable refers to: “1. capable of being wounded or physically injured...; 2. open to criticism or attack...; 3. open to attack or assault by armed forces. ...; 4. in contract bridge, liable to increase penalties and entitled to increased bonuses”; or “the quality or state of being vulnerable.” *British* dictionaries offer additional meanings: “someone who is vulnerable is easily harmed or hurt emotionally, or morally”; “susceptible to injury, exposed to damage by weapon, criticism, etc.”; as well as: “open to temptation, censure etc.”; as “unprotected against attack; liable to be hurt or damaged.”

6.1. Vulnerability as a Scientific Concept

The term is defined in encyclopaedias in the geosciences where the referent object of ‘vulnerability’ are both human beings, especially children, and the environment. The vulnerability concept is used in the global change literature (Steffen et al. 2004), on climate change impacts (IPCC 2001a) and in the disaster community (ISDR 2004). Vulnerability results from “poverty, exclusion, marginalisation and inequities in material consumption”, and it is generated by “social, economic and political processes” (Barnett 2001: 132-133). In the context of the precautionary principle O’Riordan (2002: 369) defined *vulnerability* at the societal level as: “the incapacity to avoid danger, or to be uninformed of impending threat, or to be so politically powerless and poor as to be forced to live in conditions of danger.”

For Oliver-Smith (2004: 10) “vulnerability is fundamentally a political ecological concept.” As a theoretical framework “vulnerability can become a key concept in translating that multi-disciplinarity into the concrete circumstances of life that account for a disaster.” He argues that disasters “are channelled and distributed in the form of risk within society to political, social and economic practices and institutions.” Wilches-Chaux (1989: 20-41) identified 11 types of vulnerability, “natural, physical, economic, social, political, technical, ideological, cultural, educational, ecological and institutional vulnerability.” For Oliver-Smith (2004: 11) “vulnerability is conceptually located at the interaction of nature and culture” that also links “social and economic structures, cultural norms and values and environmental hazards.” He discussed four questions: 1) the “general contributions of the cultural construction of nature to the social production of disaster”; 2) “how the political and economic forms and conditions that characterise vulnerability are inscribed in an environment”; 3) “the relationship between cultural interpretation and the material world of risk, threat and impact of disasters”; and

4) “how do we theorise the linkages among these three issues, particularly in the context of current patterns of globalisation.” Nathan (2007, forthcoming) pointed to a dual vulnerability:

on the one side ... a tendency to undergo damages, i.e. a state of fragility, or a set of conditions, that raise the susceptibility of a community to the impact of a damaging phenomenon. On the other side, vulnerability is an incapacity to anticipate, cope with, resist to, adapt to and recover from hazards. Vulnerable units are either not resistant, i.e. not capable to withstand the shock (without adapting); and/or not resilient, i.e. not capable to absorb the shock and adapt to come back to an acceptable state.

Nathan (2007, forthcoming) characterised vulnerability “as a *complex* process encompassing multiple intricate dimensions” that is constantly changing. In his view vulnerability is:

often *cumulative*, causing disasters that in turn aggravate it, or adding to vulnerabilities to other risks (such as socio-economical risks, etc.). Furthermore, vulnerability is both *hazard-related* ... and *subject-related*. ... Therefore, one has to specify which vulnerability one is talking about, and at which level of analysis (individual, group, society). ... Vulnerability is also highly *differentiated*: different subjects, even at the same ‘level’, have different vulnerabilities. ... Generally, the most miserable and isolated suffer most, as well as the less organized. ... Vulnerability is *context-dependent*, be it an individual exposed to natural hazards at the household level, or mankind at a global level. These ‘transversal’ features of global vulnerability apply to each component of vulnerability (Nathan 2007 forthcoming).

Nathan (2007) distinguished among two features of vulnerability: *exposure* and *insufficient capacities*.

a) *physical exposure*: presence and density of the people, habitat, networks, goods and services in risk zones, defining potential losses or damages, both human and non-human (stakes); and b) *socio-ecological*: human-induced ecosystemic perturbations aggravating the natural hazard (deforestation, land degradation, street pavement, some engineering practices, climate change, etc. *Insufficient capacities to prevent, prepare for, face and cope with hazards and disasters* can be separated in:

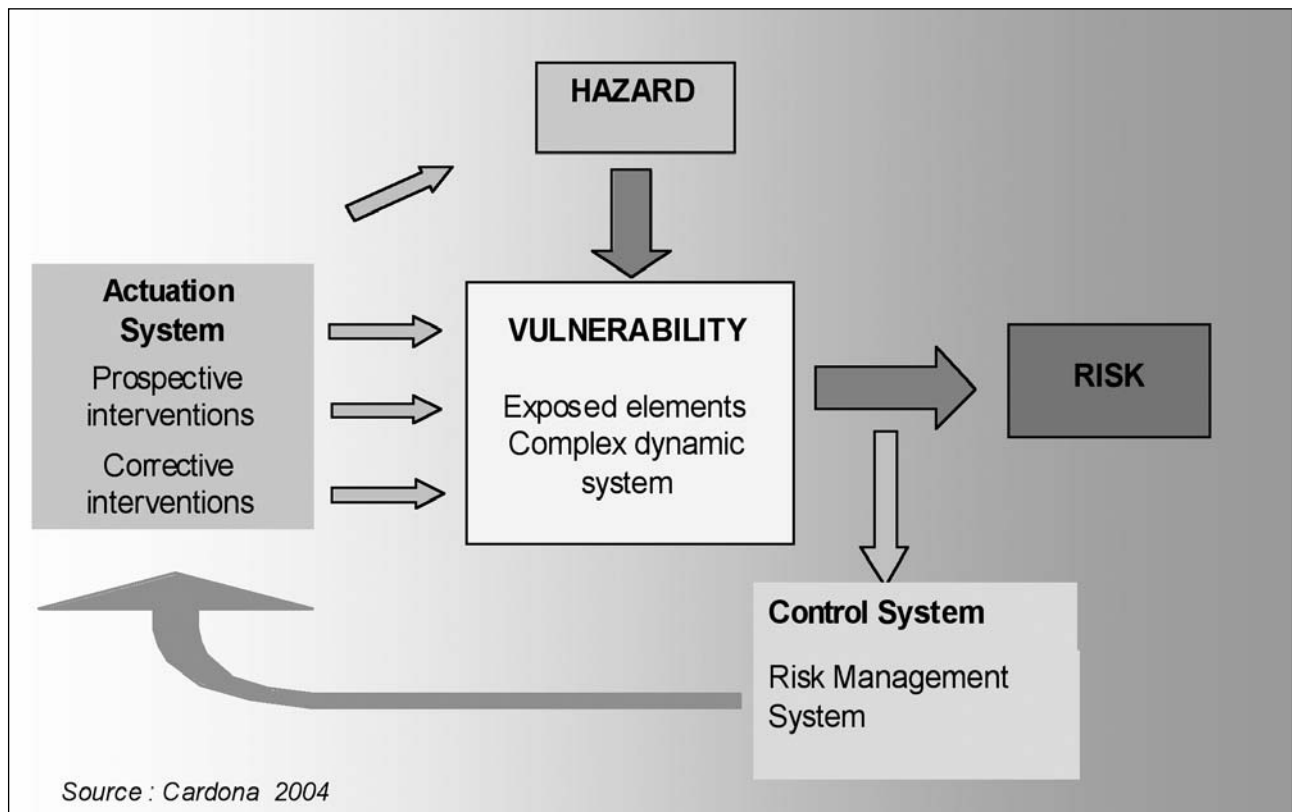
- *physical weakness*: physical incapacity to resist or recover from a hazard’s impact;
- *legal vulnerability*: weak state of the legislative and judiciary regulations to prevent, mitigate, prepare for, face and recover from disasters;
- *organisational vulnerability*: weak state of the organisational disposals, at all levels, to prevent, mitigate, prepare for, face and recover from disasters;
- *technical vulnerability*: inadequate knowledge and/or use of risk management techniques;
- *political vulnerability*: weakness of the political powers, their legitimacy and control. Inadequacy of the control schemes, policies and planning, or broad political conditions;
- *socio-economical vulnerability*: socio-spatial segregation, large inequalities of wealth and of access to the security disposals, misery, anomie and social disorganisation, poor social position and social isolation of exposed people, existence of higher social risks undergone by people;
- *psychological and cultural vulnerability*: inadequate security paradigm or risk perceptions; cultural anomie or weakness; attachment to risk zones or risky behaviour, non-willingness or incapacity to protect oneself.

Nathan concludes that “the overall vulnerability of an element (or stake) to one or several hazards is a mix of these particular vulnerabilities.” Cardona (2004: 37-51) proposed to rethink vulnerability and risk from a holistic perspective arguing that in developing countries often social, economic cultural and educational aspects are “the cause of the potential physical damage.” For Cardona “vulnerability of human settlements is intrinsically tied to different social processes. It is related to fragility, susceptibility or lack of resilience of the exposed

elements. On the other hand, vulnerability is closely linked to natural and human environmental degradation at urban and rural levels.”

Figure 4: Vulnerability in a Process According to Cardona (2004)

Source: Birkmann (2005)



Cardona (2004: 49) argues that from a social view “vulnerability signifies a lack or a deficiency of development” that often contribute to “disaster vulnerability”. He pointed out that population growth, rapid urbanisation, environmental degradation, global warming, international financial pressures and war have all increased vulnerability. Cardona argued that vulnerability originates in:

- *Physical fragility or exposure*: the susceptibility of a human settlement to be affected by a dangerous phenomenon due to its location in the area of influence of the phenomenon and a lack of physical resistance;
- *Socio-economic fragility*; the predisposition to suffer harm from the levels of marginality and social segregation of human settlements, and the disadvantageous conditions and relative weakness related to social and economic factors; and
- *Lack of resilience*: an expression of the limitations of access and mobilization of the resources of human settlement, and its incapacity to respond when it comes to absorbing the impact.

He pointed to the closely interrelated nature of efforts reducing hazard or vulnerability, thus contributing to risk reduction, and the possibility of future disaster (figure 4).

According to Heijmans (2004: 115-127) disaster agencies have often focused on physical and economic vulnerability. Based on the literature she distinguished three strategies to address vulnerability:

1. *Nature as cause* → technological, scientific solutions: Reduce vulnerability by early warning systems, technologies to withstand negative impacts (monitor seismic activity, weather forecasting, remote sensing for drought, fire, water control systems, building codes, etc.).

2. *Cost as cause* → economic and financial solutions: Costly prediction and mitigation technologies; reduction of vulnerability by national safety nets, insurance and calamity funds.
3. *Social structure as cause* → political solutions: Socio-economic factors that generate vulnerability, require political and development solutions that transform the social and political structures breeding poverty.

Heijmans (2004: 117ff.) is discussing the conceptual relationship between vulnerability and empowerment, argued that the people's perspectives are missing in all three strategies, and also in the perception of vulnerability by the aid agencies. According to Wisner (2004: 183-193) vulnerability is used in the hazard community as:

- Structural engineering vulnerability;
- Lifeline infrastructural vulnerability;
- Communications systems vulnerability;
- Macro-economic vulnerability;
- Regional economic vulnerability;
- Commercial vulnerability; and
- Social vulnerability.

Wisner distinguished four approaches on social vulnerability: a) demographic; b) taxonomic; c) situational; and d) contextual or proactive approach. He criticised that many studies on social vulnerability have devalued local knowledge and coping capacities and he supported efforts to empower people to reclaim their local knowledge. Frerks and Bender (2004: 194-205) argued that the societal focus on vulnerability has shifted from disasters as a natural event to exposure and a complex socially constructed process.

Pelling (2003: 5) analysed the vulnerability of cities to natural disasters and the role of social resilience. He defined vulnerability as “exposure to risks and an inability to avoid or absorb potential harm”, *physical* vulnerability as that “in the built environment”, *social* vulnerability as “experienced by people and their social, economic and political systems”, and *human* vulnerability as the combination of “physical and social vulnerability.”

6.2. Vulnerability as a Scientific Concept in the Global Change Research Community

Steffen et al. (2004) address the consequences of changes in the Earth system due to human activities for human well-being. The vulnerability concept offers a useful framework for the study of consequences of global change on human societies. Using a scenario-driven approach they discuss linear projections and non-linear surprises resulting from an integrated assessment approach: “Scenario-driven approaches to impact assessment, even the most sophisticated of the integrated assessment methods, do not allow the vulnerability or resilience of the impacted systems to be assessed directly” (Steffen et al. 2004: 204).

While impact assessment selects one specific environmental stress and seeks to identify the most important consequences for social and ecosystem properties on environmental stress, vulnerability assessment tries to assess the risk of diverse outcomes for a unit of concern (e.g. landless farmers) “in the face of a variety of stresses and identifies a range of factors that may reduce response capacity and adaptation to stressors” (Steffen et al. 2004: 205). While impact assessment offers little guidance among the many environmental stresses,

vulnerability assessment offers a maturing strategy to provide such guidance. Vulnerability to global environmental change has been conceptualised as the risk of adverse outcomes to receptors or exposure units (human groups, ecosystems and communities) in the face of relevant changes in

climate, other environmental variables, and social conditions. ... Vulnerability is emerging as a multi-dimensional concept involving at least *exposure* – the degree to which a human group or ecosystem comes into contact with particular stresses; *sensitivity* – the degree to which an exposure unit is affected by exposure to any set of stresses; and *resilience* – the ability of the exposure unit to resist or recover from the damage associated with the convergence of multiple stresses. ... Vulnerability can increase through cumulative events or when multiple stresses weaken the ability of a human group or ecosystem to buffer itself against future adverse events, often through the reduction in coping resources and adaptive capacities (Steffen et al. 2004: 205).

Steffen et al. point to the scale- and space-dependent property of systems and thus differ on the local, regional and global level. Complex vulnerability analyses can address “multiple causes of critical outcomes rather than only the multiple outcomes of a single event.” Thus scenario development becomes a crucial element of vulnerability analysis. An important precondition for the quantification of vulnerability parameters could be vulnerability indicators. Along these lines, Comfort et al. (1999) developed a “standardised all-hazards vulnerability index.” Others have suggested an Index of Human Insecurity (Lonergan et al. 2000). Steffen et al. (2004: 209) admit that the current status of vulnerability research and assessment “exhibit both a potential for substantial synergy in addressing global environmental risks ... As well as significant weaknesses which undermine the potential.” A major driver of GEC has been climate change where the ‘vulnerability’ concept has been extensively discussed.

6.3. Vulnerability as a Political and Scientific Concept in the Climate Research Community

Climate change impacts, adaptation and *vulnerability* have been analysed by the second IPCC working group (1990; 1996; 2001a) whose mandate is “to assess the vulnerability of ecological systems, socio-economic sectors, and human health to climate change.” The IPCC also distinguishes between *sensitivity*, *adaptive capacity* and *vulnerability* (“the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes”).

In *The Regional Impacts of Climate Change: An Assessment of Vulnerability* the IPCC (1998) explores potential consequences of climate change for ten regions based on “assessing sensitivities and vulnerabilities of each region, rather than attempting to provide quantitative predictions of the impacts of climate change”, i.e. to assess “the extent to which climate change may damage or harm a system” taking into account the sensitivity of the region to climate and the adaptive ability. The report tries to explain: “how projected changes in climate could interact with other environmental changes (e.g. biodiversity loss, land degradation, stratospheric ozone depletion, and degradation of water resources) and social trends (e.g. population growth, economic development and technological progress” (IPCC 1998: ix). It calls for more research on “interlinkages among environmental issues.” This IPCC report assessed the vulnerability of natural and social systems of major regions to climate change with qualitative methods rather than “assessing quantitatively the expected impacts of climate change.” These regional assessments focus on: a) ecosystems; b) hydrology and water resources; c) food and fibre production; d) coastal systems, human settlements, human health; and other sectors or systems including the climate system of relevance for the 10 regions analysed.

In the Third Assessment Report (TAR), the WG II examines “climate change impacts, adaptations and vulnerabilities of systems and regions” with the goal “to provide a global synthesis of cross-system and cross-regional issues”, and “in the context of sustainable development and equity” (IPCC 2001a: 22-25). In its regional assessment, the IPCC (1998) explores potential consequences of climate change by “assessing sensitivities and vulnerabilities of each region,

rather than attempting to provide quantitative predictions of the impacts of climate change.” The IPCC cautions: “The estimates ... serve as indicators of sensitivities and possible vulnerabilities” (IPCC 1998: 4). The report suggests an “anticipatory adaptation in the context of current policies and conditions” and so-called “win-win” or “no-regrets” options by adding that: “adaptation will require anticipation and planning. ... Additional analysis of current vulnerability to today’s climate fluctuations and existing coping mechanisms is needed.” The vulnerability concepts in the GEC and in the climate change communities have differed significantly from those concepts that have been employed in the hazard research community, but even within this research community conceptual differences have existed.

6.4. Vulnerability as a Political and Scientific Concept in the Hazard Research Community

From the perspective of the hazard research community, Blaikie, Cannon, Davis and Wisner (1994, 2000) redefined vulnerability commonly used as “being prone to or susceptible to damage or injury.” Their working definition is:

By ‘vulnerability’ we mean the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone’s life and livelihood is put at risk by a discrete and identifiable event in nature or in society. ... We use the term to mean those who are more vulnerable. When used in this sense, the implied opposite of vulnerable is sometimes indicated by our use of the term *secure*. ... Our definition of vulnerability has a time dimension built into it. Since it is damage to livelihood and not just life and property that is at issue, the more vulnerable groups are those that also find it hardest to reconstruct their livelihoods following disasters. ... Our focus on vulnerable people leads to give secondary consideration to natural events as determinants of disasters. Normally, vulnerability is closely correlated with socio-economic position.

In the context of the research on hazards the concept of *vulnerability* assessment was used to refer to an: “evaluation of the sensitivity of a particular ecosystem, resource or activity to a broad range of environmental and socio-economic stresses” (Bass 2002, 1: 346-347). According to Hewitt (2002: 299) a vulnerability perspective “considers especially how communities are exposed to dangers, the ways in which they are readily harmed, and the protection that they lack.” Vulnerability to a hazard is to a large extent created by the respective social order on the division of labour, cultural values and on legal rights. Thus, according to Hewitt (2002: 300), vulnerability is a “relative condition, and can only be defined and assessed in relation to the safety which others actually enjoy.”

The International Strategy on Disaster Reduction (ISDR 2002: 24, 342) defined *vulnerability* “as a set of conditions and processes resulting from physical, social, economical, and environmental factors, which increase the susceptibility of a community to the impact of hazards”. These conditions are shaped “continually by attitudinal, behavioural, cultural, socio-economic and political influences at the individuals, families, communities, and countries.” Vulnerability is closely linked to development.

Physical factors include the location and susceptibility of the built environment and are often influenced by the “density levels, remoteness of a settlement, its sitting design and materials used for critical infrastructure and for housing.” Among the *social factors*, at the level of individuals, communities and society, ISDR (2002: 47) listed “levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, knowledge structures, customs and ideological beliefs, and over all collective organisational systems.” Vulnerability highly depends on *economic factors*, including poverty, “individual, community and national economic reserves, levels of

debt and the degree of access to credit and loans as well as insurance”, but also access to communication networks and socio-economic infrastructure. Finally, among the *ecological factors*, ISDR (2002: 47, 60) referred to the “very broad range of issues in the interacting social, economic and ecological aspects of sustainable development as it relates to disaster risk reduction” and distinguished among: “1) the extent of natural resource depletion; 2) the state of resource degradation; 3) loss of resilience of the ecological systems; 4) loss of biodiversity; and 5) exposure to toxic and hazardous pollutants.”

Efforts to increase the ability of people “to cope effectively with hazards, and that increase their resilience, or that otherwise reduce their susceptibility, are considered as *capacities*” (ISDR 2002: 23-24). Vulnerability to hazards is higher in many developing countries, where they are “exacerbated by socio-economic and environmental conditions”, including “the occupation of hazard-prone areas, the concentration of industrial infrastructure and critical facilities” (ISDR 2002: 62-64).

For disaster reduction, vulnerability and capacity assessment is essential (ISDR 2002: 69-78) which is addressed by the ISDR Interagency Task Force Working Group 3 on Risk, Vulnerability and Impact Assessment. A lot of work has been done on methodologies and instruments for *Vulnerability and Capacity Assessment* (VCA) and in the framework of a *Capabilities and Vulnerability Analysis* (CVA), together with the International Federation of the Red Cross (IFRC 2002) as a major proactive promoter. The ISDR (2002: 78) considered hazard, vulnerability and capacity as “the operational basis for a culture of prevention” with four priority areas:

- Risk assessment for decision making;
- Terminology, data and methodology;
- Higher visibility and priority to reduce vulnerability and strengthen capacities; and
- Addressing new trends in hazard and vulnerability.

ISDR (2002) defined vulnerability as: “a set of conditions and processes resulting from physical, social, economical and environmental factors, which increase the susceptibility of a community to the impact of hazards”, while UNDP (2004) stressed “a human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard.” The ISDR (2002) juxtaposed vulnerability with its complementary component capacity, which is defined as “a combination of all strengths and resources available within a community or organization that can reduce the level of risk or the effects of a disaster.”

Bohle (2002) distinguished between *external* (environmental) and *internal* (human) vulnerability,

thus clearly identifying vulnerability as a potentially detrimental social response to environmental events and changes. Vulnerability can cover susceptibilities to a broad range of possible harms and consequences; it implies a relatively long time period, certainly exceeding that of the extreme event itself, which might have triggered its exposure. This interpretation of vulnerability is unavoidably related to resilience, the ability to return to a state similar to the one prevailing prior to the disaster. Thus, vulnerability is not only ill-defined, but its manifestation and magnitude depend on many partially unknown factors and their coincidence.

Plate (2002) recommended a critical index of vulnerability measured as the distance between the part of the GNP per person needed for maintaining minimum social standards and the available GNP per person. This index would focus on the financial resources available within a society or a community, or even an individual household that can reduce the effect of a disaster. This vulnerability measure would cover only some problems, while the environmental dimension cannot adequately be expressed in monetary terms.

Bogardi and Birkmann (2004) analysed the potential of vulnerability assessment for sustainable risk reduction, given the uncertainty of the vulnerability concept that was defined by Wisner (2002) as the “likelihood of injury, death, loss, disruption of livelihood or other harm in an extreme event, and/or unusual difficulties in recovering from such effects.” They call for more direct indicators of national and regional scale which could be linked to strategic goals and instruments of vulnerability assessment. For them “an interdisciplinary approach will be essential to take into account economic, social and environmental consequences as well as different objects of protection (individual, community features). While the potential economic losses caused by floods can often be quantified and estimated, methods and data to measure social, cultural, institutional and environmental features of vulnerability and coping capacity are still not sufficiently developed.” The vulnerability concept has also been used by those researchers who have worked on early warning of hazards while other concepts have been used by those who work on early warning of conflicts (Brauch 2003c).

6.5. Vulnerability in the Environment, Development and Early Warning Community

Pascal Peduzzi (2000: 2), head of the Early Warning Unit at UNEP/DEWA/GRID-Europe and of a team of authors has contributed together with UNEP to the development of key indicators for ‘global vulnerability and risk mapping’. Initially he defined *risk* as “a measure of the expected losses due to hazard event of a particular magnitude occurring in a given area over a specific time period” (Tobin/Montz 1997) and *vulnerability* as “the degree of loss to each element should a hazard of a given severity occur” (Coburn et al. 1991: 49) and as the “expected percentage of population loss due to socio-politico-economical context.”

In their feasibility study report on “Global Risk and Vulnerability Index”, Peduzzi, Dao, Herold, Rochette and Sanahuja (2001) and their ‘GRAVITY-Team’ defined vulnerability as: “the extent to which a community, structure, service or geographic area is likely to be damaged or disrupted by the impact of a particular hazard” (Tobin/Montz 1997). They separated vulnerability into *geophysical* (low evaluation along the sea, high vulnerability to Tsunami), *socio-economical* parameters (cultural, technical, economic factors using indicators as: GDP, literacy, life expectancy, corruption, population density, and urban population growth), and *mitigation capacities*.

Vulnerability cannot be directly measured but estimated “by a set of socio-economic variables and compared to actual disaster losses as reported by CRED” (Centre for Research on Epidemiology of Disasters in Louvain, Belgium). It “measures how easily the exposed people, physical objects and activities may be affected in the short or long-term.” Vulnerability can be defined as “what turns a hazard into a disaster” (Peduzzi/Dao/Herold/Rochette/Sanahuja 2001: 45). They distinguish between *economic* (impact of a disaster on the economy), *human* (human losses and injuries) and *social vulnerability* (social structure influences the impact of a hazard, e.g. on women, families etc.). Vulnerability is specific to a hazard and a region. To measure vulnerability they used disaster data (especially on observed damages) from the CRED database and socio-economic indicators.

In their report on “Phase II: Development, analysis and results” Peduzzi, Dao, Herold (2002: 4-5) and the GRAVITY-Team noted that the vulnerability concept “is perhaps the most difficult to approach” (Coburn et al. 1991: 49) and “depends on socio-politico-economical context of this population” where vulnerability factors are “socio-economic factors having an influence on the level of losses for a given hazard type.”

In their report on “Phase III: Drought analysis”, Peduzzi, Dao, Herold and Muton (2003: 4-5) and the GRAVITY-Team focused both on the natural and human induced (conflicts, bad governance)

causes of this complex hazard and developed indicators for drought and food insecurity. They distinguished among eight vulnerability indicators, which they grouped as a) *economic* (GDP, HDI); b) *type of economic activities* (percentage of agriculture's dependency for GDP, of labour force in agricultural sector); c) *dependency and quality of the environment* (human induced soil degradation: GLASOD); d) *development* (HDI); and e) *health and sanitation* (percentage of people with access to safe water, mortality rate of under five year olds).

In their report on "Phase IV: Annex to WVR and Multi Risk Integration", Dao and Peducci (2003: 1) described the "concepts, data and methods applied to achieve the Disaster Risk Index (DRI)." They offered two definitions of vulnerability. The first is reflecting "the range of potentially damaging events and their statistical variability at a particular location" (Smith 1996), and the second is pointing to "the degree of loss to each element should a hazard of a given severity occur" (Coburn et al. 1991: 49). As a specificity of their research they noted "the discrepancies of casualties induced by different vulnerabilities are used to identify socio-economical indicators reflecting such vulnerabilities."

They also broadened the scope of their *vulnerability indicators* and distinguished them for two types of hazards: drought, and floods, cyclones and earthquakes; and nine categories of vulnerability: 1) *economic* (GDP, HDI, debt, inflation, unemployment); 2) *type of economic activities* (arable land, urban population, percentage of agriculture's dependency for GDP, of labour force in the agricultural sector); 3) *dependency and quality of the environment* (forests, woodlands, % of irrigated land, human induced soil degradation: GLASOD); 4) *demography* (population growth, urban growth, population density, age dependency ratio); 5) *health and sanitation* (calorie supply per person, access to sanitation, safe water, physicians, hospital beds, life expectancy, mortality rate of under five year olds); 6) *politics* (corruption); 7) *early warning capacity* (number of radios); 8) *education* (illiteracy, school enrolment, secondary, labour force with primary, secondary or tertiary education); and 9) *development* (HDI).

The UNDP (2004) report on *Reducing Disaster Risk – A Challenge for Development* includes a *Disaster Risk Index* (DRI) – developed by the GRAVITY-Team – which provides decision-makers with an overview of risk and vulnerability levels in different countries. This risk is measured in terms of the number of deaths during disasters. The Report has defined 'human vulnerability' as a

human condition process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard. In the DRI, human vulnerability refers to the different variables that make people more or less able to absorb the impact and recover from a hazard event. The way vulnerability is used in the DRI means that it *also* includes anthropogenic variables that may increase the severity, frequency, extension and unpredictability of a hazard (UNDP 2004: 98).

Based on their previous work, Dao and Peducci (2004) discussed methodological aspects of the Disaster Risk Index (DRI) in the UNDP (2004) report on *Reducing Disaster Risk*. The report is based on the assumption "that differences in risk levels faced by countries with similar exposures to natural hazards are explained by socio-economic factors, i.e. by the populations vulnerability" with a special focus on "socio-economical indicators reflecting human vulnerability to hazards." They used a total of 38 variables dealing with economic features, dependency on environment quality, demography, health and sanitation, politics, infrastructure, early warning and capacity of response, education and development, and they discussed the global risk and vulnerability patterns for four hazards: cyclones, droughts, earthquakes, and floods. The concept 'social vulnerability' has been extensively used both in the development and in the hazard community.

6.6. Social Vulnerability in the Hazard and Development Research and Policy Community

'Social vulnerability' has been used in many definitions in the hazard research community to distinguish the social and societal factors from the manifold physical, economic, political and human aspects. In the development policy community in the UK, a DFID (Department for International Development) White Paper (1997) and a policy paper (1999: 4) focused on *socio-economic* factors that made people vulnerable to disasters. It listed among its humanitarian policy goals "to save lives and relieve suffering, hasten recovery, and protect and rebuild livelihoods and communities, and reduce risks and vulnerability to future crises" thus stressing the link between "the sustainability approach and vulnerability reduction." Cannon, Twigg and Rowell (2003: 4) argue that vulnerability analysis can "become an integral part of humanitarian work ... [and] enable [this] work to be more closely integrated with the SL [sustainable livelihood] approach, by using vulnerability analysis in both the operation of emergency preparedness and reducing poverty." In their view:

[V]ulnerability should involve a *predictive* quality: it is supposedly a way of conceptualising what may happen to an identifiable population under conditions of particular risks and hazards. ... VA should be capable of directing development aid interventions, seeking ways to protect and enhance peoples' livelihoods, assist vulnerable people in their own self-protection, and support institutions in their role of disaster prevention (Cannon/Twigg/Rowell 2003: 4).

Disasters occur when a natural hazard affects a population unprepared to recover without assistance. The impacts of hazards differ for people at different levels of preparedness, resilience, and with varying capacities for recovery.

Vulnerability ... involves much more than the likelihood of their being injured or killed by a particular hazard, and includes the type of livelihoods people engage in, and the impact of different hazards on them. ... Social vulnerability is the complex set of characteristics that include a person's

- *initial well-being* (nutritional status, physical and mental health, morale);
- *livelihood and resilience* (asset pattern and capital, income and exchange options, qualifications);
- *self-protection* (the degree of protection afforded by capability and willingness to build safe home, use safe site);
- *social protection* (forms of hazard preparedness provided by society more generally, e.g. building codes, mitigation measures, shelters, preparedness); and
- *social and political networks and institutions* (social capital, but also role of institutional environment in setting good conditions for hazard precautions, peoples' rights to express needs and of access to preparedness) (Cannon/Twigg/Rowell 2003: 5).

According to the DFID study, the vulnerability conditions are distant from the impact of a hazard. Vulnerability variables are connected with peoples' livelihoods and poverty. Thus, development work should reduce disaster vulnerability and make people become more resilient to hazards by

- the strengthening of peoples' 'base-line' conditions (nutrition, health, morale ...);
- reinforcement of their livelihood and its resilience to possible hazard impacts;
- peoples' own efforts ... to reinforce their home and workplace against particular hazards; or
- by access to proper support ... by institutions of government or civil society (Cannon/Twigg/Rowell 2003: 6).

Livelihoods are influenced by *social and political networks* that may have varying levels of cohesion and resilience in the face of hazards. When disasters occur, relief and recovery is tied with the restoration of livelihoods, and the strengthening of self-protection. Vulnerability can be seen as a term that encompasses all levels of exposure to risk. There are two separate approaches to vulnerability and capacity. The first conceives people who have a high degree of vulnerability and are low in capacity. The second perceives them as two distinct sets of factors. A capacity might include institutional membership, group cohesion or literacy. Vulnerability can include poverty, house quality, or illiteracy. Some capacities are not the opposite of vulnerabilities, and some low-level vulnerability characteristics are not amenable to being considered capacities.

The concept of ‘capabilities’ emerged in response to the term ‘vulnerability’. It was suggested that speaking of people as being vulnerable ignored many capacities which make them competent to resist hazards. Some characteristics may be considered capacities when they score well, and vulnerabilities when they score badly, even when they are in fact opposite ends of a scale. There can be high and low levels of vulnerability without implying victim-hood.

One of the reasons why capacities seem to be often separated from vulnerability is that capacities are regarded as dependent on groups or some form of social organisation, while vulnerabilities are socially-determined. One way around the problem is simply to acknowledge that high capacities are likely to reduce vulnerability. If we accept that measuring vulnerability includes any factor or process that can alter the exposure of a person or household to risk, then capacities can also be considered as scaled factors leading to greater danger (vulnerability) when they are low, and reduced danger when they are high.

Vulnerability analysis offers DFID the opportunity to integrate development work with disaster preparedness, prevention and recovery. By adopting a vulnerability assessment (VA) approach, disaster prevention, preparedness and recovery work should be integrated with development work. With VA as a means of integrating its development and disaster work, DFID may also be able to foster a better integration and convergence of the wide range of vulnerability and capacity methods which can assist in its work of creating partnerships.

From the review of many scientific vulnerability concepts used in the global change, climate change, hazard, environment, development and early warning communities no consensus has emerged on a definition, on criteria and indicators for the measurement of vulnerability. For the hazard community, vulnerability is the combination of additional contributing factors causing a hazard due to natural variability or human inducement to a disaster. The selection and inclusion of these contributing factors is configured by the worldview, mind-set, perception, the theories and models of the analyst. Thus, vulnerability is always socially constructed. In the end, therefore, ‘vulnerability’ is how the analyst or policy-maker has defined it and which of the many definitions have become accepted by a consensus within the respective research community.

7. Reconceptualising ‘Security Risks’ after the Cold War

For the term ‘risk’ (Lat.: ‘risicare’ navigate around cliffs; Fr.: ‘risque’; It.: ‘risico, risco’; Sp.: ‘riesgo’; Port.: ‘risco’; Ger.: ‘Risiko’) many synonyms are used: danger, peril, jeopardy, hazard; chance, gamble, possibility, speculation, uncertainty, venture; unpredictability, precariousness, instability, insecurity, perilousness, riskiness, probability, likelihood, threat, menace, fear, prospect.

For *Webster’s International Dictionary* risk means “1. the possibility of loss, injury, disadvantage, or destruction: contingency, danger, peril, threat ...; 2. someone or something that

creates or suggests a hazard or adverse chance: a dangerous element or factor ...; 3. the chance of loss or the perils to the subject matter or insurance covered by the contract; the degree of probability of such loss; amount at risk; a person or thing judged as a specified hazard to an insurer; an insurance hazard from a cause or source (war, disaster); 4. the product of the amount that may be lost and the probability of losing it.” *Longman defines risk* as: “1. possibility of bad result: the possibility that something bad, unpleasant, or dangerous may happen ...; 2. take a risk: to decide to do something even though you know it may have bad results; 3. at risk: to be in a situation where you may be harmed ...; 4. run a risk: to be in a situation where there is a risk of something bad happening to you ...; 5. at the risk of doing something: used when you think that what you are going to say or do may have a bad result, may offend or annoy people etc.; 6. at your own risk: if you do something at your own risk, you do it even though you understand the possible dangers and have been warned about them; 7. cause of dangers: something or someone that is likely to cause harm or danger...; 8. insurance/business: a person or business judged according the danger involved in giving them insurance or lending them money.” *The Oxford Guide to the English Language* gives this concise definition: “possibility of meeting danger or suffering harm; person or thing representing a source of risk.” Besides these many meanings in contemporary American and British English of this term, the ‘risk’ concept has also been employed in many natural and social science disciplines as a scientific concept. The concept has also been widely used by policy-makers to justify specific policy goals and programmes.

7.1. Risk as a Political and as a Scientific Concept in Encyclopaedias

As a scientific concept, risk is defined in major encyclopaedias and scientific dictionaries in many disciplines, including philosophy, political science, sociology, psychology, economics and in the geosciences. The *Brockhaus Enzyklopädie* (1992, XVIII: 440-444) offers a detailed assessment of the different meanings of the term ‘risk’, of its historic development, as well as ‘risk measures’, ‘risk assessment’, ‘risk factors’ and ‘risk indicators’, ‘risk society’, ‘risk capital’, ‘risk policy and management’ and ‘risk premiums’. The *Brockhaus* distinguishes among these meanings of risk”: 1. a possibility that an action or activity causes a damage or loss of material or persons; and 2. risk is used when the consequences are uncertain. The *Brockhaus* differentiates among *pure* (crash of an airplane), *speculative* (stock market), *insured* and *technical risks* (of equipment).

For the quantitative measurement of risks, often simple risk indicators are used: ‘Risk estimates’ always involve a prospective estimate based on the probability, frequency and intensity of damages that are often based on specific ‘risk analyses’. ‘Risk assessment’ is used in the daily practice in many disciplines and it is often influenced by the personal risk acceptance. The risk assessment e.g. of nuclear technologies differs among groups and countries. The concept ‘risk factors’ is used in social medicine, public health and epidemiology to point to factors which may increase the probability to get affected by a disease, while risk indicators may also be indirect contributing factors (e.g. social conditions for the breakout of a disease).

Beck’s (1986, 1992, 1999) concept of ‘risk society’ initiated a global debate in the social sciences that impacts on security risks. ‘Risk policy and politics’ as well as ‘risk management’ comprise all measures of an enterprise to improve its financial performance.

7.2. Risk as a Political and as a Scientific Concept in Scientific Dictionaries

The term ‘risk’ evolved since the 15th century referring to the financial danger associated with trade. This concept was primarily used with reference to insurance in economic activities. The term is widely employed in the *probability theory* (Laplace 1816, Bernoulli 1738), in *economics*

(A. Smith 1776, Ricardo 1821, J.S. Mills 1848, Knight 1921), in *existential philosophy* (Kierkegaard 1844, Heidegger, Jaspers 1932, 1956, Sartre 1948, Camus 1958), and in *decision-making theory* (Neumann/von Morgenstern 1944). The risk concept is used as a political term in nuclear technology for estimating how much security of technology is needed and how much insecurity is acceptable for society. Here risk is equated with the expectation of security contributing to risk acceptance. Since the 1970s the concept has been intensively discussed in economics, psychology, sociology, and in political science (for sources see: Rammstedt VIII, 1992: 1049).

Koschnick (1993: 1325) refers to 'risk' in the context of decision-making theory where

risk is defined as imperfect information, leading to a situation in which one is forced to take chances that certain outcomes or events will occur. Risk can range from risk that is close to perfect uncertainty to risk that approaches perfect uncertainty. ... In face of risk, one may proceed in three stages. First, one evaluates the various possible consequences of alternative policies on their merits. Second, one specifies the probability relationships between given policies and these evaluated outcomes. And finally, one tries to rank policies by the probabilistically weighted values of the consequences to which they may lead.

As complete certainty is hardly possible, Llewellyn (1996: 744-746) argues that "risk and uncertainty are an integral part of most human behaviour", especially in economics and finance: "*Uncertainty* arises when the future is unknown but no actual probabilities (objective or subjective) are attached to alternative outcomes. *Risk* arises when specific numerical probabilities are attached to alternative outcomes." *Risk analysis* largely relies on probability theory.

Behaviour is ... influenced both by the risk of an event to occur or outcome and the potential seriousness if it occurs. This ... gives rise to the concept of *disaster myopia*. ... Risk analysis is applied to situations which have multiple, uncertain outcomes. Risk analysis and management for a bank involves five key processes: first, identification and measurement of risk...; second, what can be done to lower the probability of default; third, measures to limit the damage in the event that the risk materializes...; fourth, action to shift risk to others, that is, risk-sharing, and fifth, how the residual risk is absorbed. ... The same principles apply in all risk analysis. ... Risk analysis is inseparable from risk management.

A dictionary of economics (Grüske/Recktenwald 1995: 528-529) includes 'risk', 'risk premium', 'risk theory' and 'risk management' (Grüske/Schneider 2003: 456) where 'risk' is defined

as an economic and social danger of loss in reputation, position, wealth resulting from the market dependence of the entrepreneur and the financier. In the economy it is closely linked with responsibility. Knight distinguishes between risk, where the probable distribution of results of possible actions is known and insecurity where this is not the case. Thus, insecurity cannot be measured and cannot be insured against, while risks may be insured against. In the literature the risk concept is manifold: 1) the danger to make a loss, or the distance between possible profit and loss; 2) risk expresses the positive and negative deviation from the expected value, or 3) risk as the difference between the planned data and the facts. ... The risk policy of companies tries to remove unnecessary risks, ... as a result of careful market analyses and to secure it legally. ... Decision theory has developed ... procedures to constrain risks.

Grüske and Schneider (2003: 456) defined risk management as: "The analysis of risks as well as the implementation of measures to manage risks." This covers insurance contracts of households, strategies of companies to differentiate production, and speculation in money markets as part of risk management. A major task of risk management is risk limitation.

In psychology 'risk' (Städtler 2003: 937-938) is used in decision-making theories, especially for decision situations taken under risk, synonymously for decision and decision behaviour. Risk implies that individuals show in decisions variance preferences that do not always follow the

principle of maximising benefits, but also reflect the relationship between maximum gain and loss. The portfolio theory of risks by Coombs (1975) implies a preference function for risks where the optimal value of risk is to find a balance between greed, challenge and fear. Some theories try to explain the risk-taking behaviour of humans given possible cognition of dangers.

The risk concept was gradually introduced in sociology, with a reference to environmental issues. In a German dictionary of sociology (Endruweit/Trommsdorff 1989) the term 'risk' was still missing, while in a sociological lexicon (Fuchs et al. 1978, 1988) 'risk' was included as "readiness to take risks" (*Risikobereitschaft*), as "risk population" and as "risky shift". In the dictionary of sociology (Hillmann 1994: 740-741) risk is defined as a decision situation with missing or incomplete information. In game and decision-making theory risk is distinguished from uncertainty. Subjective risk perceptions have often differed from the objective level of risk.

7.3. The Debate on 'Risk' and 'Risk Society' in the Social Sciences

The concept of risks has been used in the social sciences and especially in sociology, with a special reference to environmental issues.¹³ Löfstedt and Frewer (1998, 2004: 3-27) reviewed the debates on 'risk management' tracing the origin of risk analysis to the response of psychologists to an engineer's work on technological risks, and to the Chicago school of geography and argued that the people's response to hazards depended on their experience and knowledge. The debate on risk perception was provoked by Starr who pointed to the importance of contextual factors in risk perception pertaining to natural and technological hazards.

In the 1990s, a new school doubted the existence of objective risks pointing to the social construction of risk that influenced risk perceptions and risk-taking behaviour. Others have criticised risk comparisons because they ignored the societal risk context. A cultural theory of risks emerged in the UK but the empirical results in other countries were mixed. In the 1980s and 1990s research moved from 'risk perception' to 'risk communication' including the role of the media and of the social amplification of risk. In analysing the failure of risk communication initiatives, research increasingly focused on the lack of trust towards policy makers with regard to hazardous industrial plants and installations.

One reason for distrust has been the growing relevance of globalisation (Giddens 1990, 1994).¹⁴ The concept 'risk society' was introduced by Ulrich Beck (1986) and has widely influenced the debate in the social sciences.¹⁵ Beck (1986, 1992) has argued that risk is increasing with the

13 Keith Smith (2001: 6) noted that risk is sometimes used synonymously with hazards whereby "risk has the additional implication of the chance of a particular hazard actually occurring. ... Risk is the actual exposure of something of human value to a hazard and is often regarded as the product of probability and loss."

14 Tester (1996: 747) noted that risk is a major theme in Giddens's work who "distinguishes pre-modern (traditional) and modern environments of risk: 'The risk environment of traditional cultures was dominated by hazards of the physical world' while the modern risk environment is 'structured mainly by humanly created risks' (Giddens 1990). Giddens stresses the importance of the environment, war and personal relationships in modern experiences and construction of risk. In so doing, Giddens makes plain that 'risk is not just a major individual action. There are environments of risk that collectively affect masses of individuals'."

15 Tester (1996: 747) summarised and interpreted Beck's key concept of risk and 'risk society': "In a risk society the future has become uncertain. Possible events which technology unintentionally generates cannot be insured against because they have unimaginable implications. *The residual risk society has become an uninsured society* (Beck 1992b: 101). Instead of belief in progress and the future, risk society is experienced in terms of short-term calculations of danger: 'In this sense, one could say that the calculus of risk exemplifies a type of ethics without morality, the mathematical ethics of the technological age (Beck 1992b: 99). ... He has faith in the potential of a self-critical technological enterprise to solve risk problems. Secondly, Beck emphasises the sociological significance of the environment and ecology."

complexity of technology. Regaining trust requires competence and credibility of policy-makers. Research on mental models gained on importance focusing on misperceptions regarding different kinds of risks. Others have focused on the optimistic bias or the unreal optimism that has become a major barrier to effective risk communication. Due to the crisis of confidence, the requests on social scientists have increased to contribute to an improved risk management. Löfstedt and Frewer (1998, 2004: 19-20) argue on the future of risk research that the model of social amplification of risk should be developed further, as well as the research on risk perception and risk communication, and on public responses to transboundary risks.

In his book *On Risk*, Bonß (1995) reviewed the development of the 'sociology of risk' that has gradually emerged since the late 1960s in response to the disasters of Seveso, Harrisburg, Bhopal or Tschernobyl which Luhmann (1990:138) has described as an "articulated displeasure". With his theory of a 'risk society', Beck tried to place the problem of risk in the context of a theory of modernity focusing primarily on technical dangers and less on social action. Bonß (1995: 18-19) suggested to broaden the sociological risk debates in two respects: 1) the linkage between risk and technology must be dissolved and it should be analysed as a problem of insecurity; and 2) from a historical perspective the treatment of uncertainty should be reconstructed. He offered a systematic history of the discourse on the risk concept as a social and cultural construct with a special focus on the transition from a reactive towards an active orientation of insecurity. Among several classifications of risk concepts Bonß pointed to two alternatives to analyse risk as a social phenomenon from an action (*ex ante*) or systems (*ex post*) perspective. From an action perspective, risks are reduced to risk decisions, while from a systems perspective risks are treated as threats or danger of loss. Bonß suggests to analyse risks in the context of the social construction of uncertainties. While uncertainties due to dangers exist irrespective of human actions, uncertainties as risks include both the intentions and implementation of action. Thus, risks are often the result of decisions made under uncertainty.

Jaeger, Renn, Rosa and Webler (2001: 9) reviewed the thinking of risk, uncertainty and rational action. In their view "risk developed over the past several decades as the key analytical lens for attempting to anticipate the consequences of our purposive actions on the environment and ourselves." Risk has always been constitutive of the *conditio humana*. However, the nature of risks has changed, while they were originally local in impact, today many risks are eco-centric (i.e. they are linked to environmental problems or related to environmental conditions), and global. They are increasingly perceived as common risks, be it as systematic cumulative environmental risks, often affecting the globe as a whole (e.g. climate change), and the increasing risk consciousness of high technology. With the adoption of 'risk' as the imprimatur of our age, as suggested by Beck and Giddens, the direction of Western thought has shifted from "the expectation of progress, of continued improvement in the social world" to an epoch "in which the dark sides of progress increasingly come to dominate social debate", shifting from the 'goods' of modernisation to the often unintended 'bads' (Jaeger/Renn/Rosa /Webler 2001: 15).

In Giddens' terminology (1984, 1991) social fabric produces "ontological security"¹⁶, he specified as "the confidence that most human beings have in the continuity of their self-identity and

16 Giddens (1991) calls the need for stable expectations, e.g. of states, 'ontological security'. According to Mitzen (2005: 3) this refers to a "need to secure one's identity. Actors do this through cognitive and behavioural routines; and because the resulting routines stabilize the self, actors become attached to them." Based on Huymans (1998) and Mc Sweeney (1999), Mitzen (2005) argues that states also need ontological security and she proposes "that states achieve ontological security by routinizing relations with other states and apply that argument to entrenched interstate conflict. This reveals another, second 'security dilemma' in international politics: ontological security can impede physical security." If states try to break out of security dilemmas, Mitzen (2005. 3-4) argues that this could "generate ontological insecurity." Thus, "parties may prefer to remain in security dilemmas, even if offered credible opportunities for escape. In short, ontological security turns security dilemma logic on its head, suggesting that the persistence of conflict is rooted not in uncertainty but in the certainty such dilemmas offer their participants."

the constancy of the surrounding social and material environments of action” (1991: 92). Today they often “take the form of uncertainties, and risks associated with them”, i.e. increasing these risks results from human choice threatening both environmental conditions and individual identity.

For Jaeger, Renn, Rosa and Webler (2001: 16) “reducing uncertainties in order to maintain ontological security is clearly a task worthy of sociological investigation.” With a special focus on risks, they discuss first rational action, as the dominant worldview “for understanding and managing risk”, and then shift to alternative approaches: “reflexive modernization, critical theory, systems theory, and postmodernism.” While there are many meanings of risk, they argue that “all conceptions of risk presuppose a distinction between *predetermination* and *possibility*” (2001: 17).

Risk implies uncertainty, an indispensable element of risk. Risk “is present only to the extent that uncertainty involves some feature of the world, stemming from natural events or human activities that impacts human reality. Risk, in human terms, exists only when humans have a *stake in outcomes*.” Jaeger, Renn, Rosa and Webler (2001: 17) defined risk as “a situation or event in which something of human value (including humans themselves) has been put at stake and where the outcome is uncertain.”

In the late 20th century, for industrialised societies the new risks have reached a level that could endanger human life and survival on the planet. Technological and industrial developments have created new dangers that could endanger life in all its forms. These new risks for survival cannot be geographically limited nor can they be insured against. The competition on the division of resources has partly been replaced by the management of these global risks of survival. They require a reflexive modernisation where prevailing views, values, norms, conventions and behavioural patterns are an object of sociological reflection (Hillmann 1994). Ulrich Beck (1999: 3-4) defined ‘risk’ as

the modern approach to foresee and control the future consequences of human action, the various unintended consequences of radicalised modernization. It is an (institutionalised) attempt, a cognitive map, to colonise the future. Every society has ... experienced dangers. But the risk regime is a function of a new order: it is not national, but global. ... Risks presuppose decision. These decisions were previously undertaken with fixed norms of calculability, connecting means and ends or causes and effects. These norms are precisely what ‘world risk society’ has rendered invalid. ... What has given rise to the prominence of risk? The concept of risk and risk society combines what once was mutually exclusive – society and nature, social sciences and material sciences, the discursive construction of risk and the materiality of threats.

Beck (1999: 55-57) distinguished between predictable risks and unpredictable *threats* and offered a typology of three types of global threats: 1) *wealth-driven* ecological destruction and technological-industrial dangers (ozone hole, global warming, regional water shortage) and the unpredictable risk of genetic engineering; 2) risks related to *poverty* (environmental destruction); and 3) *weapons of mass destruction*.

Zürn (1995: 51) saw an essential difference between environmental destruction as a result of well-being and poverty: “Whereas many wealth-driven ecological threats stem from the externalisation of production costs, in the case of the poverty-driven ecological destruction it is the poor who destroy themselves with side-effects for the rich.” Thus, wealth-driven environmental destruction becomes international only through side-effects in the medium term.

Beck (1999: 36) argued that ecological destruction may promote war either as an outgrowth of resource scarcity (water) or because Western eco-fundamentalists use force to stop ongoing destruction. Such ecological destruction may trigger mass emigration which may lead to war.

This may result in a spiral of destruction where different crisis phenomena converge. In the world risk society, these

'global threats' have together led to a world where the basis of established risk-logic has whittled away, and where hard to manage dangers prevail instead of quantifiable risks. The new dangers are removing the conventional pillars of safety calculation. Damage loses its spatio-temporal limits and becomes global and lasting. It is hardly possible any more to blame definite individuals for such damage. ... Often, too, financial compensation cannot be awarded for the damage done; it has no meaning to insure oneself against the worst-case effects of spiralling global threats (Beck 1999: 36).

Since the mid 1990s, the concept of 'risk society' (Beck 1986, 1992) and 'world risk society' (1999) also became a new concept in political science and in international relations (M.G. Schmidt 1995, 2004). Beck's concept of risk society has also triggered a debate on 'risk policy' in political science.

7.4. From Security and Defence Policy to the Management of Political Risks

A group of young German scholars at the Free University of Berlin developed a new concept of 'international risk policy' for dealing with the new dangers in international relations, such as nuclear proliferation and terrorism, as well as the soft security challenges of migration, climate change, computer crime, drug trafficking, and dealing with financial markets. Daase (2002: 9-35) argued that these new dangers require a paradigmatic change in security policy from defence against threats to crisis prevention. He distinguished between risks due to transformation and globalisation and new political and international risks. Since 1990, the traditional threat triangle of an actor, his intentions, and capabilities has been replaced with different dangers that are often indirect, non-intended, and uncertain. The fundamental difference between security threats and risks, in his view, has been that the certainty of expectation has disappeared with the departure of a clearly defined threat. Instead of reacting to perceived security threats, a proactive security policy should focus on the prevention of the causes and effects of risks. This would lead to four ideal-type strategies of international risk policy that may be described as cooperation, intervention, compensation, and preparation to contain risks.

The goal of the first strategy is to reduce the probability of risks becoming reality by reducing misperceptions and by fostering a cooperative risk management¹⁷; the second intends reducing the probability of a future damage occurring by using political and military coercion; the third aims at a cooperative reduction of the level of the probable future damage by risk sharing strategies; and finally, the fourth strategy aims at a repressive reduction of the level of probable future damage by an efficient use of political, economic, legal and military measures that try to prevent follow-on damages. He distinguished economic, psychological, technical, and sociological approaches for dealing with risks. This paradigm was applied in several case studies on non-proliferation, migration, climate change, terrorism, drug trafficking, computer crimes and financial markets – but none on hazards. These studies focused on risk perception, risk policy and a risk paradox.

Daase, Feske and Peters (2002: 267-276) concluded on risk perception that while material factors played a role in the perception of dangers, socio-cultural factors determined the different risk perceptions of states. Risk perception is not stable and it may change during a political process or as a result of scientific discourses. Risk perception is a process. It is an

¹⁷ Such a strategy may lead to the creation of new institutions, e.g. of the crisis prevention centre of the OSCE, or to the adaptation of existing institutions to new tasks, e.g. of NATO. The task of scientific efforts is to review the methods and procedures of risk assessment (e.g. of prognoses, projections, estimates of probabilities) to point to shortcomings and to proposed alternative procedures (Daase 2002: 19).

important but not the only factor for the explanation of risk policy. To justify proactive political action the danger is often oversold, a threat is being created, and several risks are combined.

7.5. 'Reflexive Security' and 'Risk Society' as Key Concepts of Security Studies

The sociologists Giddens and Beck have stimulated in parts of the international relations research community a debate on 'ontological security' (Giddens 1991; Huymans 1998; Mc Sweeney 1999; Mitzen 2005) as well as an emerging debate on 'reflexive security'. Rasmussen (2004: 381-395) outlined a research programme on 'reflexive security' by applying Beck's 'risk society' to security studies. While during the Cold War the balance of power and deterrence theory constituted an expert system with its own rationality and bureaucracy, since 1990 and especially 2001 they were challenged by new non-state actors, new military technologies and terrorists who "fight for values other than those of national interests." Rasmussen asks whether the transatlantic debate focuses more on different means than on goals, or on the scale, degrees and urgency of risks.

'Risk society' is one way to explain what is missing in the debate between soft and hard security. The point is not on how to apply the concept of security, but that the concept of security itself is changing. Surveying the history of the concept of security from the Romans to the present, Ole Wæver (2002) thus argues that today's considerations of safety are increasingly about managing risks rather than achieving perfect security. The focus on risk society turns the 'broad conception of security' inside out. It is not only the case that security policy needs to take many more issues into consideration, it is argued, but along with the many other policy areas, the way security issues are being handled politically is being transformed.

Rasmussen (2004: 389-395) proposes to apply the sociological theories of reflexive modernity to "reflexive security studies"¹⁸ and to translate the empirical findings back to sociological theory.¹⁹

However, the social science debate on the concepts of 'risk' and 'risk society' was largely detached from the specific issues addressed in the environment and hazard communities to which we turn next.

7.6. Global and Regional Environmental Risk as a Scientific Concept

In security and environment policy, the risk concept is sometimes used without a clear delineation from the other concepts of threats and challenges. From an environmental perspective, Kaspersen and Kaspersen (2001: 1) tried to combine all four basic concepts: "global environmental risk is about threat; it is also about opportunity." The goal of their book

18 Rasmussen (2004) has mapped "the current achievements and future challenges of this emerging research programme on risk arguing that it offers a way to overcome the debate about whether to apply a 'broad' or 'narrow' concept of security; a debate which is stifling the discipline's ability to appreciate the 'war on terrorism' as an example of a new security practice. Discussing the nature of strategy in a risk environment, the paper outlines the consequences for applying the concept of reflexive rationality to strategy." See also: Shlomo Griner (2002).

19 Rasmussen (2004: 389-395) identified three research themes on: 1. globalisation; 2. region and individual level of non-state actors; and 3. study of specific strategies. He argues that reflexive security studies that make conceptual change an empirical matter "offer one possibility for taking account of the transformation of practice." This requires a clear definition of this scope: "Are reflexive security studies about certain 'risky' policy areas or has it something to say about the entire security agenda?" He argues that the polarised debate on the policy response to 9/11 illustrates "one of the basic facts of life in reflexive modernity: that the way by which we try to solve problems ... become a 'theme and a problem itself'." He points to a need "to develop a shared discourse on how to manage risks that takes account of strategic necessities, as well as concerns of world order, legitimacy and human rights. ... It highlights the need for security studies to catch up with the present practices of security policy and help develop a vocabulary that enables a reflexive debate on security priorities in the future."

is to take stock of “distinctive *challenges* posed by global environmental *risks*, the ability of the knowledge system to identify and characterise such *threats*, and the capability of societies to address the management of challenges.”

They distinguish between systemic risks (e.g. of global warming) and *cumulative environmental change* that may cause both short- and long-term consequences. They used risk synonymously with hazard, referring to “human beings and what they value.” For them, *global environmental risk* “refers to threats ... resulting from human-induced environmental change, either systemic or cumulative, on the global scale.” They focus on five themes: 1) Global environment *risk* is the ultimate *threat*; 2) *Uncertainty* is a persistent feature both of understanding process and causation as well as predicting outcomes; 3) Global environment risk manifests itself in different ways at different spatial scale; 4) *Vulnerability* is a function of variability and distribution in physical and socio-economic systems, the limited human ability to cope with additional and sometimes accumulating hazard, and the social and economic constraints that limit these abilities; and 5) Futures are not given, they must be negotiated.

The authors claim that global environmental risks “threaten international security and peaceful relations among states” contributing to differentiation of wealth and “increasing competition, tensions, and conflict.” They refer to five risk sources: a) disputes arising from human-induced local environmental degradation; b) ethnic clashes arising from population migration and deepened social cleavage due to environmental scarcity; c) civil strife caused by environmental scarcity that affects economic productivity and, in turn, people’s livelihoods, elite groups, and the ability of states to meet changing demands; d) scarcity-induced interstate war over, for example, water²⁰; and e) North-South conflicts over mitigation of, adaptation to, and compensation for global environmental problems (Homer-Dixon 1999: 5). On the environmental security debate they admit “that such frameworks and models remain very limited in providing satisfactory interpretations” and that “causal linkages between environmental change and attributes of environmental security are yet poorly defined and understood.”

Kasperson, Kasperson, Turner, Dow and Meyer (1995: 5-8) distinguished between *geocentric* and *anthropocentric* approaches to the study of environmental criticality which they defined as “a state of both environmental degradation and associated socio-economic deterioration.” A *critical region* refers to “an area that has reached such a state of interactive degradation.” The *geocentric* approach defines criticality “in terms of changes in physical attributes or social dimensions” due to human-induced perturbations that have altered the biophysical system. While the *geocentric* approach focuses purely on the physical environment, the *anthropocentric perspective* focuses solely on human inhabitants. Therefore, the authors suggest an integrative, holistic approach to the criticality of environmental threats which they describe with the conflicting terms – sensitivity, resistance, resilience, marginality, fragility, and vulnerability. Any analysis of criticality requires an assessment of what and who is threatened by environmental degradation. From the literature and their discussion they drew several lessons for the study of ‘environmental criticality’ of relevance for a regional approach:

Human-environment trajectories appear particularly likely to lead to criticality in situations that have some combination of:

- economies of high sensitivity and low resilience to environmental change;
- human societies with high social and economic vulnerability;

²⁰ While both international officials and national policy makers, journalists and defence officials have used the water war argument, this hypothesis has been disputed by many recent scientific publications in the social sciences (e.g. Wolf 2002; WWAP 2003; Kipping/Lindemann 2005).

- economies strongly dependent upon local environmental resources;
- frontier areas exposed to new forms of use; and
- close linkage with, and dependent position *vis-à-vis*, global markets or distant political authority (Kasperson/Kasperson/Turner/Dow/Meyer 1995: 22-23).

Non-linear environmental change may exacerbate societal diagnosis and delay responses. Criticality refers to situations where emerging environmental degradation may lead to a loss of a capability to survive. The 'critical region' concept does not adequately capture the identifiable situations, rather additional categories are needed. A lot of the change inflicted by human pressures on the environment may impose costs on future generations that must be included in approaches to endangerment and criticality. But many of the currently perceived environmental threats may disappear in the near future. These authors differentiate "criticality" from lesser degrees of environmental threats such as environmental endangerment and impoverishment. The 'critical regions' are characterised by *environmental degradation* (water, air, soil, biomass productivity), *wealth* (GNP, income, savings), *well-being* (longevity, mortality, infant mortality, nutrition, environmentally induced disease) and *economic and technological substitutability* (cash-crop dependency, technological monocultures, innovation, economic diversity). Before a region reaches a status of environmental criticality, many warning signals alert experts and the society to impending or recurring damage. The degree of response depends largely on the political and societal sensitivity but also on the resources available to cope with these challenges.

Based on nine case studies they concluded that a) external factors were more important than internal ones; and b) state policy and institutions were key factors of change while the I = PAT formula (*Impact = population – affluence – technology*) was criticised for overstressing affluence and neglecting poverty. In most third world cases "poverty rather than affluence has driven unsustainable resource use". On the regional level, they pointed to "three aspects of environmental and socio-economic conditions [that] suggest an increasing potential for higher or catastrophic losses: 1. *Vulnerability and overshoot ...* 2. *market conditions and overcapitalisation...* [and] 3. *loss of options and safety nets*" (Turner/Kasperson/Kasperson/Dow/Meyer 1995: 560). They discussed different societal responses, symptoms of emerging criticality, spatial and temporal categories. Contrary to global environmental change, the trajectories of change

in these threatened areas provide a warning, ... that supplements those recent discoveries ... at the global scale. In nearly all these regions, trajectories of change are proceeding to greater endangerment, ... while societal efforts to stabilise these trajectories and to avert further environmental deterioration are lagging and are generally only ameliorating the damage rather than intercepting the basic human driving forces of change. ... The trajectories of change in most ... regions are rapidly outstripping societal responses. ... The future populations ... are being environmentally impoverished by these trends. ... The trajectories suggest growing long-term costs of regional substitution, adaptation, and remedial measures. ... In the future, these trends will also eclipse regional societal capabilities to respond (Turner/Kasperson/Kasperson/Dow/Meyer 1995: 580).

They noted a rich variety of human causation and they argued that no single dominant human driving force can explain "the historical emergence of environmental degradation", nor could the *grand theories* offer satisfying interpretations. They conclude that "the regional dynamics of change – the interplay among the trends of environmental change, vulnerabilities and fragility, human driving forces, and societal responses – must be examined within their cultural, economic, and ecological contexts." For them "the most satisfying interpretations ... recognise the shifting complexes of driving forces and responses over time, tap diverse social science theory, and are firmly grounded in ... empirical work." The regional trajectories of change and

associated regional dynamics must be analysed in the broader framework of extra-regional linkages, such as processes of economic globalisation, including trade policies in the WTO framework that have a major environmental impact. In conclusion, Turner, Kasperson, Kasperson, Dow and Meyer (1995: 582-583) suggest a regional tailoring of global initiatives:

The regional dynamics of change ... reveal a recurring disjuncture between the fast rate of environmental change and the slow pace of societal response. ... The global scale reveals a much more mixed picture where societal responses to such changes as stratospheric ozone depletion, global warming, and industrial accidents have often been quite rapid, if less than totally effective. Still, signals of environmental threat have been processed with considerable speed and coping actions undertaken. But the trajectories of change ... provide considerable confirmation of the argument of overshoot ... by Donella Meadows and her colleagues (1972, 1992).

This debate on risk in the environmental research community has been developed further with a slightly different focus in the international scientific and political hazard community.

7.7. Risk as a Scientific Concept in the Hazard Community

A major area of the debate on risks in many scientific disciplines have been natural and human-induced hazards, technical calamities and manifold disasters or catastrophes that have focused on problems of 'risk perception', 'risk analysis', 'risk assessment' and 'risk management'. Slovic (2000) summarised the results of a research team that examined "the gap between expert views of risk and public perceptions", how these perceptions have evolved and changed over time, increasingly recognising "the importance and legitimacy of equity, trust, power and other value-laden issues underlying public concern." They described "new methods for assessing perceptions of risk" and they discussed "the implications for regulation and public policy." In a follow-up study Pidgeon, Kasperson and Slovic (2003) analysed "how both social and individual factors act to amplify or dampen perceptions of risk and through this created secondary effects such as stigmatisation of technologies, economic losses, or regulatory impacts." They focus on "risk perception and communication" and draw lessons "for public policy, risk management, and risk communication practice."

Posner (2004) offers an interdisciplinary perspective that combines the insights of a lawyer, a social and physical scientist in weighing risks and possible responses to a major catastrophe such as global warming, bioterrorism or a major accident. He argues that the risks of global catastrophe have grown due to the technological advance and industrial applications, the growth of the world economy and population, and the rise of apocalyptic global terrorism that are often underestimated due to low probability that they may happen in the near future. However, there is a difference in public attention and response between creeping natural disasters (climate change) and intended catastrophes, such as nuclear attacks, bioterrorism, and cyber terrorism that have become an objective of the military and of criminal justice. Posner calls for a mutual rethinking of the liberals "in the face of technological terrorism" and of the conservatives of global warming, many of them deny that these global challenges and risks require a global response based on international cooperation.

Blaikie, Cannon, Davis and Wisner (1994, 2000) offered a comprehensive theoretical framework on the challenges of disasters, on disaster pressure and release models, and access to resources and coping in adversity as well as an empirical analysis of famine and natural hazards, biological hazards, floods, coastal storms, earthquakes, volcanoes and landslides and on action for disaster reduction. They look for "the connections between the risks people face and the reasons for their *vulnerability* to hazards." For them disasters "are not only natural events that cause them. They are also the product of the social, political, and economic environment ... because of the way it structures the lives of different groups of people." Many disasters are a complex mix "of natural hazards and human action." In their definition:

A disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their livelihood system in such a way that recovery is unlikely without external aid. By recovery we mean the psychological and physical recovery of the victims, the replacement of physical resources and the social relations required to use them (Blaikie/Cannon/Davis/Wisner 1994: 21).

To understand risk in terms of their vulnerability analysis, they use two models of disaster: a) a pressure and release model (PAR); and b) an access model that relates to both *human vulnerability* and *exposure* to physical hazard. In the PAR model they distinguish three stages of vulnerability: a) the *root causes* (access to power, structure, resources; ideologies, political and economic systems); b) *dynamic pressures* (lack of local institutions, training, skills, local investment and markets, press freedom; macro forces: population growth, urbanisation, arms expenditure, debt repayment, deforestation, decline in soil productivity); and c) *unsafe conditions* (fragile physical environment: dangerous location, unprotected buildings, infrastructures; fragile local economy: livelihoods at risk, low income levels; vulnerable society: special groups at risk, lack of local institutions; public actions: lack of disaster preparedness, prevalence of endemic disease). They refer to hazards of a *biological* (virus, pest), *geophysical* (earthquake, volcano) or *hydro-meteorological* (storms, floods, drought) nature. They defined risk as hazard + vulnerability ($R = H + V$). Thus, vulnerability refers to “unsafe conditions.”

To overcome the separation of the hazard from the social system, they have developed a second access model that focuses on “the way unsafe conditions arise in relation to the economic and political process that allocates the assets, income, and other resources in a society” (Blaikie/Cannon/Davis/Wisner 1994: 46) and to include “nature in the explanation of hazard impacts.” For them vulnerability is a hypothetical term “which can only be ‘proved’ by observing the impact of the event when, and if, it occurs. By constructing the household access model for the affected people we can understand the causes and symptoms of vulnerability” (Blaikie/Cannon/Davis/Wisner 1994: 58). They distinguish several types of coping strategies: a) preventive strategies; b) impact-minimising strategies; c) creation and maintenance of labour power; d) building up stores of food and saleable assets; e) diversification of the production strategy; f) diversification of income sources; g) development of social support networks; and h) post-event coping strategies.

To release the pressures contributing to vulnerability and thus to reduce disasters, Blaikie, Cannon, Davis and Wisner (1994, 2000) suggest to address the root causes, to reduce pressure, and to achieve safe conditions aiming at: no loss of life, no casualties, restricted damage and food security, and to reduce hazards by improved flood control, shelter breaks etc. The management of vulnerability reduction should follow 12 principles: 1. vigorously manage mitigation; 2. integrate the elements of mitigation; 3. capitalise on a disaster to initiate or develop mitigation; 4. monitor and modify to suit new conditions; 5. focus attention on protection of the most vulnerable; 6. on lives and livelihoods of the vulnerable; 7. on active rather than passive approaches; and 8. on protecting priority sectors; 9. measures must be sustainable over time; 10. assimilate mitigation into normal practices; 11. incorporate mitigation into specific development projects; and 12. maintain political commitment. They propose efforts “towards sustainable reduction of disasters.”

In Chinese, the word risk combines the characters meaning ‘opportunity’ and ‘danger’. Risks cannot be eliminated but only managed. From a hazard perspective, Smith (2001: 14) defined risk as:

the actual exposure of something of human value to a hazard and is often regarded as the product of probability and loss. Thus we may define hazard (or cause) as ‘a potential threat to humans and their welfare’ and risk (or consequences) as ‘the probability of a hazard occurring and creating loss’. ... An earthquake hazard can exist in an uninhabited region but an earthquake risk can occur only in an area where people and their possessions exist. Clearly, both hazard and risk can be increased and reduced by human actions.

For Smith (2001: 55) *risk management* “means reducing the threats posed by known hazards, whilst simultaneously accepting unmanageable risks, and maximising any related benefits”. *Risk assessment* “involves evaluating the significance of a risk, either quantitatively or qualitatively”. He conceptualises: *risk = hazard (probability) x loss (expected) : preparedness (loss mitigation)*. Both risk assessment and management depend on value judgments that are conditioned by beliefs and circumstances. Perceived risks are often distinguished as 1. *involuntary risks* (in a hazard prone environment); and 2. *voluntary risks* (more susceptible to control).

Based on Kates and Kasperson for Smith (2001: 59) risk assessment comprises three steps:

1. The identification of local hazards likely to result in disasters, what hazardous events may occur?
2. The estimation of the risks of such events, that is, what is the probability of each event?
3. The evaluation of the social consequences of the derived risk, that is, what is the likely loss created by each event?

Risk is thus defined as the product of probability and loss: $R = p \times L$. While risk assessment depends on expert assessments, risk perception depends on an individual's intuition, estimation and evaluation. It may be determinate, dissonant or probabilistic.

From a natural hazard perspective Tobin and Montz (1997: 281-283) defined risks as a part of hazard but both are not synonymous.

Risk is an important component of hazard analysis and risk analysis forms an important subdivision of the study of natural hazards. ... Frequently risk is seen as the product of some probability of occurrence and expected loss. ... To get a better assessment of hazard risk, details of vulnerability must be incorporated in the analysis. Statistically, this relationship can be expressed as:

$$\text{Risk} = \text{probability of occurrence} \times \text{vulnerability.}$$

This formula ... fails to incorporate geographic differences in population size and density (or ... exposure) as well as communal adjustments undertaken to minimize loss. Mitchell (1990) conceptualises hazards as a multiplicative function of risk, exposure, vulnerability, and response:

$$\text{Hazard} = f(\text{risk} \times \text{exposure} \times \text{vulnerability} \times \text{response}) \text{ where}$$

risk = the probability of an adverse effect

exposure = the size and characteristics of the at-risk population

vulnerability = the potential for loss

response = the extent to which mitigation measures are in place.

Just as risk is only one component of hazards.... It comprises two elements that must be considered separately and together. These are (1) a choice of action and (2) an outcome, which includes a probability of occurrence and a consequence (or magnitude).

For Tobin and Montz (1997: 331-332) a combination of physical characteristics and political factors define risks. “By contrast, vulnerability is determined by all the elements in various combinations; this suggests that if we alter one of the elements, we have altered vulnerability. ... Risk and vulnerability are a part of the context, and they are changed when any one element in any of the three categories is changed.” This is crucial for hazard mitigation efforts that focus on reducing exposure, risk, economic losses and death as well as stress. Structural changes in society can reduce vulnerability and thus impact on reducing economic losses, death and stress. The above quotes indicate that within the natural hazard community no consensus exists on the definition of the risk concept. This definition has been used in several studies by the ‘GRAVITY team’ of UNEP/DEW/GRID and by the UNDP/BCPR Report on *Reducing Disaster Risk* (2004).

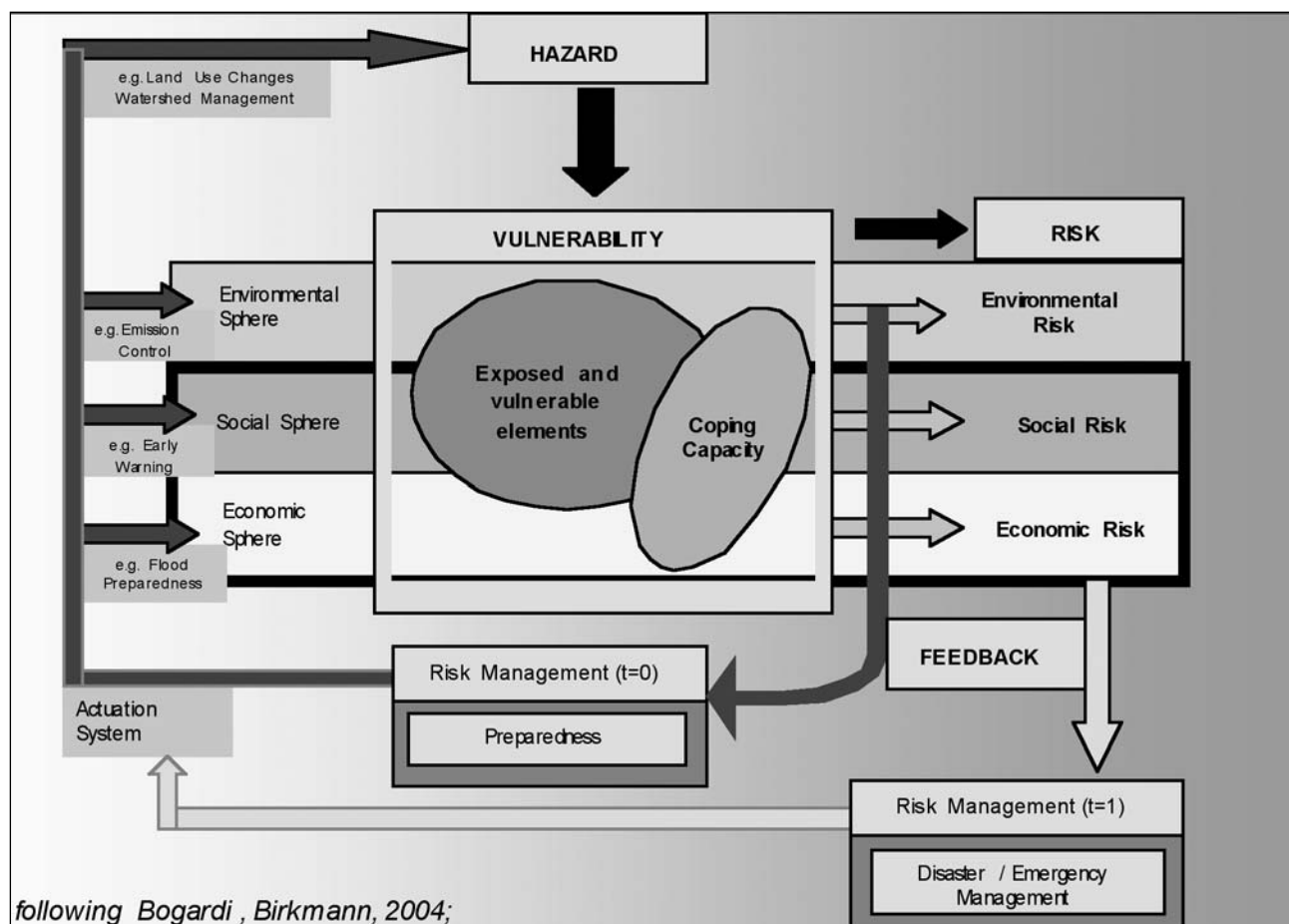
During the *World Conference on Disaster Reduction* (WCDR) in Kobe in January 2005, UNU-EHS organised a workshop on: ‘Measuring Vulnerability and Coping Capacity’.²¹ For UNU-EHS, in-

stead of focusing “on natural hazards and their quantification, the assessment and ranking of the vulnerability of affected groups should serve as the starting point.” In the short-term, UNU-EHS aims to establish “an expert group on key themes and indicators for vulnerability of urban areas”, and select case studies and pilot regions. In the medium term, the goal is “to achieve a consensus on the framework, on key indicators, for the preparation and testing of the indicators in pilot regions”, and to publish a report on indicator development. In the long-run, UNU-EHS will evaluate the results in the pilot regions, and recommend the integration of indicators in planning and decision making.²²

During the first year, UNU-EHS has developed two different vulnerability models: a so-called ‘onion model’, and the ‘BBC-model’ (Figure 5), developed by Bogardi, Birkmann and Cardona (2005). The ‘onion model’ analyses the impacts of a hazard (that is determined by processes of climate change, globalisation and innovation) both on a reality (certainty) and an opportunity (probability) axis on a *natural events sphere* (as flood event or hazard), that impact on the *economic sphere* (as flood damage or risk) and on the *social* (disutility) sphere (as flood disaster or vulnerability) whose intensity or degree will be modified by the coping capacity. Social vulnerability should include the economic dimension but also confidence, trust, fear, apathy as potential consequences of a specific hazard.

Figure 5: BBC-concept of UNU-EHS

Source: Birkmann 2005



21 See the programme and all texts at: < <http://www.adrc.or.jp/unu/UNU-ADRC-Workshop.files/frame.html>>.

22 See presentation by Birkmann (2005) at the Kobe workshop.

The 'BBC-model' defines 'vulnerability' and 'risk' as key components in the hazard-vulnerability-risk chain.²³ A hazard impacts on a multidimensional concept of vulnerability that is influenced by the environmental, the social and the economic sphere where the degree of exposure is reduced by the specific coping capacity in the specific region or country. 'Risk' is the product of these complex determinants and can be measured and observed as environmental, social and economic risk. As part of a feedback process, vulnerability impacts directly on risk management as preparedness ($t=0$), while the three forms of environmental, social and economic risk impact on risk management as disaster and emergency management ($t=1$). The actuation tools are to reduce vulnerabilities in the social system by early warning, in the economic system by insurance and preparedness (infrastructure, procedures, institutions), and in the environmental system by emissions control, sustainable agriculture and water management etc. These measures may lead to land-use changes with the goal to reduce the vulnerability to hazards of different economic and social subsystems. Thus risks can be reduced the more the coping capacity of a society can be developed, as well as a complex strategy of economic, social and environmental tools to reduce vulnerability.

While the 'onion model' excludes environmental vulnerability, the BBC-model takes social, economic and environmental vulnerabilities into account. According to the BBC-model vulnerability is reduced by the coping capacity of a system to respond to hazards. The environment is not only a cause of a hazard but also an object of anthropogenic behaviour and unintentional technical hazards as well as intentional terrorist acts. The authors argue that risk can be reduced by a broader vulnerability analysis.²⁴

7.8. Risk as a Practical Concept in the Hazard Research Community

For the practical and policy-oriented hazard community 'risk' has been a key operative concept. For example, the American Society of Civil Engineers (Haimes/Stakhiv 1989) reviewed 'risk analyses', 'risk communication decision-making', 'environmental risk analysis' and health hazards, global warming and climate change, as well as 'risk management strategies' for natural and technological hazards.²⁵ The U.S. National Research Council (2000) analysed the application of 'risk analysis' techniques for U.S. institutions, especially for the U.S. Army's Corps of Engineers, and the U.S. Federal Emergency Management Agency (FEMA).²⁶ Risk analysis should deal with temporal and spatial natural variability, knowledge uncertainty (parameters, models), and decision model uncertainty (time preferences, values, objectives).

23 This text summarises a draft paper by Bogardi, Birkmann and Cardona (2005), in: Jörn Birkmann (Ed.): *Measuring Vulnerability and Coping Capacity* (Tokyo: UNU Press).

24 The authors of the UNU-EHS team are close to the concept of Tobin and Montz but they view vulnerability in a broader context including exposure. For them vulnerability is only the 'potential for loss'. Compared to Tobin and Montz they consider the response and feedback as more than only mitigation. Vulnerability reduction ($t=0$) starts before a disaster occurs. This implies that they do not limit themselves to 'mitigation'. The general understanding that risk is the 'sum' and hazard and vulnerabilities are the main parameters is also visible in Tobin and Montz. The UNU-EHS authors do not exclude the political or institutional dimension nor the infrastructure vulnerability, but they suggest that the main covering topics should be the social; economic and environmental dimension – within the economic dimension one should take the economic infrastructure and the institutional settings into account.

25 In the introductory chapter, W.D. Rowe (1989: 1-2) defined risk as "the downside of a gamble" [that] "implies a probability of outcome, and the gamble may be involuntary or voluntary, avoidable or unavoidable, controllable or uncontrollable. The total gamble in which risk is imbedded must be addressed if the risk is to be analyzed, both the upside (benefits) and downside."

26 The NRC Study (2000: 179) defined "risk as the probability of failure during a flood event. For reaches without levees, failure means exceeding a target stage. For reaches with levees, it means a levee failure." And residual risk as: "the portion of the flood risk that still exists with the flood damage reduction project implemented."

Based on a review of global disaster reduction initiatives, UNISDR (2002: 24) defined 'risk' as:

The probability of harmful consequences, or expected loss (of lives, people injured, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards and vulnerable/capable conditions. Conditionally risk is expressed by the equation $\text{Risk} = \text{Hazards} \times \text{Vulnerability/Capacity}$.

In the second edition (ISDR 2004, II: 6) a slightly different definition of 'risk' is offered:

Conventionally risk is expressed by the notation: $\text{Risk} = \text{Hazards} \times \text{Vulnerability}$. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. Beyond expressing a possibility of physical harm, it is crucial to recognise that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.

ISDR (2004: II: 6) described 'risk assessment and analysis' as:

A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability, and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capacities pertinent to the risk scenarios.

However, the social contexts are crucial in which risks occur, and thus often the perceptions of risks and of their causes differ (Nathan 2001). Accordingly, the process of risk assessment relies on a review of both technical features of hazards and of the physical, social and economic dimensions of vulnerability, reflecting the different coping capabilities. ISDR (2002: 24) defined 'risk assessment and analysis' as: "A process to determine the nature and extent of risk by analysing conditions of vulnerability/capacity that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend."

Based on Tobin and Montz (1997), Peduzzi et al. (2001: 9-10) defined risk as "a measure of the expected losses due to hazard event of a particular magnitude occurring in a given area over a specific time period." The Gravity-team focused on risks "faced by population, in terms of wounded and killed while confronted to natural disasters." This risk definition includes: "the probability of occurrence and severity of a specific hazard for a given area and length of time, the vulnerability of the population and the capacity of mitigation, this last could be introduced in the vulnerability or taken separately, depending on authors." They offer this formula of risk:

$$\text{Risk}_i = (\text{Hazard}_i - \text{Prevention}_i) \times [\text{Population} \times (\text{Vulnerability}_i - \text{Mitigation}_i)]$$

As no data were available on both preparedness and mitigation, they proposed a simplified model:

$$\text{Risk}_i = \text{Hazard}_i \times \text{Population} \times \text{Vulnerability}_i$$

Where the hazard multiplied by the population represents the physical exposure, risk is also:

$$\text{Risk} = \text{Physical exposure} \times \text{Vulnerability or}$$

$$\text{Risk/Physical exposure} = \text{Vulnerability}$$

In their second report, Peduzzi, Dao and Herold (2002: 3) used the term 'risk': "to describe potential losses resulting from expected future hazard." Their research focused on human aspects (i.e. persons killed) from natural hazards, and they relied on the database of the Centre for Research on Epidemiology of Disasters in Louvain, Belgium (CRED) for 'killed', 'wounded', 'homeless', 'affected' and 'total affected', but due to a high variation they only used the

number of persons killed as risk indicators. Based on a definition by the United Nations Disaster Relief Coordinator (UNDRO 1979) for them risk results from three components: “*hazard occurrence probability*, defined as the probability of occurrence of a specified natural hazard as a specified severity level in a specified future time period, *elements at risk*, an inventory of those people or artefacts which are exposed to the hazard and *vulnerability*, the degree of loss to each element should a hazard of a given severity occur” (Coburn et al. 1991: 49). Peduzzi, Dao and Herold (2002: 3) proposed for modelling risk to multiply the three factors explaining risk: $Risk = Hazard \times Population \times Vulnerability$. Thus, there is no risk if no hazard exists or nobody lives in the affected area, or if the vulnerability is reduced by preparedness and mitigation measures.

In the fourth report of the GRAVITY-Team, Dao and Peduzzi (2003: 3) repeated their previous definitions and they used as risk indicators the “number of killed, percentage of killed, percentage of killed as compared to the exposed population with their respective advantages and inconveniences.” The *Disaster Risk Index* (DRI) is based on a combination of the first two indicators. In a brief article, Dao and Peduzzi (2004: 2) relied on the definition of risk by UNDRO (1979) that “refers to the expected losses from a particular hazard to a specified element of risk in a particular future time period” that may occur in terms of “human lives, or building destroyed or in financial terms.” Thus, if risk represents the losses, then “hazard can be defined as a potential threat to humans and their welfare” (Smith 1996). As extreme events, hazards “may create risk and potentially turn into disasters if the exposed elements are vulnerable.”

The UNDP Report (2004: 2): *Reducing Disaster Risk – A Challenge for Development* has applied the methodology and the DRI developed by the GRAVITY-Team of UNEP. In responding to the Millennium Development Goals (MDGs), the UNDP report tried to mainstream disaster reduction and developing concerns by a) a collection of basic data on disaster risk and the development of planning tools; b) collection and dissemination of best practice in development planning; and c) galvanising of political will to reorient both the development and disaster management sectors. The initial *Disaster Risk Index* (DRI) points to three limitations by a) focusing only on the risk of death; b) examining only risks associated with large- and medium-scale disasters; and c) representing risks associated with earthquakes, tropical cyclones and floods.

7.9. From Yokohama (1995) to Kobe (2005): Global Policy Goals for Natural Disaster Prevention, Preparedness and Mitigation

Since the adoption of the *Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action* in 1994 significant conceptual and practical policy progress has been made. The *Review of the Yokohama Strategy* (A/Conf.206/L.1) listed five major accomplishments and remaining challenges, dealing with governance, risk identification, knowledge management, reducing underlying risk factors and preparedness for effective response and recovery. Under risk identification they referred to assessment, monitoring and early warning. The review stressed a need for “greater awareness of the social and economic dimensions of vulnerability”, for improved data and analytical tools, it pointed to *emerging risks* (urban risks and exposure of complex infrastructure, greater attention to the interaction between natural and human-induced hazards (technological risks), including climate change impacts. With regard to *reducing underlying risk factors*, the review addressed (i) environmental and natural resource management; (ii) social and economic development practices; (iii) land-use planning and other technical measures; and (iv) advanced technologies (including remote sensing).

The *World Conference on Disaster Reduction* (WCDR) in Kobe (18 to 22 January 2005), in its *Hyogo Framework for Action 2005-2015* promoted “a strategic and systematic approach to

reducing vulnerabilities and risks to hazards” by underscoring “the need for ... building the resilience of nations and communities to disasters” (A/Conf.206/L.2/Rev.1: 3). The final document maintained:

Disaster risk arises when hazards interact with physical, social, economic and environmental vulnerabilities. Events of hydro-meteorological origin constitute the large majority of disasters. Despite the growing understanding and acceptance of the importance of disaster risk reduction and increased disaster response capacities, disasters and in particular the management and reduction of risk continue to pose a global challenge.

At the Kobe conference, among the five main areas where gaps for action for 2005 to 2015 were identified, two dealt with “risk identification, assessment, monitoring and early warning” and with “reducing underlying risk factors.” To achieve these aims, the conference adopted three strategic goals of which the third called for “the systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response, recovery programmes for disaster affected communities.” The *Hyogo Framework for Action 2005-2015* proposed enhanced international cooperation and assistance in the field of disaster risk reduction, including knowledge transfer, sharing of research results, enhanced governance, financial assistance to reduce existing risks and setting-up of governance systems that “can avoid the generation of new risk.” The strategy called for preventive and proactive measures (early warning efforts and systems).

In order to identify, assess and monitor disaster risk and enhance early warning, the Kobe strategy listed among the key activities: i) *National and local risk assessments* (risk maps, indicators of disaster risk and vulnerability); ii) *early warning* (people-centred, information systems, institutional capacities, better cooperation); iii) *capacity* (support for infrastructures, databases, support for methods and capacities); and iv) *regional and emerging risks* (cooperation, early warning, research on long-term changes: climate trends, diseases, land-use, environmental hotspots, slope deforestation, demographic changes and density, rapid urbanisation, relevant trade factors). For reducing underlying risk factors, the document has referred to: i) *environmental and natural resource management*; ii) *social and economic development practices*; and iii) *land-use planning and other technical measures*. In the *Hyogo Declaration* of 21 January 2005, the WCDR delegates reaffirmed the vital role of the UN system and called for the full implementation of the *Hyogo Framework for Action 2005-2015*.

On a regional European level, the Commission of the European Communities, in its “Strategic Objectives 2005-2009 – Europe 2010: A Partnership for European Renewal: Prosperity, Solidarity and Security” (26 January 2005) stated that the security of the citizen “can be put at risk by natural disasters, environmental or health crises and transport and energy threats.” The President of the Commission stated that “the Union has a role to play at all stages: risk prevention, early warning, crisis management, and acting in solidarity with the victims of disasters.” One of the five key security themes will be: “managing risk in the modern world.” The Commission documents as the first of three tasks:

Environmental and health risks such as the increased threats of floods or droughts following climate change, the fallout from potential biological, chemical or radiological attacks of serious outbreaks of disease have immediate EU-wide implications. They must be tackled in two ways: by the ability to offer early warning and immediate response to a particular crisis, and by long-term prevention. Information and surveillance networks need to be effective if they are to cope adequately with cross-border threats.

With regard to “Europe as a world partner”, the strategic objectives of the European Commission call for: 1) a stronger actor in the world economy; 2) global solidarity; and 3) making security work worldwide to enable Europe “to tackle stability and security issues at

their root by strongly promoting sustainable development through both multilateral and bilateral channels.”

The security part of the EU Commission’s “Strategic Objectives” reflects the debate on reconceptualisation of security by shifting the focus from narrow military threats to: a) non-military security challenges for justice and home affairs (to counter crime, terrorism, human and drug trafficking); b) natural disasters, environmental and health risks; c) energy supply crises and vulnerability of traffic and energy infrastructure; and d) promoting global solidarity with sustainable development.

These declaratory policy goals of the UN’s *Hyogo Declaration* and the EU’s *Strategic Objectives* reflect both a reconceptualisation and a redefinition of security ‘threats’, ‘challenges’, ‘vulnerabilities’ and ‘risks’ with an application to natural hazards.

8. Environmental Security Threats, Challenges, Vulnerabilities and Risks

The contextual change since 1990 and the scientific changes in several disciplines have contributed to a widening and a deepening of ‘security’ both in policy-making processes and in manifold scientific environments. With the change of our security understanding the related concepts of ‘security threats, challenges, vulnerabilities and risks’ have also changed. But even in specific communities, e.g. within the ‘hazard community’, no agreement exists about what ‘vulnerability’ and ‘risk’ mean and on the different referents of security (individual, communal, national, regional/international, global and interplanetary) which are to be protected. Since 1989 a debate has emerged on the ‘environmental security dimension’ and on ‘environmental’ or ‘ecological threats, challenges, vulnerabilities and risks’ for ‘national’, ‘international’ and ‘human security’.

8.1. The Emergence of ‘Environmental’ and ‘Ecological Security’ Concepts

Since the 1950s, linkages between environmental change and security have been discussed (Osborn 1953; Brown 1954; Ophuls 1977; Ophuls/Boyan 1992). Since the 1990s, the concepts of *environmental* (Westing 1986, 1997) or *ecological security* (Rogers 1997; Wöhlcke 1997; Mische 1998; Lonergan 2002) have been developed by scientists, governments and international organisations. Both policy-oriented scientists and conceptually-oriented policy-makers have focused on the complex linkages and interdependencies between environmental risks and challenges and the impacts on security perceptions for which both concepts of ‘environmental’ and ‘ecological’ security have been used often interchangeably and related to different security levels (Rogers 1996, 1997). Because both security and environment “are relatively elastic concepts”, it has been easy “to establish or challenge linkages between both terms” (Matthew 2000: 36).

From a peace research perspective, Brock (1991: 408) pointed to several linkages between peace and the environment: a) environmental depletion leading to large-scale social conflict and war; b) environmental modification as an instrument in inter-societal relations; c) environmental depletion as a specific cause of violence; d) ecological cooperation building confidence and trust; e) use of military means to enforce environmental standards; and f) a healthy environment as an integral part of a comprehensive security. He sorted them into four types of possible linkages: causal, instrumental and definitional. But only a few discussed environmental pressures against war. Brock (1991, 1997, 1999) criticised untenable generalisations that environmental scarcities lead to violent conflict. For Brock the key question is that of the

referent object: “the security or the environment, violent conflict over natural resources or the environmental quality of life” (Brock 1997: 18). In analysing the securitisation of the environment he argued “for a broader analysis of environmental change in its relationship with economic and political change.”

For Dyer (2002: 67-81) environmental security “should take account of the spatial and the temporal span (universal and intergenerational) of environmental change.” In contrast Matthew (1997: 71-90) argued “that a concise narrowly focused, and systematic definition would be beneficial for the purposes of policy, research, and environmental rescue” (Matthew 1997: 17). By integrating other ideas and concerns under world order concepts, Matthew (1997: 89) suggests that environmental security becomes “a component of a more general approach to the theory and practice of world politics that emphasises the significance of the ways in which social and ecological systems interact. At the same time, it is able to stand on its own as a bridge between environmentalists and the security community.”

Matthew (2002: 109-124) argued that environment and security research made “pioneering contributions to understanding the shifting sources of violence and changing requirements of security in an age of unprecedented inequality and interdependence.” He suggested a broader approach on the “ecological dimensions of violent conflict and national and human security” instead of the “simple causal arguments about scarcity and conflict” (Kaplan 1994, 2000). Matthew considered a retreat from environment and security research as premature, instead he suggested “to build on the remarkable achievements of the entire environmental security field” (Matthew 2002: 120). This research has revived a perspective on the nature-society relationship that was marginalised during the Cold War. These different definitions and assumptions on outcomes illustrate the lack of scientific consistency and consensus on the environmental security concept.

Initially, the key contributions to the environmental security debate were made by scholars in North America, in Central and Northern Europe and in the South Pacific. It was initially perceived with suspicion by diplomats from developing countries. An Egyptian diplomat, Ms. Somaya Saad, worried: “that wealthy countries in the North can afford to care about the environment and will undermine the international legal principle of sovereignty in the name of a higher goal called *environmental security*.” In her view this principle “provides some defence against exploitation by recognizing each state, no matter how weak in capabilities, as the legitimate authority for control over the resources within its borders” (Lonergan 2002 V: 275).

This concern indicates that Northern states may try to dictate the patterns of natural resource usage, development priorities and population policies to the South (Conca/Alberty/Dabelko 1995, 1995a): “Today ... the North has seized hold of the environment issues by using them to cloak its own security concerns” (Saad 1995: 273). The elite in certain countries may find change of past social bargains for environmental reasons to be a larger threat to state security than the environmental destruction itself. In several developing countries an academic debate has started on environmental and human security.

Rajendra K. Pachauri (2000), director of the Tata Energy and Resources Institute (TERI) in New Delhi and the present IPCC chairman, defined “environmental security” as “the minimisation of environmental damage and the promotion of sustainable development, with a focus on transboundary dimensions. ... Economic vulnerability and resource dependency play key roles in the link between environmental change and the potential for violence and insecurity in the developing world.” Pachauri (2000) pointed to these linkages between poverty and natural resource stress:

First, the continuing struggle to provide food and basic needs is increasing land degradation in the developing world. ... *Second*, worsening pollution increasingly impacts air quality, with vehicular

traffic and industrial expansion as the key contributors. ... *Third*, world climate change that has led to a rise in both temperature and sea level holds dire consequences for South Asia coastal regions. ...*Fourth*, both water quality and quantity are at risk due to land-use changes, deforestation, and polluted waters both locally and across national borders.

For Pachauri poverty refers to people's lack of ability to retain control over their living conditions. In his view, many other factors, such as lacking property rights, unsustainable resource exploitation, restricted access to resources such as fuel, the impact of science and technology, global economic factors, and national economic policies strengthen the cycle between environmental degradation and poverty.²⁷ More recently the debate on environmental security has spread in Africa, Asia and Latin America, and many different conceptualisations have been offered by scholars in the South (Brauch/Grin/Mesjasz et al. 2006).

8.2. The Environment as New 'Threats' to National Security

Westing (1988: 257-264) pointed to both the military impact on the environment and to environmental factors of security, such as territorial, shared or extra-territorial resources that require mechanisms for the non-violent resolution of resource conflicts. The former Norwegian foreign minister Holst (1989: 123-128) saw a triple relationship between conflict and environment: a) *environmental deterioration* (space, atmosphere, lithosphere, hydrosphere, biosphere) as a consequence of armed conflict; b) *environmental degradation* (due to poverty, injustice, population growth) as a cause of conflict; and c) *self-reinforcing environmental degradation* (refugees, food riots, urban violence) as a *contribution* to armed conflict. Both environmental impacts of military activities and of wars, and the environment as a cause or contributing factor to hazards, migration, crises and in the extreme case also to conflicts have posed 'threats', 'challenges', 'vulnerabilities' and 'risks' that have been conceptualised since the late 1980s in the context of U.S. 'national security' and since the 1990s increasingly also as dangers to 'human security'.

Mathews (1989) and Myers (1989, 1989a) argued: "First there was a need to redefine security and to include a new range of threats. ... Second, there was an acceptance that the object of security was no longer simply the state, but ranges to levels above and below the level of the state" (Lonergan 2002 V: 270-271). Mathews (1989: 162) proposed a "broadening definition of national security to include resource, environmental and demographic issues." She warned that global changes "in the chemical composition of the atmosphere, in the genetic diversity of species inhabiting the planet, and in the cycling of vital chemicals through the oceans, atmosphere, biosphere and geosphere" could lead to irreversible damage. Myers (1989: 23-41) pointed to several environmental factors (soil erosion, ozone layer, climate change) as legitimate causes for international concern that may have repercussions for U.S security policy. Myers (1993, 1996: 12) claimed that the "principal threat to security and peace stems from environmental breakdown" and that environmental problems can "figure as causes of conflict",

27 Pachauri (2000) identified six concrete actions that must be undertaken: "First, access to resources must be addressed through ensuring entitlements for the poor, building and sustaining ability, ensuring the property rights of the community over commons, creating market access, and creating rural enterprises and jobs. Second, governance must focus on participation, the capacity and ability to address crises, and the building of political, economic, and social infrastructure. Third, property rights must be redefined with regard to common resources. Fourth, the world must reorient the development and use of science and technology. Fifth, national economic policies in their current status are insufficient because they do not ensure equitable growth or internalise environmental costs In addition, regulatory bodies are weak or non-existent, and centralised policies benefit only a small proportion of the population. Finally, Pachauri suggested that global economic policymakers should make more effort (a) to promote traditional product markets, (b) to push development assistance agencies for a greater stress on poverty reduction, and (c) to address climate change through economic measures."

such as water in the Middle East, desertification in the Sahel, water diversion or flooding in Bangladesh. Myers (1993: 20-21) equated security with “human well-being; not only from harm and injury but access to water, food, shelter, health, employment, and other basic requisites.” He warned if the environmental foundations are depleted:

the nation’s economy will eventually decline, its social fabric will deteriorate, and its political structure will become destabilised. The outcome is all too likely to be conflict, whether in the form of disorder and insurrection within a nation or tensions and hostilities with other nations. ... National security is no longer about fighting forces and weaponry alone. It relates to watersheds, croplands, forests, genetic resources, climate, and other factors rarely considered by military experts and political leaders, but that taken together deserve to be viewed as equally crucial to a nation’s security as military prowess.

Myers (1996: 22) analysed as environmental factors contributing to conflict: population growth, ozone layer depletion and global warming, mass extinction of species and as a direct consequence: environmental refugees. These ‘Neo-Malthusian’ and ‘realist’ concerns (table 1) that focused on the ‘state’ as the major referent object had a conceptual impact on the U.S. defence and security policy during the Clinton administration but they were discontinued by his successor.

8.3. ‘Environmental Security Agenda’ as an Object of Securitisation

Simultaneously the Copenhagen school has widened the scope of security from a ‘constructivist perspective’. According to Buzan, Kelstrup, Lemaitre, Tomer and Wæver (1990) “*Environmental security* concerns the maintenance of the local and the planetary biosphere as the essential support system on which all human enterprises depend.” Later, Buzan, Wæver and de Wilde (1998: 71-93) noted a scientific and a political agenda on how to analyse and deal with these concerns.

The scientific agenda underpins securitising moves, whereas the political agenda is about three areas: (1) state and public awareness of issues on the scientific agenda ...; (2) the acceptance of political responsibility for dealing with these issues; and (3) the political management questions that arise: problems of international cooperation and institutionalisation – in particular regime formation, the effectiveness of unilateral national initiatives, distribution of costs and benefits, free-rider dilemmas, problems of enforcement, and so forth (Buzan/Wæver/de Wilde 1998: 72).

On the scientific environmental agenda the following issues are often included (Buzan/Wæver/de Wilde 1998: 74-75): a) *Disruption of ecosystems* (climate change; biodiversity loss, deforestation, desertification, soil erosion; ozone layer depletion; pollution); b) *energy problems* (nuclear energy, oil transportation, chemical industries, scarcities, uneven distribution); c) *population problems* (population growth, consumption beyond carrying capacity, epidemics, poor health conditions, declining literacy rates, uncontrollable migrations, unmanageable urbanisation); d) *food problems* (poverty, famines, overconsumption, diseases related to extremes; loss of fertile soils and water resources; epidemics and poor health conditions; scarcities, uneven distribution); e) *economic problems* (protection of unsustainable production, societal instability leading to cyclical and hegemonic breakdowns, structural asymmetries and inequality); and f) *civil strife* (war-related environmental damage and violence related to environmental degradation). Securitisation efforts were made at all levels but the most effective were on the local level. For Buzan (2004), the ‘state’ and the ‘society’ remained major referents of securitisation, and he was sceptical to the ‘human security’ concept.

8.4. 'Environmental Security Issues' as New Causes of Conflicts

In the centre of the second empirical phase of the debate on environmental security have been many case studies conducted by two research teams in Toronto (Homer Dixon 1991, 1994, 1999, 2000), and in Zürich and Bern (Bächler/Spillmann 1996). They focused on the linkages between environmental stress and extreme outcomes: societal crises, domestic or international conflicts and cooperation. While these case studies focused primarily on environmental scarcity ('grievance') other more recent studies have argued that resource abundance (diamonds, coltan and others) or 'greed' has been a major cause for the new wars led by local war lords (Gleditsch 2001, 2003; Conca/Dabelko 2002; Collier 2000, Bannon/Collier 2003; Collier et al. 2003). A recent study by Kipping (2005) has shown that water scarcity in the Senegal River basin has been the reason for cooperation between Senegal and Mauritania. But after the building of dams and introduction of irrigated agriculture water abundance had become a cause of violent conflict.

John Gerard Ruggie (1998: 155-171) argued on the eco-demographic contexts of emerging new conflicts in developing countries that a part of the populations may experience "institutional barriers long before they encounter absolute physical scarcity" which may result in a spill-over of population pressures into international conflict behaviour. On rapid urbanisation, Ruggie (1998: 163) argues that social turmoil may result from the "insufficient capacity on the part of the cities to service such large increments of population in so short a time. A social turmoil in turn may provide targets of opportunity, either for domestic forces to internationalise the problem or for foreign forces to meddle in domestic affairs." Ruggie concluded that in contrast to the past, the "interplay between socio-economic forces and biophysical factors have reached a planetary scale."

Paul Kennedy (2000: 239-245) stated that environmental pressures "could produce threats to human well-being and social stability" and that, if the projected effects of climate change are accurate, "then mankind will face atmospheric turbulences and environmental hazards in the future that will cause distress: melting of the polar ice caps, rise in sea levels, more extreme weather conditions, greater storm damage, crop displacement, and habitat changes", challenges that could be addressed with regular means, at least in the U.S. But on the regional and local level these environmental damages could result in unrest and migration often combined with violence. He argued that the new global challenges, including global warming and migration pressure, which are further intensified by demographic and environmental stress, bring some societies to worrying thresholds and thus could become threats to national and international stability.

8.5. Environmental Security 'Threats', 'Challenges', 'Vulnerabilities' and 'Risks'

Security with its dual focus is achieved if there is an absence of objective threats and subjective fears to basic values. The ecosystem was introduced as the reference object of '*environmental security*'. Its values at risk are sustainability and the sources of dangers are humankind and global environmental change (table 3). The environment (figures 1, 2) is considered both as a cause and an object of specific threats, challenges, vulnerabilities and risks posed by GEC, by environmental pollution and by natural hazards to the 'objective' and 'subjective' security of human beings and humankind (*human security*), of societal groups (*societal security*), of nation states (*national security*), and of association of states (*European security*) from the impacts in the most affected states outside of the EU, for macro regions (*regional security*), and in a few extreme cases, such as 'abrupt climate change' (NRC 2002) also for the Earth (*global security*). While most securitisation efforts have focused on the 'state' or on the 'society' as major referent objects, Westing (1989: 129-134) introduced the environment into a 'comprehensive human

security' concept that requires both a *protection* (quality of the environment) and an *utilisation* requirement (human welfare). In this concept renewable natural resources must be used in a sustainable way.

Table 4: Compilation of Environmental 'Threats', 'Challenges', 'Vulnerabilities' and 'Risks'

Environmental causes, stressors, effects and natural hazards pose	Natural and economic factors		Societal impact factors (exposure)	
	Substantial threats for	Challenges affecting	Vulnerabilities for	Risks for
	Security objects (for what or whom?)			
Climate change – temperature increase (creeping, long-term)	– Human health – agriculture (yield decline) – biodiversity – desertification	– tourism – food security – fisheries – government action – economic action	– infectious disease – damage to crops – natural systems – water scarcity – forest fire	– human populations – the poor, old people and children due to heat waves
Climate change – sea level rise (creeping, long-term)	– Small island states – marine ecosystem, – indigenous communities, – industry, energy	– deltas – coastal zones – marine, freshwater ecosystems	– coastal cities, habitats, infrastructure, jobs – cities, homes, jobs	– livelihood – poor people, – insurance, – financial services
Abrupt climate change – e.g. cooling in Central and Northern Europe, in North America (USA)	– Countries and people in Northern Europe, benefiting from Gulf stream	– livelihood – survival	– agriculture – habitat – people	– human life and animals, property – forced migration of people
Climate change – Extreme weather events: storms (hurricanes, cyclones, winter storms)	– Habitat, technical infrastructure, transportation, etc	– forests (health of trees) – food security	– coastal ecosystems – forests, settlements – electricity transmission	– human life & property – insurance, – financial services
Climate change – Extreme weather events: Floods	– Habitat, technical infrastructure and people	– vulnerable, flood-prone areas	– persons living in flood-prone areas	– human life & property
Climate change – Extreme weather events: Drought	– Availability of water and food, survival of people	– decreased crop yield and water quality & quantity	– arid and semi-arid zones, agriculture – forests (tree health)	– human life & animals, property
Geophysical hazards – earthquakes, – volcanic eruptions – tsunamis	Hazard prone areas – regional and local affected areas – coastal areas (in Indian Ocean)	– habitat, – technical & economic infrastructure – people	– poor living in hazard prone areas and in vulnerable housing	– poor people with little resilience & disaster preparedness, no insurance
Soil erosion, desertification, drought	– Water scarcity – agriculture – habitats	– food security – human livelihood (forced migration)	– livelihoods – rural areas – specific crops	– people & livestock in rural areas – people in slums
Deforestation	– Landscape, cities, habitat	– water availability	– landslides	– informal housing (slums)
Water scarcity and degradation	– Agriculture, food security, people	– econ. behaviour – human health	– poor in slums	– old people, children, poor
Forced Migration	– Resident population, clash on water and food	– overgrazing on marginal soils, – environment	– fragile ecosystems – people on the move	– migrants and their animals

Table 4 provides a heuristic compilation of possible linkages between environmental causes, stressors, impacts or outcomes that may pose security threats, challenges, vulnerabilities and risks for human beings or humankind within their respective natural environment. Natural and human-induced hazards are rapid onset events also influenced by long-term, creeping or structural factors or processes referred to in the survival hexagon (figure 1, 2) as supply side factors, i.e. climate change (*air*), deforestation, *soil* erosion, desertification, drought, *water* scarcity and degradation.

Hazards and hazard-induced distress or forced migration (figure 2) may trigger socio-political consequences beyond the traditional scope of the hazard community, such as societal crises among residents and migrants competing for scarce soil and water for food security and survival. The peace and conflict research community has not systematically studied hazards as a cause of conflicts. These socio-political consequences have become an object of securitisation in the context of a 'human security' approach often with the affected human beings as referent objects.

8.5.1 Security Impacts of Climate Change and Extreme Weather Events for Small Island States

The interactions between *rapid-onset situational events* (hazards) and long-term *creeping or structural processes* (climate change, desertification) are most obvious for many small island states in the Indian and Pacific Oceans as well as for the Caribbean. These small island states are prone to a high number of tropical storms which will increase due to climate change, but will also be affected by sea-level rise resulting in a significant loss of low-level coastal territory.

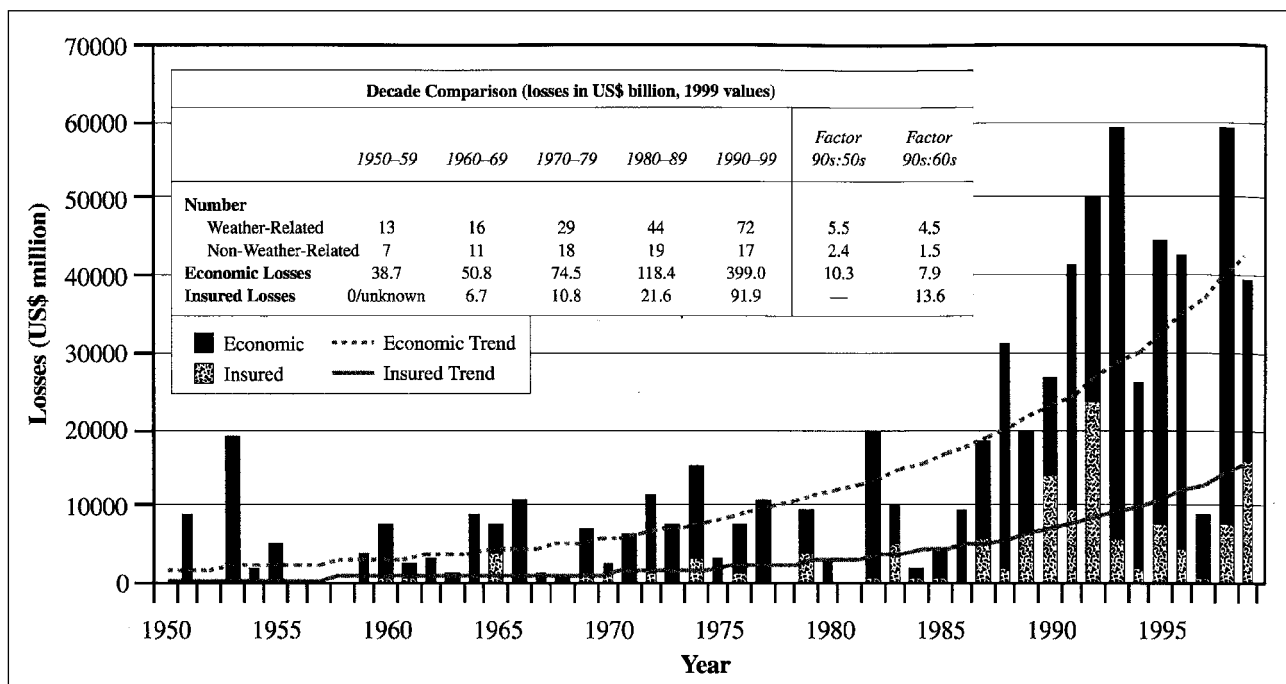
Thus, climate change and many other aspects of global environmental change (e.g. deforestation, soil erosion and desertification) may pose complex and manifold threats, challenges, vulnerabilities and risks for different dimensions of security (environmental, societal, economic, but only in very extreme cases also for political and military security) and for different referents from the individual, to the family, village, tribe, for the micro-region, state, macro-region. Only in very extreme cases with a low probability they will affect the entire globe.

Since 1950 hydro-meteorological hazards, resulting disasters and economic losses have increased, but the vulnerability and impact differed regionally. Between 1985 and 1999, 77% of the deaths were in Asia, 4% in Africa and 1% each in Europe and North America caused by floods (49%), earthquakes and volcanic eruptions (30%), windstorms (15%) and others (6%). Of the economic losses, 45% occurred in Asia, 33% in North America, 12% in Europe, but only 1% in Africa.

National efforts and international activities for an improved assessment and mitigation of natural hazards have intensified (IFRC 2001). The IPCC (2001: 422) noted a rapid upward trend in the costs of catastrophic weather events since 1950, especially since 1988, most of them are weather-related (figure 4): "Weather-related events of all magnitudes resulted in US\$ 707 billion in insured and uninsured losses between 1985 and 1999." However, a longer term comparison of large catastrophic events compiled by MunichRe "over the past 50 years reveals that economic losses (adjusted for inflation) increased by a factor of 10.3. Over this period population grew by a factor of 2.4" (IPCC 2001: 422).

Figure 4: Costs of Catastrophic Weather Events (1950-1999)

Source: IPCC 2001: 422



According to the *World Disaster Report 2001* of the International Federation of the Red Cross the total number of reported disasters increased from 454 in 1991 to 752 in 2000 reaching a total of 4,703 events from 1991 to 2000. In 1991 a total of 170,093 persons were killed (most in Bangladesh) and over the decade until 2000 a total of 752,521 died and 2,108,025 were affected by disasters causing damages amounting to US\$ 809,785.8 million (in 2000 prices). Table 5 offers the total and average numbers of people reported, which were killed or affected by disasters; by country (between 1981-1990, 1991-2000), and in 2001 for Bangladesh and Mexico and for selected island states in the Caribbean and small island states in the Atlantic, Indian and Pacific Oceans.

Although the group of 'Small Island States' have contributed less than 1% of global greenhouse gas emissions, they are most vulnerable to the adverse effects of both extreme weather events (hurricanes, cyclones) and sea-level rise. Those countries with a high level of poverty have only limited resources to adapt to and to mitigate against both rapid onset hazards projected due to longer-term climate change impacts. The IPCC projected "that sea level will rise by as much as 5 mm yr⁻¹ over the next 100 years as a result of GHG-induced global warming" which will have serious consequences for their social and economic development. Thus, those countries which are highly vulnerable to both events will suffer disproportionately from the effects of sea-level rise.

Table 5: Total and Average Number of People Reported Killed and Affected by Disasters, by Country for 1981-1990, 1991-2000, and in 2001

Source: IFRC 2002; Brauch 2002

Countries	1981-1990				1991-2000				2001	
	number of people		annual average		number of people		annual average		number of people	
	killed	affected	killed	affected	killed	affected	killed	affected	killed	affected
Mexico	11,961	753,887	1,196	75,389	4,902	2,851,231	490	285,123	43	6,400
Bangladesh	27,903	228,794,460	2,790	22,879,446	147,753	90,473,239	14,775	9,047,324	469	729,033
Selected (Small) Island States										
Cap Verde	64	119,722	6	11,972	18	16,306	2	1,631	-	-
Mauritius	161	37,358	16	3,736	5	10,800	1	1,080	-	-
Seychelles	0	1,218,000	0	121,800	5	1,237	1	124	-	-
Antigua	2	83,030	0	8,303	5	76,684	1	7,668	-	-
Cuba	289	815,680	29	81,568	813	2,306,172	81	230,617	5	5,900,012
Dom. Rep.	245	1,343,190	25	134,319	782	1,024,425	78	102,443	-	-
Haiti	475	1,165,491	48	116,549	4,110	2,605,670	411	260,567	71	5,091
Jamaica	166	882,703	17	88,270	13	556,512	1	55,651	1	200
Maldives	0	300	0	30	10	23,849	1	2,385	-	-
Fiji	79	606,201	8	60,620	80	430,730	8	43,073	1	-
Micronesia	5	203	1	20	0	84,000	0	8,400	-	-
Salomon I.	8	197,000	1	19,700	2,724	1,637,506	272	163,751	-	-
Tonga	0	1,832	0	183	37	88,904	4	8,890	-	16,450
Tuvalu	8	149,617	1	14,962	0	6,571	0	657	-	-

For the Caribbean islands average temperature rose by 0.5°C for the years 1900-1995 while mean annual rainfall decreased by 250 mm. For the Pacific islands the temperature rise was below 0.5°C and rainfall records did not indicate a clear trend. The IPCC pointed to observed temperature increases in the South Pacific between 0.3 to 0.8°C (IPCC 2001: 848). While there is uncertainty on the full extent of climate change impacts for small island states, the IPCC has pointed to:

The combined effect of GHG-induced climate change and sea-level rise can contribute to coastal erosion and land loss, flooding, soil salinization, and intrusion of salt water into groundwater aquifers. The quantity and quality of available water supplies can affect agricultural production and human health. Similarly, changes in SST, ocean circulation, and upwelling could affect marine organisms such as corals, seagrasses, and fish stocks. Tourism – which is a very important economic activity in many island states – could be affected through beach erosion, loss of land, and degraded reef ecosystems, as well as changes in seasonal patterns of rainfall (IPCC 2001: 848-849).

The IPCC listed among the key regional concerns of the small island states their high vulnerability and their low adaptive capacity to climate change. Sea-level rise is expected to have disproportionately huge effects on many small island states that may be further worsened due to increasing storm surges and flood risks. In some areas beach erosion will increase, coral reefs may be weakened, many mangroves will be put under additional stress. Water supply is very vulnerable in the atoll states of the Pacific and in the low limestone islands of the eastern Caribbean. The population density may increase even further than indicated in table 6 due to the shrinking territory resulting from sea-level rise, especially for the atoll states. Climate change will have direct and indirect effects on tourism due to a loss of beaches, degradation of coastal ecosystems, saline intrusion, and damage to infrastructure. This will be very serious given their high dependence on tourism for their economic survival (table 6).

Table 6: Land Area and Population for Small Island States

Source: IPCC 1998: 338, UN 2001

Country	Land area km ²	Population (1995)		Population (2050)		Coastline length (km)	Tourists % of popula- tion (1997)
		in '000	Density pers./km ²	in '000	Density pers./km ²		
<i>Atlantic Ocean</i>							
Cap Verde	4,033	392	97	807		965	11.4
Sao Tome & Principe	960	133	139	294		209	
<i>Caribbean Sea</i>							
Antigua & Barbuda	280	66	236	73		153	364.2
Bahamas	13,935	276	20	449		3,542	586.4
Barbados	431	262	607	263		97	182.4
Cuba	110,861	11,041	100	10,764		6,073	10.5
Dominica	750	71	95	72		148	97.6
Dominican Republic	48,442	7,823	161	11,959	246	940	28.1
Grenada	312	92	295	105		121	116.2
Haiti	27,750	7,180	259	13,982	503	370	2.2
Jamaica	10,991	2,447	223	3,815	347	1,022	45.6
St. Kitts & Nevis	269	41	152	34		135	210.5
St. Lucia	616	150	244	189		158	164.7
St. Vincent & Grenadines	389	112	288	138		84	54.6
Trinidad & Tobago	5,128	1,306	255	1,378		3,760	28.7
<i>Indian Ocean</i>							
Comoros	2,171	653	292	1,900	875	340	4.9
Maldives	300	254	854	868	2,893	644	130.7
Mauritius	1,850	1,117	547	1,426	770	177	46.4
Seychelles	280	73	261	145	517	491	166.7
<i>Pacific Ocean</i>							
Cook Islands	236	(20)	x	27		120	
Fed. St. of Micronesia	720	(123)	x	269		6,112	
Fiji	18,272	784	43	916		1,129	45.3
Kiribati	728	79	109	138		1,143	
Marshall Islands	181	(383)	x	413		370	
Nauru	21	11	523	26	1,238	30	
Palau	497	(19)	x	39		x	
Samoa	2,842	171	61	223		403	31.1
Solomon Islands	28,446	378	13	1,458		5,313	3.7
Tonga	697	98	141	125		419	
Tuvalu	26	10	385	16	615	24	
Vanuatu	14,763	169	14	462		2,5287	27.1

Sea-level rise would also directly affect the agriculture in the low islands and atolls of the Pacific. In many island states a majority of the population lives close to the coastline and thus these settlements will be directly threatened by sea-level rises. Impacts of climate change on human health have been reported due to heat waves, drought and floods, and the increase in malaria and dengue has been projected for some island states. With the increasing damage due to extreme weather events, e.g. in the Caribbean due to hurricanes and storms, the insurance costs already rose significantly. The high vulnerability of the small island states to

major hazards has also been demonstrated by the Indian Ocean tsunami for the Maldives whose population density has been projected to grow significantly until 2050.

And yet climate change is only one of several challenges they will be confronted with in the 21st century. Poverty alleviation, high unemployment, housing, education and health care facilities will compete for scarce resources. The IPCC suggested that adaptation to climate change should be integrated into risk reduction strategies for sectoral policies such as “sustainable development planning, disaster prevention and management, integrated coastal management, and health care planning” (IPCC 2001: 846). The IPCC (2001: 869) admits uncertainties to assess accurately the effects of climate change on small island states: “Thus, planning of appropriate responses in regions of low adaptive capacity, such as small island states, presents an even greater challenge. One of the likely outcomes of climate change and sea-level rise in natural systems is their collapse.”

The two IPCC reports (1998, 2001) did not include in their discussion the population projections that will increase the severe environmental stress. In the Caribbean the population will increase significantly, especially in Haiti and in the Dominican Republic, but only slightly in Cuba. In all small island states in the Indian Ocean the projected population growth and the high reliance on tourism may increase the environmental stress, even without climate change impacts.

The most likely implication of the ‘threats, challenges, vulnerabilities and risks’ posed by climate change for small island states may be a ‘survival dilemma’ (Brauch 2000, 2004, 2006) confronting the poor population with unattractive alternatives: to stay at home and be exposed to an increasing number and more intensive tropical hurricanes and cyclones, or to be forced to migrate from the Caribbean to North America and from the small islands in the Indian and Pacific Ocean to countries that offer their families better prospects for survival and economic well-being.

Thus, causes related to GEC and extreme outcomes, especially extreme weather events and hydro-meteorological hazards and resulting disasters, pose threats, challenges, vulnerabilities and risks primarily for ‘*human security*’. i.e. for human beings and humankind, ‘*societal security*’, for ethnic, religious or societal groups, ‘*gender security*’, for women, children, old and indigenous people and minorities (Oswald 2001), but in very extreme cases also for ‘*national security*’, if such events trigger major population movements recipient countries are not willing to accept.

8.5.2 Climate Change Impacts on Extreme Weather Events and Hazards as Security Issues

According to the IPCC, extreme weather events have become more likely in the 20th century and will become very likely during the 21st century (table 7). With the projected increase of hydro-meteorological hazards, their socio-political and economic consequences (figure 2) will rise and they will pose security dangers for the poor with low resilience and adaptive capacity.

Table 7: Extreme Weather Events Triggered by Climate Change in the 21st Century

Source IPCC 2001

Confidence in observed changes (latter half of the 20th century)	Changes in Phenomenon	Confidence in projected changes (during the 21st century)
Likely ⁷	Higher maximum temperatures and more hot days over nearly all land areas	Very likely ⁷
Very likely ⁷	Higher minimum temperatures, fewer cold days and frost days over nearly all land areas	Very likely ⁷
Very likely ⁷	Reduced diurnal temperature range over most land areas	Very likely ⁷
Likely ⁷ , over many areas	Increase of heat index ¹² over land areas	Very likely ⁷ , over most areas
Likely ⁷ , over many Northern Hemisphere mid- to high latitude land areas	More intense precipitation events ^b	Very likely ⁷ , over many areas
Likely ⁷ , in a few areas	Increased summer continental drying and associated risk of drought	Likely ⁷ , over most mid-latitude continental interiors. (Lack of consistent projections in other areas)
Not observed in the few analyses available	Increase in tropical cyclone peak wind intensities ^c	Likely ⁷ , over some areas
Insufficient data for assessment	Increase in tropical cyclone mean and peak precipitation intensities ^c	Likely ⁷ , over some areas

The impact of climate change differs with regard to climate zones and world regions as do the capabilities for adaptation and mitigation (table 8). For example in Asia (IPCC 2001: 48) the 'vulnerability' to climate change of six key sectors: food and fibre, biodiversity, water resources, coastal ecosystems, human health and settlements are different for the *boreal* (moderately vulnerable to slightly resilient), *arid and semi-arid* (not highly vulnerable), *temperate* (moderately to highly vulnerable), and *tropical sub-regions* (highly vulnerable).

Table 8: Vulnerability of Key Sectors to Climate Change in Asia

Source: IPCC 2001a: 580

Regions	Food & fibre	Biodiversity	Water resources	Coastal ecosystems	Human health	Settlements
Boreal	+ ***	***	+ ***	+ **	**	***
Central	****	**	***	**	***	***
Tibet	**	***	**	not applicable	no information	
Temperate	****	***	****	****	***	****
South Asia	****	***	****	****	***	***
South East	****	***	****	****	***	***

**** highly, *** and ** moderately vulnerable, + slightly resilient

As discussed above for the small island states, the impact of sea-level rise poses existential threats to the survival of many other countries, e.g. in Bangladesh, a 45 cm increase in the sea-level would lead to a loss of 10.9% of its territory and expose about 5.0% of its presently rapidly growing population (Table 9). Due to high population growth and vulnerability to multiple hazards (cyclones, floods, droughts) the environmentally triggered urbanisation and distress migration have already become political issues between Bangladesh and India as well as for Mexico and the United States. For India and the U.S. this immigration is considered by

part of the security elite as a ‘national security’ issue but for the migrants and their families relying on their remittances it has become a ‘human security’ problem (Brauch 2002).

Table 9: Potential Land Loss and Population Exposed in Asia

Source: IPCC 2001a: 569

Country	SLR (cm)	Potential land loss		Population exposed	
		km ²	%	million	%
Bangladesh	45	15,668	10.9	5.5	5.0
	100	29,846	20.7	14.8	13.5
India	100	5,763	0.4	7.1	0.8
Indonesia	60	34,000	1.9	2.0	1.1
Japan	50	1,412	0.4	2.9	2.3
Malaysia	100	7,000	2.1	>0.05	>0.3
Pakistan	20	1,700	0.2	n.a.	n.a.
Vietnam	100	40,000	12.1	17.1	23.1

Little systematic empirical knowledge exists so far on the complex causal interaction between human and environmentally induced hydro-meteorological and geophysical hazards, migration, crises and conflicts (Figure 2, 3).

8.5.3 Environmental Factors as Security Threats, Challenges, Vulnerabilities and Risks

Contrary to the ‘state-centred national security’ concepts of the realist school, global environmental change, as well as hydro-meteorological hazards, affect primarily the individual or humankind whose perception of ‘insecurity’ therefore changes. Elsewhere evidence has been provided for Bangladesh, Mexico and Egypt (Brauch 2002) that environmental factors, both *rapid-onset* hydro-meteorological hazards and *creeping* challenges posed by global environmental change have increased ‘human insecurity’ by confronting the highly vulnerable and poor people with a ‘survival dilemma’: either to stay at home in their village continuing their traditional livelihood, or to move first to the next major urban centre. The young and those who can afford it have of course a third possibility: to move to a country or a region that offers them better economic conditions and future prospects for survival of their family.

Hazard induced or environmentally triggered distress migration has become a major ‘human’ and ‘societal’ security challenge for the 21st century. Both in India and in the U.S., the counter strategies have been similar in tightening border controls. On behalf of the U.S. a fence was built to make the entry for Mexicans more difficult. However, these measures could neither stop nor prevent immigration; they rather increased the number of illegal immigrants from Mexico to the U.S., from 40.000 during 1980 to 1984 to some 485.000 per year between 2000 and 2004 (Oswald/Brauch 2005).

From a *Hobbesian*, *realist* or narrow national security perspective, since 2001 the military threat perception has been focused exclusively on ‘weapons of mass destruction’ of so-called outlawed (or ‘rogue’) states, and on non-state terrorist actors and failed states that offer them refuge from persecution. These new threats have been instrumentalised to legitimate new military missions and expenditures, and the use of force. From this realist mind-set ‘migration’ is perceived as a soft security threat that must be contained by police forces. This primary reactive policy to counter terrorism or to contain migration processes does not address the longer-term structural ‘root causes’.

From a *Kantian* perspective, legal provisions offer an effective framework for dealing with these challenges, e.g. by establishing international development goals (MDG), strengthening existing international institutions (UNDP, UNEP, OCHA) and environmental regimes (UNFCCC, UNCCD, CBD) or setting up a new international environment organisation (Rechkemmer 2005; Biermann / Bauer 2005) along with implementation measures against free-riders and violators, and instruments for agenda setting and policy coordination, including strengthening the International Criminal Court.

From a pragmatic *Grotian* perspective, international cooperation matters addressing not only the perceived short-term and hard military security threats, but also the longer-term structural factors as well as rapid onset hazards. Those hazards pose ‘threats, challenges, vulnerabilities and risks’ to other referents than the nation state: to both human beings and humankind (‘human security’).

8.5.4 Proactive Security Response Strategies

Addressing the environmental dangers to security (table 4) requires a complex combination of strategic instruments and policies to reduce the vulnerability to natural hazards and the related risks for human beings and affected societal groups. Thus a dual strategy is needed for dealing with:

- *short-term situational* impacts of extreme weather events and natural hazards; and
- *longer-term structural* impacts of global environmental change.

While the global environmental change, the climate change and the hazard research communities have used different concepts of environmental, social and economic ‘vulnerabilities’ and ‘risks’, a conceptual and a policy-oriented mainstreaming is needed to address both impacts.

The disaster response to the tsunami of 26 December 2004 has shown a clear preference for short-term reactive policies of disaster response, and a continued hesitation towards long-term proactive climate change policies by reducing greenhouse gas emissions in the domestic energy and transport sector. Some governments even questioned the scientific basis of the projections of the IPCC on the link between climate change and extreme weather events. Three groups of vulnerability and risk indicators are needed: a) for both climate change and hydro-meteorological hazards; b) for specific hazards (storms, floods, drought), and c) for temperature increase and sea-level rise.

Thus, effective climate policies with legally binding obligations may be the most cost-effective solutions to counter the projected increase in extreme weather events. To respond to these complex and manifold environmental security ‘threats, challenges, vulnerabilities, risks’ as well as to those posed by manifold hazards, it is primarily *proactive* non-military policies and measures (Table 10) which are needed. More conceptual work on the linkages between ‘environmental’ and ‘human’ security is necessary. Mainstreaming efforts are required on the scientific and political tracks with regard to:

- a) the environmental dimension of human security (conceptualisation in the scientific community); and
- b) a ‘paradigm shift’ in the UN system from ‘national’ towards a ‘human security’ perspective.

Table 10: 'Human Security' Policies and Measures for Coping with Environmental Threats, Challenges, Vulnerabilities, and Risks for 'Ecosystems' and 'Sustainability'

Strategies & means for coping with	Threats of	Challenges for	Vulnerabilities of	Risks of
	Environmental Security for			
<i>Sustainable development policy goals</i>	– Air (climate), soil, water	– agriculture and food security	– vulnerable people (old, children, women, indigenous groups)	
<i>Environment policy</i> (implementation of environmental treaties, regimes)	– Climate change, – soil erosion, – water scarcity and degradation	– economy – agriculture – tourism – health	– rural livelihood – urban habitat – transport & economic infrastructure	– reducing exposure of people with low resilience
<i>Early recognition</i> (research, education, training, agenda-setting)	– Extreme weather events (storm, flood, drought)	– agriculture (shift in crops)	– city planning – building standards	– enhancing knowledge of these people
<i>Early warning of hazards and disasters</i>	– Hydro-meteorological (storms, floods, drought) and geophysical (earthquake, volcano, tsunami) hazards	– agriculture (specific crops) – public health	– vulnerability mapping of hazard prone areas and housing	– enhancing training of these people
<i>Effective disaster preparedness and rapid disaster response</i>		– (inter)national organisations and resources	– vulnerability mapping of hazard prone areas and housing	– enhancing protection of these people
<i>Humanitarian aid</i>	– Hazards and conflicts	– access to affected areas	– spread of infectious disease	– reducing low recognition
<i>Refugee assistance</i>	– Distress migration	– environment – food supply	– refugees (in times of conflict)	– old, weak and poor

With regard to the work of international organisations, a dual mainstreaming may be needed:

- to incorporate a 'human security' perspective into 'environmental security initiatives', such as the Kiev process of OSCE, UNEP, UNDP²⁸, and NATO²⁹, into the 'green diplomacy' of the European Union launched at the European Council in Thessaloniki in June 2003³⁰; and
- to include an 'environmental security dimension' into the work of the Human Security Network (HSN) focusing primarily on 'freedom from fear', elaborating it further also in the context of the report of the Commission on Human Security (CHS 2003) focusing on 'freedom from want'.

UNU-EHS can enhance the mainstreaming efforts within the UN system through its scientific forum function and through human capacity building activities with regard to 'freedom from

28 See the joint initiative of OSCE, UNEP and UNDP on: *An Environment Agenda for Security and Cooperation in South Eastern Europe and Central Asia*, at: < <http://www.iisd.org/natres/security/envsec/> > ; < www.osce.org/documents/sg/2003/01/324_en.pdf >; and at: < <http://www.oecd.org/dataoecd/53/3/33687392.pdf> >. See: OSCE/UNEP/ UNDP (2003); UNEP/UNDP/OSCE (2004).

29 NATO has joined the ENVSEC initiative in 2004; See: UNEP/UNDP/OSCE/NATO (2005).

30 See at: <http://europa.eu.int/futurum/documents/other/oth200603_en.pdf> and at: <http://europa.eu.int/comm/environment/international_issues/gd_conclusions_rome.pdf>.

hazard impacts'. However, the introduction and support of states to adopt vulnerability concerns in the human security concept in their respective environmental management plans and actions require the active involvement of other UN agencies and programmes.

9. Human Security Threats, Challenges, Vulnerabilities and Risks

Parallel to the academic debate on environmental security which influenced the policy agenda of several international organisations, the human security concept used by UNDP (1994) triggered a global and ongoing scientific debate. UN Secretary General Kofi Annan (2001) has referred to the need for a human-centred approach to security. For him “human security can no longer be understood in purely military terms. Rather, it must encompass economic development, social justice, environmental protection, democratisation, disarmament, and respect for human rights and the rule of law.”

9.1. Human Security Concepts in Different Regions

UNESCO has been instrumental for initiating and supporting the scientific debate on “human security” especially in developing countries, by organising regional conferences in all parts of the world. These regional conceptual efforts have linked the debate with pertinent security concerns. An intensive debate is continuing in OECD countries (Brauch 2005), and there is a growing debate in developing countries focusing on specific ‘human security’ threats, challenges vulnerabilities and risks.

For Neff (2003: 40), human security “is founded on the notion of mutual vulnerability” and for him the “central theme of human security is the reduction of collective and shared risk through analysis, decisions, prevention and action at reducing the causes and circumstances of insecurity.” Human security “focuses on the causes of violence and stresses the need to control the latter by attacking its roots and the factors of its recurrence, not only its expression”. For Palma (2003: 111) human security deals with internal security and has two aspects that refer to “hunger, sickness and repression, but also to absolute disruption of daily living”, like “natural catastrophes or series of crises that can lead to human tragedies.” For Palma, “human security can be threatened by economic, food, health, personal security, environmental, community or cultural and political problems.” Kornblith (2003: 321) suggested to develop an objective and subjective human security index and pointed to several challenges for human security in Latin America and in the Caribbean. Bonilla (2003: 337-351) applied the concept to the fight against drugs in the Andean region, while Lopez (2003: 353-363) outlined a human security agenda for the MERCOSUR dealing with both ‘freedom from want’ and ‘freedom from danger’.

Based on a widening of the security concept of the Copenhagen school of Buzan, Wæver and de Wilde (1998), from a South Asian perspective, Chari and Gupta (2003: 1-21) from India noted the potential dichotomy of ‘national’ and ‘human security’ if the state and the individual are at variance. In the UNDP (1994: 8) definition “individuals and collectives ... were made the referents of security, and threat perceptions were reformulated in this perspective.” For the former Pakistani finance minister, World Bank and UNDP official, Mahbub-ul Haq³¹, human development was the bedrock of security and he called for “securing people from economic deprivation, disease, hunger, social conflict and environmental degradation.”

³¹ Mahbub ul Haq (1934-1998) was a Pakistani economist who in 1990 created the Human Development Index, which the UNDP used in its annual reports on people's standards of living to determine their countries' wealth. He had served as the World Bank's director of policy planning and Pakistan's finance minister.

Chari and Gupta (2003: 8-9) listed among the major threats to human security: “challenges of globalisation, questions of energy security, mass migration and gender discrimination.” They pointed to “the right to live” as the basic value of human security, and “violence – physical, socio-economic, or psychological – directed against citizens exacerbates human insecurity.” For them, human security “is inextricably linked to human rights, human development and human governance” and “the state should be vitally concerned with human security to ensure its own security.” For South Asia, a further erosion of human security arises from the environmental degradation of water, forests, farmland, and fisheries. They define human security as freedom from fear (anxiety) and want (certitude, protection). To avoid a trivialisation of human security by overextending it, Chari and Gupta (2003: 16-17) have proposed:

- 1) to distinguish “between threats to human security that are amenable to state intervention and others that must be left to public and social action;”
- 2) non-military threats to human security may become legitimate as threats to state or societal interests if they “meet rigorous criteria for securitising those threats and disaggregating them into their component sectors;” and
- 3) threats to human security may be linked with other threats, e.g. environmental degradation can trigger internal displacement of people leading to growth in slums where many people live in fear and suffer from want, thus the effects of environmental degradation lead to human insecurity.

Abdus Sabur (2003: 35-51) from Bangladesh saw a major outcome of the rethinking of security since 1990 in “the idea that the security of an individual in terms of his physical safety, human dignity and development is as important as the security of the state” (Sabur 2003: 37). While national security requires investment in the military, “human security needs investment in human development and humane governance.” From a maximalist approach Sabur distinguished 15 human security issues where the intensity of these threats differs for different societies, countries and regions:

1. personal security of the individual from the consequences of violent conflict; 2. economic security (assured basic income); 3. food security (physical and economic access to food); 4. human development: health and education; 5. good governance: democracy and human rights; 6. rights of ethno-racial and religious communities; 7. discrimination against and abuse of women and children; 8. globalisation and disparities in economic opportunities; 9. unchecked population growth; 10. migration and refugees; 11. environmental degradation, 12. natural and man-made disasters; 13. misuse and overuse of natural resources; 14. crime and terrorism, national and international; and 15. drugs.

With regard to South Asia, Sabur (2003: 47) has noted a lack of attention on human security so far while traditional security issues have dominated. At the same time “the human security situation in South Asia is one of the worst in the world characterized by a high degree of both want and fear”, both of which must be addressed jointly. Sabur (2003: 48-50) refers for South Asia to seven human security issues each for both ‘freedom from want’ and ‘freedom from fear’:

Freedom from want: 1. economic security (assured basic income); 2. food security (physical and economic access to food); 3. human development: health and education; 4. population control; 5. environmental degradation; 6. misuse and overuse of natural resources; 7. natural and man-made disasters;

Freedom from fear: 1. personal security of the individual from violence and harm; 2. good governance: democracy and human rights; 3. rights of ethnic and religious minorities; 4. discrimination against and abuse of women and children; 5. crime, corruption and terrorism; 6. migration and refugees; and 7. drugs.

While the primary responsibility for ensuring human security remains with the state, within the state, non-state actors, civil society and NGOs play a major role in ensuring human security also regarding actions caused by the state.

The Pakistani scholar Najam (2003: 1-24) analysed many roots of human insecurity in South Asia: 1) the world's poorest region (with a GNP/capita below that of Sub-Saharan Africa); 2) the world's most illiterate region; and 3. the region with the highest human deprivation. Based on a project with colleagues from India, Pakistan, Bangladesh, Sri Lanka and Nepal on non-traditional security issues Najam (2003: 21-22) drew five lessons:

- For South Asia ... environment and security are at best conceptualised within the context of sustainable development;
- The challenge of environment and security in South Asia is principally a challenge at the domestic, even local, level; but it is a challenge common to the region;
- The challenge of environment and security in South Asia is ... not just a problem of resource endowments or geography but, quite distinctly, a problem of institutions and governance; it is only because the issue is the latter rather than the former that we have the ability to change the situation;
- The possibility of an eruption of interstate violence in South Asia over environmental issues is slim; however, given the region's history of distrust and dispute between nations, environmental differences can add to existing tensions and apprehensions, thereby perpetuating the general sense of insecurity that pervades interstate relations in the region;
- There is the potential – albeit small – for a generation for security relations in South Asia, based on the principles of mutual trust, harmony and cooperation rather than on legacies of distrust and dispute, to emerge there around the nexus of environment and security.

Fukuda-Parr (2003: 1-13) referred to these new threats to human security in the era of globalisation: a) global crime; b) human trafficking; c) instability and contagion in financial markets; d) labour market insecurities and threats to job security; e) spread of diseases; and f) conflicts within national borders. From this perspective, human security requires a strategy for better social protection. Alkire (2003: 15-39; 2004) pointed to the many different definitions of human security as: “a) safety from chronic threats such as hunger, disease and repression; b) protection from sudden and hurtful disruption in the patterns of daily life”; of the *Commission on Human Security* (2003) that focused on threats from both poverty and violence aiming: “to protect the vital core of all human lives in ways to enhance human freedoms and human fulfilment”, a goal that should be realised “by joint strategies of protection and empowerment.”

For the *International Commission on Intervention and State Sovereignty* (2001) in its report: *The Responsibility to Protect*, ‘human security’ meant: “their physical safety, their economic and social well-being, respect for their dignity and worth as human beings, and the protection of their human rights and fundamental freedoms,” For the Ministry of Foreign Affairs of Japan (2000; Shinoda 2007) human security “comprehensively covers all the menaces that threaten human survival, daily life, and dignity ... and strengthens efforts to confront these threats”, while for the Canadian Department for Foreign Affairs human security recognises “that lasting security cannot be achieved until people are protected from violent threats to their rights, safety or lives” (Alkire 2003: 30-31; McRae/ Hubert 2001; Mack 2004; Krause 2004).

Khagram, Clark and Raad (2003: 107-135) discussed both environmental threats (and their impacts on human survival, well-being and productivity) and environmental opportunities for human security. Environmental change can have direct and immediate effects on well-being and livelihoods, it can also impact on health, economic productivity and political instability.

Environmental threats can affect “individuals, families, communities, social organisations, identity groups (women, children), diasporas, governments and biological species”. Also, a single environmental threat “can have potentially adverse effects at multiple scales from the household to the planetary”. The effects (e.g. of climate change) can be both local and global, and they may impact today or in the future. On the other hand, environmental protection, cooperation and peace-making can improve human security.

9.2. Towards a Human-centred Environmental Security Concept

What poses a threat, challenge, vulnerability or risk to human security, that is to the individual human being or to humankind, depends on whether a ‘wide’ or a ‘narrow concept is chosen focusing on ‘freedom from want’, ‘freedom from fear’ or ‘freedom from hazard impact’. GECHS (1999) argued that the following types of environmental change affect *human security*: a) natural disasters, b) cumulative changes or slow-onset changes, c) accidental disruptions or industrial accidents, d) development projects, and e) conflict and warfare.

Barnett (2001: 127) considered a “human-centred environmental security concept” as justified on moral and pragmatic grounds “because addressing the welfare of the most disadvantaged means addressing many of the future sources of environmental degradation” by protecting the rights of the most vulnerable members of society and by enhancing “welfare, peace and justice” on which legitimate institutions should be built which are required “for human and environmental security” (Conca 1994, 1994a). Najam (2003: 1-24) proposed an environment and security discussion around two sources of insecurity (violent conflict and social eruption), and to focus the analysis on state centred and society centred activities. This leads him to four outcomes: 1) *interstate war* (state centred violent conflict); 2) *civil strife* (society centred violent conflict); 3) *institutional failure* (state centred social disruption); and 4) *human insecurity* (as a society centred social disruption).

9.3. Human Security as a Key Theme of the United Nations University System

While UNDP (1994) has introduced the human security concept to the UN system, and UNESCO has initiated many regional debates on it and thus contributed to spreading the concept, the *United Nations University* has analysed human security as a new scientific concept in many projects and publications. In its Strategic Plan 2000, UNU (2000: 7-9) referred to ‘human security’ as one of four powerful ideas for the new millennium, besides ‘development as freedom’, ‘risk societies’, and ‘comprehensive development’. This plan contrasted ‘national security’ as military defence of the nation state, with ‘human security’ emphasising “the individual’s well being.” Accordingly, human security refers to *freedom from* “want, hunger, natural disasters, attack, torture” etc. and *freedom to* “the capacity and opportunity that allows each human being to enjoy life to the fullest, starting from the basic human needs of clean water, food, shelter and education.”

The *UNU Strategic Plan 2002* stressed the “need for a stronger global governance system” focusing on “the maintenance of world peace, human security and development as well as the sustainable management of the world’s resources” to provide “global public goods, such as financial stability and environmental security, and fights ‘global public bads’ such as organized crime, terrorism, and illegal trade.” Repeatedly, the UNU called for developing the dual goals of “human security and development.”

The *UNU Annual Report 2003* pointed to the work on “the roots of human, national, regional, and international security threats, and on the role of civil society and state, regional and international actors in the provision of security.” One project on “refugees and forced displacement” focused on the interrelationship between international security, human

vulnerability and the State by contrasting the ‘traditional security approach’ with the ‘human security perspective’. The resulting book on the nexus between security concerns and migration flows calls for a “reappraisal of the legal, political, normative, institutional and conceptual frameworks through which the international community addresses refugees and displacement.” Two related projects discussed human flows in Northeast Asia, and issues of poverty, international migration and asylum (UNU-WIDER 2004).

9.4. UNU-EHS and ‘Freedom from Hazard Impact’

The *United Nations University Institute on Environment and Human Security* (UNU-EHS) in Bonn was established in late 2003 to develop the environmental dimension of human security further. From its perspective, the improvement of human security, particularly the improvement of the environmental dimension of human security, requires a better understanding of the various forms of vulnerability in different societies, their economies and of the environmental conditions for hazards of natural origin as well as with regard to creeping environmental degradation that impact on the vulnerability and the hazard components. Bogardi and Brauch (2005) suggested that human security should rest on three pillars reflecting the corresponding pillars of sustainable development:

- ‘Freedom from want’ (economic and societal security dimensions) by enhancing the implementation of the millennium development goals through active development and environment policies aiming at sustainable development by reducing *social vulnerability* through poverty eradication programmes (UNDP 1994; CHS 2003);
- ‘freedom from fear’ (political and military security dimension) by reducing the probability that people become victims of violence and conflict and by enhancing human rights;
- ‘freedom from hazard impacts’ (environmental security dimension) by reducing vulnerability of societies confronted with natural and human-induced hazards and by enhancing resilience, disaster preparedness and response (UNU-EHS 2005; Brauch 2005).

A major conceptual and policy task for UNU-EHS (2004) could be to develop the third component of the human security concept, and to contribute to the implementation of this goal through capacity-building for early warning, developing vulnerability indicators, and vulnerability mapping. While human induced and natural hazards cannot be prevented, the impact of these tragic events can be reduced by both measures of early warning and better disaster preparedness. ‘Freedom from hazard impact’ would imply that people can mobilise their resources to address sustainable development goals rather than remain in the vicious cycle of the survival dilemma (Brauch 2004). To achieve this goal requires four hazard-specific policies and a combination of technical, organisational and political measures in case of:

- *Slow-onset hazards*: sea-level rise and temperature increase due to climate change require a) long-term strategies for *reducing greenhouse gas emissions*, b) measures of *adaptation* (dams in affected areas), and c) *mitigation* (restriction of housing in coastal areas);
- *Rapid-onset hydro-meteorological hazards*: Climate change has contributed to an increase of extreme weather events. This requires *disaster preparedness* (education, training, infrastructure) and *disaster response* on the national and international level. Different early warning systems are needed for storms (early warning centres, infrastructure), floods (vulnerability mapping), forest fires (monitoring from space and plains), and droughts (precipitation monitoring from satellites);
- *Rapid-onset geophysical hazards*: earthquakes, tsunamis, volcanic eruptions and their possible extreme consequences require improved early warning systems (closer cooperation among seismic and volcanic research centres, tsunami early warning systems), better

disaster preparedness (vulnerability mapping), improved national and international disaster response and clear guidelines for post hazard reconstruction activities;

- *Human induced disasters*: technical (malfunctioning of technical systems, collapse of buildings, dams), industrial (e.g. chemical industry, nuclear reactors) and traffic accidents (road, railway, ships, airplanes etc.) as well as *intentional malicious acts* by states in war (attacking objects containing dangerous forces, dams, energy and chemical plants) and by non-state societal (terrorists) and economic (organised crime) actors or a combination of these.

‘Human security as freedom from hazard impact’ is achieved when people who are vulnerable to and at risk of these manifold environmental hazards and disasters (floods, landslides, and drought) that are often intensified by other associated societal threats (poverty), challenges (food insecurity), vulnerabilities and risks (improper housing in highly vulnerable flood-prone and coastal areas) are better warned of impending hazards, prepared and protected against these impacts and are empowered to prepare themselves effectively to cope with the ‘survival dilemma’ (Brauch 2000, 2004, 2005). Such extreme events often pose for the most vulnerable three ‘no-win’ alternatives: a) to die, b) to be forced to migrate, or c) to struggle for their own survival and that of their community.

The concept of human security is closely related to ‘vulnerability’, the latent threat that some dimensions of human insecurity could manifest themselves in crises and disasters. UNU-EHS in its initial phase focuses on the *response* to floods and droughts aiming at ‘freedom from hazard impacts’ by reducing vulnerability and enhancing the coping capabilities of societies confronted with environmental and human induced hazards. The level of risk they pose in different locations, the vulnerability of societies to them and the response capabilities have generally worsened (Bogardi 2004a, 2004b; Bogardi/Birkmann 2004).

While hazards and vulnerabilities lead to a direct deterioration of human security, especially for those segments of a society with low coping capacities, strategies to reduce environmental, economic and societal vulnerability by environmental, economic and social policies and measures and to improve coping capacities (by disaster preparedness, management and response) will contribute to reducing the risks for different strata of the society and thus improve their human security.

During the last 30 years evidence has pointed to a marked growth in the frequency and magnitude of natural hazards and their economic consequences (Munich Re 2000; IPCC 2001; UNISDR 2004; UNDP 2004). The statistical and political evidence will underline the necessity to study and document the environmental, economic and social vulnerabilities and thus also the environmental dimension of human security that can only be achieved through a dynamic equilibrium between humankind and its surroundings.

In the perspective of UNU-EHS, the concept of human security focuses on ‘threats’ that endanger the lives and livelihoods of individuals and communities, including human induced environmental degradation patterns. Safeguarding and improving human security requires a better understanding of many interrelated social, political, institutional, economic, cultural, technological and environmental variables. Deterioration of these factors amplifies the impacts of environmental change and their superposition with the consequences of extreme events when they occur.

The UNU-EHS has been established to improve the knowledge base for the assessment of vulnerability and the coping capacity of societies facing natural and human-induced hazards, in a changing and often deteriorating environment. UNU-EHS aims to improve the understanding of cause and effect relationships and to offer options to help reduce the vulnerabi-

lities of societies. Interdisciplinary science-based and human-centred, the institute will support policy and decision makers with authoritative research and information within this mandate.

9.5. Human Security Threats, Challenges, Vulnerability and Risks

From a human security perspective many threats, challenges, vulnerabilities and risks exist for the major referent: the individual human being or humankind in contrast to the state in prevailing national security concepts. From a human security perspective all five security dimensions and also sectoral security concepts may be analysed. Human security is infringed by underdevelopment ('want'), conflicts and human rights violations ('fear') and by hazards and disasters. These three pillars of human insecurity pose threats, challenges, vulnerabilities and risks to different aspects of human security and call for three different but interrelated strategies for coping and overcoming human insecurity for which different national and international organisations and means are needed.

Table 11: Compilation of Human Security Threats, Challenges, Vulnerabilities, Risks

Dangers for Human Security Posed by	Human Security			
	Threats to	Challenges for	Vulnerabilities to	Risks for
Underdevelopment ('freedom of want')	<ul style="list-style-type: none"> – Human wellbeing – human health – life expectancy 	<ul style="list-style-type: none"> – social safety nets – human development – food security 	<ul style="list-style-type: none"> – economic crisis and shocks – communicable diseases 	those most vulnerable (socially, economically) and exposed to underdevelopment, violence and hazards: <ul style="list-style-type: none"> – peasants, – poor – women, – children, – old people – indigenous – minorities.
Conflicts and human rights violations ('freedom from fear')	<ul style="list-style-type: none"> – Human life and personal safety (from wars) – identity, values 	<ul style="list-style-type: none"> – feeling secure in a community – human rights – democracy 	<ul style="list-style-type: none"> – war lords, criminals – corrupt regime, ruler – human rights abuses, violations 	
Hazards and disasters ('freedom from hazard impact')	<ul style="list-style-type: none"> – Livelihood – survival – settlements, urban slums 	<ul style="list-style-type: none"> – sustainable development – food security 	<ul style="list-style-type: none"> – exposed population – livelihoods, habitat – disease (cholera, dengue, malaria, etc.) 	

All three pillars of human insecurity (want, fear, hazards) also impact on health insecurity. Chen and Narasimhan (2003: 3-12) in their human security agenda for global health argued that three factors: 1) conflicts and humanitarian emergencies; 2) infectious crisis (HIV/AIDS); and 3) impoverishment impact on illness, injury, disability, death posing critical pervasive threats to the vital core of human security: a) human survival and flourishing; b) livelihood; and c) dignity. For Leaning, Arie, Holleufer and Bruderlein (2003: 13-30) measuring human security focuses on a) the fulfilment of basic needs; and b) home, community and future.

10. Conclusions and Research and Policy Suggestions

This survey reviewed the scientific concepts dealing with four basic insecurity dangers, namely 'threats', 'challenges', 'vulnerabilities' and 'risks'. These concepts have been used in several scientific disciplines (political science, economics, psychology, sociology, international law) and research communities focusing on global environmental change, sustainable development, climate change, as well as on hazards and disasters.

This survey of scientific concepts is a part of a scientific effort to reconceptualise security, its five dimensions, its levels of analyses since the global turn of 1989 and 1990 (global security order) and since the terrorist attack on the United States of 11 September 2001. Since then in many countries a widening of security has occurred away from the narrow military, political and economic security of the Cold War towards a wider scope that has also included societal and environmental dimensions, but also a return to a narrow Hobbesian primarily military security concept. In the 21st century, with regard to the thinking on security and sovereignty, three different contexts have coexisted:

- a) the *pre-modern* world where state sovereignty and the ability to rule the whole state territory has ceased to exist in so-called failing, or failed states many of them having fallen victim to internal conflicts or civil wars where war lords control part of the country and major resources;
- b) the *modern* world where the defence of the Westphalian state and of its population and territory against undue outside intervention and intrusion is a major goal of 'national security' policies; and
- c) the *postmodern* world where a progressive internal de-borderisation (e.g. within the EU) combined with a tightening of external borders has occurred and both integration and globalisation processes have reduced the classical *domaine réservé* of the nation state.

In addition, since the early 1990s, influenced by the concerns for 'human development' (UNDP 1994), a shift in the referent object of the security concept has taken place from an exclusive focus on the 'nation state' to 'human beings and humankind' or from the prevailing 'national security' to 'human security'. Since the late 1990s two parallel debates have taken place on 'environmental security' and on 'human security' both in the social sciences and within international organisations that have also been stimulated by several international commissions and high-level expert panels.

Within the UN system and within UNU, UNU-EHS has started to advance the development of the 'environmental dimension of human security' (Bogardi/Brauch 2005; Brauch 2005) trying to bring both scientific and political communities together, and to develop the conceptual ideas of those further (Barnett 2001) who have called for a 'human centred environmental security' concept. For the dual empirical focus of UNU-EHS on the impacts of floods in urban centres and on problems of desertification and drought, conceptualising the 'environmental dimension of human security' implies that the victims (human beings and humankind), their social, economic, environmental and political vulnerabilities and risks become the central object of analysis and not the state, its institutions and governance structures, strategies, policies and measures.

Since the early 1990s, the scientific and conceptual debate on security concepts has proliferated from the OECD countries to other regions and to developing countries that have been major victims of the interaction between humankind and global environmental change, and where the need to overcome 'want' (development) and 'fear' (cooperation, disarmament, human rights) as well as to reduce the 'impact of hazards' is most severe. This survey of the

conceptual thinking on *security threats, challenges, vulnerabilities and risks* has stressed a dual need for:

- *more precise definitions*, to the greatest extent possible, to reach a consensus on these concepts especially with regard to practical political measures to achieve the agreed goals; and
- *a systematisation of the threats, challenges, vulnerabilities and risks* for military, diplomatic, economic, societal, environmental as well as human, food, health, energy, livelihood, and gender security.

However, the latter is influenced by the political mind-set of policy-makers and by the scientific worldview, disciplinary and theoretical approaches and models, as well as by the economic status and by the geographic location of the country concerned but also by the systems of rule and the level of participation of civil society in local, provincial and national decision making.

For the hazard community, the concepts of vulnerability and risk have been crucial in a wider context that moves from the purely physical aspects of natural hazards to an assessment and ranking of vulnerability through indicators where the environmental (air, soil, water, ecosystems, natural resources), the economic (development, resources), the *social* (coping capacities), but also the *political* (governance, participation) contexts are fully taken into account.

A major conceptual and policy task for UNU-EHS (2004) could be to develop a component of the human security concept which may be called ‘freedom from hazard impact’, and to contribute to the implementation of this goal through capacity-building for early warning, developing vulnerability indicators, and vulnerability mapping.

While human-induced and natural hazards cannot be prevented, the impact of tragic events – like the Tsunami of 26 December 2004 in the Indian Ocean – can be reduced primarily by measures of early warning and better disaster preparedness that address the ‘social vulnerability’ of those most exposed to both hydro-meteorological and geophysical hazards. The third suggested pillar of the environmental dimension of human security aiming at ‘freedom from hazard impact’ would imply that people are empowered to mobilise and use their resources to address sustainable development goals rather than remain in the vicious cycle of a ‘survival dilemma’ (Brauch 2004).

‘Human security’ as freedom from hazard impact is achieved when people who are vulnerable to these manifold environmental hazards and disasters (floods, landslides, and drought) often intensified by other associated societal threats (poverty), challenges (food insecurity), vulnerabilities and risks (improper housing in highly vulnerable flood-prone and coastal areas) are better warned of impending hazards, prepared and protected against these impacts and are empowered to prepare themselves effectively to cope with the ‘survival dilemma’.

Abbreviations

ABM	Antiballistic Missile System
AFES-PRESS	<i>Peace Research and European Security Studies</i>
BBC-model	Model developed by Bogardi, Birkmann and Cardona
BCPR	Bureau for Crisis Prevention and Recovery of UNDP
CASA	College of Associated Scientists and Advisers of UNU-EHS
CBD	Convention on Biological Diversity
CHS	Commission on Human Security
CRED	Centre for Research on Epidemiology of Disasters in Louvain, Belgium
CVA	Capabilities and Vulnerability Analysis
DAC	Development Assistance Committee of OECD
DEPI	Disaster Management Branch of UNEP
DEWA	UNEP's Division of Early Warning and Assessment
DFID	Department for International Development in the UK
DIVERSITAS	International Programme on Biodiversity Science
DRI	Disaster Risk Index
DTIE	UNEP's Ozone Action Programme
EB	Encyclopaedia Britannica
ENVSEC	Environment Security Initiative of OSCE, UNEP, UNDP and NATO
EOLSS	Encyclopaedia of Life Support Systems of UNESCO
EU	European Union
FAO	Food and Agricultural Organization
FEMA	U.S. Federal Emergency Management Agency
GDP	Gross Domestic Product
GEC	Global Environmental Change
GECHS	Global Environmental Change and Human Security
GHG	Greenhouse Gases
GLASOD	Human Induced Soil Degradation
GNP	Gross National Product
GRAVITY	Global Risk and Vulnerability Index
GRID	Global Resource Information Database
HDI	Human Development Index
HESP	Human and Environmental Security and Peace
HSN	Human Security Network
HUGE	Human, Gender and Environmental Security Concept (developed by Ú. Oswald)
I = PAT formula	Impact = Population – Affluence – Technology
IEA	International Energy Agency
IFRC	International Federation of the Red Cross
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimensions Programme
IPCC	Intergovernmental Panel on Climate Change

ISDR	International Strategy for Disaster Reduction of the United Nations
MDG	Millennium Development Goals
MERCOSUR	<i>Mercado Común del Cono Sur</i> – Common Market in the South of Latin America
NATO	North Atlantic Treaty Organisation
NGO	Nongovernmental Organisation
NPR	Nuclear Posture Review Report
NRC	U.S. National Research Council
OCHA	Office for the Coordination of Humanitarian Affairs of the UN
OECD	Organisation for Economic Co-operation and Development
OSCE	Organization for Security and Co-operation in Europe
PAR	Pressure and Release Model
PCAU	UNEP's Post Conflict Assessment Unit
PRIO	International Peace Research Institute Oslo
QDR	Quadrennial Defense Review Report
$R = H + V$	Risk as hazard + vulnerability
$R = P \times L$	Risk as the product of probability and loss
SIPRI	Stockholm International Peace Research Institute
SL	Sustainable Livelihood
TAR	Third Assessment Report of the IPCC published in 2001
TERI	Tata Energy and Resources Institute in New Delhi
U.S.	United States of America
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNDRO	United Nations Disaster Relief Coordinator
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations International Strategy for Disaster Reduction
UNU- EHS	United Nations University, Institute for Environment and Human Security
UNU	United Nations University
VA	Vulnerability Assessment
VCA	Vulnerability and Capacity Assessment
WBGU	Scientific Advisory Council on Global Environment Issues in Germany
WCDR	World Conference on Disaster Reduction
WCRP	World Climate Research Programme
WEU	Western European Union
WG II	Working Group II of the IPCC
WHO	World Health Organization
WTO	World Trade Organization
WVR	World Vulnerability Report

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

UNU-EHS reflects the overall mission of UNU: 'Advancing Knowledge for Human Security and Development'.

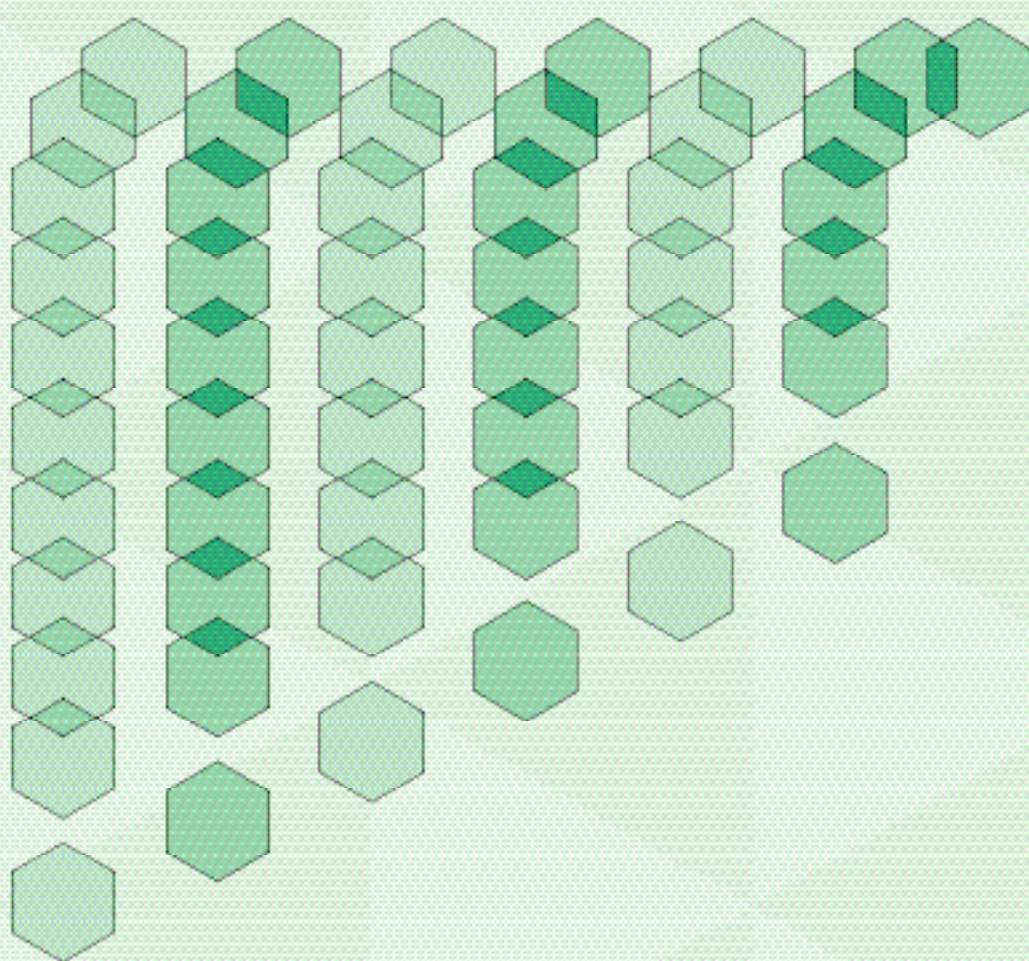
UNU-EHS explores threats to human security from environmental degradation, unsustainable land use practices, and from natural and man-made hazards. The Institute spearheads UNU's research and capacity building activities in the broad interdisciplinary field of 'risk and vulnerability'.

Within this framework UNU-EHS will:

- **Foster better understanding of forces and processes of environmental degradations and their influence on hazard magnitude and frequency and subsequent disasters;**
- **Explore links between different hazard events as well as creeping processes such as climate change, soil erosion and their impact on the inherent risk and vulnerability;**
- **Contribute to development, testing and verification of vulnerability indicators, and investigate relationships between risks, vulnerability and coping capacity.**

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