

THE MODEL: GLOBAL ENVIRONMENTAL CHANGE, POLITICAL PROCESS AND EXTREME OUTCOMES

Hans Günter Brauch

Otto-Suhr Institute for Political Science, Free University of Berlin, Germany

Keywords: Bächler, environment, environmental conflict, environmental degradation, environmental peacemaking, environmental scarcity, environmental security, environmental stress, extreme weather events, global environmental change, GECHS, Homer-Dixon, human and environmental security and peace (HESP) project, IPCC, reconceptualizing security, security dilemma, survival dilemma, syndromes of global change, water.

Contents

1. Introduction
 2. The Model
 3. Natural Causes: Global Environmental Change
 4. Global and Socio-economic Contexts
 5. Impacts: Environmental Scarcity, Degradation and Stress
 6. Extreme and Fatal Outcomes
 7. Societal Consequences of Extreme Outcomes
 8. Political Process: Responding to Societal Consequences of Extreme Outcomes
 9. Conclusions for Policy-relevant Research Needs
- Acknowledgements
Glossary
Bibliography
Biographical Sketch

Summary

This chapter tries to illustrate the complete linkages between both natural or *ecospheric* (air, water, soil) and *anthropogenic* (population, rural (food/agriculture) and urban (urbanization, pollution, health etc.) factors of global environmental change, effects of socio-economic interaction resulting in environmental scarcity, degradation and stress that may under specific global and national conditions cause, contribute or trigger extreme and or fatal outcomes such as natural or human-induced environmental hazards, or forces migrations that interact and in some cases may lead to national and in the very worst case also international crises. These crises could result in disasters or even conflicts, that may be avoided and prevented, or escalate to different forms of violence, from protests, riots to civil strife and only in the most extreme and least likely case to civil or international wars. Crucial for the specific outcome is the national and international political process (response) resulting from the interaction of the institutions representing the state, society and the economy, as well as both traditional and modern scientific knowledge.

This contribution first outlines the *political and scientific context* (1), it then illustrates the *model*, especially the pressure side represented by a “survival hexagon” and the

potential extreme outcomes with a pentagon of conflict constellations (2), before the natural causes of *global environmental change* (3), the *global and socio-economic contexts* (4), the *impacts* (environmental scarcity, degradation and stress) (5), the extreme and fatal *outcomes* of both (6) and their *societal consequences* (7), as well as the *political process* (8) are being reviewed and conclusions are drawn for policy-relevant research needs (9). The paper proposes a third pillar of human security besides “freedom from want” and “freedom from fear”, i.e. “freedom from hazard impact”.

1. Introduction

During the first three phases of social science research on environment and security (see *Four Phases of Research on Environment and Security*) the focus has been primarily on the linkage between factors causing, triggering or contributing to environmental stress that have resulted in violent environmental conflicts. The contributions of the research on global environmental change (GEC) have often been ignored in research on environmental security (ES), while the global change community often ignored the research results on environmental security. The Global Environmental Change and Human Security (GECHS) project within the International Human Dimensions Program (IHDP) has tried to link both communities addressing primarily issues of human security. After two decades of ES and GEC research a mainstreaming of both research communities, its theoretical models and empirical results is needed.

Instead of more sophisticated specialization and thus fragmentation of the research community, more integration is needed in order to achieve policy relevant results that can contribute to policies dealing with the causes of GEC (by adaptation and mitigation process), their socio-economic impacts that are also influenced by a dual global and national political and economic context and that often result in environmental and political stress that may result in extreme or fatal (often also human-induced) natural hazards as well as violent conflicts.

Since 1990, the fourth major—and first peaceful—global turn since the French Revolution has occurred (after the systems of Vienna (1815), Versailles (1919) and Yalta (1945) that were all the result of major (French and Russian) revolutions and wars (Napoleonic, World Wars I, II). This fourth global turn ended the bipolar period in world politics that was determined by nuclear deterrence and doctrines of mutual assured destruction. Both the nature of war and the thinking on security (see *Reconceptualising Security From National to Environmental and Human Security*) have changed. The number and intensity of internal, domestic and civil wars has increased and this has triggered new efforts to focus on these new wars and their ethnic, religious, economic, societal and environmental causes.

Since the global turn, with the global summits in Rio de Janeiro (1992) and Johannesburg (2002) new environmental regimes (climate, biodiversity, desertification) and forms of transnational governance have evolved that require full governmental support both with regard to the evolution of the principles, norms, rules, and decision routines of these regimes (Krasner 1983) and their national implementation to achieve regime effectiveness.

In this chapter the author (building on Brauch 2003) develops a model further that links three causal patterns (global environmental change; national and international political and economic) or contexts with socio-political consequences, such as environmental scarcity, degradation and stress that may cause, trigger, or influence both extreme (human-induced) and sometimes fatal outcomes, such as natural hazards and disasters as well as societal and political violence. Whether the outcome of extreme events is fatal and fosters violence often depends on the political process, i.e. the interaction between the state, societal and economic actors and processes where the application of knowledge has often made a difference with regard to the severity of the impact, the number of human fatalities and economic losses. To improve the resilience of the affected populations requires improved processes and means of early warning of both natural hazards and conflicts but also improved strategies of crisis management to prevent that “critical” situations erupting into violence. On the international level, this requires a better integration of foreign, security, development and environmental strategies and means at the national and international level.

2. The Model

Between the earth system (ecosphere) and the human or social systems (anthroposphere) complex interactions exist within and between both systems and processes that have been simplified and visualized by Brauch (2003; Bogardi/Brauch 2005) in a “survival hexagon” (Figure 1) of three resource challenges.

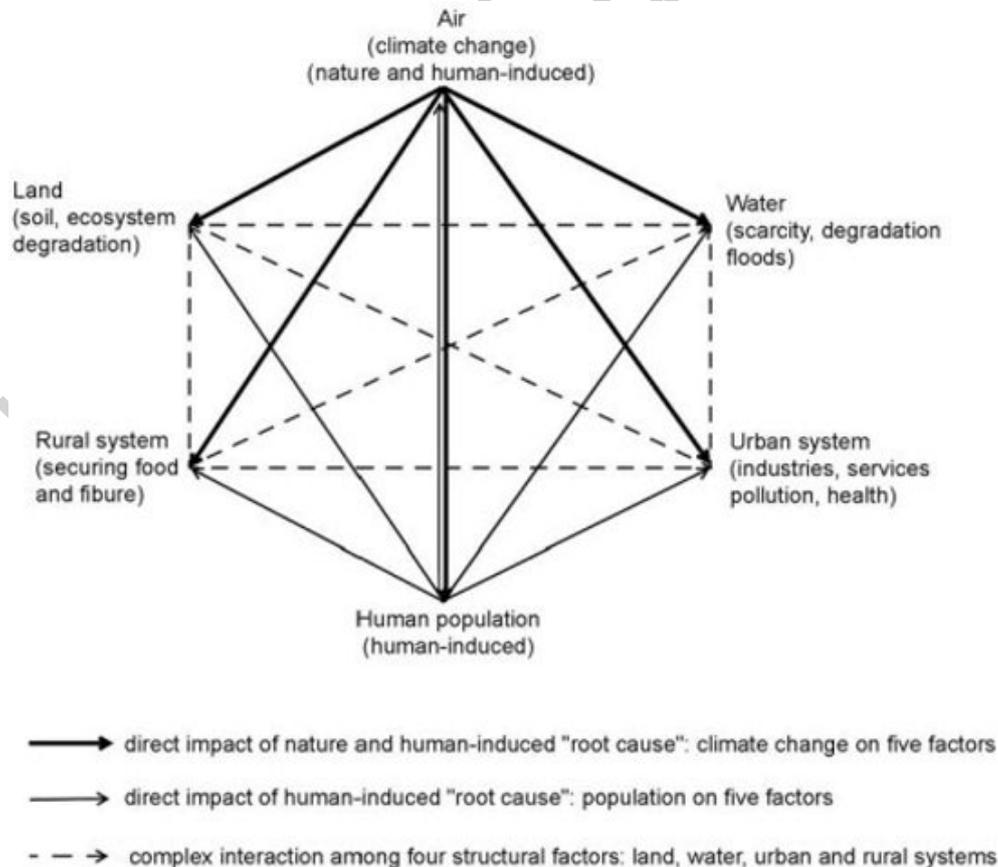


Figure 1. Survival hexagon of six resource and social factors (after Brauch, 2003)

There are three environmental resources:

- *Air* (weather, climate change),
- *Land* (soil erosion, deforestation, desertification, ecosystem degradation) and
- *Water* (scarcity, degradation)

and three social challenges:

- *Human population* (growth or decline due to changing patterns of fertility, ageing and migration, changes of its value systems),
- *Urban systems* (services, industries, pollution, health) and
- *Rural systems* (securing food and fibre).

Within the global change community, the three basic elements for life: land, water and air have been a primary object of research of three GEC programs: a) the International Geosphere-Biosphere Program (IGBP), the World Climate Research Program (WCRP), and DIVERSITAS, while the fourth the International Human Dimensions Program (IHDP) has covered the remaining three factors (population, rural and urban systems).

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 international and national context into account, in environmental stress that may lead – under certain socio-economic and national and international conditions – to severe domestic economic and political crises and in the worst case to violent outcomes. These may be resolved, prevented or avoided by domestic policy decisions and diplomatic efforts. Whether environmental stress results in extreme and potentially violent outcomes depends on the *political process* (i.e. the interaction between state, society and economy but also on how knowledge is used for adaptation and mitigation purposes) and on the structures of governance (Figure 2).

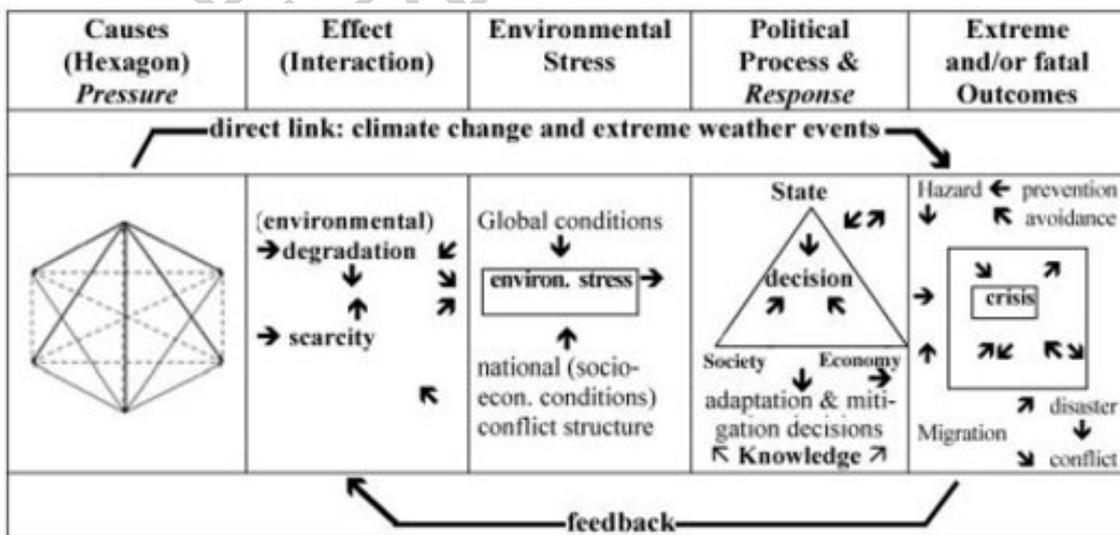


Figure 2: Causes and Outcomes of Environmental Stress based on Brauch (2003: 126)

The IPCC (2001) has pointed to a direct causal connection between climate change and an increase in number and intensity of hydro-meteorological extreme weather events that cause hazards (storms, floods, drought) and often human disasters. Climate change has already increased and will further increase the probability and intensity of such extreme weather events and thus increase internal displacements, transboundary or intercontinental migration.

The six factors of GEC have caused, triggered, intensified or contributed to a scarcity of renewable environmental resources (water, fertile land, agricultural products and food). Population growth has increased the demand for food and where the scarcity of land and water was severe, the increase in demand forced many to overexploit fragile soils, thus intensifying processes of environmental degradation. These processes have already resulted in an increase in environmental and political stress.

The outcome of these processes differ due to the specific global and national economic and political contexts and prevailing socio-economic conditions. The number of human fatalities is higher in those regions where the vulnerability to these environmental challenges is the highest due to poverty and where there is hardly any warning, disaster preparedness and only low resilience. With regard to the extreme and sometimes fatal outcomes of societal processes leading to environmental and political stress factors, the two major outcomes (hazards and migration) closely interact.

On 26 December 2004, the earthquake and tsunami in the Indian Ocean has illustrated this vicious circle. The tsunami made millions in Indonesia, Sri Lanka, India and in Thailand homeless and forced them to leave their destroyed houses and villages for rescue camps. The tsunami also affected two conflict prone regions, e.g. in Aceh in Northern Sumatra and in Sri Lanka between the Singhalese and Tamil populations. In extreme weather events (storms, floods, droughts) those countries with high greenhouse gas emissions per person which have primarily caused global warming and the primary victims (e.g. Bangladesh, Caribbean) differ what poses problems of global equity.

In some cases, hazards (floods and drought) that resulted in internal displacement and transboundary migrations (e.g. in the 1970s and 1980s in the Sahel region, or after the cyclones in Bangladesh in 1970 and 1991) that have contributed, triggered or caused domestic crises that may escalate to different forms of low-level violence. In other cases, after the earthquakes in Turkey and Greece in 1999, the subsequent earthquake diplomacy eased bilateral relations. Thus, the nature- and human-induced factors of GEC may contribute, trigger or intensify ethnic, religious or political conflicts but they may also lead to environmental peacemaking.

At least four different socio-economic scenarios of the complex interplay of the above six structural causes have occurred: domestic societal conflicts; resource and border conflicts (Klare 2001); regional violence with implications for the security perception of the North and militarization of non-military causes of conflicts.

The political process on the inter- and transnational level generates at least five outcomes: affluence (North) or poverty (South) that produce two inputs for human mobility and migration (due to pull or push factors) that may result in tensions and

crises that may lead either to a successful resolution by cooperation or in conflict at the 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 3).

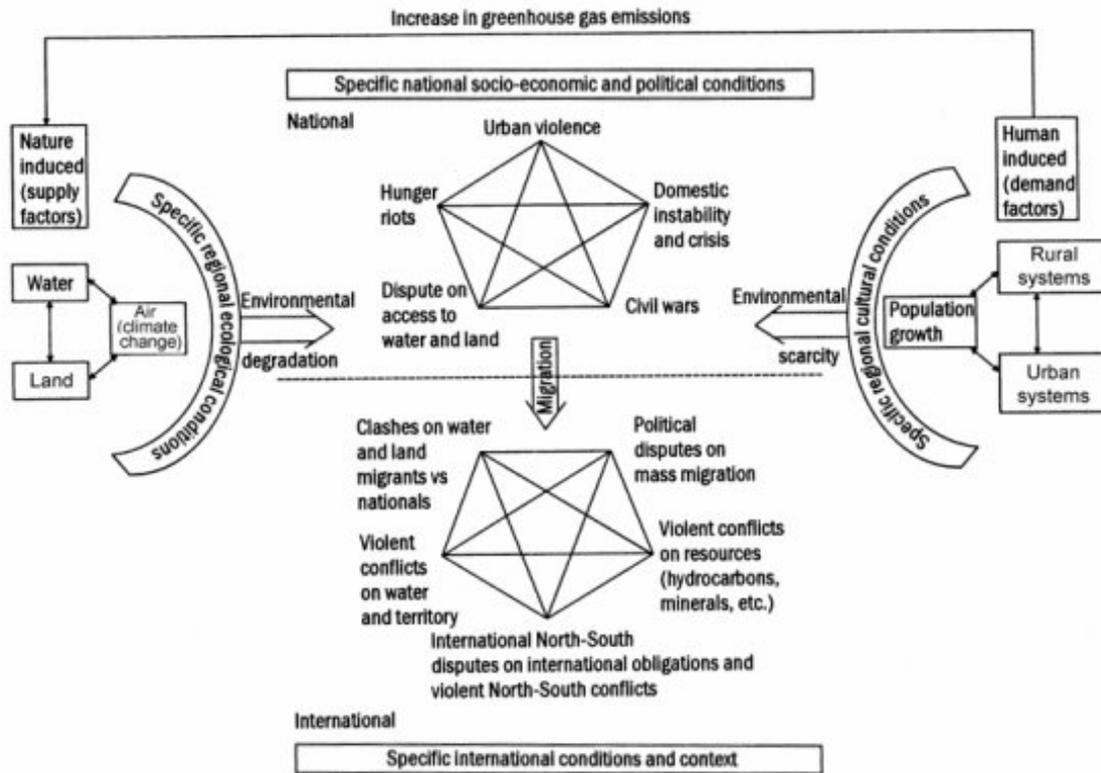


Figure 3. Pentagon of conflict constellations (after Brauch 2003: 130).

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. No violent domestic and international conflict has been caused alone by environmental degradation and population growth. The key question is how do the highly complex processes of global environmental change (GEC) affect humankind and individuals. They may thus be analysed from a human security rather than a national security perspective (see *Reconceptualising Security From National to Environmental and Human Security*). Do they pose new threats, challenges, vulnerabilities and risks for security [see: *The Model: Global Environmental Change, Political Process and Extreme Outcomes*] and survival for the human species (Brauch 2005, 2005a), and how should these challenges be addressed pro-actively to reduce the vulnerability to and impact of extreme events, and to contain an escalation of violence?

3. Natural Causes: Global Environmental Change

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* (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: “study of the relationship between organisms and their environment” (1998, IV: 354). *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 a cause of this change and often also a victim.

The interactions among the six factors of the hexagon (Table 1) may be either linear, exponential or chaotic resulting in abrupt climate change that “have repeatedly affected much or all of the earth, locally reaching as much as 10°C change in 10 years”. According to the NRC (2002: 14) study:

an abrupt climate change occurs when the climate system is forced to cross some thresholds, triggering a transition to a new state at a rate determined by the climate system itself and faster than the cause. Chaotic processes in the climate system may allow the cause of such an abrupt climate change to be undetectably small.

In the past abrupt and persistent droughts “caused social disruption for Mayan culture and ... abrupt climate shifts played a role in the collapse of Mesopotamian civilization”. Climate changes have contributed to the century of migrations that resulted in the collapse of the Roman Empire and in major population movements from Central Asia (Huns, Mongols) in the 9th and 13th centuries (Brown 2001). Both gradual (IPCC 1990, 1996, 2001) and abrupt global and regional climate change (NRC 2002) had observable ecological and economic impacts in the past on which there is no systematic research (NRC 2002: 121; Street/Glantz 2000). These impacts may be analyzed for individual or comparative case studies, as well as with new modeling efforts, or they may be simulated and projected into the future. The NRC (2002: 159) study suggested:

New modeling efforts that integrate geophysical, ecological, and social-science analyses should be developed to focus on investigating abrupt climate changes. ... Modeling should be used to generate scenarios of abrupt climate change with high spatial and temporal resolution for assessing impacts and testing possible adaptations. Enhanced, dedicated computational resources will be required for such modeling. ... Because of the strength of existing infrastructure and institutions, the United States and other wealthy nations are likely to cope with the effects of abrupt climate change more easily than poorer countries. ...

Steffen et al. (2004: 203) discussed the consequences of GEC in the Earth System for human well-being for the sufficiency and quality of food, water resources, air quality, and an environment conducive to human health. However, the impacts differ for many parts of the world due to the interaction of “particular biophysical and socio-economic processes typical of a given region”. This IGBP study considers “the concept of vulnerability...a useful framework within which to study the consequences of global change for human societies”. The authors conclude in their call for earth systems science and global sustainability that:

Much of the current understanding remains at the hypothesis stage, triggering

tantalizing ideas about how the Earth System operates, but lacking confirmation. ... The Earth System has moved well outside the range of natural variability exhibited over the last half million years at least. The nature of changes now occurring simultaneously in the global environment, their magnitudes and rates, are unprecedented in human history and probably in the history of the planet. ... The Earth is now operating in a no-analogue state. ... It is much more difficult to discern the implications of the changes. They are cascading through the Earth's environment in ways that are difficult to understand and often impossible to predict. Surprises abound...[These] changes...require societies to develop a multitude of creative responses and adaptation strategies. The results of the research on GEC has been ignored in many social science studies on environmental security. The social science research has focused too narrowly on the linkage between environmental scarcity, degradation, stress and on potential and real violent outcomes.

4. Global and Socio-economic Contexts

Whether, how and to what extent human-induced changes in the Earth System result in environmental and political stress depends both on the global economic and political as well as on the national socio-economic context, the specific conditions and conflict structure, on the society as well as on cultural and religious values and traditions. The higher the GDP per capita, the higher the position of a country on the human development index, the more affluent a country and society is the less severe the impacts of environmental scarcity and degradation will be. Nevertheless the economic damage and the insured loss due to extreme weather events and other natural disasters may be much higher than in those countries where the population cannot afford insurances. Where the financial resources exist, adaptation and mitigation strategies can be initiated to prevent that years of extreme environmental stress lead to political stress that may instigate violent societal responses. Thus, the empirical studies on environmental security can hardly be detached from the status of economic development and from socio-cultural factors of the country concerned.

Thus, country-specific strategies of sustainable development are needed that address the global causes of climate change by drastic constraints and reductions of global greenhouse gases, as well as the regional and local causes of soil erosion, deforestation and desertification. While the tsunami of 26 December 2004 has triggered many promises for disaster relief and response, the readiness to address the causes of climate change at the roots in the countries that contribute most, and to contribute to development assistance projects that enhance disaster preparedness and insist in their inclusion in development plans and strategies has been less articulate.

While repeated droughts and storms cannot be prevented, their socio-economic impact and the loss of lives have been reduced significantly in most OECD countries, and they should also be reduced in those countries where highly vulnerable populations are confronted with a survival dilemma (Brauch 2004, 2007). Thus, the third pillar for achieving human security should not only require “freedom from want” (underdevelopment) and “freedom from fear” (violence, overcoming civil strife) but also “freedom from hazard impact” (Brauch 2005).

-
-
-

TO ACCESS ALL THE 26 PAGES OF THIS CHAPTER,
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

Additional bibliographic references (also other than in English) not included in this list can be obtained from:

Brauch, Hans Günter, (2005a). *Threats, Challenges, Vulnerabilities and Risks of the Environmental Dimension of Human Security, Intersections*, UNU-EHS Policy Brief (Bonn: UNU-EHS). [This free report may be accessed free of charge at: <http://www.ehs.unu.edu/index.php?action=overview&cat=17&menu=36>]. Hard covers may be ordered by Email from: roberts@ehs.unu.edu].

Brauch, H.G. (2005). *Environment and Human Security: "Towards Freedom from Hazards Impacts", Intersections*, UNU-EHS Policy Brief (Bonn: UNU-EHS). [This free report may be accessed at: <http://www.ehs.unu.edu/index.php?action=overview&cat=16&menu=35>].

Brauch, H.G.; Liotta, P.H; Marquina, A.; Rogers, P.; Selim, M. El-Sayed (Eds.): *Security and Environment in the Mediterranean. Conceptualising Security and Environmental Conflicts*. Berlin-Heidelberg, Germany: Springer, 1003-1089. [This book has been donated to more than 200 libraries in 91 countries. A list of the depository libraries may be found at: http://www.afes-press-books.de/html/book_aid_project.htm].

Selected and commented references referred to in the text:

Bächler G. (1999). *Violence Through Environmental Discrimination*. Dordrecht: Kluwer. [Case study on Rwanda focusing on the links between environmental degradation and conflict]

Bächler G. (1998). "Why Environmental Transformation Causes Violence: A Synthesis", in: *Environmental Change and Security Project Report*, Issue 4, Spring. Washington: Woodrow Wilson Center, 24-44. [Summary of the research conducted by the Swiss ENCOP project on the linkages between environmental stress and violence]

Black R. (2001). *Environmental refugees: myth or reality?* New Issues in Refugee Research, Working Paper No. 34. Falmer: University of Sussex, CDE [Critical analysis of the concept environmental refugee]

Bogardi J.; Brauch, H.G, 2005: "Global Environmental Change: A Challenge for Human Security – Defining and conceptualising the environmental dimension of human security", in: Rechkemmer A. (Ed.): *UNEO – Towards an International Environment Organization – Approaches to a sustainable reform of global environmental governance* Baden-Baden: Nomos, 2005. [This contribution conceptualizes human security in light of global environmental change and suggests as a third pillar of human security: freedom from hazard impacts]

Brauch H.G. (2000-2001). "Environmental Degradation as Root Causes of Migration: Desertification and Climate Change. Long-Term Causes of Migration from North Africa to Europe", in: Friedrich, Peter; Jutila, Sakari (Eds.): *Policies of Regional Competition*. Schriften zur öffentlichen Verwaltung und öffentlichen Wirtschaft, Vol. 161 (Baden-Baden: Nomos, 2000/2001): 102-138 [Study on environmental degradation as causes of migration from North Africa to Europe].

Brauch H.G. (2002). Climate Change, Environmental Stress and Conflict - AFES-PRESS Report for the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, in: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Ed.): *Climate Change and Conflict. Can climate change impacts increase conflict potentials? What is the relevance of this issue for the inter-*

national process on climate change? Berlin, Germany: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 9-112; see <<http://www.bmu.de/english/download/files/clim ges.pdf>>. [Contract study for the German federal environment ministry on the linkages between climate change and potentially conflictive impacts in some of the most affected regions focusing on Bangladesh, Egypt, Mexico and the Mediterranean region]

Brauch H.G. (2003). Security and Environment Linkages in the Mediterranean: Three Phases of Research on Human and Environmental Security and Peace, in: Brauch, H.G.; Liotta, P.H; Marquina, A.; Rogers, P.; Selim, M. El-Sayed (Eds.): *Security and Environment in the Mediterranean. Conceptualising Security and Environmental Conflicts*. Berlin-Heidelberg, Germany: Springer, 35-143. [This text offers an introduction to the research on environment and security issues since the 1980's with a special geographical focus on the Mediterranean]

Brauch H.G. (2004). "From a Hobbesian Security to a Grotian Survival Dilemma", 40th Anniversary Conference of IPRA, Peace and Conflict in a Time of Globalisation, Sopron, Hungary, 5-9 July, see at: <http://www.afes-press.de/pdf/Sopron_Survival%20Dilemma.pdf>. [This presentation suggests the concept of a survival dilemma for environment-security linkages to complement the security dilemma dealing with peace and security linkages]

Brecher M. (1993): *Crises in World Politics. Theory and Reality* (Oxford – New York: Pergamon Press). [Political science review and assessment of the theoretical and empirical crisis research]

Brown N. (2001): *History and Climate Change. A Eurocentric Perspective* (London – New York: Routledge). [A historical analysis on the impacts of climate change on national disasters triggering major population movements]

Clark W.C.; Jäger J.; Eijndhoven J. van, (2001). "Managing Global Environmental Change: An Introduction to the Volume", in: The Social Learning Group: *Learning to Manage Global Environmental Risks. Vol. 1: A Comparative History of Social Responses to Climate Change, Ozone Depletion, and Acid Rain*. Cambridge, MA – London: MIT Press: 1-20. [Conceptual introduction to political efforts to manage global environmental change with a focus on climate change, ozone depletion, and acid rain]

Cohen R. (1995). *Cambridge Survey of World Migration*. Cambridge – New York: Cambridge University Press. [Good overview of the research on migration until early 1990s]

Dalby S. (2002). "Security and Ecology in the Age of Globalization", in: Woodrow Wilson International Center for Scholars (Ed.): *Environmental Change & Security Project Report*, Issue No. 8 (Summer): 95-108. []

Gleditsch N.P.; Wallensteen P.; Eriksson M.; Sollenberg M.; Strand H. 2002: "Armed Conflict 1946–99: A New Dataset", in: *Journal of Peace Research*, vol. 39, No. 5 (September): 615-638. [Statistical analysis of armed conflicts between 1946-1999 in all parts of the globe]

Gleick P.H. (1989). "Climate change and international politics: Problems facing developing countries", in: *Ambio*, 18,6: 333-339. [Impacts global warming on freshwater availability and food productivity for poorer nations]

Haas P.M. (1990). *Saving the Mediterranean. The Politics of International Environmental Cooperation* (New York: Columbia University Press). [Major study on epistemic communities promoting environmental cooperation around the Mediterranean]

Hall P.A. (1993). "Policy Paradigms, Social Learning, and the State: The case of Economic Policy Making in England", in: *Comparative Politics*, 25 (4): 275-296. [He argues that learning involves changes in the higher-order concepts including norms, goals and overall interpretative frameworks or new policy paradigms]

Hauge W. and Ellingsen, T. (1998). "Beyond Environmental Scarcity: Causal Pathways to Conflict", in: *Journal of Peace Research*, 35,3 (May): 299–317. [They integrated environmental degradation into a model of civil war]

Homer-Dixon T.F. (1999). *Environment, Scarcity, and Violence* (Princeton, NJ: Princeton University Press). [Study summarizing the theoretical and empirical results of the second phase of environmental security of the Toronto school]

Homer-Dixon T.F.; Blitt, J. (Eds., 1998). *Ecoviolence: Links Among Environment, Population, and*

Security. Oxford: Rowman & Littlefield. [This volume contains case studies on environment and security linkages conducted by the Toronto group during the 1990s]

IPCC (2001). *Climate Change 2001. Impacts, Adaptation and Vulnerability. Mitigation* (Cambridge – New York: Cambridge University Press). [One of four volumes of the third assessment report of the Intergovernmental Panel on –climate Change, the first assessment was in 1990 and the second in 1995, the fourth is due in 2006/2007]

Kawashima Y.; Akino S. (2001). “Climate Change and Security: Regional Conflict as a New Dimension of Impact of the Climate Change”, in: *Global Environmental Research*, 5,1: 33-43. [The article discusses possible longer-term security implications of climate change]

Klare M.T. (2001). *Resource Wars: The New Landscape of Global Conflict* (New York: Henry Holt and Metropolitan Books). [Basic study on resource conflicts and wars in the 20th century and its relevance for the future]

Krasner S. (Ed., 1983). *International Regimes* (Ithaca –London: Cornell University Press). [The study that introduced the concept of international regimes and launched regime analysis in international security, economic and environmental relations]

Kriesberg L. (1996). “Conflict, Social”, in: Kuper, Adam; Kuper, Jessica (Eds.): *The Social Science Encyclopedia* (London – New York: Routledge): 122-125. [This brief lexicon article argued on social conflict argues that conflict permeates all aspects of human interaction and social structure]

Mack A. (2002). “Civil War: Academic Research and the Policy Community”, in: *Journal of Peace Research*, vol. 39, No. 5 (September): 515-525. [The article argues that each conflict and war database has used different definitions of conflicts that prevent systematic comparisons]

Munn T. (2002). Preface to the Encyclopedia of Global Environmental Change, in: Munn, T. (Ed.): *Encyclopedia of Global Environmental Change*, 5 volumes (Chichester, UK: John Wiley): xi-xv. [Encyclopedia is a major topical source of information on global environmental change; review at: < http://www.afes-press.de/pdf/HGB_environmental.pdf >]

Myers N. (2002a). “Environmental Refugees”, in: Munn, Ted (Ed.): *Encyclopedia of Global Environmental Change*, vol. 4: Tolba, Mostafa K. (Ed.): *Responding to Global Environmental Change* (Chichester, UK: John Wiley): 214-218. [Analysis of the concept of environmental refugee and of the empirical evidence from a Neo-Malthusian perspective]

National Research Council (2002). *Abrupt Climate Change. Inevitable Surprises*. Washington. D.C.: National Academy Press. [A review by the U.S. National Research Council on the possibility that incremental climate change may result in a turning of the Gulf Stream due to changes in the salinity of the North Atlantic Ocean]

OECD, 2001: *Trends in International Migration. SOPEMI 2001* (Paris: OECD). [Major statistical study by OECD on international migration to OECD countries]

Steffen, W.; Sanderson, A., Tyson, P.D., Jäger, J., Matson, P.A., Moore III, B., Oldfield, F., Richardson, K., Schellnhuber, H.J., Turner II, B.L., Wasson, R.J. (2004). *Global Change and the Earth System. A Planet under Pressure. The IGBP Series*. Berlin-Heidelberg-New York: Springer-Verlag. [Major study of the International Geosphere-Biosphere Programme (IGBP) on global environmental change]

Stripple J. (2002). “Climate Change as a Security Issue”, in: Redclift, M.; Page, E. (Eds.): *Human Security and the Environment: International Comparisons* (Cheltenham: Edward Elgar, forthcoming) [Conceptualization of climate change as a security issue]

Swain A. (1996). “Environmental migration and conflict dynamics: focus on developing regions”, in: *Third World Quarterly*, vol. 17, No. 5: 959-973. [Conceptual analysis on environmental migration]

UNFPA (2002). *People, Poverty and Possibilities. The State of World Population 2001* (New York: UNFPA). [Study by the UN Fund for Population]

UNHCR; IOM; RPG (1996). *Environmentally-Induced Population Displacements and Environmental Impacts Resulting from Mass Migration*. International Symposium, Geneva, 12 – 14 April 1996 (Geneva: International Organisation for Migration with United Nations High Commissioner for Refugees and Refugee Policy Group). [Report of a symposium of three international agencies that did not adopt the

concept of environmental refugees]

United States Committee for Refugees (2001). *World Refugee Survey* (Washington, D.C.: United States Committee for Refugees). [Annual survey of the world refugee situation by a private U.S. NGO]

Wilson E.O. (1999). *Consilience. The Unity of Knowledge*. New York: Knopf. [Study by a renowned biologist calling for interdisciplinary cooperation among natural and social scientists on environmental issues]

Biographical Sketch

Hans Günter Brauch

Since 1999 PD Dr. habil. (equiv. of Adj. Prof.) at the Faculty of Political Science and Social Sciences, Free University of Berlin, since 2004, Member of the College of Associated Scientists and Advisers (CASA) of the UNU Institute on Environment and Human Security Institute (UNU-EHS), Bonn; since 1987 chairman of Peace Research and European Security Studies (AFES-PRESS). He was guest professor of international relations at the universities of Frankfurt on Main, Leipzig, Greifswald and at the Teachers Training College in Erfurt. From 1976-1989 he was research associate at Heidelberg and Stuttgart university, a research fellow at Harvard and Stanford University and he was also teaching at the universities of Darmstadt, Tübingen, Stuttgart and Heidelberg. He holds a Dr. phil. degree from Heidelberg University and a habilitation from Free University of Berlin.

He was a member of the Council of the International Peace Research Association (1992-1996), of the Board of Editors of UNESCO Yearbook on Peace and Conflict Studies (1990-). Membership: Institute for Strategic Studies, Pugwash Movement for Science and World Affairs, International Studies Association. He is editor of: *Hexagon Series* (Springer); *Frieden - Sicherheit - Umwelt - Klima - Energie* (Lit); *AFES-PRESS Report; Rüstungskontrolle aktuell*.

He has published more than 30 books and 20 research reports in English and German on issues of security policy, climate and energy issues and on the Mediterranean. Books on this topic: *Liberalisation of the Energy Market for Electricity and Gas in the European Union: a Survey and implications for the Czech Republic* (2002); (Co-ed.); *Climate Change, Environmental Stress and Conflict* (2002): 9-112; lead editor of: *Security and Environment in the Mediterranean. Conceptualising Security and Environmental Conflicts* (2003); *Globalisation and Environmental Challenges: Reconceptualising Security in the 21st Century* (2006); *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts* (2007).