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Working Paper

Disasters and violence, 1946-1997: The link between the natural and the social environment

WZB Discussion Paper, No. P 98-302

Provided in Cooperation with:

WZB Berlin Social Science Center

Suggested Citation: Eberwein, Wolf-Dieter; Chojnacki, Sven (1998) : Disasters and violence, 1946-1997: The link between the natural and the social environment, WZB Discussion Paper, No. P 98-302, Wissenschaftszentrum Berlin für Sozialforschung (WZB), Berlin

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P 98 - 302

**Disasters and Violence, 1946-1997
The link between the natural
and the social environment**

von

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August 1998

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Eberwein, Wolf-Dieter; Chojnacki, Sven: Disasters and Violence, 1946-1997. The link between the natural and the social environment.. Discussion Paper FS-98-302. Berlin : Wissenschaftszentrum, Berlin, 1998.

URL: <http://bibliothek.wz-berlin.de/pdf/1998/p98-302.pdf>

This paper has been prepared for presentation in the Panel "The Politics of Humanitarian Aid" at the Third Pan-European International Relations Conference and Joint Meeting with the International Studies Association in Vienna, September 16-19, 1998. The paper is an enlarged and revised version that was originally presented at the IDNDR-Meeting in Potsdam, June 26, 1998. It is part of the current project "Die Politik der humanitären Hilfe", funded by the Deutsche Forschungsgemeinschaft.

Abstract

Disasters are not only random events. They are also the product of the interaction between man and nature on the one hand, the dynamics of collective action within and between societies on the other. These disasters are the field of activity of humanitarian organizations which have gained in importance over the last two decades. Not only has there been a considerable increase of disasters but the number of victims has grown dramatically due to human made disasters, in particular internal violence. In the following analysis a basic typology of disasters is developed, followed by the description of short- and long-term natural as well as human made disasters from 1946 to 1997, at the global, regional and national levels. Finally, the analysis shows that the hypothesis can not be refuted at this stage that there is a relationship between natural and human made disasters.

Zusammenfassung

Katastrophen sind keineswegs nur zufällige Ereignisse. Sie resultieren sowohl aus der Interaktion zwischen Mensch und Natur als auch aus der Dynamik kollektiven Verhaltens innerhalb wie zwischen Gesellschaften. Diese Katastrophen stellen das Tätigkeitsfeld der humanitären Hilfsorganisationen dar, die in den letzten zwei Dekaden zunehmend an Bedeutung gewonnen haben. Nicht nur ist die Zahl der Katastrophen insgesamt angestiegen, sondern darüber hinaus ist auch die Zahl der Opfer durch menschlich verursachte Katastrophen, insbesondere interne Gewalt, dramatisch angewachsen. In der nachfolgenden Analyse wird zunächst eine Typologie von Katastrophen entwickelt. Im Anschluß daran wird das Auftreten der kurz- und langfristigen menschlichen und natürlichen Katastrophen von 1946 bis 1997 beschrieben, global, regional und national. Abschließend wird gezeigt, daß die Hypothese derzeit nicht verworfen werden kann, daß ein Zusammenhang zwischen natürlichen und menschlich verursachten Katastrophen besteht.

Table of Contents

	page
Introduction	1
1. The Theoretical Framework.....	3
2. Disasters and Vulnerability	9
3. Data, Measurement and Methodology	17
4. Empirical Analysis	26
4.1. The international system level.....	26
4.2. The regional level.....	28
4.3. The state level.....	30
4.4. Linkages between natural and human made disasters ...	30
5. Summary, Conclusions and Outlook.....	31
Literature	48
 Appendix	
Figure 1: Disasters and Policy Areas.....	35
Figure 2: Disasters and Risks.....	35
Figure 3: CREDs Short-Term Disasters	36
Figure 4: CREDs Long-Term Disasters.....	36
Figure 5: Reported Damage in the CRED Database	37
Figure 6: Number of Injured Persons in the CRED Database	37
Figure 7: Number of Homeless Persons in the CRED Database	38
Figure 8: Trends in the Levels of Killed Persons	38
Figure 9: Civil Wars Begun and Under Way (COW).....	39
Figure 10: Militarized Interstate Disputes Begun.....	39

	page
Figure 11: Wars of the Third Kind and Interstate Wars (Holsti)	40
Figure 12: Civil War Trends since 1946 (Holsti, AKUF, and COW)....	40
Table 1: Disaster Typology.....	11
Table 2: Short-Term Disaster Events Operationalized	19
Table 3: Long-Term Disaster Events Operationalized.....	21
Table 4: Regions Defined.....	25
Table 5: Relational Properties of Disasters.....	41
Table 6: Regional Breakdown of Short-Term Disasters	42
Table 7: Regional Breakdown of Long-Term Disasters	42
Table 8: Regional Distribution of Major Disasters	43
Table 9: Regional Breakdown of Civil War Years and Military Interstate Disputes (Participations)	44
Table 10: Disaster Occurrence on the State Level.....	45
Table 11: Crosstabulation for Civil Wars and Disaster Types.....	46
Table 12: Crosstabulation for Militarized Interstate Disputes (MIDs) and Disaster Types	47

Introduction

With the International Decade for Natural Disaster Reduction the UN have expressed, as it says in the Yokohama Message from May 27 1994, "... deep concern for the continuing human suffering and disruption of development caused by natural disasters...". This decade long effort concentrates on natural disaster prevention, mitigation, preparedness and relief. In the public discussion, however, natural disasters are given much less attention than human catastrophes in general, complex emergencies in particular. Conventional wisdom suggests that such disasters are on the rise. That the concern is rising, seems to be true even though the data reveal a much less clear-cut picture¹. These human disasters are related to genocide, human rights violations, refugee flows within and across borders, hunger and disease. If, as the Yokohama declaration rightly acknowledges, "disaster response alone is not sufficient, as it yields only temporary results at a very high cost", both prevention and reconstruction should therefore be accorded greater attention. These goals, however, can only be achieved or the means to achieve them be improved if the causes of disasters, the context in which they occur, and the resulting consequences, are better known.

Against this background, a broader perspective on disasters research seems necessary. As the International Federation of the Red Cross's (1993:13) points out, disasters are fundamentally socio-economic phenomena. If this is the case, neither natural nor human made, disasters and their causes as such are the central issue but rather the ability or inability of the political system or society to manage them properly. Specifically longer term disasters, either natural or human made, can lead to the breakdown of social order (i. e. in the case of famine). Human made disasters can even be identical with the breakdown of social order as in the case of civil wars. In the latter case, human behavior *is* the disaster. Disasters are thus, on the one hand, *triggering events* in the natural environment, whereas on the other they are identical with specific *interaction processes* taking place in the social and political environment. In both cases, large-scale human suffering and the consequences this entails for the states respectively the international system, constitute the core problem.

In the IDNDR-Report of the Deutsche Forschungsgemeinschaft "Natural Catastrophes and Catastrophe Prevention" (1993) the political dimension has been ignored. Only review chapters on the sociological as well as the psychological dimensions of disaster research are included. If disasters have social and psychological consequences we must assume by implication that they can have profound effects on the political systems un-

¹ See the details below

less the disaster itself remains insulated from politics and society at large. This omission is due to the fact that there is no "political disaster research" which fits the IDNDR approach. Humanitarian relief as such, directly tied to disasters, has thus far been largely ignored by political scientists with the exception of the French speaking research community in Europe (cf. among others Braumann, 1995).

Some societies are vulnerable with respect to natural disasters, others vulnerable with respect to human made disasters. Depending on the ability of societies to deal properly with these two seemingly distinct types of socio-economic phenomena, a central issue immediately arises: is there a linkage between the two? Two propositions are equally plausible: the greater the vulnerability of societies for natural disasters the greater their propensity for human made disasters. Alternatively: the greater the propensity of a society for human made disasters the greater the probability of natural disasters. Both relationships seem to be plausible. Assuming that such an interdependence relationship (or feedback-loop) exists, the follow-up issue is how communities and states deal with disasters internally and to what extent the international community, the states as well as non-state actors, will get involved or not. This particular issue opens the Pandora Box of the *raison d'être* and the functioning of the international relief system. Relief agencies, freed from the straitjacket of the Cold War (African Watch, 1994:3) are "expanding today in a void left by the contracting power of host governments and the declining political interest of Western powers" (op.cit.:6). This unbound humanitarianism (cf. African Watch, 1994) has had consequences which become more and more visible every day. Humanitarian action is increasingly taking place in an environment where violence prevails (cf. ECHO, 1998) which led to an unprecedented growth of nongovernmental actors who are major contractors of relief activities financed by official and private sources. As a consequence, the necessity of relief raises increasingly the issue of the states' responsibilities. First: is it a responsibility of the international community at all to provide humanitarian aid? Second, if so, is it the duty of the states to ensure that humanitarian aid is actually provided impartially and neutrally? And thirdly: does the international community have the responsibility to prevent, and if this is impossible, to interfere in disasters for humanitarian reasons in order to end the suffering, protecting both victims and relief workers?

Practically every major disaster is accompanied by relief operations even though to varying degrees. Often, neither relief nor reconstruction measures pose a major problem. In the case of large scale disasters, however, that hit vulnerable societies the relief operations take place in a political minefield. The mines may blow up or not, depending on the political context. Therefore, disasters have economic, social, political and psycho-

logical consequences, at the individual, the community, the state and the international system levels. Disasters management has to take these aspects into account, of which humanitarian aid is but one small element.

In the following paper a preliminary outline of the theoretical framework for the analysis of the dynamics of disasters, suffering and relief will be presented in order to justify why a general conceptual framework is necessary. We will then define disasters and present a first rudimentary classification. This involves two issues. One is to keep the causes of disasters, the disasters themselves, and their consequences separate. If this condition can not be met, the specific dynamics of disasters as fundamental socio-economic phenomena nor their consequences can meaningfully be analyzed. How these types of disasters are related to the varying degree of vulnerability of the societies affected will be then discussed by identifying different types of risks followed by the operational definitions of the disaster types included in our present data set. This comprehensive data set is now under construction and includes data collections that have been published elsewhere. For our descriptive and explanatory approach, the macro-level of analysis is adequate. Each disaster is treated as a finite event that has occurred in the past. For the purpose of prediction and prevention, however, the longer-term disasters have to be disaggregated in order to study their escalatory dynamics. Such an approach goes far beyond the reach of this paper. Preliminary descriptive results of the occurrence of disasters between 1946 and 1997, at the global, the regional, and the state level of analysis will then be presented. The empirical analysis will be rounded up with a preliminary study of the relationship between human made and natural disasters. This potential linkage has not, thus far, been analyzed systematically.

1. The Theoretical Framework

From a theoretical point of view, disasters unleash a complex interaction process between the natural environment and the social environment. This interaction process can be conceptualized from a variety of theoretical perspectives, three of which seem to be particularly important: the environment and security nexus, the development and disaster linkage, and, finally, the international relief system and disaster interconnection. The relief dimension is at the core: disasters lead almost automatically to a humanitarian response. The various actors of the international relief system are mobilized while at the same time they mobilize support for the victims. Both natural and human made disasters have security implications, within the state affected as well as for the international sys-

tern. Disasters may further exacerbate resource scarcity and/or involve violence, thereby raising the security issue. This is one dimension, which broadens the conceptual framework for disaster research. But there is still a third perspective, namely the implications of disasters for the development of a particular society. Depending on the severity of the disaster will the process of development either be interrupted or the developing society be thrown back in this process if disasters occur in conjunction with social and or political disruptions. In figure 1 these interdependencies are represented graphically in terms of overlapping circles. At the center is the disaster itself embedded in the international relief system and its various constituent actors. This area overlaps partially both with the security as well as with the developmental issue areas. The degree of overlap may vary from case to case, with each issue area being to some extent "autonomous", i. e. where interdependence may be absent.

Figure 1: Disasters and Policy Areas about here

In the scholarly discussion there still is disagreement whether the environmental issue is related to security at all. As the senior author has argued elsewhere (Eberwein, 1998; see also Diehl, 1998; Gleditsch, 1998) the environment has security implications if and only if there is a linkage to violence. Furthermore, a direct linkage between the environment and conflict is difficult to establish. Resource scarcity does not per se lead to conflict but rather the way how distributional or redistributional issues are perceived and resolved in a society. It is unquestionable that a linkage between disasters and the environment exists. Natural disasters do not occur absolutely randomly, but some causes can be traced back to anthropogenic sources (cf. for example the list in DFG). Disasters are related to the environmental degradation. If natural disasters exacerbate resource scarcities already prevailing in a society, conflict potential may accumulate. But it seems unlikely that resource scarcity alone will lead to violence, but rather overall dissatisfaction with the political performance, in short the lack of regime legitimacy (cf. Easton). The hypothesis seems plausible that the resource issue per will not be the dominant issue. Ironically, the case study by Percival and Homer-Dixon (1998) can be interpreted as lending support to this proposition. Environmental scarcity in South Africa has been a relevant contextual factor exacerbating existing conflicts, but not a direct cause. The theoretical and empirical challenge is to systematically identify potentially relevant paths that lead to conflict. If political violence erupts, the consequences may be destabilizing internally, if the problem is located within a given state (i. e. arable land), or in-

ternationally if the scarcity issue transcends borders (which is the case for water). Once this happens, national and international security are at stake.

With a few exceptions the environmental dimension has not, thus far, not been included in a systematic fashion in the analysis of intra- and inter-state conflicts (cf. Eberwein, 1998). The special issue of the *Journal of Peace Research* (Diehl, 1998) is a first attempt to study in some depth the linkage between inter-state conflict and environmental conditions. Conceptually, disasters have thus far been ignored as a relevant variable with the exception of complex emergencies, usually understood as ethnic or clan wars where the civilians are the primary targets and state organization has broken down (Harff/Gurr; 1997, Natsios, 1997). This is particularly striking if one considers the hypothesis that violence contributes to environmental degradation (Brock, 1992; Gleditsch, 1998) and that environmental degradation, to use Percival and Homer Dixon's terminology (1998:280) can simultaneously be supply-induced, demand induced and structurally induced. Thus, one would not just expect the probability of violence but also the probability of natural disasters to increase.

If environmental issues in general, disasters in particular are related to violent conflict, the security dimension comes directly into play. Buzan (1991) among others has argued that environmental issues are likely to represent threats to national and international security. Violent conflict has direct implications for national and international stability. In the case of disasters, including violence, states may decide to act or abstain from action on the basis of strategic calculations in terms of power and influence. The issue, however, is not that simple. The overlap with the humanitarian domain (what we call relief system in fig. 1) brings in an additional complication for states as utility maximizers. Disasters are related to suffering. Suffering is not just the tragic fate of a group of individuals, but also a challenge to a fundamental human rights norm, the right to life. Thus, how should states behave if human rights are violated or if genocide takes place? And what should they do if some states refuse relief assistance to be delivered? This were not necessarily an issue had not the states - or rather the "West" - since 1989 committed themselves increasingly to global human rights enforcement and democratization. Whether this is actually the case, is not fully clear. With respect to an increasing humanitarian commitment two contradictory explanations for this policy change exist. One is that humanitarianism is the veil used by governments behind which they hide their unwillingness to act politically. The other is that, freed from the cuffs of the cold war, humanitarian intervention into the domestic affairs of states where human catastrophes occur is not just a possibility but a moral necessity to protect human rights. In any event disasters lead to increasing tensions between the professed

adherence to humanitarian principles, human rights and democracy on the one hand, power and interests on the other.

If disasters overlap with the security domain, another one is equally relevant, namely development. It is obvious that disasters and relief are biased towards the South as the primary target or recipient. In this part of the world the potentially disruptive effects of disasters are the most likely. Development is considered as crucial for a process of state-and nation-building along the Western model. Thus far not too many of these new states were able to achieve statehood in the classical sense (cf. Holsti 1995; Jackson 1990). They are dependent upon development assistance the effect of which seems to be deceptive. Developmental research respectively policy (cf. BMZ, 1997) is increasingly concerned with the role of natural and human made disasters. In combination with the concept of sustainable development, some societies are more prone to human made disasters than others and at the same time generally more vulnerable to natural disasters. Therefore it comes as no surprise that the relief development linkage is gaining in prominence, both for practical as well as scientific reasons (among others, ECHO, 1998). Human suffering and humanitarian aid are seen as one aspect of the complex process of development and the formulation of an adequate overall development strategy. The central problem is whether and how relief and development are related. From a theoretical point of view, the underlying longer term causes which lead to the inability of the existing social systems to cope adequately with natural disasters and the prone-ness of these social systems to disruptive violence is crucial. Why in the past developmental strategies have failed or rather facilitated disruptive processes in combination with natural disasters (if at all) or in terms of complex emergencies is an open issue.

The problem with the security as well as the developmental perspective is that both conceptually approach relief operations from an instrumental perspective. From a security perspective, relief may be a palliative for the missing political will to take a firmer stance on human rights issues and their enforcement. By financing relief governments may buy themselves out of their political responsibilities. From the developmental perspective disasters and relief are but two disturbing elements in the overall process of economic, political and social change. The relief system perspective, in contrast, conceptualizes this particular domain as a policy field in its own right. (Eberwein, 1997a). The specific property of this particular policy issue area is that humanitarian aid is simultaneously an instrument as well as a goal. Humanitarian aid presupposes disasters. The humanitarian actors seem to assume that bringing relief is self-evident that needs no further justification. This is no longer the case because humanitarian is no longer unconditionally accepted as a goal in and by itself.

Looking at the functioning of humanitarian aid one problem is to what extent the uncontested moral principle upon which humanitarian aid rests, can actually be implemented in reality. Two dimensions are of theoretical and empirical interest. The one is directly related to what we have called disaster management in a broader sense. That is, does the international relief actually function in such a way that it achieves what it actually pretends to achieve: bringing relief in order to empower individuals, groups and states to recover again? Or do the operations of the relief system have unintended if not perverse effects in the sense that they become an asset for political factions in their power struggle? That is, do humanitarian organizations get trapped in political processes they are unable to control? The second theoretically and empirically important dimension whether and how the international relief system is related to the normative order of the interstate system. For the humanitarian organizations, representing a segment of civil society, to help the helpless is a moral duty. To this moral obligation corresponds the commitment by the community of states to human rights. From the states' perspective disasters can lead them to get trapped in their own humanitarian rhetoric or symbolic commitment to human rights. At the same time such a commitment automatically raises the fundamental issue of state sovereignty: After the end of World War II, the newly founded United Nations had sanctified the principle of nonintervention in the internal affairs. In recent times, however, we can observe a slow erosion of this principle (Bettati, 1995). Yet we are far from the situation where a fundamental change in the international system of global governance has occurred. These various political implications can only be understood once we know more about the causes and effects of the various disasters, their likelihood to occur, their immediate and longer term implications they have as a function of the context in which they take place as well as the behavior of the various actors involved.

By focusing on this specific intersection of the three distinct domains enumerated we are able to relate disasters both to the activities that go with them as well as their impact in political terms. The intersection is certainly not fixed but variable and depends on the specifics of each single case. Nevertheless, we assume that all of these individual cases do also share a number of commonalities that hold in general. This does not imply that we either argue for the construction of a comprehensive theory of disasters or that we suggest the need for a theory of humanitarian aid in narrow terms. We are pursuing instead a problem oriented bottom-up approach, starting with the disasters themselves and their basic correlates. At this point we are also developing our theoretical framework in greater detail. It consists of the following elements:

- a) the civil-society-state linkage and humanitarian aid,
- b) the policy-network concept, which looks at the international relief system and how the various actors are related, and
- c) the change in the international normative order, with particular reference to sovereignty and nonintervention.

The first theoretical approach identifies the interactions and influence relationships that exist between the two domains. The second tries to conceptualize the relief system in terms of cooperation, coordination but also competition among the humanitarian actors, governmental and nongovernmental. The third is centered around the notion of ideas (Goldstein/Keohane, 1993), in particular around those norms that are crucial for accomplishing adequately the humanitarian mission, which is not only relevant for the victims themselves but also for the credibility of the commitment to democracy and equity in the international system at large.

2. Disasters and Vulnerability

Disaster definitions abound. In the following we will use as a starting point two standard definitions, the one by the (former) Department of Humanitarian Affairs of the UN, the other by the International Federation of the Red Cross. The UN Department of Humanitarian Affairs (1992:3) defines disasters as "a serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of affected societies to cope using only its own resources". A slightly different definition is proposed by the International Federation of the Red Cross (IFRC, 1993:13): "Disasters combine two elements: events and vulnerable people. A disaster occurs when a disaster agent (the event) exposes the vulnerability of individuals and communities in such a way that their lives are directly threatened or sufficient harm has been done to their community's economic and social structures to undermine their ability to survive".

Both these definitions emphasize vulnerability as a central element of disasters which is certainly plausible. Vulnerability is a disposition either of the society in which a disaster could occur or of a potentially threatened group of individuals, should it actually take place. Vulnerability, according to the DHA, also refers to the consequences of disasters, once they have taken place, i. e. as those events which exceed the ability of societies to cope with them using only their own resources. That would imply that the annual hurricanes affecting among others parts of Florida would not count as disasters because the United States are able to cope with the damage. One could easily get around this shortcoming by arguing that the group of individuals or the community in the US directly affected by the hurricane are unable to cope with it had they to use only their own resources. The US at large, however, are absolutely capable of doing so, as a long experience with such disasters shows. But there are other countries which cannot cope at all with the disasters by themselves, in particular poor countries such as Bangladesh. Inability to cope with a situation refers not to the event but to the ability or inability of polity or a society at large to deal with the consequences.

Both definitions are too broad because they include too many aspects that should be kept separate: the vulnerability disposition, the direct impact of the disaster, and the consequences in terms of managing the damage that occurred. A very narrow definition of disaster seems therefore preferable in order to avoid any conceptual ambiguity. We suggest the following definition:

disasters are events which have a high probability to cause human and/or material losses in a given geographical area.

This is the most parsimonious definition we can think of. It limits disasters to a group of people, unable to avoid its immediate impact. The definition avoids any reference to the ability of a community or the society at large to deal with the consequences. It does also exclude any reference to the follow-up risks but rather relates a disaster to a geographical area, thereby identifying with it a specific community or, in more general terms, a specific group of people affected by it. The definition furthermore stresses the direct impact of a disaster in terms of the immediate material losses. These are damages to the infrastructure in a given geographical area, i. e. roads, factories, housing. Material losses may also relate to the environment but only under the condition that this damage is directly related to the disaster itself. When a chemical plant is destroyed by an explosion, for example, the damage to the environment may be the poisoning of the ground as was the case in Seveso. The follow-up damage for example in terms of the people getting affected later on should be excluded. The reason to for this restrictive definition is the intention avoid as much conceptual ambiguity as possible in the first place, which will make it easier to define the different attributes required to derive operational criteria for the events themselves.

Customarily, a distinction of two different attributes of the events themselves is made according to their source on the one hand, with respect to the time dimension on the other. By source we mean that a disaster can either occur through the behavior of people or in the natural environment. Whereas the German IDNDR-Committee (1998:1) makes a distinction into natural, technical and human-made disaster, we will just use the dichotomy *natural disasters*, such as earthquakes, and *human made disasters*, either technical catastrophes or conflicts. We include technical catastrophes because technology is a man-made invention predicated on the assumption of the ability to control it. The second fundamental distinction relates to the time dimension, the duration, of the disaster. Whereas a conflict evolves over time an earthquake occurs abruptly. We therefore use the *short-term* vs. the *long-term* categories for this second dimension of disasters.

Combining these two dimensions (origin and time) we get the simple two by two table 1 shown below. The two short-term categories pose no major problem. The typical type of short term natural disaster (type 1) would be an earthquake or a flooding. Unproblematic as well is the type 2 disaster which is man made and short term² such as a technical catastrophe, the explosion for example of a chemical plant or a nuclear power station. In these cases we can clearly separate the disaster itself from the longer-term effects.

² One could certainly argue, and quite rightly so, that there are also technical deficiencies at the root of such disasters. Yet, in the end, such risks can , this at least is what the specialists usually stress, be managed.

Table 1: Disaster Typology

	short-term	long-term
Natural Disasters	(1)	(3)
Human Made Disasters	(2)	(4)

Conceptually difficult to deal with are the longer-term disasters, both natural and human made. A typical type (3) disaster would be a drought, the end of which may be easier to identify as opposed to its beginning. As every drought comes to an end, no insurmountable problem should arise in assessing ex post the duration and the observed damage to people and the material environment. More complex is the issue with respect to a famine. One could consider it as a natural disaster. This was the official interpretation in the case of Ethiopia in the 80's or in Somalia. A drought is not logically equivalent with a famine because the latter can purposefully be created, (cf. Politics of hunger). In addition, human behavior, purposeful or not, will determine to some degree the number of victims. Even more complex is the typical type 4 disaster, originating in the social domain, violent conflicts in general, complex human emergencies in particular (cf. Natsios, 1997). Fighting and killing begins at some point, they also end or will end at some later point in time. Domestic as well as international conflicts begin with a triggering event, a crisis, either domestic or foreign (cf. Brecher/Wilkenfeld, 1997). But these crises can not be viewed as short-term disasters. They do not, and can not satisfy the definition given above. Furthermore, these short-term triggering events may or may not escalate to a full-scale long-term human made disaster.

Conceptually as well as methodologically the issue just mentioned raises serious problems if one maintains a disaster research perspective, including both natural as well as human made types of events. We subsume war under the general heading of disasters. In contrast, conflict research or a number of theoreticians in international relations consider war as a more or less rational instrument of statecraft. Both perspectives are legitimate. Whereas the disasters' perspective focuses primarily on human suffering, the conflict research focus is power politics among nations. Conceptually, the central issue is whether, and if so how, the different types of disasters are interrelated. If they were not, the typology suggested above would remain a simple classificatory exercise. We assume, however, that natural and human made disasters are interdependent, as will be argued below. The theoretical problem is therefore to formulate testable linkages.

Theoretically, the explanation of long-term disasters is the most difficult problem. As long as we remain at the macro-level of analysis, a perspective which is absolutely legitimate from a scientific point of view, one can explain the type (3) and (4) events in terms of contextual or structural properties. This strategy is commonly pursued in the study of domestic and international violence. The duration and the effects of such longer-term events can be assessed *ex post*.

Such a strategy has certainly its merits but, as Stuart Bremer (1996a:11) has argued, such a variance theory approach, as he calls it, postulates causality as the basis of explanation. The (structural and contextual) precursors are assumed to be necessary and sufficient conditions for the outcome, the long term disasters in our case. But even if these types of explanatory models are successful in terms of explained variance for example, we can not predict their occurrence. In the case of droughts, for example, the severity of the damage is directly related to purposeful human behavior. People threatened by the drought can either be left alone or their fate can be alleviated, if not completely, then at least to some extent by outside help. In the case of complex emergencies it makes no sense either to postulate that the original conflict or conflicts which later on led to the observed human disasters in terms of casualties, refugees and internally displaced persons, for example, have causally determined the final result. In other words, disaster management or social interaction is an integral element of the long-term disasters themselves which is not the case for the short-term events.

A possible methodological way out of this conceptual trap at the macro-level of analysis, where cause and effect become impossible to disentangle, is a process theory approach (Bremer, 1996a:11). In this case the basis of explanation is a probabilistic rearrangement of the events, where the time ordering among them is generally critical for the outcome. Such an approach requires the disaggregation of the long-term disasters, the macro-events, into discrete states and events. The transition from one state - or event - to the next is not necessarily assumed to be causal but probabilistic. If that is done, one could possibly predict the transition probability of an ongoing process to degenerate either in terms of fatalities (as in the case of droughts) or in terms of the escalation of an internal conflict across space and in time³. Such an approach may turn out to be much more problematic if it can be shown that there is no single path to a particular disaster⁴, or, put differently, that different combinations of conditions all have a certain probability to lead

³ An intermediary step has been suggested by Brecke (1997). Using a neuronal network approach, he identifies clusters of elements that go with specific types of conflicts. This static approach is an intermediary step towards a dynamic approach.

⁴ See the argument developed by Bremer (1996:20-25) which is anything but widely acknowledged by the conflict research community.

same result. If such an approach is chosen, the theoretical focus shifts from accounting for the outbreak, duration or type of macro-level disaster to the dynamics of the disaster over time, its management and the social and political interaction processes that go with it. In order to achieve the latter, the macro-events have to be available. This is why the macro-level of analysis is a necessary first step towards the study of the dynamic processes of disaster occurrence and evolution in time and space.

The disaster definition presented above has omitted vulnerability as a constitutive element. Vulnerability is a complex concept which carries with it a variety of connotations. It can be considered to be both a property of the disaster (occurrence and damage) or as the risk a particular community of people is exposed to should a disaster occur. The latter notion emphasizes the societal and/or political context. In "People, States, and Fear" Barry Buzan (1991) has elaborated the concept of vulnerability from the security perspective. He relates vulnerability to the concept of national security. In order to enhance security at the various levels (individual, societal, state) vulnerability has to be reduced. Vulnerability consists of two dimensions: power and socio-political cohesion (Buzan, 1991:114). Buzan thereby combines two analytically different dimensions, namely the internal conditions, determining domestic security and the likelihood of instability to occur, and the external dimension, the relationship between states. Threats perceived, real or imagined, are the linkage between vulnerability and power. How vulnerability and threats are related does not become fully clear. One can assume, however, that the leadership or the ruling elite of a vulnerable state is either more likely to be perceived as a threat (real or imagined) by others, or that this type of state tends to perceive its environment as a greater threat than others. This is due to the fact that vulnerable states, as Buzan (1991:113) argues, are internally poorly organized and at the same time lack sociopolitical cohesion. Thus, any potentially disruptive event can either lead to internal or external conflicts.

Poor state organization and the absence of sociopolitical cohesion have direct implications for the status of a state in the international system. If states were all like units, as Waltz (1979:95) argues, and if sovereignty were a fixed parameter in the international system, internal vulnerability would be irrelevant to our discussion. Sovereignty is a central norm in the international system with important behavioral implications. But this norm is subject to changing interpretations (Barkin/Cronin, 1994; Thompson, 1995) which implies behavioral change. This becomes directly clear when the two dimensions of sovereignty are fully appreciated. Following Jackson, sovereignty has both an internal and an external dimension. The classical definition was one of positive sovereignty, implying the legitimate monopoly of power internally, and the ability to maintain one's

own independence towards the other states in the international system. With the UN-Charter not only the norm of nonintervention in the domestic affairs of any state by any other was established, but also the guarantee for weak or vulnerable states that their sovereignty would be respected and guaranteed by others. For the former colonies their territorial integrity was thereby guaranteed by the major powers and with it negative sovereignty established. One could also argue that the inequality among states was thereby officially sanctioned by the UN-Charter.

Seen in this light vulnerability therefore corresponds to the degree to which states are in full command of their own sovereignty internally and externally. If we take Buzan's two dimensions of vulnerability, then internal vulnerability is related to the absence of sociopolitical cohesion, thus a low level of internal sovereignty. External vulnerability, in turn is related to the degree of weakness of a state in terms of its power status and therefore the degree to which a state is able to survive on its own in the international system. This very rough specification of vulnerability leads to two very basic propositions. The first is that disasters of any kind are more likely to have disruptive effects within vulnerable states. The second is that these disruptive effects in general relate to international stability, if looked at from the power perspective, or international governance. The effect is the same with respect to the norm of nonintervention, derived from a specific interpretation of sovereignty. If the international system operates under a purely power political regime, a particular disaster can lead to the intervention by third parties if it is considered as a threat to the balance of power. If, in contrast, the international system operates under a "democratic" type of regime, to put it in these simple terms, intervention may also occur but justified with human rights norms to safeguard people's lives. In more concrete terms, the issue boils down to a number of alternatives: if weak, vulnerable or failed, states face major disruptions some states can seize the opportunity to intervene directly or indirectly in pursuit of their own strategic interests. Or, if other states support the formally recognized government in power as the legitimate representative of a non-state in real terms, they may also help to fight the recognized regime's contenders. Or third parties could also opt to intervene unconditionally if chaos exists and genocide and human rights violations take place. Vulnerability therefore presents risks both internally as well as externally. The international community is therefore confronted with difficult choices. Depending on the way how sovereignty is practiced and understood, in conjunction with human rights can we expect that some states in the international system will pursue a more power political or more normatively based strategy when a vulnerable state actually experiences a disaster.

Vulnerability can therefore be interpreted in terms of the risks both for the individual states as well as the inter-state system that disasters will occur and that the occurrence of a specific disaster will have certain consequences. We can distinguish five different types of risks, all embedded in the general concept. From the narrow perspective of the disaster itself, vulnerability therefore implies that a group of people and/or a society is confronted with risks. These risks are not only related to the event itself but also to the context in which the event (or series of events) occurs. Each of them poses different problems, in reality as well as theoretically.

In the first place risk can be defined as the probability of an event to occur in a given geographical area, which we will simply call **risk₁**. This type of risk is an individual property of the disaster itself and thereby implied in the disaster definition proposed above.

Risk can further be defined as the probability of people to get injured or killed or lead to material losses if a disaster actually occurs. We will call this type of risk simply **risk₂**. In this case we identify a relational property of the disaster proper. Both these two risks are directly tied to the disaster itself in terms of given probabilities.

The third type of risk is defined as the probability of a society to manage a disaster on its own (or its inability to do so) so that the polity or society will not suffer from follow-up disruptive effects. We will call this type of risk simply **risk₃**. In this case we are dealing with a contextual property of a disaster.

For the macro-level of analysis these three definitions of risk are sufficient. They are unproblematic with respect to short term disasters, highly problematic with respect to long-term disasters because in that particular case **risk₃** implies another one that remains concealed at the macro-level of analysis actually.

At the micro-level, we can identify a fourth type of risk, we will call **risk₄**, the probability that the damage will increase over time or that a conflict will continue or escalate, once a certain event has taken place or begun, such as a drought, or a conflict that led to first violent outbreaks. To be precise, **risk₄** consists of a whole series of transition probabilities distributed along the time axis determining the final state of a process, a long-term disasters.

These different types of risks all point to a great degree of variability in terms of the consequences of a disaster as a function of the degree of vulnerability of a society.

If we were to assume that each disaster event were self contained, these four types of risks were sufficient. There is, however, a final aspect which needs to be taken into account as well. Vulnerability as nominally defined can have additional effects, namely that one disaster, once it has occurred carries with it the probability to trigger another one. This proposition remains to be specified and tested. Yet it is testable. We will call this type of risk **risk₅**.

How these types of risks are interrelated with respect to the two basic types of disasters, short- and long-term, is graphically represented in figure 2. As one can see, risk₃ can be disaggregated into risk₄ in that a process oriented approach would actually determine the probability of an event or a state at any given time to escalate with respect to intensity of a conflict for example, the human losses, or the ecological and/or material damage.

Figure 2: Disasters and Risks about here

This leads to a number of basic propositions, where the general assumption is that the vulnerability of a society is related to the probability of political and/or social disruptive effects. This leads us to formulate the following provisional hypotheses:

- (H1) the more vulnerable a society, the greater risk₁ for longer-term human-made disasters.
- (H2) Vulnerability of a society is unrelated to risk₂.
- (H3) The more vulnerable a society, the greater is risk₃.
- (H4) The more vulnerable a society, the greater risk₄.
- (H5) The more vulnerable a society, the greater risk₅.

Whereas hypotheses one to three and five can be explored at the macro-level of analysis, hypothesis four can only be tested at the micro-level. In the following section we will operationalize the types of disasters and identify the correlates of the risks as defined above.

3. Data, Measurement and Methodology

Having outlined the theoretical concept the next step consists in outlining the publicly available disaster data as well as in defining the spatial and temporal domain for the considered disasters. The time period under investigation is the post World-War II period, 1946-1997. The disasters' two dimensions, as mentioned above, are the origin (natural disasters vs. human made disasters) and their duration (short-term vs. long-term). We use five different data sources that identify the different types of disasters -both the non-conflictual events as well as violent conflicts - which will be discussed in detail below. Next to the disaster as discrete events we use the nation-state to identify the location of these events on an annual basis. Included in the data collection are all sovereign and internationally recognized states as defined by the standard Correlates of War (COW) rules - the so-called Small-Singer criteria for membership in the international system (for details see Small/Singer, 1982).⁵ This particular selection rule is appropriate in that sovereignty is an important norm in the international system in general, and a critical factor for relief activities which follow disasters in particular. Quantitatively, the number of states in the international system grew from approximately 70 states after the Second World War to nearly 190 in the present. Aggregating over time and space yields a population of 6.848 nation-years (or observations) for the post World War II period.

For most types of disasters, especially for both the short-term natural and short-term human made disasters, we rely on the dataset generated by the "Centre for Research on the Epidemiology of Disasters" (CRED) in Belgium. In its present version, the CRED database (called EM-DAT) identifies a comprehensive set of disasters - ranging from short-term events such as earthquakes to longer-term disasters such as famines. With a population of over 10.000 disaster events worldwide from 1946 to 1997 CRED provides the most comprehensive data collection that is - to our knowledge - publicly available.⁶ The data set includes the occurrence of a particular disaster event with information on the onset date (year, month and day), the type of disaster as well as additional characteristics such as fatality level or material losses.

The operational criteria for inclusion of a disaster in the data set are as follows: First, a disaster is included when at least 10 persons have been killed, or at least 100 have been

⁵ The recently updated COW membership list of sovereign and internationally recognized political entities with information about the composition of the Correlates of War Interstate System, 1816-1997, is available on the internet at <http://pss.la.psu.edu/intsys.html>.

⁶ For a brief discussion of the development of a database on disasters as well as for information about the CRED coding rules see Sapir/Misson (1991).

affected, or when an international appeal for assistance has been launched. Second, any event that has entailed the displacement of 2,000 or more persons is included. Finally, all chemical accidents are entered, even if there are no killed, injured or affected persons (see Sapir/Misson, 1991). According to our criteria, to be eligible for inclusion a CRED disaster must have taken place in an internationally recognized state as defined by the COW rules.⁷ The requirement of sovereignty excluded all disaster events occurring in non-recognized entities, for example Algeria during its struggle for independence from France. This reduces the total population of events to 9,450 for the 1946-1997 period. Removing the censored cases from our analysis, however, does not change this study's results appreciably.

The additional attributes included in the data set are (1) number of killed persons, (2) number of injured people, (3) affected persons, (4) number of homeless persons, and (5) material losses. These attributes are indicators of the intensity or severity of disasters. They raise, however, the issue of both validity and reliability. In terms of validity, it may be difficult to draw a precise borderline between those people killed by the disaster itself, and those that have been injured but died in a later phase. In terms of reliability it is important to note that an increase in the number of deaths reported does not necessarily mean that the severity of disasters is generally increasing. Rather the observed increase may simply be a consequence of better reporting and data collecting over the last years.

The category injured persons covers physical injury, trauma or illness requiring medical treatment as a direct result of disaster. We are not in a position to assess either the reliability or the validity of this specific attribute. The same is valid for the category of affected persons which relies only on estimates. The indicator homeless persons is defined as the observed number of people needing immediate assistance with shelter; included are displaced populations and refugees. Refugee flows as one of the consequences of a disaster may occur within states (internally displaced persons) or across borders. To assume that reliability and validity may be relatively high in the case of major disasters would be misleading, especially in the case of complex emergencies where such figures are part of the power game among the various factions (for example in the case of the Eritrean refugees). In the case of smaller disasters the data may simply be missing or unreliable. As it turns out, there are a lot of missing data for these attributes discussed thus far: of the 9,450 disasters about 30 percent have missing values for the category

⁷ If disasters affect more than one sovereign state, separate records are entered for each political entity. Disasters with an exclusive regional coding in the CRED data set were excluded since there is no information on specific countries.

killed persons, 70 percent for both people affected and people injured, and more than 85 percent for the number of homeless persons.

The data set also provides information on the material losses measured by the indicator estimated amount of damage. Unfortunately, this information is far from being precise with the exception when the damage is covered by reinsurance companies. The reinsurance companies do in fact report an exponential growth in the damages (cf. Allianz, Bericht). This should not lead one to ignore the absence of any standard methodology for the estimation of economic damages. There are more than 75 percent of the cases with missing values in the database which may not necessarily be interpreted as evidence that most of the disasters did not lead to economic damage.

Finally, we are confronted with the problem that material losses can occur immediately (short-term effect) but also in a protracted fashion over time. Short-term material losses, for example, may be related to the destruction of houses and cars, the blocking of roads and rails or to the breakdown of communication lines. The long-term impact, in contrast, could be declining agricultural production due to the spread of toxic materials released by a chemical explosion for example, lowered economic activity, or the loss of capital. Thus, indirect costs such as lower production, income losses, or forced unemployment may in some cases be greater than the immediate material damage (cf. OCHA, 1997) In addition, the severity of a disaster is not just a function of the disaster itself, but also of the vulnerability of a particular group or society which will increase with the recurring of disaster events over short periods (e.g. Bangladesh). All these problems are not unique but rather classic of empirical research of this kind.

Table 2: Short-Term Disaster Events Operationalized

Short-Term Natural	Short-Term Human Made
<p data-bbox="422 1758 671 1794">Geological Origin</p> <p data-bbox="331 1800 759 1877">Earthquake, Landslide, Volcano, Avalanche, Tsunami</p> <p data-bbox="341 1883 750 1919">Hydro-Meteorological Origin</p> <p data-bbox="296 1926 791 2042">Extreme Weather (Heat/Cold Waves), High Winds (Storm, Cyclone, Typhoon, Hurricane); Floods</p> <p data-bbox="469 2049 619 2085">Others: Fire</p>	<p data-bbox="1007 1800 1139 1832">Accidents</p> <p data-bbox="916 1839 1230 1874">(e.g. technical disasters)</p> <p data-bbox="943 1881 1203 1917">Chemical Accidents</p> <p data-bbox="927 1924 1219 1960">(e.g. nuclear disasters)</p>

Based on these general remarks we can now turn to the operationalization of the various types of short-term disasters, which are listed in table 2. On the short-term natural side, we can distinguish between disasters of hydro-meteorological origin and disasters of geological origin. Typhoons, hurricanes, cyclones, tornadoes and tropical storms are fundamental hydro-meteorological disasters which can be further disaggregated to the term "high winds" with respect to their similarities - a severe depression causing high and destructive winds. They are largely differentiated by their place of origin (hurricanes, for example, occur in the Caribbean, typhoons originate in the Pacific area). Other hydro-meteorological disasters such as flood disasters (river floods and coastal floods) may be seasonal - due to a regular annual rise and fall of water - or sudden (flash floods) as a result of storms or snow melt. Coastal floods can be caused by cyclones leading to storm surges or by off-shore earthquake-induced tidal waves (tsunamis). Earthquakes such as the Kobe disaster in Japan in 1995 are obviously sudden disasters of geological origin, though large scale events may be followed by aftershocks over several days or weeks (for example Northern Italy in 1997). Like earthquakes, volcanic disasters (e.g. Montserrat or Cape Verde) are also potentially destructive disasters of geological origin which trigger will be the eruption of molten rock or lava, ash or gases. Other short-term natural disasters such as landslides may be best considered as consequences of other short-term natural disasters such as earthquakes or floods. Tsunamis are seismic seawaves generated by a submarine earthquake, volcano or landslide. The category fire is somewhat ambiguous in that forest and bush fires can be caused by natural conditions (e.g. heat waves) as well as by deliberate or careless human-made activities. Because of the given pre-conditions in the natural environment, i.e. heat waves, it seems to be conceptual plausible to catch this category on the short-term natural side.

On the short-term human made disaster side, we focus on CRED's two categories of accidents (technical disasters, structural collapse) and chemical accidents (e.g. factory or mine explosions and nuclear accidents) which are obviously man-made and short-term. Their occurrence, however, can be, under certain conditions, related to the natural environment. In the case of technical disasters, for example, another short-term event may lead to its outbreak, i. e. an earthquake may lead to a technical disaster if, say, a chemical plant breaks down.

Moving on to the long-term disasters, we find environmental change or environmental scarcity combined with social conflicts (e.g. Percival and Homer-Dixon, 1998) as the basic characteristics for longer term disasters. Given the existing constraints on the availability of data concerning environmental scarcity

(land degradation, freshwater availability or annual change in forest cover) over long periods, we have decided to focus on a limited set of factors presented in Table 3 which satisfy our criteria for inclusion in the data set (i.e. the 1946-97 time span and the cross-national perspective). Once again CRED is our primary source for analyzing longer-term natural disasters.⁸ Included in the data set are epidemic diseases, insect infestations, and droughts. Droughts are periods of abnormally dry weather so that the lack of water causes a serious problem for food production etc. in a given area. In the case of epidemic diseases the typical starting point is a pathogen (virus, bacteria or parasite) which may be contextual related to social conditions such as overcrowding and poor housing, limited/poor food, lack of hygiene/clean water and limited access to treatment. These different types of long-term disasters are listed in Table 3.

Table 3: Long-Term Disaster Events Operationalized

Long-Term Natural	Long-Term Human Made
<p data-bbox="424 1133 676 1256">Epidemic Diseases, Insect Infestations, Droughts</p>	<p data-bbox="868 1133 1286 1308">Famine, Food Shortage (CRED) Interstate Conflicts (COW) Civil Wars (COW) Wars of the Third Kind (Holsti)</p>

On the long-term human made disasters side, we have decided to distinguish two different types of disasters. There are those reported disasters by CRED and those which are directly related to violence. The first class consists of food shortage and famines which are either caused by droughts or related to serious conflicts and partly created by counter-insurgency strategies of governments. The trigger to these types of disaster will be a point at which land is rendered unusable, cities are blocked or crops are requisitioned for armies. The second class of human made disasters is related to organized collective

⁸ Unfortunately, the CRED data set records only the occurrence of long-term disasters, but contains no information on the duration. For a sudden natural disaster the coding of duration is, of course, less important. Floods or cyclones are, relatively spoken, temporal limited and well monitored. But disasters of gradual onset are, by definition, long-term phenomena with different spatial-temporal dimensions and consequences. Thus, information on duration is quite important. On the other hand, it is still problematic to determine the exact day of occurrence of long-term disasters. Neither droughts nor famines occur on one particular and identifiable date.

violence, i.e. conflictual events (domestic and internationally). At this point we use the data that have been recently collected by the Correlates of War project. Additionally, we rely on conflict data compiled by Kalevi Holsti (1996) and by Klaus Jürgen Gantzel's "Hamburger Arbeitsgemeinschaft Kriegsursachenforschung" (Gantzel and Schwinghammer, 1994). At this stage, however, we have not yet cross-checked the data sources empirically nor analyzed in depth the different theoretical and conceptual foundations. This will be done in the near future. Such a systematic comparison is necessary given the great differences in the number of cases and types of conflicts each of these data sources reports, in particular the relative frequencies of internal and external violent conflicts (cf. Eberwein, 1997b).

We focus on conflictual events from two angles. First, conflicts and wars are according to our definition disasters, even though they are not looked at from this perspective within the conflict research community. Second, we are interested in the relationship between the natural environment and collective violence as a specific form or stage of social conflict. A conflict is simply defined as a sharp disagreement or collision of interest between two or more collective actors. The main criteria for inclusion of domestic and interstate conflicts are both collectivity and intensity (actual uses of force and wars with a defined minimum of deaths during a particular year). Thus, less intensive forms of violence such as sporadic fighting or terrorist incidents as well as contextual or structural conditions such as foreign policy crises and international crises (cf. Brecher and Wilkenfeld, 1997) are not included. For further research, however, it seems to be theoretically necessary to include crises characteristics as background conditions and as potential symptoms of vulnerability (cf. below).

The first data set for the observation of conflictual events is the COW Militarized Interstate Dispute (MID) data set. Conceptually, a militarized interstate dispute is defined as a set of interactions between or among states involving explicit threats to resort to military force, displays of military force or actual uses of military force (Maoz and Gochman, 1984; Jones, Bremer and Singer, 1996).⁹ To qualify for inclusion these military acts must be explicit, overt, nonaccidental, and government sanctioned. Because the primary concern of the MID concept is to understand the processes from normal interstate interactions to interstate war, other conflictual interactions involving non-recognized entities or non-state actors are excluded. If a -

⁹ For a theoretical and empirical discussion of the original MID data set see Gochman and Maoz (1984). A detailed discussion of rationale, coding rules and empirical patterns of the updated militarized interstate dispute data appears in Jones, Singer and Bremer (1996). The MID data set is available on the internet at: http://128.118.17.397MID_DATA.HTM.

militarized confrontation between two states resulted in 1,000 or more battle-related deaths, the dispute is classified as having escalated to war - as defined by the standard criteria of the COW project (Small and Singer, 1982). Thus, operationally, the MID data set covers four stages of hostile interstate interaction: threat to use force, display of force and use of military force and interstate war.

For our research problem the less intense forms of violence, militarized disputes under the threshold of the actual uses of military force were excluded. Thus, the domain of inquiry is limited to those events that have already crossed the threshold of threats or displays of force. In the updated version (2.1) the MID data set provides a total of 2,034 militarized interstate disputes and 4,798 dispute participations for the 1816-1992 period.¹⁰ A temporal breakdown of the data set for the post World War period and the exclusion of less intensive forms of violence such as threats or displays produce a sample size of 1,226 militarized disputes and 2,785 dispute participations. The total number of full-scale interstate wars (more than 1,000 battle deaths), however, is by far smaller (25 cases since 1946).

The second conflict-related data set, also generated by the Correlates of War project (Small and Singer, 1993), covers the internal or domestic dimension of collective violence, i.e. civil wars. Conceptually, a civil war is defined as any armed conflict that involves military action internal to the metropole, the active participation of the national government, and effective resistance by both actor sides with a minimum of 1,000 battle-related deaths (Small and Singer, 1982: 203-222). For the COW project, internality, type of participants and degree of effective resistance are, by definition, the criteria for the existence of civil wars. For the 1946-1992 period COW lists 80 cases where rebels sought to overthrow the existing regime of an internationally recognized state. In addition, we have added three cases from COW's extra-systemic war data list because they satisfy the civil war definition mentioned above.¹¹

Given the restricted temporal domain of the COW civil war data (the time series ends 1992) we have updated that list with the data from the Uppsala research project (see Wallensteen and Sollenberg, 1998) until 1997¹². This inclusion is

¹⁰ The MID-data set provides additional information about the dispute outcome, method of settlement, identity of revisionist and status quo states, type of revision sought, the fatality level of each participant and the duration of dispute; for coding rules see Jones, Bremer and Singer (1996) and Bremer (1996).

¹¹ COW's selection rules are somewhat ambiguous for a few cases (e.g. the civil war in Ethiopia which appears on the extra-systemic list). We will check this systematically in the near future.

¹² We gratefully acknowledge that Peter Wallensteen sent us in advance the most recent list of armed conflicts that will be published in fall in the *Journal of Peace Research*.

unproblematic because both data collections rely on similar conceptual and operational criteria with a quantitative threshold of 1,000 battle related deaths.¹³ In the following empirical analysis, we will limit ourselves to the presentation of two indicators, civil war initiations and civil war underway. The latter is defined as the number of civil wars in a given year war initiations are the total number of wars beginning in a given year. Together with the Wallensteen et al. data (1998), we have 87 civil wars with a total of 517 civil war years in the 1946-97 period. All the figures presented graphically have been aggregated to four-year time intervals.

In addition to the conflict and war data presented by the Correlates of War project and with respect to the scientific study of different types and changing patterns of warfare, the empirical analysis relies also on Holsti's domestic and international war data as presented in his book "The State, War, and the State of War" (1996). The main conceptual advantage of this particular data source is its identification of different types of domestic violence - the "wars of the third kind" which are conceptually defined as (a) internal factional/ideological wars (e.g. India or Greece after the Second World War) and (b) irredenta/secession/resistance wars (e.g. Ethiopia or Somalia in the 1980s). The operational criteria for identification of interstate and domestic wars are similar to the COW coding rules, but included are also some major instances of armed conflicts that did not qualify for inclusion in COW list (see Holsti 1996, 210-224). For the temporal domain from 1945 to 1995, Holsti provides a sample of 183 armed conflicts. Similar, Gantzel's research project "Hamburger Arbeitsgemeinschaft Kriegsursachenforschung" (Gantzel and Schwinghammer, 1994) covers the period from 1945 to 1992 with a sample of 184 wars. Both are ambitious research projects advancing the scientific study to some degree, but they suffer from conceptual weaknesses, especially from questionable qualitative definitions and coding rules which violate the scientific standards of reproducibility (cf. Eberwein, 1995, 1997b).

From a methodological perspective at this early stage of our investigation we use simple descriptive statistics for the quantitative evaluation of the occurrence of disasters at the system level, the regional level and on the state level. Additionally, the study uses contingency tables and chi-square test statistic as well as the odds ratio as indicators for the significance of the strength of the relationship between the natural disasters listed in the CRED data base and collective violence. These statistics will be appropriate in terms of the identification of different types of risk mentioned above.

¹³ In contrast to the COW data, the Uppsala project also identifies armed conflicts under the recognized threshold of 1.000 battle-related deaths (minor armed conflicts and intermediate armed conflicts respectively). The data are published annually in the Journal of Peace Research.

To test this particular relationship we use the nation-year as the unit of analysis. To evaluate the different levels of risk at the regional level, we calculate and compare the probabilities for the occurrence of disasters. While the analysis on the system level as well as on the state level is still unproblematic, the regional breakdown is more difficult, because some regions are more complex and heterogeneous than others such as Africa and Asia. We defined 15 world regions, each of which consisting of relatively homogenous groups of states - from North America to Oceania. These regions are listed in Table 4:

Table 4: Regions Defined

- North America (United States and Canada)
- Central America (from Mexico to Panama)
- South America (from Colombia to Argentina)
- Western Europe (EU-Region)
- Central Europe (East from Germany/Italy)
- Russia and Central Asia (includes former Soviet Republics and Afghanistan)
- North Africa (Egypt to Morocco)
- East Africa (Ethiopia, Somalia, Kenya, Tanzania, Uganda, Sudan etc.)
- Central Africa (Rwanda, Burundi, Chad, Niger etc.)
- West Africa (Nigeria to Senegal)
- Southern Africa (Angola, South Africa etc.)
- Middle East (Afghanistan west to Syria and Arabian Peninsula)
- South Asia (India, Pakistan, Bangladesh, Sri Lanka, Nepal, Burma)
- Southeast Asia (China, Korea, Japan, Cambodia, Philippines, etc.)
- Oceania (Australia to Western Samoa)

Having described the criteria of disaster types, data selection rules and measurement procedures as well as some methodological aspects, we now turn to examining some of the basic empirical patterns and identifying the correlates of risks across the different levels of analysis.

4. Empirical Analysis

4.1 The international system level

Beginning with the empirical analysis of disaster occurrence at the international system-level figures 3 and 4 summarize the relevant time series results for each disaster type for the post-World War II period. Of the 9,450 CRED disasters included in our analysis the short term disasters are by far the most frequent with a total of 8,453 events. Of these are 6,041 short-term natural disasters and 2,412 short-term human made disasters (fig. 3). In contrast there are 997 long-term disasters, of which 950 are natural disasters as compared to only 47 long-term human made disasters for the 1946-97 period (fig. 4). For both short and long term disasters the graphs reveal a steady rise in the number of disasters world-wide with peaks at the beginning of the 1990's for the former and a peak in the early 80's for the latter. In both cases there seems to be declining tendency from these peaks.

In figures 5-7 estimates of the damage reported in billion US dollars as well as the number of people injured and homeless (in millions) should not be taken at face value given the measurement problems. What is striking, however is that the damage (fig. 5) due to disasters has virtually exploded in the 90's. The graphs for the number of people injured and homeless, however, follow a similar pattern to the graphs shown in figs. 3 and 4: There is a peak in the late 80's and since then a decline. Looking at the absolute figures, however, reveals that there have been more than 150 million people injured and more than 5 million people homeless on the average per year between 1994 and 1997. Furthermore, figure 8 summarizes the disaster frequencies of different fatality levels for the post-World War II period referring to similar patterns with one exception. The lowest observed threshold (1-99 deaths per disaster) is increasing continuously in the 1990s.

Figures 3-8 and Table 5 about here

A more detailed analysis of the risks of the different disaster types with respect to the number of people killed, people injured, material losses and homeless is given in Table 5. We have chosen three categories: high, where the proportion of disasters with the indicated thresholds is greater or equal to a 1:15 ration, medium where this ration varies between 1:16 and 1:50, and low where the ratio is smaller than 1:50 (risks of material losses are arranged according to their annual means). The results

show that floods and earthquakes (short-term natural), epidemic diseases (long-term natural) and famines (long-term human made) have the highest risk to cause human losses with more than 1,000 deaths or injuries and/or material losses. Short-term natural disasters such as floods, earthquakes and high winds also lead to high numbers of homeless people. Accidents as increasing short-term human made disasters account for the largest proportion of short-term disasters but the probability that they will cause major human losses is low. Earthquakes and high winds disasters are responsible for the vast majority of reported material losses. Keeping in mind the substantial number of missing data, it seems nonetheless plausible that the different disaster types have a different impact for the societies hit by them. Earthquakes, floods, droughts, epidemics, and famines, all being very lethal and leading to a high number of people injured. At this point it becomes clear that a more systematic way to classify the different types of disasters according to the four attributes listed in table 4 might be useful. In particular, for the international relief system people injured, killed, and homeless are certainly highly relevant parameters for action.

Turning now to collective violence as a specific class of longer term human made disasters in the post World War II period, the corresponding time series for civil wars (COW) are listed in figure 9 whereas figure 10 shows the interstate military conflict events over time. The civil wars begun series reveals some fluctuations but no systematic trend. In contrast the civil wars under way have clearly been on the rise until 1989 (fig. 9). Whereas interstate wars reveal a comparable temporal pattern to the civil wars even though at a lower level the use of force series could be interpreted as revealing some cyclical fluctuations with peaks in the 58-61 period, another one in the 74-77 period and a final one in the 89-89 period. Rather than subsiding during the post-World War II period, militarized interstate disputes and civil wars appear to erupt more or less continuously. Similar to the CRED disasters, we observe the highest level of MID occurrence as well as the maximum of civil war years in the 1980s. The dramatic increase in the duration of civil wars in the international system, especially during the 1975 to 1990 time period has been accompanied by dramatic fatality levels. Nearly 65 percent of the total battle deaths in the post-World War II period have occurred in civil wars. Of all the wars listed by the COW project (Small/Singer, 1993) about 70 percent are of the internal type. The mean ratio of interstate wars to civil wars since 1946 is 1 to 3.2 with some significant deviations in the mid 1970s (1 to 0.7) and in the mid 1980s (1 to 10).

Figures 9-12 about here

With regard to the militarized interstate disputes, the nuclear area is by far the most conflictual period since 1816 in terms of the number of militarized interstate disputes begun and under way (see Gochman/Maoz, 1984; Jones et al., 1996). The frequency of disputes increases in absolute but not in relative terms, i. e. when controlling for the increasing size of the international system. Thus, the increase is clearly related to the growing number of sovereign states which implies a greater number of conflict opportunities. Furthermore, the distribution of MIDs suggests an increase in disputes among minor powers or relatively weak states and a sharp decrease in conflicts between major powers and advanced economies.

In his more detailed typology of war in the contemporary international system Holsti (1996) identifies a similar empirical pattern to the COW series with respect to the ratio of major interstate conflicts to and civil wars (see figure 11). Given his conceptual distinction between the wars of the third kind (irredenta or internal factional) and interstate wars, about 70 percent are of the third kind (33.9 percent irredenta and 35 percent internal factional wars). Less than 20 percent are interstate wars (the remaining 13 percent were anti-colonial liberation wars). Holsti's typology is anything but trivial. One can may be pertinent for the international relief system in terms of the different implications they have for humanitarian action.

The violent conflict data can not be taken for granted due to the differing coding rules. The differences become obvious when looking at figure 12 where we have listed the frequencies from three different data sources. There are some similarities (i. e. the 1970-73 period) but also striking dissimilarities (i. e. 1962-65 period). If the discrepancies across different data sets are too great, each one will by definition lead to different interpretations of the world. As long as such differences remain an issue of contention within the academic world no major problem should arise. If, however, trends as observed on the basis of such time series lead to recommendations or serve as a guide for humanitarian action or preventive diplomacy, these discrepancies are unacceptable. We will look into this issue in the near future.

4.2 The regional level

We now turn to the regional level of analysis. The regional breakdown of the different types of disasters as reported by CRED are listed in tables 6-7. The first column in each figure provides information on the number of nation-years for each region. The other columns list the observed number of disasters, the distribution for

each region (in percent) as well as the conditional probability of disasters which is the observed number of events divided by total nation-years in a given region (Pr-Dis). As table 6 reveals North America (PR-Dis: 5.82), Oceania (PR-Dis: 3.14) and South Asia (PR-Dis: 2.2) run the highest risk to suffer from short-term disasters. By far the least prone short-term natural disaster region is Central Africa. All the other regions vary between an average annual risk for short-term disasters of .35 and about 1.4. As table 7 shows the African regions are most vulnerable with respect to the long-term disasters. East Africa, in particular, has the highest probability ratio for the occurrence of long-term human made disasters such as famines (PR-Dis: .41); closely followed West Africa (PR-Dis: 0.37) but also South Asia (PR-Dis: 0.30).

Tables 6-9 about here

In terms of people being killed table 8 reveals that East Africa, the Middle East and South Asia have significant discrepancies between the observed and expected values. These results reflect the high number of recurring disasters such cyclones and floods causing periodically serious fatalities. On the other hand, we have found positive ratios for Europe and Northern America, i. e. where the expected values are much higher than the observed ones. This shows that there is an uneven distribution of risk across the defined regions where Asia, the Middle East and some African regions are substantially more prone to major disasters than the others.

Turning to the domestic and interstate conflictual events in the post-World War II period, table 9 shows dramatic differences between the 15 regions. On the interstate dispute side, state participations on the hostility levels use of force and interstate war have been concentrated in the Middle East and Southeast Asia. But Western Europe and South Asia were also frequently involved in interstate violence. The conditional probabilities for MID involvement are highest for Russia and Central Asia (0.66), the Middle East (0.64) and North America (0.57). Internal conflicts, in contrast, occurred and endured over time particularly in East Africa, Southern Africa, the Middle East and in Asia, but also in Central and South America. The conditional probabilities show us a similar pattern with high values for East Africa (0.26) and South Asia (0.20) which are two or three times higher compared other conflictual regions such as Central or South America. Again we find that with respect to collective violence there are substantive regional differences.

4.3 The state level

What about the disaster proneness of the individual states? The empirical results for the occurrence of different disaster types at the state level are summarized in table 10 (with additional information on annual means and disaster severity). On the short-term natural side we have the United States on top with an average of roughly 10 disasters per year, followed by the Philippines, China and India with about 8 disasters every year. It is equally clear, however, that states with high amounts of annual disasters are not necessarily those where people run the highest risk to get killed. Short-term human made disasters occur most frequently in India, China and the United States with an average of 3-5 events per year. These disaster types have, fortunately, a relative low fatality risk (than 1,000 people killed). The annual average of people killed in disasters is by far lower than the observed mean for the short-term natural type. With respect to the long-term natural disasters India and Bangladesh reach the highest annual mean (about one disaster per year on the average) - followed by Burkina Faso and Niger. Epidemic diseases, a single category including cholera or malaria, produce human losses most frequently in India, Nigeria and Ethiopia. Long-term human made disasters such as famines occur clearly most frequently in Ethiopia followed by South Africa and Indonesia. Generally spoken, the results observed at the state level further strengthen the impression of a differential disaster proneness which has already been observed at the regional level.

Table 10 about here

4.4 Linkages between natural and human made disasters

Are the different types of disasters related to one another? This was our central problem as formulated at the outset. If this were the case, that would suggest nontrivial consequences for international security, development and the international relief system. We will focus here on the relationship between different disaster types and collective violence, the relationship between the disasters listed in the CRED data set and the civil war years from COW and the MIDs respectively. At this exploratory stage we will limit ourselves to cross-tabulations and use the odds ratio as our indicator. Table 11 indicates a significant relation across all types of disasters with an odds ratio of 1.77 for short-term natural disasters, 2.25 for short-term human

made disasters and 2.58 for long-term-natural disasters. In other word, the statistical risk of the joint occurrence of CRED-disasters during civil war years is about twice as high as compared to normal nation-years where no civil war occurs. This risk is highest for droughts or epidemic diseases. When the two-year-periods prior to, and after, the civil war years are included this particular joint occurrence of violence and all the other disaster types vanishes. Furthermore, table 10 provides information on the relationship between the severity of a CRED disaster and the risk of occurrence in civil war years. The statistical test indicates a significant relation of severe disaster occurrence (more than 1,000 deaths) and civil war years (odds ration 4.34). In other words, the higher the fatality level of a disaster the higher the statistical risk that this particular disaster occurs during a civil war year.

Table 11-12 about here

In contrast we have not found a significant statistical odds ratio for the relation between interstate conflicts (MIDs) and the natural disasters reported in the CRED data set (see table 12). Whereas short-term natural disasters have an odds ratio of 1.3 the long-term natural side comes equal to one with no statistically significant results below the 0.05 level. There is, however, a medium odds ratio (1.78) for the relationship between militarized interstate disputes and short-term human made disasters and an even more significant relation between MID occurrence and civil war years with an odds ratio of 2.17, i.e. the statistical risk of the occurrence of serious interstate disputes in civil war years is more than twice as high as compared with normal non-conflictual nation-years. It is important to note, however, that the test statistics does not allow any inference with respect to the direction of the relationship. This problem will be explored at a later stage.

5. Summary, Conclusions and Outlook

The initial assumption has been that natural and human made disasters might be interdependent. If this is the case, as the foregone initial data analysis suggests, the nontrivial problem arises what this implies for humanitarian aid. The first assumption is that relief operations or what humanitarian actors do, is dependent on the type of disaster. The type of disaster determines on the one hand the conditions

under which these actors have to work. The context in which the disaster occurs determines on the other the extent if not the success, so at least the feasibility to help the victims. The most problematic disasters are longer-term human made disasters. Whereas natural disasters, short or even longer term, may be considered as unforeseen events, human made disasters, in contrast, represent a particular class of human behavior. Two specific disasters are outstanding in this respect: famines and violence (in particular civil wars or wars of the third kind). The first is the manipulation by some collectivities of food shortage in such a way as to lead to human suffering which can be lethal. The second is equivalent to hurt and kill civilians for whatever reason. Civilians, individuals or collectivities may be forced to migrate, a strategy that characterized among others the Rwandan Disaster or the situation in the Kosovo today. The killing of civilians for the simple reason that they belong to a particular ethnic, religious or otherwise unidimensionally defined collectivity, is also part of this political strategy that has been used by governments or opposition groups or is actually still in use.

These new disasters which could be interpreted partially as a move back into the future of the pre-Westphalian Peace treaties between 1618 and 1648. In this time period these religious wars devastated Europe and decimated the civilian population by roughly 30 percent. Today, in some parts of the world a comparable development seems to recur again. Such civil wars seem to be not necessarily more frequent but much longer in duration. The price has to be paid by the civilians. These kind of disasters have also raised the fundamental issue as to what humanitarian aid can do, when the imperative to bring relief to innocent victims must be abandoned, and what the notion of impartiality and neutrality of humanitarian aid makes sense at all.

Thus, to find out how the different types of disasters have evolved in the different parts of the Post-World-War Period, need to be analyzed in the first place. Without this empirical background one might lose out of sight the overall trends in this specific area and be inclined to generalize too quickly from the present situation. This first empirical analysis is located at the macro-level. At that level of analysis we can at least reconstruct ex post the origin, location, duration and consequences of the different types of disasters. As the analysis revealed, the short-term natural disasters are by far the most frequent, followed by the short-term called human-made disasters. Whereas the former may be related to the environmental degradation in general, global climate change in particular, the latter may be considered as the price of the modern technological civilization in terms of technical disasters. These two types of disasters followed an exponential growth path which shows in the early 70's for short term natural disasters and in the mid 80's for short-term human made disasters.

The former peaked in the 90-93 period with a maximum for almost 1200 events for the four-year-period and 300 disaster per year, the later peaked in the same period with a figure that approached the 800 threshold, i.e. 200 events per year. Since then there has been a noticeable decline even though it is difficult to assess whether that trend is systematic or not.

Coming to the long term natural disasters there frequency is by far lower. Whereas the total sum of short term disasters in our data base is comprised of 6041 natural and 2412 human made events for the total period, only 950 long term natural disasters occurred during the period under study (1946-1997). Long-term human made disasters in contrast are even much less frequent in that there are only 47 events observed. These include famines and food shortages and not violence as a specific type of longer-term human made disaster. To this one might add between roughly about 150 civil wars of different kinds, between roughly 25 interstate wars and more than 1200 military conflicts between sovereign states. These figures vary according to the data source used. At this point we can not assess yet in detail as to why such impressive differences exist. We find, however, considerable and substantial differences in the theoretical frameworks as well as in the definition and measurement of the dependent variable.

As we found out, the various types of disasters vary considerably in terms of fatalities, people injured, material losses and homeless. Famines are the most disastrous in terms of people killed and injured as well as earthquakes and epidemics. The least costly are accidents and chemical accidents, and avalanches. The different regions differ considerably in terms of their disaster proneness. Short-term natural disasters occur most frequently in North America, with the United States the Philippines, China and India as the most endangered states. India and China are the most short-term human disaster prone nations. Long-term natural disasters occur most frequently in India, again, and in Burkina Faso, Niger, and Mali, with additional African states showing on this list. Long-term human made disasters are most frequently found in Africa at large, with Ethiopia, South Africa as the two leading nations. But in this list we also find Indonesia, Cambodia as well as India.

As the data analysis reveals, short term as well as long-term natural disasters more than twice as frequent in countries where civil wars take place. The same odds ratio is true for the combination of interstate military conflicts and civil wars. In countries involved in military conflicts the probability that other types of disaster will also occur is 1.78 for short-term human made disasters, and 1.38 for short-term natural disasters.

The conclusion is that there is indeed considerable variation in terms of types of

disaster, type occurrence, their location and their consequences. This variation then can be expressed or translated into our initially developed notion of risks that are associated with natural disasters. Short term natural disasters reveal the highest risk (or what we have called risk, in terms of occurrence with considerable variation across countries respectively regions. The risk, or what we have identified as risk₂ of losses in terms of lives, injuries, money, and displaced persons, varies considerably among the different types of disasters. At this point we can not assess the relative importance of the remaining three risks. As far as risk₃ is concerned we can simply state that violence as a particular form of disasters seems to be associated with other types of disasters. Whether this relationship is systematic or spurious remains to be analyzed yet. The risk of an initial minor disaster to evolve to one of longer duration, which particularly applies to longer-term human made disasters, remains to be seen. Our analysis of this particular type of risk, risk₄, can not be evaluated yet. This could only be achieved at the micro-level of analysis. For that purpose our data base is clearly deficient. Finally, risk₅, or the probability that vulnerability of a society is associated with the recurrence of disasters, can not be assessed either. It seems, however, that the most disaster prone nations are to some extent those that fall under this category. To test such a proposition nonetheless requires the systematic definition and measurement of this very concept.

A final word is certainly in place as far as the indicators used are concerned. There are, as we know for certain, considerable problems of reliability and validity involved. This is true for all of the indicators, but even more true for some of them. In general terms any quantitative approach is plagued with these problems. But there is no option than to be aware of these issues and by trying to find remedies. With respect to specific indicators, in contrast, they are intrinsically difficult to measure systematically. This is true, for example, for material losses. The definition of the indicator itself and the underlying conceptualization will not determine the actual losses, but simply capture at best what the indicator is supposed to measure.¹⁴

The provisional results presented above do have nontrivial implications as such, even more so in terms of their consequences for the policy-field of humanitarian aid.

¹⁴ One could draw the analogy to the IQ: intelligence is what the IQ measures.

Appendix

Figure 1: Disasters and Policy Areas

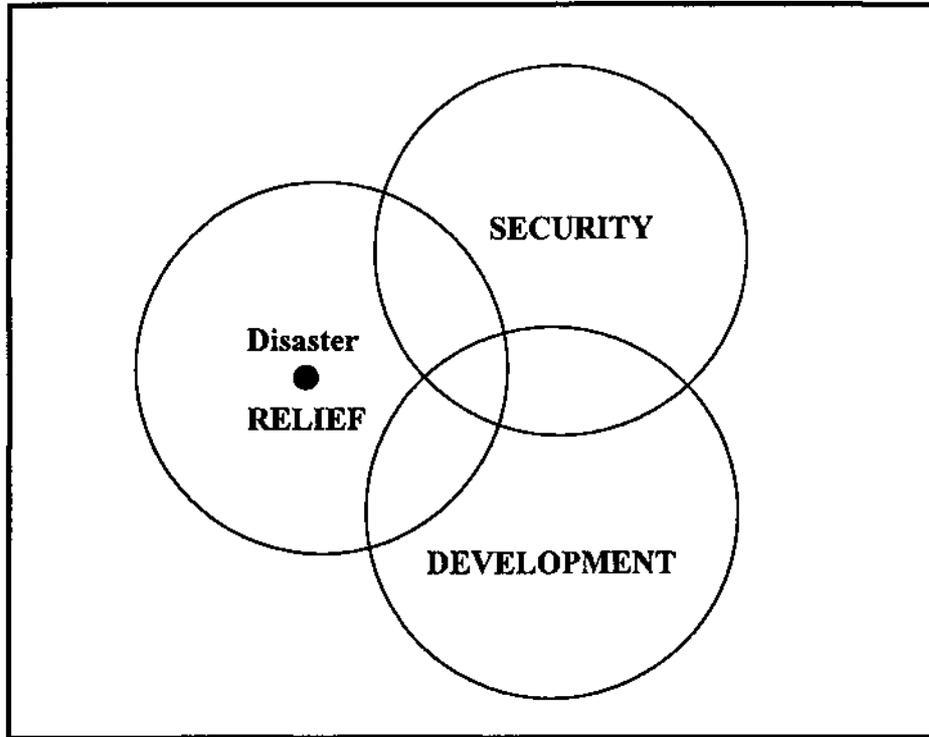


Figure 2: Disasters and Risks

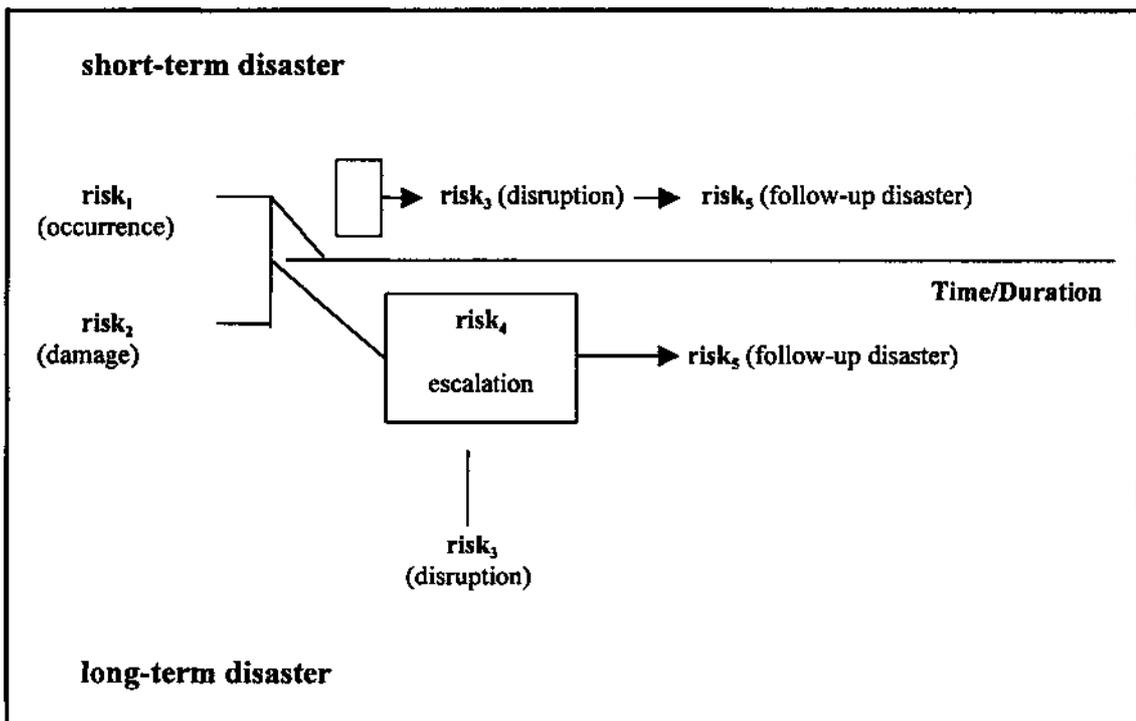


Figure 3: CREDs Short-Term Disasters

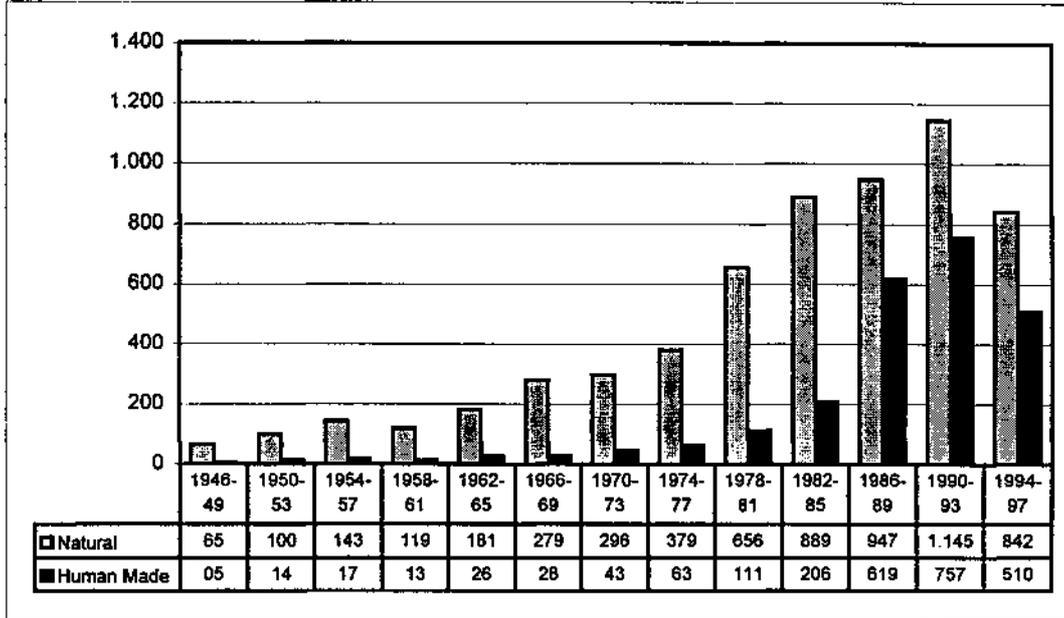
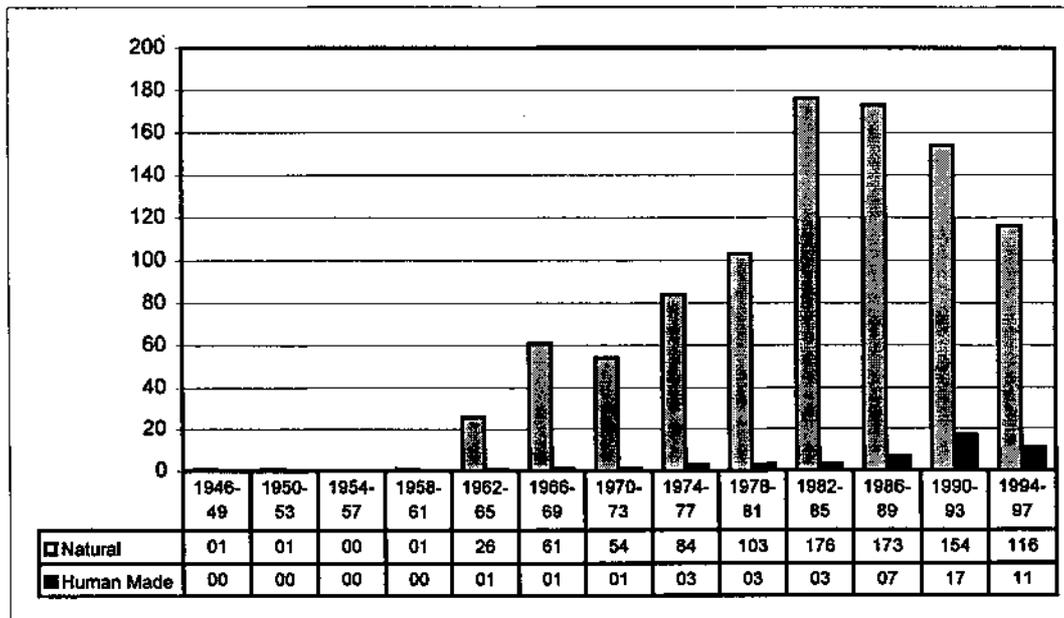
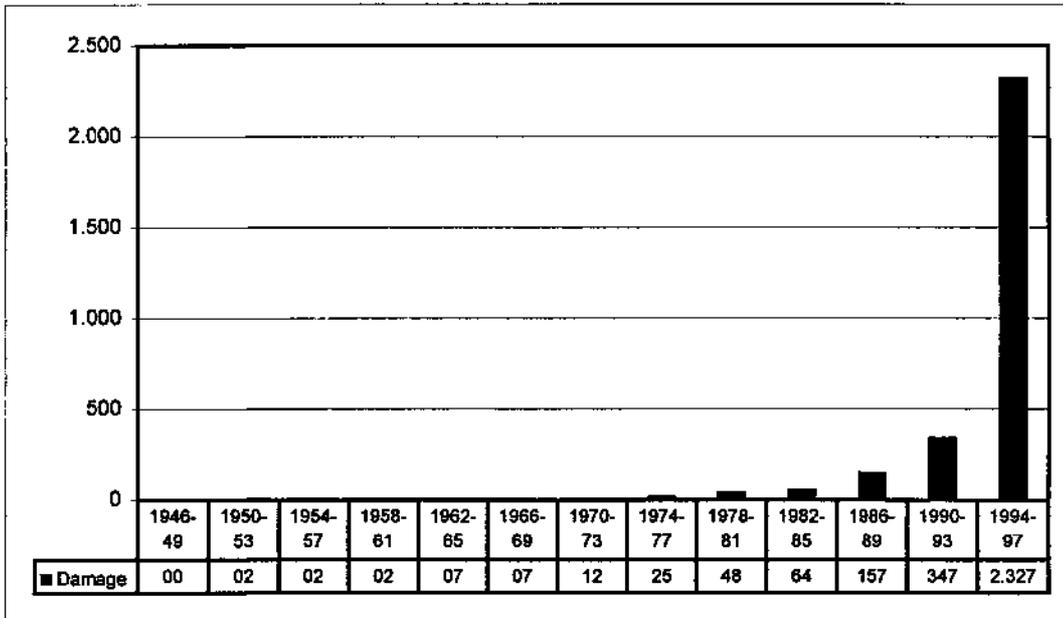


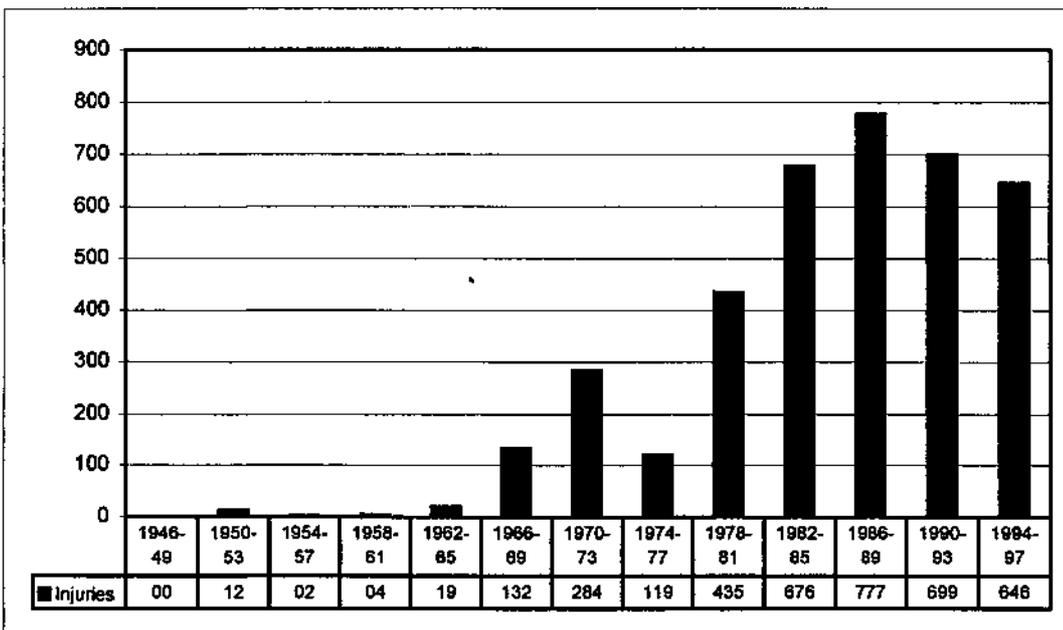
Figure 4: CREDs Long-Term Disasters



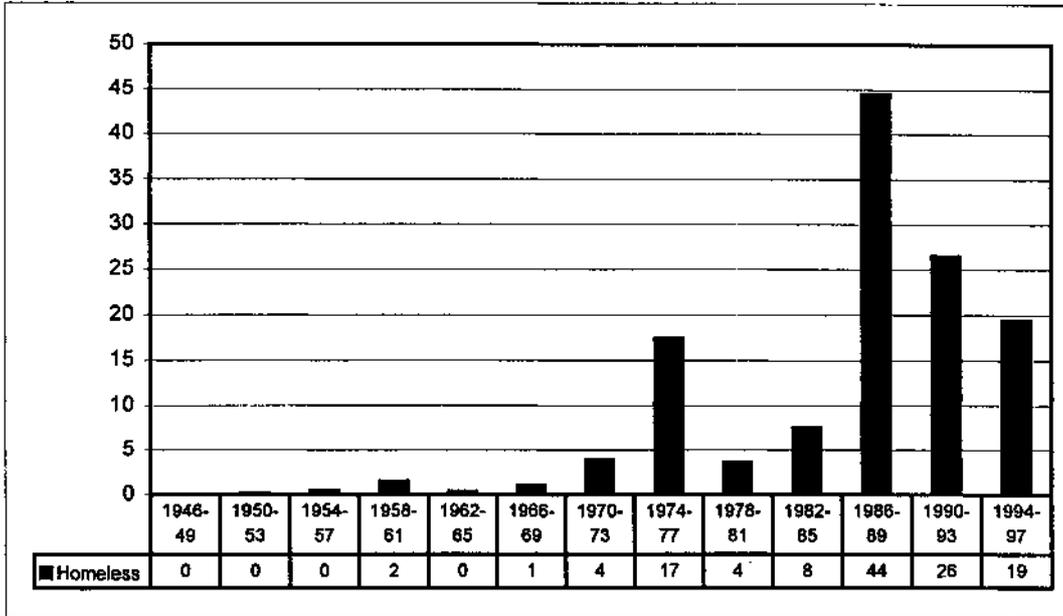
**Figure 5:
Reported Damage in the CRED
Database (Estimated Amount in
Billion US \$)**



**Figure 6:
Number of Injured Persons in the CRED
Database (Estimated in Millions)**



**Figure 7:
Number of Homeless Persons in the CRED
Database (Estimated in Millions)**



**Figure 8: Trend in the Levels of
Killed Persons**

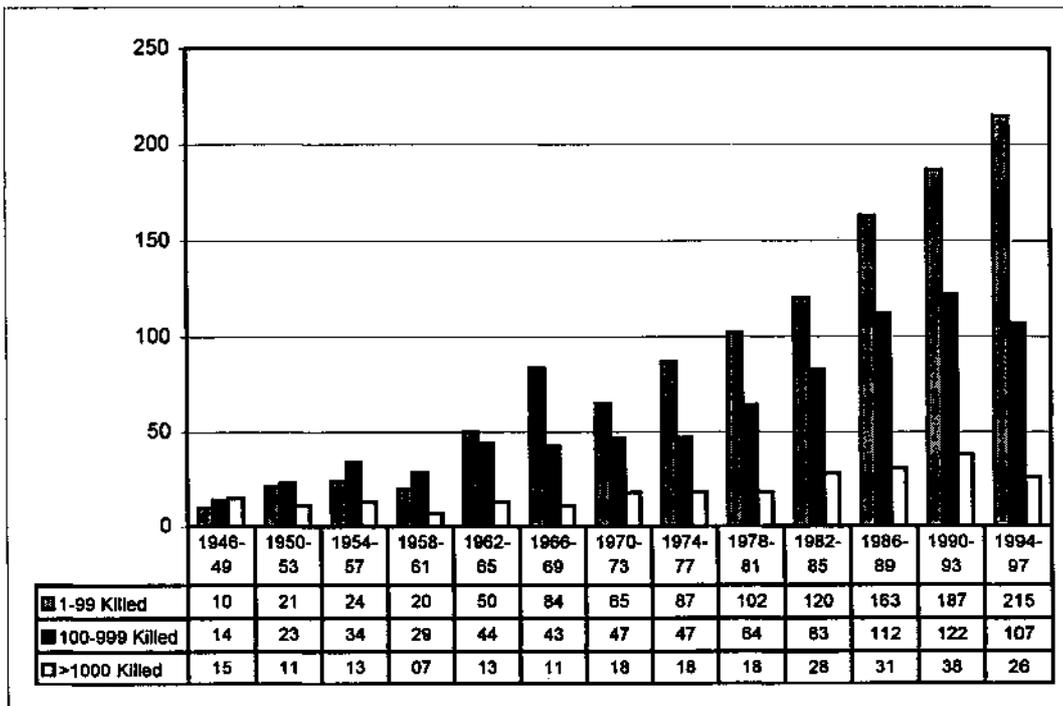


Figure 9: Civil Wars Begun and Under Way (COW)

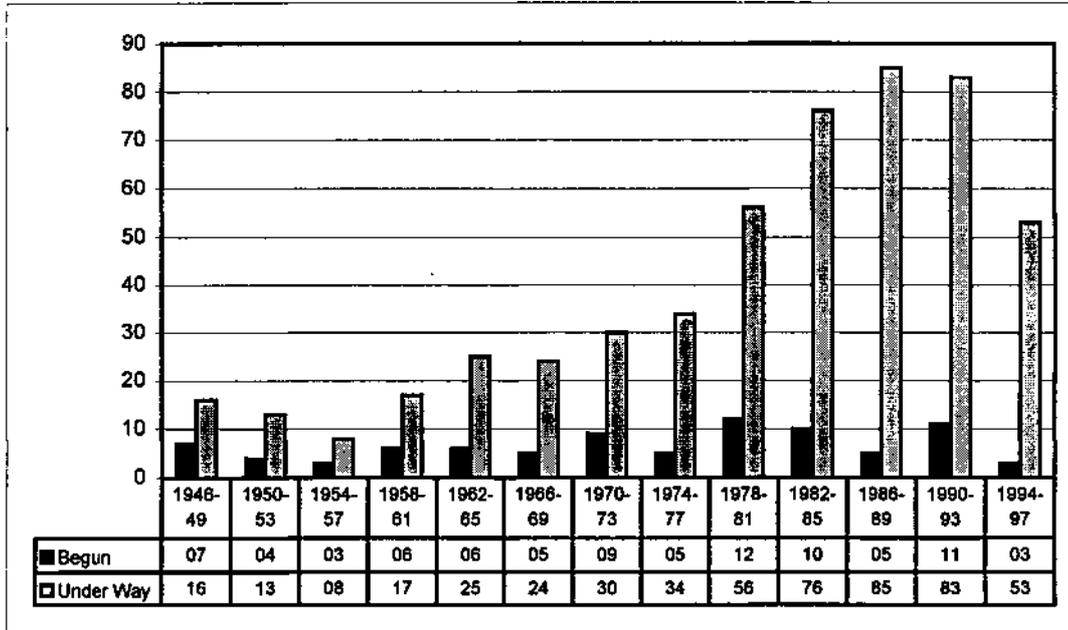


Figure 10: Militarized Interstate Disputes Begun (Use of Force and Interstate War)

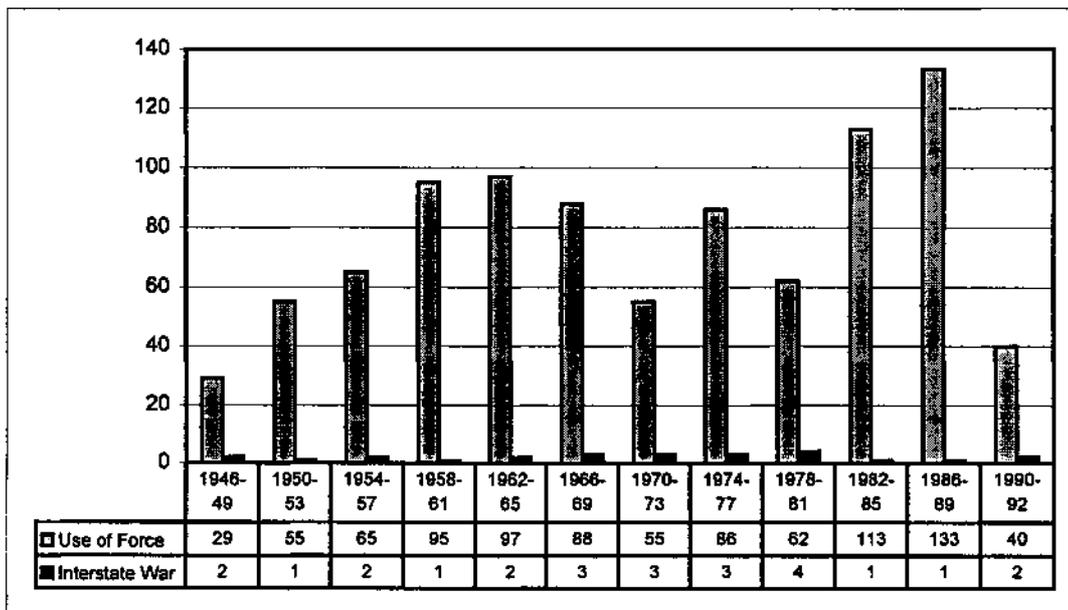


Figure 11: Wars of the Third Kind and Interstate Wars (Holsti)

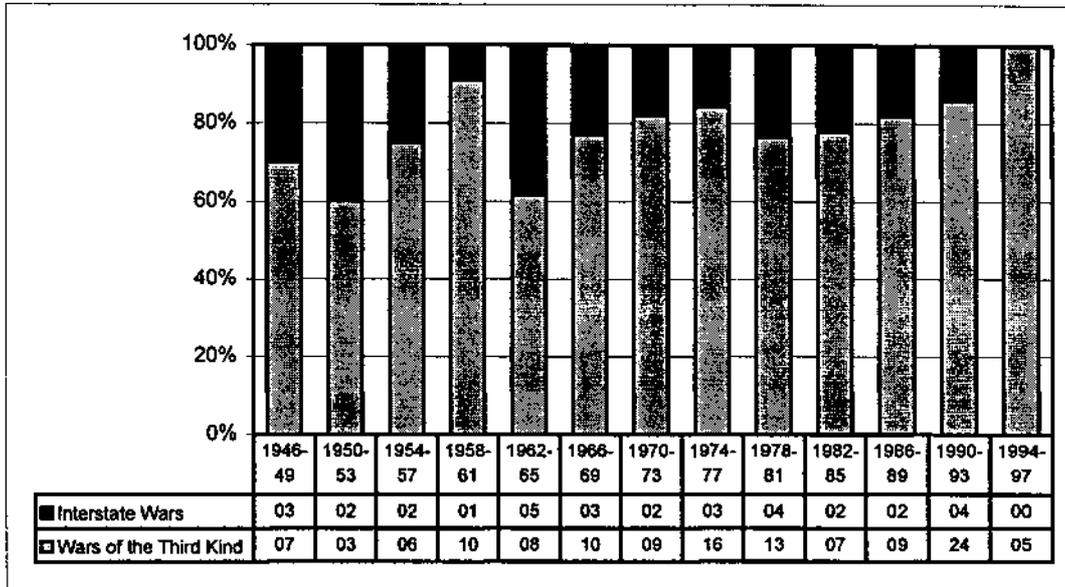


Figure 12: Civil War Trends since 1946 (Holsti, AKUF, and COW)

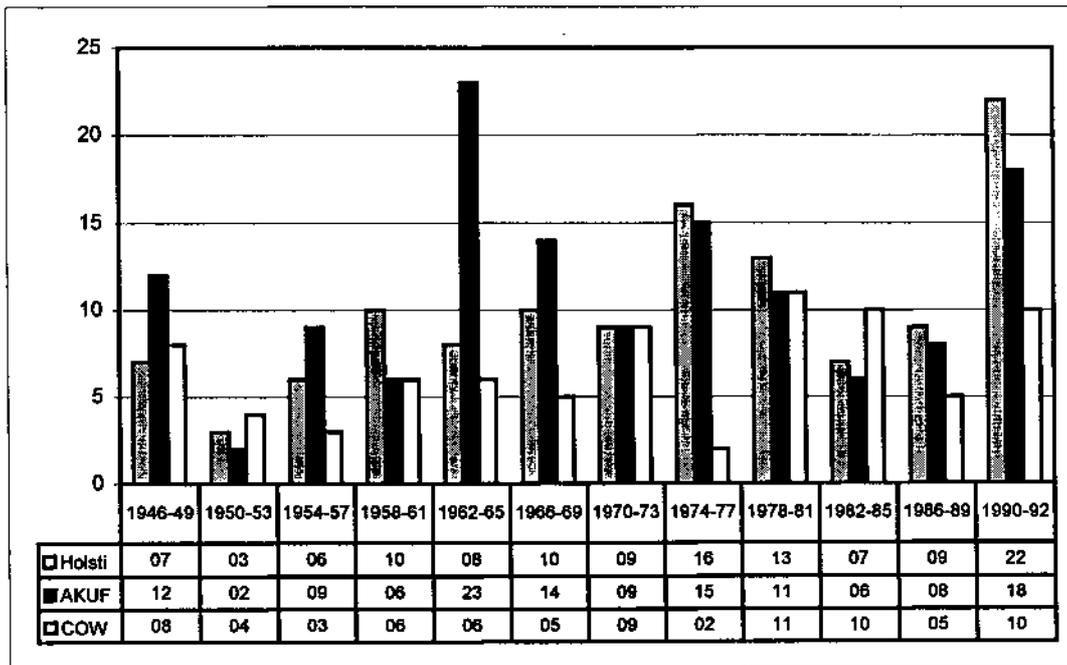


Table 5: Relational Properties of Disasters

Disaster Type	Killed Persons (>1000)	Injured Persons (>1000)	Material Losses	Homeless Persons (>1000)
Short-Term Natural				
Floods	Medium	High	High	High
High Winds ^(a)	Medium	High	High	High
Earthquakes	High	High	Medium	High
Landslide	Medium	Medium	Medium	High
Fire	Low	Medium	Medium	Medium
Volcano	Medium	High	Medium	Medium
Avalanche	Low	Low	Low	Low
Heat/Cold Wave	Medium	Medium	High ^(b)	Low
Short-Term Human Made				
Accident	Low	Low	High	Low
Chemical Accident	Low	Low	Medium	Low
Long-Term Natural				
Drought	Medium ^(b)	High	Medium/High	Low
Insect Infestation	Low	Medium	Low	Low
Epidemic	High	High	High ^(b)	Low
Long-Term Human Made				
Famine	High	High	Low	Low ^(b)
Food Shortage	Low ^(b)	High	Low ^(b)	Low ^(b)

(a) The category high winds covers hurricanes, cyclones, tornadoes and tropical storms as well as

tsunamis which have similar impacts on coastal communities

(b) Not yet valid (high number of missing values in the CRED database)

Table 6: Regional Breakdown of Short-Term Disasters

Region	Nation-Years	Short-Term Natural			Short-Term Human Made		
		N	(%)	PR-Dis	N	(%)	PR-Dis
North America	104	605	(10,0)	5.82	229	(9,5)	2.20
Central America	780	476	(7,9)	0.61	106	(4,4)	0.14
South America	575	578	(9,6)	1.01	193	(8,0)	0.34
Western Europe	960	603	(10,0)	0.63	307	(12,7)	0.32
Eastern Europe	482	171	(2,8)	0.35	59	(2,4)	0.12
Russia/Central Asia	202	219	(3,6)	1.08	143	(5,9)	0.71
North Africa	219	126	(2,1)	0.58	62	(2,6)	0.28
East Africa	266	101	(1,7)	0.38	72	(3,0)	0.27
Central Africa	264	23	(0,4)	0.09	26	(1,1)	0.10
West Africa	683	79	(0,4)	0.12	72	(3,0)	0.11
Southern Africa	414	133	(2,2)	0.32	90	(3,7)	0.22
Middle East	632	269	(4,5)	0.43	87	(3,6)	0.14
South Asia	340	747	(12,4)	2.20	449	(18,6)	1.32
Southeast Asia	594	864	(14,3)	1.45	343	(14,2)	0.58
Oceania	333	1047	(17,3)	3.14	174	(7,2)	0.52
Total	6848	6041	(100,0)	0.882	2412	(100,0)	0.35

Table 7: Regional Breakdown of Long-Term Disasters

Region	Nation-Years	Long-Term Natural			Long-Term Human Made		
		N	(%)	PR-Dis	N	(%)	PR-Dis
North America	104	14	(1,5)	0.13	-	-	-
Central America	780	58	(6,1)	0.07	2	(4,3)	0.003
South America	575	65	(6,8)	0.11	-	-	-
Western Europe	960	14	(1,5)	0.01	-	-	-
Eastern Europe	482	10	(1,1)	0.02	2	(4,3)	0.004
Russia/Central Asia	202	15	(1,6)	0.07	1	(2,1)	0.005
North Africa	219	23	(2,4)	0.11	-	-	-
East Africa	266	110	(11,6)	0.41	11	(23,4)	0.041
Central Africa	264	48	(5,1)	0.18	3	(6,4)	0.011
West Africa	683	250	(26,3)	0.37	8	(17,0)	0.012
Southern Africa	414	100	(10,5)	0.24	9	(19,1)	0.022
Middle East	632	25	(2,6)	0.04	1	(2,1)	0.002
South Asia	340	103	(10,8)	0.30	2	(4,3)	0.006
Southeast Asia	594	54	(5,7)	0.09	5	(10,6)	0.008
Oceania	333	61	(6,4)	0.18	3	(6,4)	0.009
Total	6848	950	(100,0)	0.14	47	(100,0)	0.007

**Table 8:
Regional Distribution of Major
Disasters (>1000 People Killed)**

Region		<1000 Killed		Total
		No	Yes	
North America	Count Expected	489	2	491
	Count	473.2	17.8	491
Central America	Count Expected	399	19	418
	Count	402.9	15.1	418
South America	Count Expected	630	18	648
	Count	624.6	23.4	648
Western Europe	Count Expected	476	5	481
	Count	463.6	17.4	481
Eastern Europe	Count Expected	141	3	144
	Count	138.8	5.2	144
Russia / Central Asia	Count Expected	273	11	284
	Count	273.7	10.3	284
North Africa	Count Expected	152	3	155
	Count	149.4	5.6	155
East Africa	Count Expected	164	16	180
	Count	173.5	6.5	180
Central Africa	Count Expected	60	3	63
	Count	60.7	2.3	63
West Africa	Count Expected	212	13	225
	Count	216.9	8.1	225
Southern Africa	Count Expected	202	6	208
	Count	200.5	7.5	208
Middle East	Count Expected	273	23	296
	Count	285.3	10.7	296
South Asia	Count Expected	1060	63	1123
	Count	1082.4	40.6	1123
Southeast Asia	Count Expected	1029	38	1067
	Count	1028.4	38.6	1067
Oceania	Count Expected	809	16	825
	Count	795.2	29.8	825
Total	Count	6369	239	6608

$\chi^2 = 80.34$
Sig. < 0.001 (df=14)

**Table 9:
Regional Breakdown of Civil War Years and Militarized Interstate
Disputes (Participations)**

Region	Nation- Years	COW Civil War-Years		PR-Dis	Militarized Interstate Disputes		
		N	(%)		N	(%)	PR-Dis*
North America	104	-	-	-	54	(3,7)	0.57
Central America	780	46	(8,8)	0.06	59	(4,0)	0.09
South America	575	44	(8,5)	0.08	73	(5,0)	0.14
Western Europe	960	-	-	-	107	(7,3)	0.13
Eastern Europe	482	11	(2,1)	0.02	57	(3,9)	0.14
Russia/Central Asia	202	33	(6,3)	0.16	81	(5,5)	0.66
North Africa	219	7	(3,1)	0.07	74	(5,0)	0.38
East Africa	266	50	(13,1)	0.26	73	(5,0)	0.32
Central Africa	264	28	(5,4)	0.10	34	(2,3)	0.15
West Africa	683	13	(2,5)	0.02	41	(2,8)	0.07
Southern Africa	414	43	(11,0)	0.14	57	(3,9)	0.17
Middle East	632	53	(10,2)	0.08	358	(24,3)	0.64
South Asia	340	68	(13,1)	0,20	113	(7,7)	0,38
Southeast Asia	594	47	(9,0)	0.08	260	(17,7)	0.49
Oceania	333	33	(6,9)	0.11	31	(2,1)	0.11
Total	6848	520	(100,0)	0.08	1472	(100,0)	0.25

* The observation is restricted to the 1946-92 span with a total population of 5914 nation-years.

Table 10: Disaster Occurrence on the State Level

	Frequency	Annual Mean	Frequency (>1000 People Killed)	People Killed - Disaster Mean*
Short-Term Natural				
United States	519	10,0	2	71
Philippines	409	7,9	9	185
China	390	7,5	27	8.544
India	373	7,3	25	375
Australia	223	4,3	-	8
Japan	213	4,6	7	174
Indonesia	195	4,0	5	122
Bangladesh	152	5,8	16	3.504
Mexico	132	2,5	4	241
Russia (USSR)	128	2,5	6	2.980
Short-Term Human-Made				
India	256	5,0	2	58
China	184	3,5	-	55
United States	179	3,4	-	38
Russia	103	2,0	-	37
Philippines	87	1,7	1	94
Bangladesh	83	3,2	-	92
Pakistan	68	1,3	-	44
United Kingdom	63	1,2	-	45
Indonesia	59	1,2	-	62
Brazil	56	1,1	-	71
Long-Term Natural				
India	52	1,0	8	700
Burkina Faso	31	0,8	2	783
Niger	30	0,8	2	532
Mali	29	0,8	1	216
Ethiopia	27	0,5	7	40.846
Indonesia	27	0,6	1	445
Mauritania	24	0,6	-	17
Chad	24	0,6	3	889
Sudan	24	0,6	2	12.744
Bangladesh	24	0,9	3	467
Long-Term Human Made				
Ethiopia	8	0,15	1	600.000
South Africa	4	0,08	-	-
Indonesia	3	0,06	-	220
Mauritania	2	0,05	1	2243
Cameroun	2	0,05	-	-
Chad	2	0,05	-	-
Uganda	2	0,06	-	-
Eritrea	2	0,09	-	-
Cambodia	2	0,04	-	-
India	1	0,02	-	500

*All missing values were excluded

Table 11: Crosstabulation for Civil Wars and Disaster Types

Disaster Types				Civil War Years		Total
				No	Yes	
Short-Term Natural Disasters $\chi^2 = 55.97$ Sig.< 0.001 (df=1) Odds Ratio = 2.25	No	Count	Expected Count	4453	294	4747
				4390.7	356.3	4747
	Yes	Count	Expected Count	1881	220	2101
				1943.3	157.7	2101
Short-Term Human Made Disasters $\chi^2 = 38.39$ Sig.< 0.001 (df=1) Odds Ratio = 1.77	No	Count	Expected Count	5468	379	5847
				5408.1	438.9	5847
	Yes	Count	Expected Count	866	135	1001
				925.9	75.1	1001
Long-Term Natural Disasters $\chi^2 = 74.97$ Sig.< 0.001 (df=1) Odds Ratio = 2.58	No	Count	Expected Count	5685	397	6082
				5625.1	456.5	6082
	Yes	Count	Expected Count	649	117	766
				708.5	57.5	766
>1000 People Killed $\chi^2 = 103.99$ Sig.< 0.001 (df=1) Odds Ratio = 4.34	No	Count	Expected Count	6147	454	6601
				6105.5	495.5	6601
	Yes	Count	Expected Count	187	60	247
				228.5	18.5	247

Table 12:
Crosstabulation for Militarized Interstate Disputes (MIDs)
and Disaster Types

Disaster Types				MIDs		Total
				No	Yes	
Short-Term Natural Disasters $\chi^2 = 19.60$ Sig. < 0.001 (df=1) Odds Ratio = 1.38	No	Count	Expected Count	3502	679	4181
				3442.9	738.1	4181
	Yes	Count	Expected Count	13668	365	1733
				1427.1	305.9	1733
Short-Term Human Made Disasters $\chi^2 = 39.23$ Sig. < 0.001 (df=1) Odds Ratio = 1.78	No	Count	Expected Count	4334	856	5190
				4273.8	916.2	5190
	Yes	Count	Expected Count	536	188	724
				596.2	127.8	724
Long-Term Natural Disasters $\chi^2 = 0.02$ Sig. > 0.05 (df=1) Odds Ratio = 1	No	Count	Expected Count	4340	929	5269
				4338.9	930.1	5269
	Yes	Count	Expected Count	530	115	645
				531.1	113.9	645
Civil War Years $\chi^2 = 47.71$ Sig. < 0.001 (df=1) Odds Ratio = 2.17	No	Count	Expected Count	4593	923	5516
				4542.3	973.7	5516
	Yes	Count	Expected Count	277	121	398
				327.7	70.3	398

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