

**Unlocking disaster paradigms:
An actor-oriented focus on disaster response.**

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This paper introduces a way of looking at disaster response through the study of science, governance and local knowledge as social domains of knowledge and action. Social domains are areas of social life such as family, community and market whose study allows one to understand how social ordering works. Disaster studies are often presented as constituting two competing paradigms: the behavioural and the structural paradigms, the second epitomized by the well-known book *At Risk* of 1993 by Piers Blaikie, Terry Cannon, Ian Davis and Ben Wisner. The paper demonstrates how this familiar distinction of paradigms is becoming outdated. Although both paradigms continue to be used, I daresay that increased attention to environmental processes and human-induced climate change has marked the emergence of another disaster studies paradigm in the 1990s. This paradigm emphasises the *mutuality* and *complexity* of hazard and vulnerability to disaster due to complex interactions between nature and society.

While complexity thinking looks promising, the paper argues that in practice it is divided by an old schism between structure and agency thinking. Much of complexity theory is based on 'system-thinking'. It denies agency and diversity, and puts unwarranted boundaries around people and phenomena. The study of social domains may be a way out of this problem, since it allows us to focus on the everyday practices and movements of actors negotiating the conditions and effects of vulnerability and disaster.

Introduction

This paper introduces a way of looking at disaster response through the study of science, governance and local knowledge as social domains of knowledge and action. Social domains are areas of social life where ideas and practices concerning risk and disaster are exchanged, shared and more or less organized because of a certain proximity, physically or discursively, in the ways references are made to disaster and risk. The paper starts from the premise that disaster studies in the last decade is increasingly overtaken by a paradigm that accords central importance to mutuality and complexity in the relations between nature and society. While welcoming this shift, I am concerned about the system thinking remnant in much of complexity theory. It denies agency and diversity, and puts unwarranted boundaries around people and phenomena. Instead of conceptualizing science, governance and local responses as separate and different sub systems of society, the study of social domains allows us to focus on the everyday practices and movements of actors negotiating the conditions and effects of vulnerability and disaster.

Disaster studies are often presented as constituting two competing paradigms: the behavioural and the structural paradigms (Keith 1999/ 1996, Oliver-Smith 1996). Heralded by the work of Gilbert White, the first became to dominate disaster studies in the 1950s. It coupled a hazard-centred interest in the geo-physical processes underlying disaster with the conviction that people had to be taught to anticipate disaster. It is a technocratic paradigm dominated by geologists, seismologists, meteorologists and other scientists who can monitor and predict the hazards, while social scientists are brought in to explain people's behaviour in response to risk and disaster and develop early warning mechanisms and disaster preparedness schemes (Oliver-Smith, 1996). Towards the 1980s, anthropologists, sociologists and geographers increasingly began to challenge the technocratic, hazard-centred approach to disaster. This culminated in the 1983 landmark publication of "Interpretations of Calamity from the Viewpoint of Human Ecology" by Kenneth Hewitt. He postulated that disasters were not primarily the outcome of geographical processes. Especially in developing countries structural factors such as increasing poverty and related social processes accounted for people and societies' vulnerability to disaster. The introduction of social vulnerability touched at the heart of understanding disaster. Whereas disasters used to be practically equated to natural hazards, they now became understood as the interaction between hazard and vulnerability, graphically expressed by Blaikie et al (1993) in the pseudo-formula of Risk = Hazard + Vulnerability.

Upon scrutiny, this familiar distinction of paradigms is becoming outdated. Although both paradigms continue to be used, I daresay that increased attention for environmental processes and human-induced climate change has marked the advent of another disaster studies paradigm in the 1990s. This paradigm emphasises the *mutuality* of hazard and vulnerability to disaster due to complex interactions between nature and society. The mutuality or complexity paradigm takes the structural analysis of disaster a step further. While structural theory mainly looked at society to explain people's vulnerability to disaster, the mutuality paradigm looks at the mutual constitution of society and environment. People, in this view, are not just vulnerable to hazards, but hazards are increasingly the result of human activity. This is particularly clear in the cases of the meteorological and hydrological processes producing high winds and floods. These hazards have become more frequent and more devastating due to environmental degradation and under the influence of human-induced climate change. This has the important implication that vulnerability might not just be understood as how people are susceptible to hazards, but can also be considered as a measure of how well the environment fares around society (Oliver-Smith 1999a, p. 31).

I consider the mutuality idea a new paradigm and not just an elaboration of structuralism, because it rests (explicitly or implicitly) on different notions of causal effects, social change and possible responses to disaster vulnerability. The structural paradigm is based on the idea that causes of disaster vulnerability can be deduced to a limited number of root causes. In order to overcome disaster vulnerability, these root causes must be addressed. Even though there are many practical and political obstacles, at least there is a clear political agenda for the required radical changes. The mutuality idea on the other hand has much more affinity with complexity theories. These theories are characterised by the complexity of interactions between society

and nature, the unpredictability of causal chains and social change. They are far less clear about the required policies to overcome vulnerability (Green and Warner 1999).

In this paper, I will first elaborate the outlines of a complexity paradigm and discuss its merits for disaster studies. Then, the concept of social domains of disaster response will be introduced using complexity theory while taking into account diversity and human agency in responding to risk and disaster. Although the notion of social domains imply a shared repertoire of practices and languages, it is emphasized that contradictions, conflict and negotiation takes place within the domain as much as in interactions with other domains. Although a focus on social domains turns the analysis of disaster response increasingly complex, I hope to make clear this can lead to a number of practical considerations for dealing with vulnerability and disaster.

Complexity Theory and Disaster Studies

Complexity theory, in general terms, is concerned with stability and change in systems that are complex in the sense that they consist of a great many independent agents that interact with each other in many ways (Waldrop 1992, p. 11). Originating with mathematics and physics, since the mid 1980s complexity theory has entered the social sciences, where it found application in areas as widely varying as the breakdown of political systems, the working of markets and traffic jams. Complex systems are formed by a number of simultaneously acting components that each have a certain degree of local information and influence but can not determine the whole state of the system (Possekel, 1999, p. 13). It makes systems inherently instable and the ways in which processes of ordering and change occur unpredictable and non-linear. This is expressed in the concept of self-organization, which stipulates that through the interactions within systems and between systems and their environments systems undergo spontaneous self-organizations.

Complexity theory has been explicitly applied to vulnerability and disasters in the work of Louise Comfort on self-organisation following disaster (1995) and in Anja Possekel's study of the volcano eruption in Montserrat (1999). In addition, much of current developments in disaster theory have affinity with the premises of complexity. Complexity theory is highly relevant for disaster studies, because it provides an entry point to describe disasters as the interaction between (sub-) systems of nature and society, or hazard and vulnerability. Disasters caused by natural hazards can easily be recognised as instances of complexity. They result from complex interactions of nature and society, different dimensions of space, i.e. where hazards may affect remote places, and different time frames, i.e. the conjunction of different patterns of change: short-term, long-term and cyclical (Holling et al. 2002, p. 9). Oliver-Smith (1999b) and Comfort et al. (1999) describe such complexities for the Peruvian earthquake and Hurricane Mitch respectively. Floods can originate from the unlucky coincidence of a number of contingent variations and interactions in social, natural and meteorological elements. Although these variations may each be insignificant and fall within perfectly normal ranges producing non-floods everyday, at particular junctions they result in dramatic flood events (Linde, 2002, cf Perrow 1984).

Complex system approaches can, I believe, have a major impact on the study of disasters caused by natural hazards. In the first place, the approaches enable the study of environmental and society impact on disasters in a symmetrical fashion. Disaster could be portrayed as resulting from interactions between several subsystems in the

geo-physical and climatological environment on the one hand and subsystems of society, such as science systems and local knowledge systems, on the other. In the second place, complex system approaches remind us of the profound impact of disaster risks on society and environmental relations. All too often, disasters are still considered aberrations from the normal situation, or a temporary interruption of development. A major disaster like the 2000 floods in Mozambique are invariably followed by statements of politicians and experts outbidding each other on television with estimates on the number of years the country was 'set back' in development. These comments disregard that disasters may result from, rather than impinge on development. They also fall back on a notion of linear development as the norm of temporal change, disregarding the multi-directional ways in which societies evolve. Hence, complexity can provide an alternative for erroneously putting disasters in a linear timeframe of development.

Since complexity theory promises to provide a major contribution to disaster studies, it is especially important to realise that different approaches are developed under the heading. Complexity theory has the potential to bridge natural and social sciences, but in practice it often reanimates divides between, for instance, positivist or social constructivist notions. These differences can remain hidden in the use of similar, abstract vocabulary but can have important implications for dealing with risk and disaster in policy and practice. It is impossible to discuss the enormous body of emerging theory on complexity, but to elaborate this point, I want to at least discuss briefly the ways in which change is appreciated in different strands of complexity theory. Stacey et al (2000) distinguish three strands of theory based on chaos, dissipative structures and adaptive systems respectively. In chaos theory, change occurs because of the many ways in which different elements of an open system interact upon each other, resulting in unpredictable patterns of change. Chaos is often exemplified by referring to the effect where a butterfly flapping its wings in Amazonia can cause a storm in Chicago, but at other times will have no effect, depending on its interaction with other conditions. Although the interactions between components of a system or between sub-systems follow predictable patterns, chaos stems from the unpredictability of the combined interactions where small variations in each of them can accumulate into large consequences. Note that unpredictability here refers especially to the "inability of humans to measure with infinite accuracy" (Stacey et al, 2000, p. 89). It is a mathematical approach, where complexity becomes equivalent to the computertime needed to analyze a system (Possekkel 1999, p. 16). The term dissipating structures stems from the Nobel laureate Ilya Prigogine who demonstrated the imbalance of chemical and physical systems by proving how changing conditions (such as supply of energy) leads to the spontaneous formation of new structures. Self-organization in this case is a property of systems but gets triggered by interaction with external factors.

The third strand of complexity theory identified by Stacey et al. centres around the notion of complex adaptive systems. The difference compared to the other two is that adaptive systems are able to learn by experience, to specifically process information and to adapt. Here, self-organization means agents interacting locally according to their own principles or intentions in the absence of an overall blueprint of the system (Stacey et al, 2000, p. 106). Adaptive systems don't just passively respond to events, they actively try to turn whatever happens to their advantage (Waldrop, 1992: 11). This strand leads to a more radical kind of unpredictability than for instance the

unpredictability of chaos that contains the promise of becoming predictable once mathematics and computers are up to the task. The unpredictability of adaptive systems stems from the creative interaction of sense-making and diverse agents. This way of thinking opens a venue for understanding vulnerability and disaster in terms of multiple realities and has many implications, among others for the relation between scientists and lay people.

If complexity is defined as a multitude of systems, agents and interactions the challenge becomes to devise models to capture and control complexity. Indeed, according to Shackley et al (1996, p. 221), much of complexity work (in natural and social sciences) still seems “largely inspired by the commitment of discovering the principles of predictability (and thus control, or theological reassurance?) just at a meta-level”. On the other hand, some scientists use a different notion of complexity based on sense-making agents. Complexity, in this view, can be defined as a function of the number of ways in which we can interact and the number of separate descriptions required to describe these interactions (Mikulecky 1997, p. 4, in Possekkel 1999: 15). In this view, complexity becomes the need to select. Complexity requires people and scientists alike to reduce their interactions and interlinkages. Because of the many possible ways this happens, situations of multiple realities emerge. Instead of capturing and controlling complexity, the challenge then becomes to acknowledge multiple realities (shaped by culturally and politically informed ‘selections’) and to “embody the realization of complexities in developing institutional relations, mediations and identities” (Shackley et al, 1996, p. 221).

These two views of complexity lead to different kinds of science and policy. Given the dire need to reduce vulnerability to disaster and the history of top-down disaster management styles, it is likely that many disaster students and institutes would be attracted by the prospect of controlling complex systems. The other road of acknowledging multiple realities is more insecure. It is still difficult to imagine disaster policies that are not based on the aim of control and are nonetheless effective, but since they more accurately reflect disaster realities, in the end this may be the more fruitful road to take,

From Complex Adaptive Systems to Complex Social Domains.

While further exploring the possibilities embedded in reflexive strands of complexity theory, I like to step away from the concept of systems. The notion of systems or sub-systems does no justice to the dynamics of societies' disaster response. The very idea of a system supposes that the elements of the system relate in functional and predictable ways. This runs against the notions of agency and diversity. People are social actors that do not merely react to what happens around them, they have the capacity to process social experience and respond accordingly (Long 1992). Because people and institutions, acting from diverse histories and life worlds, have different interpretations of situations and events, they develop differential responses to similar conditions and processes thereby changing the meaning of institutions and the course of events in unpredictable and multi-directional ways. This property of especially human systems has to some extent been acknowledged in systems theories and has resulted in qualifications like open, adaptive systems or soft systems.

However, the more open systems remain problematic because of the implicit assumption that elements or people belong to one particular (sub) system. This

overlooks that actors may belong to different systems at the same time, and relate with each other in different capacities, and that they have the ability to integrate and rework knowledge derived from different systems. As a result, even the softest system thinkers risk overestimating the commonalities within systems and the differences between them. The difference this can make to our understanding of disaster is so substantial, that I rather avoid the concept of systems altogether. Instead, I prefer to work with the notion of social domains.

Social domains can be defined as areas of social life that are organized by reference to a series of interlocking practices and values (Villarreal 1994, 58-63). Social domains of response to risk and disaster are areas of social life where ideas and practices concerning risk and disaster are exchanged, shared and more or less organized because of a certain proximity, physically or discursively, in the ways references are made to disaster and risk. The concept of social domains explicitly departs from the idea that they would be composed of functionally relating elements. Although domains imply a shared repertoire of practices and languages, it is emphasized that contradictions, conflict and negotiation takes place within the domain as much as in interactions with other domains. Differential interpretations are often concealed because people use the same language. "Domains represent for people some shared values that absolve them from the need to explain themselves to each other - [but] leaves them free to attach their own meanings to them" (Cohen 1986, p. 16).

Working with the concept of social domains, rather than systems, may redirect our gaze and lead to a different way of analyzing disaster. It can make the analysis more sensitive to social change within domains. Domains are not just changing in response to interaction with or penetration of other systems. Due to ongoing negotiations over the meanings of and responses to everything happening within and around these domains, they are subject to social change from within. It will also tune the analysis better to the fluidness of domain boundaries. Although a notion like open systems takes into account the softness of the boundaries of systems, the concept of social domains gives more central attention to the travelling of people, resources and ideas between domains.

The three main domains of response to risk and disaster are the domain of science and disaster management, the domain of disaster governance and the domain of local responses. They are the respective domains of scientists and managers, bureaucrats and politicians, and local producers and vulnerable people. As will be elaborated, each of these domains of knowledge and action represent notions and relations of nature-society interaction, vulnerability, risk, and disaster response. They are associated with particular discourses through which meaning is given to phenomena. They are, for instance, characterised by different ways of experiencing and producing nature (Escobar 1999, p. 5). On scrutiny, however, these domains turn out to be differentiated and constituting multiple realities. At the same time, there are more common aspects in different domains than apparent at first sight. As will be elaborated, this property of domains leads to more complexity, but may also hold the key to developing alternative ways of policing about disaster.

The Domain of International Science and Disaster Management.

The domain of disaster science and management is dominated by a hazard-centred paradigm. This paradigm is embedded in a general discourse of capitalist modernity

where nature and society are seen as separated, and nature is considered a commodity that can be appropriated and controlled through expert knowledge and modern administration (Escobar 1999). Disasters seem to pose a challenge to this paradigm since they are constituted of moments where nature clearly escapes human control. Disaster management, however, can bring hazards nonetheless as much as possible under control. Because disasters mainly happen in developing countries, moreover, Greg Bankoff stipulates that disasters actually reinforce the dominant paradigm. Disasters are mainly considered phenomena of tropical areas whose insufficiently modernized relationships with nature make their populations vulnerable as a matter of course. Western technology, then, provides the remedy to this vulnerability to the whims of uncontrolled nature.

The modernity discourse can clearly be recognized in the central assumptions, notions and priorities of hazard-centred disaster science and management. Keith Smith (1999/1996) summarizes these as pre-dominantly interested in the geo-physical processes underlying disaster, geared to developing technology for monitoring and predicting these processes, and preferring to contain nature through engineering works such as flood embankments or avalanche sheds. This scientific approach is coupled to modern forms of governing disaster through disaster plans and emergency responses according to a military style organization, often in fact delegated to armed forces (Hewitt 1983). It is modern organizing to the extreme, based on notions of intervention as linear processes, where empirical complexity is divided into a series of independently given realities (Long and van der Ploeg 1989, p. 229).

Although this paradigm may dominate the field of disaster science and management, it forms by no means a hegemonic claim conditioning scientists and disaster managers into predictable and uniform actors. The paradigm is contested by rival approaches, in particular the structural approach as was discussed in the introduction to this paper. This rival approach is invariably presented as critique from the margin, but has in fact made considerable dent. In the case of flood management, for instance, Smith and Ward (1997) consider that a structural development paradigm where floods in developing countries are considered as being rooted in civil war, foreign debt, uncontrolled urbanisation and poor building constructions, has largely overtaken earlier paradigms in the 1970s and continues to dominate flood theories and practice, where the emphasis has become increasingly on sustainable solutions rather than expensive constructions.

Further differentiation in paradigms would be found when moving into the specific approaches of the numerous disciplines concerned with disaster, estimated to be at least 30 (Alexander 1997). The question is whether these differences are more than variations within the discourse of modern capitalism, since they all continue to rely on expert knowledge and modern interventions. But the extent differs. The development paradigm has brought with it a call for participation, and the reliance on local knowledge, which represents a move away from the so-called dominant paradigm. Likewise, the Netherlands has recently embraced a new paradigm wherein the reliance on dikes is abandoned in favour of a policy to give water space and have water dictate landscape planning rather than the other way around. This is a significant step for a water engineering country *par excellence* towards a more holistic approach to nature normally considered exclusive to people in the South (Rijkswaterstaat 2002).

Portraying the Western hazard paradigm as hegemonic not only dismisses rival, parallel or previous discourses and paradigms, it also ascribes too much consistency and homogeneity to the paradigm. Natural science is in many respects as local, parochial and cultural as folk or local knowledge. Numerous definitions compete over the meaning of concepts like risk, disaster, hazard, vulnerability and mitigation, and work often rests on scientifically ungrounded assumptions. Bruno Latour (1997) showed how making science is a social endeavour where enrolling people into accepting certain truths depends more on the social relations and status of institutions than on the use of scientific methods. Hence, social networks, political rivalry, career considerations and personal characteristics like age and social background may better account for ongoing paradigm schisms than the value of the arguments raised. In other words, we should not derive from the forceful way in which the idea of Western rationality is advocated (or attacked), the expectation that organizations in 'the West' (whatever that may be) actually operate according to this image (Herzfeld 1992, p. 47).

These considerations are more than cracks in a hegemonic scientific bastion. It means that the analysis of empirical situations requires more than a 'dominant science versus local perspectives' binary. Rather than representing some exceptions to a solid rule, they imply that we have to revise our explanatory framework for understanding disaster intervention. Instead of assuming that the field is ruled by a uniform, hegemonic paradigm, we have to base our analysis on the notion of complexity and contradictions within the domain of disaster science and management. It means that we have to study how actors in this domain make sense of risk, vulnerability and disaster through their everyday practices, how rival scientific narratives are being formulated and through what processes particular narratives gain the status of truth.

The Domain of Disaster Governance.

The domain of disaster governance is the disaster response domain where society's priorities regarding risk and vulnerability are defined. It is the domain where disaster knowledge and management is mediated and altered through political and bureaucratic governance practices and institutions. In a broader sense, the domain of disaster governance is also the domain where it becomes apparent how disasters affect state-society relations and, vice versa, how state-society relations affect responses to risk and disaster.

The official policies of governance of disaster are often derived from the domain of disaster science and management, but in actual decisions and practises they take on a different nature. In developing countries, where disaster science and management is often imported the question how it works in practice and articulates with governance is especially relevant, but such gaps between science and governance occur to some extent in every situation. Politicians and civil servants weave their own narratives explaining the relations between hazards, vulnerability and disaster picking bits and pieces from science as they deem fit according to their own beliefs. These reflect political interest and motivations, but are also informed by cultural patterns of governance, including the governance of risk. Mary Douglas and Aaron Wildavsky postulated in 1982 that societies selectively choose risks for attention and that this choice reflects beliefs about values, social institutions, nature and moral behaviour.

As Wildavsky remarked in 1991: "Every survey study of risk perception, including among risk professionals, concludes that knowledge of actual dangers makes no difference whatsoever". It is the 'adversarial context' and not whether people are likely to be harmed that matters most.

Writing in the early 1980s, Douglas and Wildavsky thought it was possible to identify particular risk cultures for societies. More recent work has left intact their basic notion of the social constructed nature of risk, but started to point to the variability between and within domains of risk regulation. So, leaving aside the search for *the* risk culture of a society, these works have come to analyse how risk regulation is shaped in an amalgam of many possible dimensions (Hood et al 2000). A single government, for instance, can take different attitudes towards different hazards. The same country that would command forced evacuation for prospective victims of a volcano eruption, could be much easier and reactive to for instance the monitoring of brakes on cars even though traffic accidents may be a much larger killer than volcanoes. While some hazards are regulated by the specialised risk bureaucracies and militarily-structured operations, others are regulated by generalist agencies, left to local governments, to people to cope for themselves or dealt with by a multiplicity of agencies.

The complexity of risk and disaster governance becomes more pronounced when taking into account the international dimension of risk governance and when we consider the every day practices of disaster management. The international dimension is important because risks and disasters do not often respect national boundaries and need to be dealt with by international, regional or global bodies of regulation. The resulting governance patterns may be far from coherent. Everyday practises of disaster management may be substantially diverging from official policy and reflect more of historically grown patterns of bureaucrat-client relationships. For instance, after the floods in Mozambique students of disaster studies found that managers of relocation camps charged contributions from people to get access to the camps, thereby effectively excluding the vulnerable people the camp meant to shelter (Holla and Vonhof, 2001). These practices were probably the effect of years of post-war construction programmes where low-income bureaucrats handled foreign funded projects and had grown accustomed to getting paid for services supposed to be given for free. Hence, risk cultures do not form an invisible infrastructure of risk regulation, but patterns of risk governance evolve in the everyday practices of risk and disaster management.

The domain of disaster governance is also important because it opens a venue to analyse the mutual impact of risk and disaster response and state-society relations. When disaster lures or strikes, social actors (local people, bureaucrats and scientist alike) grapple to understand the reality around them. Narratives that people create about risk, vulnerability and disasters are not just statements about nature but also statements about state-society relations. Often, disasters are seen as the implicit breach of a social contract where states should protect their citizens from vulnerability to disaster. True or false, the ideas people have of the state in relation to society shape their interpretations of and responses to disaster. In Turkey, for instance, the 1999 earthquake shook people's confidence in the state because it strongly brought out the fallacy of the dominant discourse promoted by the State that "father State would take care of everything" (Arkel 2000). Alternatively, vulnerability to disasters may be seen as the delayed outcome of colonial policies or international adjustment programmes.

This underlined for instance Grace Machel's accusation after the Mozambique floods in 2000 on BBC World that international donors failed in their *duty* to deliver adequate humanitarian assistance. Vice versa, responses to risk and disaster also affect state-society relations. Where disaster is frequent, such as in Philippines, disasters can be seen as one of the ordering elements that over centuries shape state-society relations and the differentiations within societies (Bankoff 1999). Single disaster events can accelerate, reverse or change the way state-society relations evolve. Disaster in Nicaragua speeded the downfall of Dictator Samosa and the Armenia earthquake in 1988 accelerated Glasnost in the former Soviet Union (Benthall, 1993, p. 108-121). The direction of disaster impact is not always the same: disasters can enhance radical change or bureaucratic reform, bringing about the potential for change by exposing conditions that need alteration (Hoffman and Oliver Smith 1999, p. 10). However, disasters also often reinforce existing power relations when resourceful people manage to profit from the potential for change over more vulnerable people or provide an opportunity for military factions to strengthen their grip on democratic institutions.

Shackley et al noted that complexity resides especially in the social relationships within and between institutions and agents (Shackley et al 1996, p. 201). The domain of disaster governance is clearly no exception to this rule. It is highly complex because in the interactions within governance institutions and at the interfaces between these institutions and scientists and managers on the one hand and vulnerable people on the other, disaster responses get shaped. The domain is particular to local histories, governance patterns and state-society relations and it is hardly possible to define its characteristics, actors and dimensions beyond meso-level analyses at country, region or river basin levels.

Domain of Local Knowledge and Coping Practices.

The domain of local disaster response is constituted by the manifold ways in which local people cope with emergency, maximising their own capacities, resources and social networks. People anticipate disaster and rely on themselves and their community folks for survival. It has been estimated that no more than 10% of survival in emergencies can be contributed to external sources of relief aid (Duffield, 1993, p.144). In recent decades several publications have pointed to the extensive knowledge people avail of to cope with crisis, such as ingenious practices to regulate the size of herds by nomad peoples to overcome periods of drought (Toulmin 1995) (see also Blaikie et al, 1994, p. 64-9; Curtis, 1993, p. 4-7, Frerks 2000).

Local knowledge domains are different from the other two because they are rarely self-referential. With the exception of some indigenous movement actors, people refer to their local knowledge as knowledge. It is rendered local because outsiders, in particular intervening experts label this knowledge as local, a status that no matter how admiring is ascribed to them by people from a superior position of universal knowledge. The use of the notion is not homogeneous. Kees Jansen (1998) distinguishes three approaches to local knowledge in development practice that can be recognised as well in disaster management. The first is a utilitarian or instrumental approach that views local knowledge as a barrel of information that can be tapped for disaster management. The second stems from a critique to modernization and stresses the different character of local knowledge. It is assumed that local knowledge overcomes the separation of nature and culture and can thus inspire to 'decolonize' our

minds (Apffel-Marglin 1996, in Jansen 1998, p. 165, Fairhead 1993). The third approach to local knowledge also criticizes the modernist approach, but stresses local knowledge as a source of political-economic empowerment of local people. It points to the need for an alternative development agenda based on self-reliance, ecological soundness and popular empowerment. This approach can be recognised in structuralist approaches to disaster calling for participatory societal change to structurally address vulnerability.

The three lines of thinking share the same assumptions that there exists a growing body of homogeneous local knowledge that is community-owned and can be separated from extra-community kinds of knowledge. These assumptions are problematic. Firstly, local knowledge can not be represented as an accumulating and homogeneous community stock. It is often not shared in the sense that everybody possesses the same knowledge, it could even be said that the only one knowing all is the outsider collecting the knowledge taxonomy. In addition, people in communities do not need to have the same ideas about nature, vulnerability and disaster. In the smallest communities alternative discourses prevail around the same concepts, such as for instance development (Hilhorst 2001). These discourses are partly distributed along gender or other locally relevant categories of people, but people also adhere to conflicting discourses simultaneously and use them according to the contingency of the situation. Hence, the same people may hold on to holistic notions about society-nature relations and to notions that nature can be used and destroyed (Bruun and Kalland, 1995).

Secondly, local knowledge does not emerge in isolation. It gets shaped at interfaces with other domains of knowledge, such as scientific or bureaucratic knowledge (Arce and Long, 1992). Local knowledge is constituted of a blend of bits and pieces of information and insights from different pedigrees. Local producers may thus anticipate extreme weather by reading signs from animal behaviour, but may just as likely have heard the forecast on the radio. Following Arce and Long, “rather than premise one’s view of knowledge on a binary opposition between Western and non-Western epistemologies and practice, one should attempt to deal with the intricate interplay and joint appropriation and transformation of different bodies of knowledge” (2000, p. 24). This conclusion brings us back to the question how people in situations of complexity make sense of knowledge and select what is relevant to them.

It brings me to a third point, regarding the way local knowledge is produced. Using the category of local knowledge implies that it stands apart from non-local or modern and universal knowledge. It would stem from a different mode of thinking, where science seeks (causal) relations, local people would be holistic. However, just like science does not obey to its ideal typical norms, local knowledge may likewise be more varied in nature. Agricultural producers do experiment, try to combine information in ways that are often highly rational. Paul Richards (1989) speaks in this respect of ‘people’s science’ and points to the capacity for people to improvise. Experimenting and improvising are usually social activities, fed by things heard on the radio or in a shop and discussed with neighbours. This means that knowledge gets constructed in social processes, including the role of social networks and power relations (Long and Villarreal, 1993). In these processes some people become much better positioned to obtain knowledge and make their interpretations of events and processes authoritative in the community (Hilhorst 2001).

Like the other two domains, then, the domain of local knowledge is also diverse and conflictive. What local knowledge constitutes can, as a consequence, only be gathered in community studies that acknowledge the heterogeneity and power differentials in communities and step away from viewing communities as isolated units. Local knowledge is not a stock of knowledge, but constantly evolves through the social negotiations, accommodations, exchanges and power struggles of local actors.

Domains and People.

The interpenetration and internal diversity of domains of knowledge and action becomes evident when we take into account the multiple identities and movements of people. Domains overlap partly because of the simple reason that some people belong to more than one domain or because they travel between domains. Scientists and bureaucrats are also community members. Even in the most remote communities one might find a retired meteorologist, repatriated migrants with some particular expertise, people with social networks able to mobilise high level government officials or international knowledge centres. Two categories of people and institutions are particularly apt to surf along the different domains: NGOs and the media.

NGOs are often lumped together as one category sharing the same characteristics, value orientation and interests. In reality this is not the case: NGOs are highly diverse in all kinds of features. Some combine different approaches whereas others would suit into one of the distinguished domains. For instance, the Turkish NGO Arama Kurtama Dernegi (AKUT, Search and Rescue Team) grew from the volunteer rescue work of amateur mountaineers during the 1999 earthquake. The NGO has ever since been active during earthquake in the world, offering their rescue expertise (Arkel, 2000). Another disaster-oriented NGO is the Philippine Citizen's Disaster Preparedness Center (CDPC). This NGO adopts a participatory approach to identify with community folks the hazards and vulnerabilities they are exposed to in order to work out community preparedness plans. The first NGO would belong to the disaster science and management domain, whereas the second would identify much more with the local domain of knowledge and action. NGOs may be in a very good position to bridge domains of knowledge and action. National Red Cross organizations, for instance, are sometimes considered government and sometimes NGO. They bridge the governance and the scientific domain, and in some countries are also reaching out to the local domains of knowledge and action.

Media can take different positions too. From a content analysis of three Dutch newspaper reports about three disasters, it was found that reporters normally adhere to the dominant view of natural disasters as caused by nature, a fascination for the hardware of rescue operations, especially the use of helicopters, and a representation of affected people as hapless victims (Belloni et al). However, there was variation in the way reports were made. Background features or analysis would usually take a more structural position on disaster, and the general news clippings would become more sensitive of root causes and vulnerability after some time lapsed. Remarkably, reporting on Mozambique and Honduras would be more likely to adhere to the dominant view and perpetuating disaster myths than reporting on Turkey, which was explained because unlike the other two countries, Turkey is more close to the Netherlands and not considered a developing country. While in the other cases the vulnerability of the countries to 'the cruel side of Nature' were taken for granted, in

Turkey reporters were instantly speculating about root causes, mismanagement and other social explanations for the disaster. Media, then, too can be associated with the different domains and it could be said that good reporters manage to straddle them all.

Conclusions and Implications

This paper began by identifying the emergence of a new paradigm in disaster theory focusing on the mutuality and complexity of environment-society relations in creating vulnerability and disaster. Complexity theory is a promising field for disaster studies, and its implications for disaster management have only begun to be explored. It is already clear, however, that complexity theory can involve radically different ways of thinking, alternating between identifying complexity as a multiplicity of relations and interactions waiting to be described and controlled, and identifying complexity in the reflexive agency that makes systems inherently unpredictable. Taking on the second line of thinking, this paper has introduced the notion of social domains as one way of accommodating the effects of human agency and actors movements across systems of disaster response. These domains are obviously different from one another: a university or research centre has other modes of organizing and operating than disaster committees and operational structures. Both are very different and remote from the coping practices of local communities. Yet, the domains are diverse within and may have more in common with each other than meets the eye. One of the reasons why they stand apparently apart may be because they are described and analysed through different perspectives and accorded different rationale and status. For instance, the universal status of scientific knowledge may blind observers to some of the more mundane dynamics of knowledge production, while romantic notions about the holistic nature of local knowledge may stand in the way of observing the rationality of people's science or conflicts at the community level.

What are the major conclusions to draw from this paper for the conception of social domains of disaster response? Firstly, it will be clear that none of the domains can be privileged for being decisively more trustworthy. The domains, as I argue, are equally tainted by parochial concerns; constrained by historically grown patterns of disaster response; challenged by rival discourses and meanings attached to vulnerability; and riddled by political intricacies. Secondly, if there is more analogy than assumed between the knowledge generated by scientists, bureaucrats or local farmers, this has implications for how we consider the ranking of knowledge. Instead of assuming that scientific knowledge is superior to local knowledge, or the other way around, a more open and critical eye needs to be cast on each approach. Thirdly, and most importantly, it means that the domains can only be understood in relation to each other. Disaster responses come about through the interaction of science, governance and local practices and they are defined and defended in relation to one another.

What does a focus on complexity, agency and social domains imply for the research of disaster response? Firstly, case studies are important. Meso-level analyses at country, region or river basin level may yield the best results for accumulating knowledge on disasters, even when these are global in nature. Secondly, ethnography is important to grasp how actors in different domains attach meaning to disasters and disaster response and how they influence each other. Ethnography should not be limited to local domains but can be equally suitable and insightful when done in and between other domains of disaster response. Recent developments towards multi-sited

ethnography and studying-up ethnographies are interesting to take into account (see for instance Burawoy et al, 2000). Finally, we have to find ways of representing the social domains in a meaningful way that provides handles for systematic discussion and possibly action without downplaying the complexity involved. Some promising methods are stakeholder analyses, the use of narratives whereby conflicting notions are outlined in rival narratives without necessarily judging their objective truths (Roe, 1991) and the use of multiple scenarios in projecting risk and disaster response (Possekel, 1999).

An approach focusing on social domains of disaster response, finally, has also implications on a practical vein. Such an approach can draw out the relations between actors in different domains. Present stakeholder approaches reinforce the idea that social domains of knowledge and action stand apart from each other and each have different perceptions and interests regarding vulnerability and disaster. By focusing on contradictions within domains and possible analogies between them, it is possible to identify alliances between actors from different domains. For instance, rather than collapsing the collaboration of radical scientists, NGOs and organised local people into a local domain of knowledge and action, such collaboration can be viewed as an alliance between parts of the different domains. Such a view enhances questions of how knowledge and power differentials between the partners evolve, acknowledging that alliances between domains may constrain relations or enlarge gaps between different parties. It also enhances the search for complementarity and win-win situations that alliances can entail. In the latter case, such alliances can be seen as one of the ways to reduce people's vulnerability to disaster.

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