



The vulnerable can't speak. An integrative vulnerability approach to disaster and climate change research¹

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Abstract

This article discusses a vulnerability approach to disaster research and research on climate change adaptation. As an integrated approach, it claims to consider social, economic and ecological factors. A central aspect is thereby added to the discussion of such a framework. A hypothesis is debated in which the vulnerability of a reference unit (humans, community, ecosystem, etc.) is highly dependent on the degree of influence the unit can exert on its relevant conditions for subsistence. The ability to influence these conditions depends, to a large extent, on discursive factors. This holds true on a local as well as regional and global scale. So far, these factors have been largely ignored. To emphasise this special determinant of vulnerability, the term “participative capacity” is proposed.

Keywords: vulnerability; resilience; disaster prevention; climate change; adaptation;

Introduction

It is expected that climate change will foremost manifest itself as an increase in disasters (heavy rainfall, droughts, epidemics, civil wars etc.). Hence, both the climate change discourse and the discourse on disasters raise the question: who will be affected by these changes, in which way, and who is particularly vulnerable? The answer is mostly: children and women, the elderly, the ill and the poor, ethnic minorities, psychologically or physically handicapped people etc. However, even entire regions, especially in the more southern countries, in the so-called developing countries, are seen as vulnerable. These reference units all have in common that they are less able than others to protect themselves against disastrous processes. Especially in the social sciences, this uneven distribution of vulnerability led to a criticism of the speech of “natural disasters”. *Hazards* were natural, for example geological, hydrometeorological or biological events which impact societies. Yet *disasters* result primarily from *social* and *economic* processes of marginalisation that force humans into dangerous regions and living conditions and make it difficult for them to access resources which are vital to their survival (Cannon 1994). Under these conditions any further stress endangers their very existence. The key reason for

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vulnerability, when seen from this perspective, is not “raw nature”² but rather social and economic exclusion (Hilhorst/Bankoff 2004). An approach to reduce vulnerability should therefore be aimed at reintegrating these excluded people. For example, as poor people are more vulnerable, an emphasis should be placed on improving their income, and as vulnerability under woman is above average, they should be “empowered” etc. (an example of this is the “(Sustainable) Livelihood approach”³). The most favoured *technical* approaches, however, still focus on natural events, not addressing causes of vulnerability but, at best, treating symptoms (Bankoff et al. 2004). Briefly summarised, this is the current state of the discussion from a social science perspective.

However, the term vulnerability can also be used in the context of *non*-human systems. Also physical institutions or infrastructures, but especially ecosystems and biological species, are vulnerable in various ways. Furthermore, the underlying “causes” are also increasingly social and economic. For instance, ecosystems are vulnerable to the consequences of globalisation such as accelerated migration of species, genetic modification, or urbanisation, as they are vulnerable to changes in the frequency and the magnitude of extreme weather conditions amplified by *anthropogenic* climate change (Lovejoy/Hannah 2005). As well as in human societies among animals and plants characteristics can be identified which are at least partially based on social and economic causes, and which make certain species or ecosystems more susceptible to extreme conditions than others. For example, the slash-and-burn of the rainforest signifies the destruction of the habitat for the majority of species for *economic* reasons. Especially in climate change and in disaster research, this mutual permeation and indivisibility of social and natural processes, has increasingly led to questions which cannot be solved adequately in particular research areas. Integrative approaches are needed to help visualise the complex arrangement of social or cultural, economic and ecological aspects.

Subsequent to state of the art studies, this paper will briefly set out the most important aspects of such an approach. Additionally, it will extend this approach by a dimension which *ex ante* has to be discussed. In my opinion, vulnerability is neither based purely on natural processes, nor solely on social processes. But I believe that social processes, or more specifically, *political* processes of discursive exclusion, have greater influence on vulnerability than what is believed so far. In research and application, discursive processes are largely neglected. An important factor for vulnerability, no matter whether human- or eco-system, is, that in the past the vulnerable of today had no “voice” or no representatives to give them a voice. Their world-views, their needs, their cognitive patterns and their interests did not find the adequate form of articulation, and nobody listened. At the same time the people with the loudest “voices” increased their influence and their property. The voices of the vulnerable were, and are, excluded or silenced on different levels and through a variety of means and practices, some of which are discussed in the next section. This “exclusion” happens mostly covertly, so to speak through “microphysics of power” (Michel Foucault). This fundamental dimension of vulnerability – I call it the “participative capacity” – needs to be included within an integrative framework, en-

2 Especially in the discourse on disasters nature is still often seen as the key cause. For the current state of discussion on this compare Felgentreff/Glade 2008.

3 The Sustainable Livelihood approach is mostly based on the work of Amartya Sen, e.g., Sen 1981, 1984, 1985, Olmos 2001).

compassing economic, social and ecological factors. This article will sketch the vulnerability approach from the perspective of a social scientist. This means, that although all three factors will be considered and connections will be made to interdisciplinary discourse, the emphasis of the deliberations, as well as the two given illustrations, are based on considerations taken from social science.

This paper is structured as follows: disaster and climate change discourse converge in the vulnerability approach. Through the examples of two Indonesian case studies, the similarities between the two discourses will be illustrated and the advantages of an integrative approach will be clarified. Initially, deliberations, as outlined above, based on a social science analysis of discursively based social inequality will be discussed in greater detail. Afterwards, the integrative approach will be outlined and extended by the discursive component of participative capacity. The emphasis is on processes which exclude *human* voices. However, where suitable the transferability of the argument to ecological processes will be stressed, thus emphasising its value for an integrative approach. The paper will end with an outlook.

Hegemonic discourse and capital

Vulnerability is often seen as *cause* for the unequal way in which people are affected by earthquakes, volcanic eruptions or even by market fluctuations, for instance by the price of oil (with reference to Indonesia e.g. Birkmann 2008; Pepinsky 2006; Syarifuddin 2006). However, it is often overlooked that, on the one hand, vulnerability is a *relative* concept as it depends on what a society defines as a risk and how people construct everyday-life-normality. On the other hand, in most cases vulnerability itself is a *consequence*, meaning it is first of all an indicator for deficits in the societal organisation of everyday life which led to vulnerability. In an economic sense for example, poverty reduces the ability of individuals to protect themselves against future dangers. However, it is the underlying causes *leading* to poverty which need to be understood. But even this extended chain of cause and consequence remains ideologically blinding, if, while searching for the reason for vulnerability, fundamental conditions generated by *discursive* social inequalities, are not questioned. For example, indigenous cultures have, in the recent past, sometimes been given the chance to speak on international stages such as at United Nations Conferences. Previously, as a minority, they hardly ever had the chance to articulate their interests. Nevertheless, the mechanisms of exclusion, the subtle tentacles of powerful forms of distinction have not been eliminated. Speech alone does not necessarily make a voice, if the language which it is expressed in is not understood, or if others do not want to understand it. This is the case if the voice talks in a way which is not compatible with the hegemonic discourse. But it is within this hegemonic discourse, from which they are shut out, where their living conditions are set. If their interests and their definitions of the world – including own definitions of risk and normality – remain structurally unheard, people's ability to manage everyday routine, but even more their ability to deal with extreme situations declines.

The global hegemonic discourse, of which I speak here, is the historic result of struggles between *actants* and their *allies*. The terms actants and allies are introduced here with reference to Bruno Latour (for example 2006, 2001) to pinpoint the fact that it is not just human actions that determine the result of negotiation processes. Plants and animals as well are either active, or passively resisting powers, and thus, like humans, also affecting the discourse as actants. The term *allies* is used to define everything which helps to

push through a personal worldview and own interests, also in the face of resistance. This includes repressive (canons and soldiers, claws and poisons), but also subversive (money and networks, colours and odours) “technologies of power” (Foucault/Sennelart 2006; Bröckling/Krasmann/Lemke 2007). In the field of disaster research (especially within the livelihood approach) it has long since been realised that vulnerability is not purely based on economic poverty, even though this is a major factor. To account for this, an expanded definition of capital has been used to evaluate livelihoods. In addition to economic capital, this approach also includes social (briefly: networks), human (education, skills, competences), physical (infrastructure), as well as natural (land, forest, water etc.) capital (DFID 1999-2005). However, this static and context-independent definition is unable to take into account the *structural* forms of exclusion which have determined the actual living conditions historically. Pierre Bourdieu’s concept of capital, well known in the field of sociology, goes a step further. It focussed on individual cognitive patterns and options of action or agency which both are determined by possessions and, this is important, the formal or informal (discursive) *rules* of the field. To defend or increase actual possession, capital is needed. The “objective” as well as the “cognitive” value of the different forms of capital thereby depends on the history of the arguments between actors (Bourdieu 2007). According to this approach, the hegemonic discourse can be characterised as the discourse which, in a given social field and according to historic distribution of capital, privileges those who own a higher than average part of the highest capital value goods. This gives them a superiority to construct the conditions which grant them the best results – they therefore have a special “participative capacity”. The position of the privileged, and the position of the marginalised, is therefore a *result* of this discourse. At the same time, this discourse is *constructed* by the privileged as they use their capital to define *who* bargains, *when* and *what* the bargain is about, and under *which conditions* the bargaining takes place (I call these the “4 W’s” for setting the agenda, see Voss 2008). This holds true for agenda setting at the global and regional level, as well as at the local level. In the following, two illustrations are given to clarify the process of exclusion and the relevance of participative capacity for the vulnerability approach on a local level. Subsequently I will look at the global level.

The vulnerable can’t speak – Two illustrations from Indonesia

In her article ‘Can the subaltern speak?’ Gayatri Chakravorty Spivak (1994) criticised intellectual representatives of postmodernism who claimed to give voice to the excluded. In fact they were still reproducing Western ideologies because they based their reasoning on underlying assumptions (such as a Western understanding of the subject), which were not necessarily shared by their clients. This criticism is relevant to the vulnerability approach, as it highlights the difficulty in representing the needs and worldviews of others.

The following illustrations shall clarify the necessity to become sensitised to this.⁴ This can only be *illustrative*, as the problem discussed is one of *comprehension* and *meaning*.⁵

The Indonesian province of West Sumatra is home to the Minangkabau. Officially, the Indonesian government accepts that the Minangkabau govern themselves following their traditional “Adat” system. Although this system was strongly curtailed during the time of President Sukarno (1949-1967) and President Suharto (1967-1998), it still regulates e.g. the local religious belief, rites and ceremonies, societal norms and values, as well as the connection to the environment. Traditionally the Minangkabau had no formal concept of land rights: land was used by the community according to Adat rules. Especially with the spread of palm oil plantations in the 1980s this became a problem. The chosen solution was to authorise Adat leaders to decide on land use rights, after receiving the consensus of the entire community. Though, the reality today looks different. Multinational companies use all available means and allies to secure land rights for themselves. The companies contact local Adat authorities or church representatives and promise them educational institutions for the community or high compensation payments. In general, these promises were never kept. If the community resists, Adat leaders were corrupted or browbeaten to make decisions against the Adat. Police sometimes use brutal force to silence protestors. As a consequence, the local societal order erodes step by step and vulnerability increases.

The local communities, which still often follow the Adat as an ethical and moral imperative, frequently lost out in these negotiations. If, for example, Europe experiences an energy crisis leading to a high demand for renewable energy crops to reduce greenhouse gas emissions, the local community has nothing to oppose the power of the mobilised allies. Actors in the energy sector build powerful networks associated with large amounts of capital which in the last instance put the locals under stress in various forms. In relation to these actants, the Minangkabau's resources have almost no value. Decisions taken by the globally active protagonists thus have an immediate impact on the local community structures in West Sumatra. The voices of the locals which express their world views, their structures of meaning and cognitive patterns, are drowned out. They only passively experience the impact of others decisions in the form of growing stress.

A second illustration shows that even the legitimate speakers of whole cultural areas normally cannot make their voices heard outside their region as their capital and their allies remain locally bounded. As is the case with many volcanoes all over the world, there is a holy person on Java who communicates between the volcano and the world of humans and thereby guarantees security to the region (Schlehe 2006). “The Keeper of the Key” (Juru Kunci) to the shrine of the holy volcano Merapi, Mbah Marijan, became supra-regionally known in 2006. During the months in which the volcano became increasingly active, an earthquake measuring 6.2 on the Richter Scale occurred, causing severe destruction to the areas Bantul, Klaten and parts of the city Yogyakarta. Shortly after-

4 The following example is based on the publication “Promised Land: Palm Oil and Land Acquisition in Indonesia” (Colchester et al. 2006). Thanks to Marianne Klute from Watch Indonesia for important background information regarding the effects of the “bio-” or “agro fuel boom” on Indonesia and on the affected minorities.

5 I am talking of illustrations as it is a part of the problem's structure as a discursive, “symbolic” form that it can not be explained in detail like an objective fact e.g. by giving clear cut examples, but it can be understood (see Voss 2006).

wards the coast nearby was hit by a tsunami caused by a seaquake leading to further victims. Because of the increasing activity of the volcano, the local population were repeatedly asked to evacuate their homes. Many locals insisted on staying on their own land. However, they were forced to leave and evacuations were carried out against the expressed pleas of the population. They invoked the words of the Juru Kunci. He interpreted the activities of the volcano as a warning from the spiritual world to the living, to critically reflect on the actual societal and political conditions.

In an interview held by the author with the help of a translator (English-Javanese-English), the Juru Kunci stressed that Javanese language transports a special dimension of *meaning*. Thus, similar to Arabic, Javanese was, in his opinion, not translatable into other languages. Rather, it was entirely different. This was the reason why he mostly used metaphors when speaking with us:

“I used to say: there are clever people, that are the people for example from Germany, and there are not so clever people, like the Javanese. The clever people use Roman alphabet, which is for making money. The Javanese language is for how to live, for the mind and the heart and for spirituality. [...] When clever people said, volcano Merapi will erupt, I said, it is only reconstructing himself. It is only developing its crater. While the clever say, it will erupt, we think, the mountain will get angry when we say, that he will erupt, that’s why for Javanese it is taboo to say, he will erupt. If someone says, he will erupt, than it is like expressing a hope that he will erupt. [...] When the ground shakes, for Javanese it means that we have to be aware of what happens next. When this happens, we just say ,as-Salaam 'alaikum waar-rahmatu allah wa-barakatu‘ [basic Islamic blessing: ‘Peace be on/with you and the mercy of Allah and his blessing’] to the activity of the volcano, if he wants to develop himself and wants to expand his ground. Clever people say, it is an earthquake and this means, it is dangerous. But when the earthquake happens, we should better say ‘La illah illa allah’ [‘There is no God but Allah/God’, meaning that man recognises the omnipotence of Allah], as everything that develops is a creature. We look at the Merapi as a creature, as a human being.”⁶

In this situation the 80 year old charismatic Juru Kunci opposed to the attitude of the more secular, more science-friendly, and more Western sultan (who is at the same time governor) of the region. This increased his recognition by the locals and led to raised media interest in his person. The media coverage staged the conflict between the Juru Kunci and the Sultan (Schlehe 2006). Even though the belief in spirits and in mythological elements which are assimilated in Islamic teachings, play a significant role in regional press coverage, the underlying meaning of the words of the Juru Kunci were lost in the mass-medial staging. For the locals, the Juru Kunci undeniably has plenty of capital. But this value is lost through the media’s construction of its own reality, following very similar patterns to those used by Western media. The only thing that counts here is the quota. A complex phenomenon is reduced to a binary coded message: Sultan vs. Juru Kunci, worldly vs. sacred, economy vs. culture, modern vs. tradition etc. For the local people, the words of the Juru Kunci have a direct meaning creating relevance. They are receptive to his words and gestures because they are embedded in a shared, historically formed interrelation of experiences, as well as in a view of the world which has grown through local conditions. This dimension, the creation of meaning in contexts which obviously

6 Thanks to André Bank for translating from Arabic and for instructive discussions.

seem to be hazardous for outsiders is a highly relevant but largely ignored factor in the debate on vulnerability. Vulnerability is not only a question of (objective) physics or physiology; it is also a question of (context dependent) *cognition*, of how people construct reality and the value of their lives in their local environment, of what they see as a disaster (in relation to all their other problems of managing everyday-life) and of what they think is the best strategy to protect themselves. Unfortunately, as cognition is dependent on contexts, it has no simple, measurable value in absolute terms. Different Forms being used to express very different worldviews have very different weights in local, regional or global negotiation processes. Thus vulnerability depends on how far ones perspective can be “translated” into global terms – translated in terms of meaning and in terms of power. The Minangkabau are bounded to their local adat. The Juru Kunci speaks in Javanese, which he himself judges as untranslatable. Because of this the capacity to participate in discourses which are highly relevant for their own living conditions is very low – for the Minangkabau as well as for the Juru Kunci.

Global agenda setting and regimes

The voices of the vulnerable sound localised and situational. Their needs arise from their living conditions and are adapted to these. Notwithstanding, even locally they have a hard time making their voice heard compared to other actants involved who can mobilise more resources and allies. However, the level of the global discourse they can only reach through spokespersons (mainly representatives of NGOs), who inevitably alienate the situational perspectives of the vulnerable (Claessens 1977). Furthermore due to lack of capital and allies, even these representatives of the vulnerable, as a rule, lose out to other actors, especially when it comes to tangible economic interests. This is examined further in the following view of the agenda setting and the actors in the discourses on climate change and disasters.

For a long time the predominant opinion was that the pressure of an “objective” problem was enough to initiate solution orientated processes. This was based on a fundamental trust that all problems today or in the future could be successfully dealt with through technology and science (Ulbert 1997; Meyer et al. 2005). This approach veiled the actual processes of defining and solving problems in a cloud of apoliticalness (Latour 2006). Nowadays, the *political* nature of decision-making processes is becoming more visible. This focuses the view on all the different actors involved and on their interests. There are different actors active in the climate discourse as are in the discourse on disasters and in both fields different political and economic interests play a role (Schipper 2008). However, in both discourses the amount of capital available to the individual parties involved has a structural effect on the agenda: It has a major influence on when and what is negotiated, what framework or set of rules is used for the negotiations, and who may participate (Voss 2008). Consequently, capital distribution is responsible for forming an understanding of the problem and the solutions which are to be achieved, *before* the official negotiations have even started. Thus capital ownership means that interests can be powerfully pursued, it determines the participative capacity.

The energy industry (i.e. oil industry or nuclear power industry, e.g. Lohmann, forthcoming) for instance, exercises a significant amount of pressure on agenda setting within the climate discourse. The actual dominant framework for the negotiations is a neo-liberal view of politics,⁷ while energy security is becoming an objective superior to all other aims. Against this background, the numerous NGOs representing the vulnerable have a weak position. If they, for example, try to highlight the consequences of European climate policies for the Minangkabau, their ethical arguments are at the earliest heard when the damage is already evident. As long as this is not the case, ethical argumentations today have no place on the international agenda. In the field of disasters, it is not so much single business-actors who have the power to call the shots, but governments with their development policies and aid organisations. Humanitarian aspects have taken a back seat as state-budgets are running low and aid organisations have to compete for donations. Even in the field of “humanitarian aid” the needs of the victims have to comply with the rules of the market.

The discourses on climate change and disasters also differ in their degree of institutionalisation: Binding frameworks only exist in relation to climate change (United Nations Framework Convention on Climate Change, UNFCCC; Kyoto Protocol). Through the Intergovernmental Panel on Climate Change (IPCC) the discourse is supported by a panel based on a nexus of scientific authority (Schipper 2008). In this context one can clearly speak of a climate *regime* which regulates the participation in decision-making processes (Holz, forthcoming). This regime has developed certain forms for identifying problems, as well as methods and standards to solve them (Meyer et al. 2005). In favourable conditions, such a regime can implement methods more efficiently (as in the case of the ozone regime, Breitmeyer 1996; Hey 2006). However, in the face of a regime, collectives with less capital will hardly get across their alternative views of problems. With regards to disasters, only declarations of intent exist (especially the “Hyogo Framework for Action”). But for the parties involved in disasters, even humanitarian aid and emergency aid are often experienced as regimes which drown out their own voices.

The “voices” of nature

Social sciences have an important contribution to make to an integrative vulnerability approach which surpasses the analyses of behaviour or economic influences. This is especially true in areas where the borders between different disciplines are blurred as for example in the discussion on the (communicatively and cognitively deep-seated) dualism of nature and society (Voss/Peuker 2006). As mentioned earlier, it is not only human voices which are discursively excluded, but, in a metaphorical sense, also the “voices” of animals and plants. *All* living beings express themselves in their environment through (active) behaviour or just through (passive) resistance, even when these expressions are not coded as speech (Böhme 2006). However, the expressions of the actants reach the rele-

7 The consequences of the current crisis – not only of the financial market – are of course not yet entirely foreseeable. On the one hand there are reasons to believe that this dominant neo-liberal framework will change in the near future, as e.g. the states are recapturing agency again, the United States are weakened and governed by a new president etc. On the other hand – and I tend to believe that this is the more powerful argument – the deteriorated global financial situation could lead to a setback in the negotiations on climate change (as on environment and development at all).

vant recipients unequally. Through economic, cultural, but also ecological globalisation for example, biological species, due to a change of location, come into conflict with other species with which they have never been in contact before. The reduction of their traditional habitats leads to a clash with each other on ever decreasing space. Some species are more able than others to survive under these conditions. Some are even able to draw human attention to themselves and to find “lobbyists” who “represent” them. An example could be the Orang-Utan in the Indonesian rainforest who suffers from global attempts to deal with climate change just like the Minangkabau. In the recent past, the Orang-Utan attracted more attention from media and environmental activists than the Minangkabau. However, even if the concept of capital can not really be used here, at least it can be said that animals or plants *can* mobilise resources, but as a rule less than those which can be mobilised by human actants. Under the dominant rational-technical framework and through discourses which are regulated by the laws of the market (Voss 2008), most species in the world have few or, at worst, no resources, or: no voice (any more) which they could bring into negotiation processes. This makes them particularly vulnerable, but up to now this determinant has been largely ignored in vulnerability analysis.

An integrative approach to vulnerability

A vulnerability analysis can be applied to different reference units: countries, regions, economic sectors, companies, communities, households and individuals can all be researched just as ecosystems can be. However there is no common definition of vulnerability. Its conceptualisation differs widely, historically dependent on political and scientific fashions, as well as according to the individual problem. Two positions can be outlined. The mainstream of disaster research still defines vulnerability as an exposure of a reference unit to, mostly natural, risks (for example the “*Risk-Hazard-Approach*”, e.g. Turner et al. 2003, as well as the “*Natural-Hazard-Approach*”, e.g. Adger 2006). The largely natural science based climate change research narrows the definition even further down to exposure to extreme weather and climate phenomena. As mentioned at the beginning, this approach is often criticised for neglecting the characteristics of the reference unit. However, especially in socio-scientific disaster research, a “paradigm shift” (McEntire, 2004) has been apparent in recent years which started off in research on famine in the 1980s. According to this research, the amount of damage and the number of victims are first of all based on the ability of humans, households or groups to stand against “natural” risks, as well as critical economic and political processes (this is the “*Social-Vulnerability-Approach*”, for example Adger et al. 2004; or Blaikie et al. 1994).

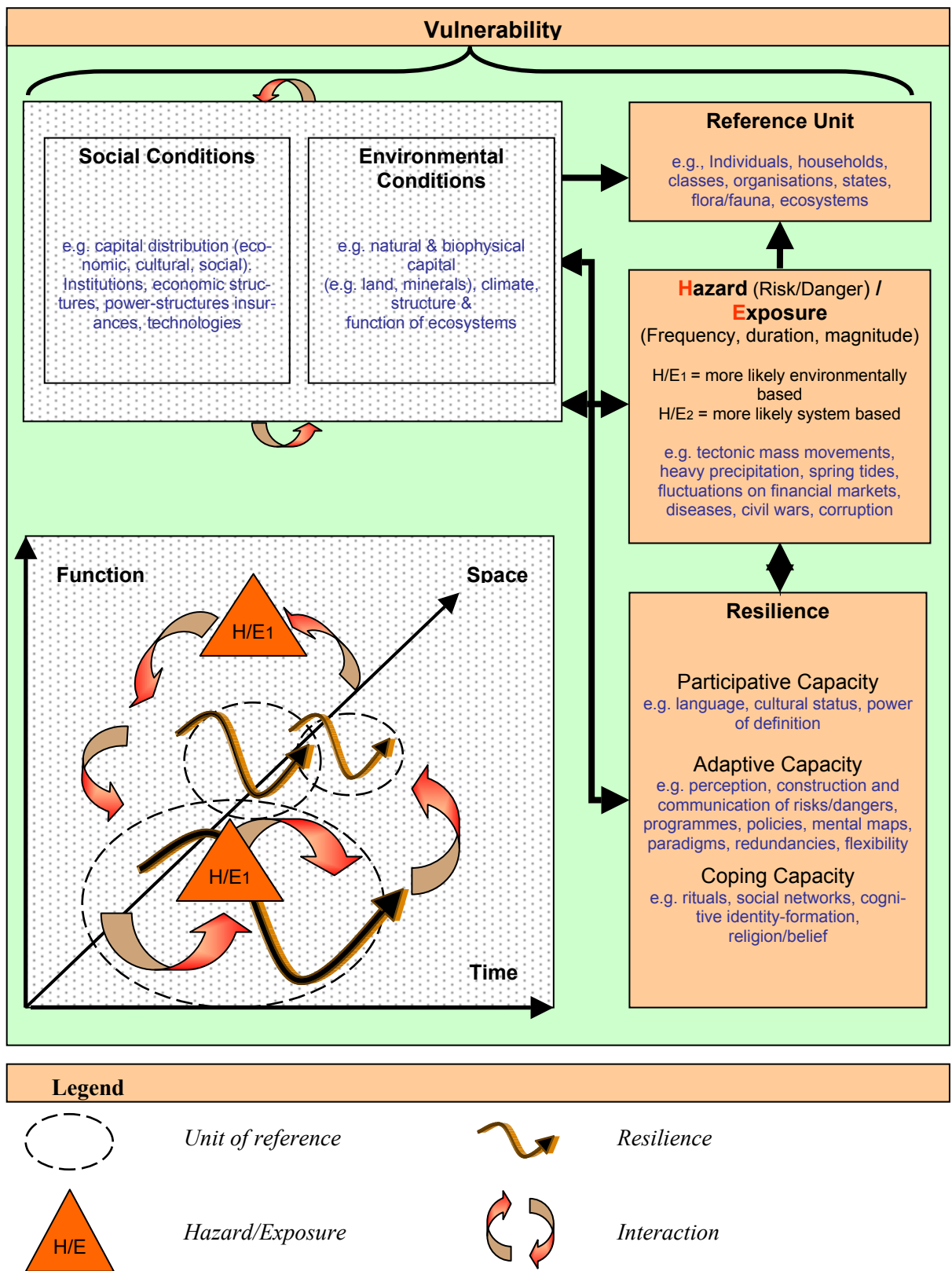
In the following, the earlier deliberations regarding “participative capacity” are integrated into a framework for vulnerability analysis which includes social, ecological and economic aspects. The approach is subtly based on Turner and colleagues (2003) although it has been significantly modified. In their approach, Turner and colleagues address both the Risk-Hazard-Approach as well as the Social-Vulnerability-Approach. They define vulnerability as “the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress/stressor” (2003). Hazards thereby can generally include *all* developments which puts a system under “stress” or under pressure to adapt. This encompasses physical and social dangers as well as economic pressure which have been increasing in the course of globalisation. The “classic” natural hazards such as earthquakes, volcanism, flash floods, storms, landslides etc. are just factors among others now. Thus, the underlying definition

of disasters in the integrated vulnerability framework is disassociated from the close link with “extreme forces of nature”. This is achieved at the cost of analytical differentiation (Quarantelli 2006), but in support of overcoming reductionism (Voss/Wagner 2008). Disasters then, with the words of Wolf R. Dombrowsky (2004) are generally “real-falsifications” of social organisations, no matter whether the most powerful driving forces were natural, social or something hybrid.

An *integrative* vulnerability approach goes further than earlier studies of susceptibility to disasters. As a rule, vulnerability studies were designed within one discipline and aimed at smaller spatial and temporal sections. In the last decades however, more and more interdisciplinary questions have come up and thus cross scale linkages and interactions have obtained more attention. Complex, non-linear structures are now seen, where earlier, research units were imagined to be in a spatially and temporally isolated and static condition. The borders of these structures are no longer attached to individual objects or to a clearly defined geographic space which would set the research limits. Instead the borders are set by the question, the identified processes, the network of actants, but also by the existing research funds and capacities (on this level, everything which was said earlier with regards to the influence of capital structure on the agenda setting is applicable again). Even the powerful negotiation processes which were outlined above come under scrutiny, as vulnerability can no longer be defined as a simple causal relation between single elements. These “natural” as well as “social” factors influence and overlay each other in a highly complex, ambivalent or blurred and multi-dimensional manner. Evaluation and weighting of these factors is therefore now mainly a question of the more extensive *political* discourse, rather than the narrower *scientific* discourse as it was in the past.

The integrative approach which has been drafted here offers support in identifying relevant factors by mapping the problems and research questions in their entire complexity. It visualises the spectrum of potentially relevant factors. These factors then need to be *weighted* in the specific analysis. This approach does not exonerate experts nor politicians from decisions, it does not produce any “objective” data which someone could simply rely on; instead it highlights the importance of finding competent actors, because the *choice* and the *weighting* of the factors are more important in the framework of an analysis than their individual measurements. Through this, even qualitative socio-scientific knowledge which cannot be quantified to indicators gets connected, because it offers indispensable knowledge for the weighting of all data.

Figure: Integrative vulnerability approach



Components of the approach: Unit of reference, hazard/exposure and resilience

As visualised in the text boxes of the figure on the previous page, four components of an integrative framework concept can be analytically differentiated. These are: unit of reference, exposure/hazard, social and environmental conditions, and resilience. A vulnerability analysis generally starts with the choice of a reference unit, i.e. whether individuals, households or classes, organisations or whole states, single animal or plant species, or entire ecosystems etc., are the focus of the analysis. On the one hand, this leads to the question of which particular hazards, with what frequency, duration and strength this unit is or could be exposed to. On the other hand, it should be taken into account that not all potential hazards are known. The unit of reference must therefore also be examined for its *general* abilities to adapt to unexpected and unexpectable perturbations or to deal flexibly with the stress which it is exposed to. I therefore differentiate between *risks* which can be estimated on the basis of experience, and up to now unknown *dangers* as stress factors. In my definition, the term *hazard* combines these two aspects (Voss 2006).

Hazards are the result of complex interactions. The abilities of the reference unit to withstand hazards needs to be evaluated in relation to social factors and the environmental conditions (see the top left part of the graph). Important social factors are: capital endowment and distribution (economic, cultural, social and other forms of capital), the fundamental social institutions which for instance regulate land rights, their anchoring in civil society, economic structures, the way risks and dangers are perceived, the degree of insurance coverage, the level of technological development etc. Important environmental factors include for example: looking at the developing status of ecosystems from a historical perspective, who owns natural and biophysical capital (e.g. land, climate, minerals, ecosystem structure, ecosystem function etc.) and how these endowments are distributed.

Hazards can not be evaluated without taking into account these specific constellations. Hence the differentiation which is often made between “man made”, “technical” or “natural” hazards is at best useful for an initial approximation. Beyond that it tends to mask the real complexity of the interrelations and therefore leads to wrong conclusions. The category “hazards” subsumes all biophysical factors as discussed in detail in disaster research: tectonic mass movements, heavy precipitations, flash floods, landslides etc. These types of risks can be quite easily operationalised, as for example an earthquake by use of the Richter Scale. These parameters can give indications, for example, on what type of architecture can be considered “safe” in an earthquake prone region. The damage expected by these particular risks can then be calculated in monetary terms. By taking into account population density and demographic data (age, income, sex etc.), it becomes possible to predict the likelihood of human casualties. Disaster research is well positioned in this sense. Research into climate change adaptation can build on this. The analysis of vulnerability to climate change can be carried out based on further developed regional models, as well as on the basis of predicted climatic developments (Adger et al. 2004).

However, biophysical factors only constitute one part of the relevant factors and therefore the insight gained from such data is still slight. In the past, vulnerability analyses were mainly focussed on such factors. They were also mainly focussed on stable processes and small areas. More complex interactions and cross scale dynamics were largely ignored. Without taking into account *temporal*, *spatial* or *functional* connections, the likelihood of coming to wrong conclusions is high: what works in one place today, may turn out to be fatal somewhere else in the future. A current drastic example for this is again the “bio fuel boom”. Factors and functions need to be looked at and *weighted* as

temporarily and spatially overlapping and increasing or diminishing. This is visualised through the three-axis model in the bottom left-hand corner of the graph. For example, the current inequality-creating economic world system and its power and ownership structures has (or had?) a wealth-creating effect in industrial countries. At the same time, at least at the moment, it has a negative influence on the resources of the Minangkabau. They become more dependent on the global economic condition and on market price fluctuations (e.g. food prices). Including the Minangkabau in increasingly globalised social structures is to be seen along side the erosion of their norms and values. This can lead to modified social behaviour and potentially to such deviances as alcohol and drug consumption, criminality or increasing corruption. The likelihood of infection with a modern civilisation disease such as HIV-Aids increases in globally marginalised populations. At the same time, they hardly ever have access to medical infrastructure. The industrial use of land and resources in the residential environment of these people, for instance on palm oil plantations, means on the one hand a direct loss of CO₂ sinks. On the other hand the extensive land use has further ecological impacts such as the loss of biodiversity or the volatile fluctuations of the food price which may occur much deferred. The expansion of the road networks to transport fruits harvested, construction of buildings for settlement and resettlement, all these collateral factors lead to sealed surfaces. The consequence is an increase in the speed of the water cycle and subsequently an increase in extreme weather conditions.

Through the initially separately developed approach of (social and/or ecological) *resilience* the vulnerability approach in recent years has gained further input, particularly concerning the three dimensions of time, space and function. Resilience in this article is taken as the fourth component of the integrative approach on vulnerability. Essential for the current discussion was a paper by C. S. Holling published in 1973. In a scientific study on the interaction of different populations, Holling came to the conclusion that the relative stability of an ecosystem was based on a number of different attractors. These attractors had varying speeds with which they developed and interacted with each other in a non-linear, dynamic way. The interaction between these attractors formed a structure (a "Basin of Attraction"). A disruption to the structure or a transgression of a threshold could cause the pattern of the structure to change suddenly ("Regime Shift"). Holling therefore concluded that ecosystems were complex and "multi stable" (Holling, 1973; Holling 1996; Gunderson/Holling 2002). While vulnerability research generally just focused on single, more or less isolated factors, based on the assumption of an invariant and culturally independent order in nature and society (e.g. Voss 2006), the resilience approach draws attention to the complex interaction of a multitude of factors. Only through their dynamics they create an equilibrium, the "Basin of Attraction". "Stressors" can therefore never be evaluated objectively, but instead only in relation to the constitution of this "Basin of Attraction", which itself is a result of earlier interactions of various types of actants and/or stressors. Whether a unit of reference is resilient is dependent on its abilities to cope with, to absorb, or to deal with stressors and perturbations of various types. It is resilient, if it thus can maintain the central services and proficiency level of the system.⁸ Within the resilience approach, the distinction between natural and social compo-

8 Initially, this definition is completely non-judgemental. For example, the military junta in Myanmar is resilient. Though, in disaster research and in the discussion on climate change, it is often used in combi-

nents seems to be no longer necessary. Instead, the indissoluble interconnection between “nature” and “social aspects”, “things” and “practices” is stressed. Even more strongly than in the discussion on vulnerability, the characteristics of the reference unit and especially its “soft skills” are focussed on. It is assumed that a system (social and biological) is more resilient (against risks but even against unknown dangers) when it can react flexibly (cognitively, habitually, biophysically etc.) to internal and external changes. This flexibility or adaptability is, for example, influenced by the degree of dependency on resources (social and natural), whether redundancies are available for exhausted resources etc. (Adger 2000).

Within the discussion on resilience as a component of the vulnerability approach, a differentiation is frequently made between adaptation and adaptability (Adaptive capacity), and coping strategies or coping capacity (e.g. Davies 1996; Alwang et al. 2001; Adger et al. 2004; Adger 2006). Thereby the interpretations differ widely. I take on that differentiation and add the term participative capacity, which was introduced earlier. The term adaptive capacity refers to the ability to structurally adjust. This can be either actively-reflexive, i.e. steered through conscious learning processes, or initiated through “trial and error”. The latter is rather the rule than the exception with regards to ecology, but it also holds true in a social context. In everyday life, people often don’t act with a plan, more likely they are “muddling through”, constantly failing on a small level (Voss 2006; Dörner 2000; Dombrowsky 1996.). The decisive factor is that the proficiency level of the reference unit is not majorly influenced by this failing, i.e. that the adaptation remains within the expected or “normal”. However there are many reasons why this flexibility, the adaptive capacity, can be restricted. For instance, social actors in politics, science and in everyday life tend to generalise problem solving strategies which have so far been successful. Even when the first signs crop up that the strategies are no longer adequate, they keep hold of them. The fact that a solution exists then determines the view on the problem at least for a while (Dombrowsky 1996, Voss/Wagner 2008). Alternative views or critical “voices” – especially those of the already vulnerable – remain unheard. The resonance to critical developments decreases (Voss 2006). Thus, participative capacity becomes a key category in the circle of disasters: the lower the participative capacity, the lower the resonance for critical developments, the lower the prevention activities, the lower the capacity to respond and to adapt and so on.

Both terms – adaptive capacity and participative capacity – can, though not completely, be transferred to ecology: Thus, for example, organisms create close symbioses which used to prove of value, but now, under rapidly changing environmental conditions, lead to whole species groups being endangered if one species were to die out. They had, on the one hand, no participative capacity; they could not influence the causes of the environmental changes nor their consequences. On the other hand the adaptive capacity was inadequate: it was not possible for them to adapt to the changes.

Finally, coping strategies make stress bearable. The term refers to all methods of (constructive) dealing with crisis, disasters or with stress in general. Coping strategies are a way of re-connecting what seems in the first instance *extraordinary*, to the habitual, orderly processes. For instance, rituals in the animal kingdom, as among humans, serve the purpose of de-escalating conflicts or of strengthening weakened orders of everyday life.

nation with the normative idea of sustainable development (for example Carpenter et al. 2001; Walker et al. 2002).

Social networks are comforting and give security. One comes together, discusses a situation and looks for new perspectives. Religion and belief both create meaning, they offer explanations for what is otherwise incomprehensible. Even worst case situations, which for an outsider look disastrous, can be given a meaning through, for example, religious practices as coping strategies. Vulnerability on Java could not be adequately evaluated without taking into account such strategies. For example, the victims of a volcanic eruption are seen as holy beings, which the volcano has called for a wedding party. The possibility of creating meaning in such a way, necessitates a much more complex evaluation of the relationship between potential gains on the one hand, (for example by staying on land, which is *a part* of his owner, his “proprium”), and the possibility of losing material valuables (which might be accepted because this loss has a meaning) or even human lives.

Outlook

Disaster and climate change research can both profit from an integrative vulnerability approach. Specifically this approach is helpful with reference to the identification and especially the *weighting* of indicators, which, when seen in isolation have basically no value. In this framework, discursive and cognitive factors are both considered as important elements. They have at least a weighting influence on “hard” indicators and “objective” data. Research carried out in all disciplines can be interrelated in this framework, so that a weighting of the results can be carried out, with participation of *all* relevant parties – including the vulnerable themselves. Thus the framework opens a way for democratisation, as it visualises complexity and stresses the political character of decision processes and of vulnerability. For the vulnerable, the chance to influence processes which are important to them might increase, if the importance of their participation is seen more clearly. Within science, the increasingly narrow, but still clearly existing rift between social scientists, natural scientists, and engineers might close further if they stop arguing their position with “hard facts”. Instead they better discuss the *meaning* of individual positions and data – not only with each other but also with those they are investigating. The integrative framework might help to mediate and thus to increase participative capacity in disaster and climate change discourses.

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