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Learning from (small) disasters

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Abstract: In this article, disasters are understood as processes that have different impacts on social routines in terms of scale, scope and duration. The extent of adaptive processes in society can provide the ground for a rough classification of disaster types. Such classification has, on the one hand, practical and analytical advantages. On the other hand, they harbour the danger of overlooking transitions of scale and discourage comprehensive scale-related learning forms. Based on the disaster scale by Fischer (2003), flash floods in mountain rivers and torrents are described as extreme emergencies or small town disasters. Three given examples will clearly show that learning rarely takes place within an institutional setting that is subjected to *small* disasters because the stakeholder's focus remains on only one level. Therefore, we propose to implement a system of self-organised and scale independent learning, so called deutero learning, within the political subsystem. Following a damaging event, participative processes, that involve all levels, should be initialised. Their task would be to assess the combination of causes and draw conclusions for mitigation measures. An aggregation of these assessments would help the responsible political subsystems to adapt the current natural disasters policy to the changing environmental conditions.

Keywords: single loop learning, double loop learning, deutero learning, natural hazards, disaster, resilience

1. Introduction

The word disaster usually produces images of large scale crisis such as the hurricane Katrina in New Orleans 2005 or the Elbe floods in Germany in 2002. Flash floods that damage just a few houses are usually not associated with the word disaster. Mostly, they enjoy just short media frenzy and accordingly, the political pressure to draw consequences from such events is low. For America, Birkland (2006) could show that it needs large scale disasters, so called focusing events, to trigger learning processes within a political system. But even small disasters provide learning possibilities for stakeholders and administrations. A disaster highlights weak points not only at the local level, the analysis can also be relevant for super ordinate systems. In this article, we want to look at the question, if and how learning from “small” disasters can help reduce the probability and occurrence of, or the destruction resulting from “large” disasters. In the following chapters, we will in the first step define small disasters and how we develop learning processes from them. This requires a fundamental discussion about the advantages and disadvantages of disaster scaling. Basic considerations about learning from disasters are the result. Three typical examples of different small disasters will then be used to describe the considerations above and subsequently provide actionable options for the responsible administrations.

2. Small disaster? About the advantages and disadvantages of scaling

Statistical trends point towards additional and more costly damaging events; economic and cultural globalisation is increasingly diversifying crises; terrorism, ecological destruction, global climate change and the attending complexity and insecurity all contribute to the urgent question of how dangers and catastrophes can be anticipated, their destructive potential reduced and the, nevertheless, occurring damages overcome. But within the social sciences, even the question of what constitutes a catastrophe is still debated (compare to Quarantelli 1998). In 2003, the sociologist Henry W. Fischer proposed the establishment of a classification system for catastrophes similar to the Richter scale for earthquakes. Fischer advocates a distinction between *the Disaster* as a "precipitating event resulting in widespread destruction and distress" and *the Sociology of Disasters* which addresses the "process of change from daily routine to the emergence of a (usually) temporary alternative" (Fischer 2003, 96). He suggests a division of work along this distinction: the social scientist should focus on the extent of the disruption of social routines in terms of scale, scope and time/duration. The others, mainly natural scientists and engineers, should look at disasters as a "precipitatory event". The suggested classification scale would represent the social scientist's interpretations of the extent of the adjustment by a community or society in relationship to the other disaster data. Two questions have to be answered: „How severe is the destruction and distress?" (scale) and "How widespread is the disruption within the community?" (scope). As stated by Fischer, these two answers would inform about the third category: "The greater the scope and scale of disruption, the more likely the time for recovery will be extended" (Fischer 2003, 97). All attained information is distributed on a scale involving ten categories: (1) everyday emergencies, (2) severe emergencies, (3) partial disruption and adjustment in a town, township, or rural area, (4) massive disruption and adjustment in a town, township, or rural area, (5) partial disruption and adjustment in a small or medium city, (6) massive disruption and adjustment in a small or medium city, (7) partial disruption and adjustment in a large city, (8) massive disruption and adjustment in a large city, (9) catastrophic and/or simultaneous massive disruption and adjustment in several communities (10) the complete annihilation of a society.

An extensive debate about the categories need not be led at this point. In this article, we analyse "small" disasters and can therefore use Fischer's classification scale as an orientation before we offer criticism of his approach. By "small disasters" we refer to the categories 2 to 4 determined by Fischer. In the course of small disasters everyday routines are disturbed and expectations regarding human behaviour as well as procedures within the human environment are disappointed. Adaptations and adjustments within the social, cognitive and material culture are the consequence, which do not occur after "normal" accidents covered routinely by the emergency services. Therefore, small disasters require supernormal measures that impact at least on parts or the whole of a community's daily routine. Nevertheless, they usually stay largely within the affected community and can be handled by the collaborative efforts of the local organisations and stakeholders. It remains to be seen whether the stakeholders are capable of not only handling the immediate damaging event but also of analysing and assessing the underlying cause-effect structure as well as the long-term and possibly spatial extended effects of the event. The scale of Fischer only covers the immediate risk as well as the actual disruptive event, but most disasters include further factors, as will be shown below.

But first of all, we need to discuss the advantages and disadvantages of such a scaling system which has direct, but not only positive and intended consequences for the practical application. In our perspective, the usefulness of scaling is not categorically in dispute. As shown by Quarantelli through comprehensive research (e.g. Quarantelli 2006), very different conditions and consequences occur, if (a) an *everyday emergency* brings the emergency services into action or (b), if a *disaster* spontaneously activates an entire community or (c), if an organisational capacity of an entire society and culture is put to the test or overloaded (catastrophe). Quarantelli argues, that a disaster is not just a large accident. He sees the different organisational demands resulting from an occurrence. Hence, according to Quarantelli (ibid.) and Fischer (2003, 99), both research (e.g. focusing on specific questions) and practical use (e.g. designing emergency plans) profit from distinguishing between the different conditions and consequences of crises so as to gain analytical clarity. With this in mind, Fischer's request for a division of work, especially for the practitioners who often lack the analytical procedures for determining behaviour and decisions, between "objective" (natural sciences and engineering) disaster research and the Sociology of Disasters (the disruption of everyday routine) can be understood.

We believe this argumentation to be coherent and considerate of the practical application, but inadequate if the unwanted "side-effects" of such a work division and analytical differentiation are not considered. In general, every form of differentiation and scaling is somehow reductionistic and it always has *social* implications and this means that mistakes are usually the norm and not the exception. As these mistakes are incorporated within a scaling system which is used to determine structural behaviour, this can be catastrophic in its own sense. This opens general questions regarding scales and definitions. In the first instance the extent of the social upheaval and the necessary re-orientation cannot be evaluated without considering the local, materially collated and socially differentiated culture. The scaling, as proposed by Fischer, is based on generalized definitions, which cannot include local circumstances in their concreteness. Secondly, the question of origin and therefore responsibility comes up. Fischer argues for a division of work between social and natural scientists with each viewing the situation from their specific perspective. This leaves questions open for which neither fraction feels responsible: was it "nature"? Was it "technology"? Was it "human"? Or was it a "collective" and complex, possibly singular, interaction between all these factors? In actual situations, these questions – often broken down or reinforced by mass media (c.p. Murdock et al. 2003) – are answered based on specific disciplinary patterns and on the paradigm of "normal sciences" (Kuhn 2006) and they are largely independent of the actual complexity of the connections. Consequently the answer usually is "nature" or "technology". Hence, the prevailing policy images or the scientific division of work as recommended by Fischer prevent the search for innovative solutions – even the causal analysis formulation as put into definitions excludes important interactions[1] (Dombrowsky 1996; 2004).

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[1] For example, the report for the White House (2006) analyses only the federal response to hurricane Katrina: „While the Report notes that disaster preparedness and response to most incidents remains a State and local responsibility, this

The criticism of a catastrophe scale can be expanded by consulting the approach on social-ecological resilience which is discussed in both the natural and social sciences (for further information see Folke 2006). There are multiple definitions in different disciplines and policy communities (Gunderson/Holling 2002, 27, Adger 2000, 349 et. seq.). Here resilience can be defined in the first instance as the capacity of a system to prevent disruptions through adaptation and (self-)re-organisation of processes to ongoing and anticipated change of the society and its environment. It encompasses, secondly, the ability to absorb unpredictable disruptive occurrences and thereby to reduce their destructive potential. In general, resilience means the ability to maintain the overall structure of the socio-ecological system and to maintain the interconnected social and ecological organisational level (everyday life/normality) against different kinds of pressure. The resilience of a system depends on a certain level (e.g. at community level or a river course at a certain time) and due to scale overlap of conditions and the influence of other variables (e.g. slower or faster evolution) and scales (space and time) above and below the specific level.

Everyday actions at a local level, for example, contribute to global climate change but the effects are felt in completely different regions of the globe and with a time delay. On the other hand, climate change can lead to sudden and unexpected changes and effects at the local observation level. As the underlying cause-effect structures are blurred and the expectation of other categories dominates the perception, the real causes were hardly considered. For example, if "century floods" take place at short intervals to each other, this points towards changes in a critical variable, a so called threshold-effect (Berkes 2007, 285), with the consequential changes to other relevant variables or even a scale jump. Understanding threshold-effects would demand the inclusion of different levels of space and time. According to that, the traditional way of solving problems at this level is no longer applicable. The clear distinction between sciences and Fischer's classifications scale harbours the danger of not considering the different levels of scale or rather the inherent connections. Instead, learning to bridge the classes and categories has to be institutionalised.[2]

In view of the fundamental uncertainty of designing society and the human environment, Folke et al. (2006) identified four factors or clusters of factors that interact over temporal and spatial scales. Influencing them can strengthen socio-ecological resilience (also Berkes 2007, 287 et. seq.):

(1) The genesis of disaster-cultures and cultures of response in the sense that disaster expectations lead to the development of precautionary and responsive strategies for locally specific and expected risks,

(2) the securing and developing of ecological, social, cultural and economic diversity and redundancy so as to ensure a broad action and development potential,

(3) the combination of various knowledge types; "scientific" and "local" or "indigenous" (Berkes 2007, 289 et. seq.) and by the direct involvement of all relevant stakeholders into the research and implementation

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review did not include an assessment of State and local responses". The connection between emergency management and hazard mitigation is not addressed, either.

[2] Discursive approaches on „risk governance" try to overcome these simplifications and its unwanted side-effects, at least the "root-causes" of disasters. The IRGC-Framework (Renn/Walker 2008) for example offers practice orientated guidelines to understand risks in their broader connectedness and contexts. The approach developed in this article can be seen as a supplementation to these approaches by focusing on underlying cognitive, social and material factors and their interconnections and interactions in the context of disasters.

process, who possess non-coded, specific types of problem solving, within the research and development process,
(4) by creating or strengthening self-organisation capacities a) at community level (organisational, governance and management) and b) the formal and informal cross-scale networking of organisations and stakeholders, especially in a geographic sense, but also in view of the expansion of the planning horizon, etc. c) by strengthening organisational and institutional knowledge and memory capacities, and d) by strengthening organisational and institutional learning capacities (Berkes 2007, 290 et. seq.).
These four components can be grouped into two complementary characteristics, that a system is more resilient, if it is transformable and capable of adaptation (Walker et al. 2006) and when these characteristics become fundamental and structured for the system. With this point of view, the advantages of scaling are turned around: the analytical clarity and the decision and planning support are bought with the loss of complexity, flexibility and adaptive capacity. In reality, scales (space and time) often overlap and seemingly simple cause-effect structures are in fact complex and highly dynamic non-linear relationships. In contrast, the ten categories scale nicely orders and separates events from each other, which is in line with the needs of practice. Therefore, the question is: How can the advantages of the scale system and the inherent abstraction which we ourselves use for classifying “small disasters“ be combined with the demand for real complexity and its entanglements and thereby live up to the sustainability concept? With the use of three “small” disasters examples, we will beneath show how these seemingly contrary demands can be brought together, but before we have to analyse more in detail, what is meant by speaking of learning.

3. Learning from disasters

Disasters mean failure of existing cognitive and material safety provisions, accordingly they point to inadequate societal organization and mental maps. The “real-falsification” of existing solutions to problems (Dombrowsky 2004, 183) calls for a learning process from empirical experiences. Initially, it is irrelevant on which scale, scope or time/duration the failure takes place. Nevertheless, *especially* the small scale failure – the small disasters – should provide reasons for adjustments, because a) learning from experience is more relaxed when the damage is relatively containable and b) the aggregation of small scale failures might lead to bigger scale disasters or even to catastrophes. Accordingly, learning, with regards to resilience, must encompass different levels and dimensions. Consideration must be given to the temporal and spatial frameworks. In the line with Schreyögg (2002, 99 et. seq.) we argue, that the following questions need to be answered to unfold the root causes of disasters:
(1) Are the action-orientated structures of the stakeholders and organisations as well as the institutional practice (Brown/Duguid 1991), routines (Nelson/Winter 1982), shared mental models (Kim 1993) and fixed assumptions, generalisations and images that impact upon the understanding of reality conscious and optimised (Senge 1996, 2006)?
(2) Can short-sightedness within the decision making process be overcome and replaced by a long-term perspective or a systemic view of the entire situation?

(3) Are the organisational and institutional competences capable of handling the challenges or require modifications or amplifications?
(4) Are the information and knowledge bases and distribution (still) adequate or can they be positively influenced?
(5) Can future learning pitfalls be prevented such as a one-sided use of past problem solving forms or an exclusive orientation towards future discoveries without the productive use and conservation of past experiences?
This article can not provide a total overview of the different learning theories. Nevertheless, a prominent proposal will be made which includes the key discussion points from the past years and which will provide the baseline for the three case studies. Within social routine, changes or learning has an "evolutionary" character. Work processes are adapted step by step based on the past experiences without fundamental changes to these processes or by changing the interpretation pattern. Existing problem solving procedures are maintained, optimised or "modernised" in the sense of "first-order-change". Occasionally, more radical changes take place, so called "second-order-change". This particularly occurs as a result of disasters. The approach to organisational learning by Argyris and Schön (1978, 1996; for a critical overview see Schreyögg 2002) which we use here addresses the fundamental difference between first-order-change and second-order-change. On the basis of Gregory Bateson (1972), they differentiate between „Single-Loop-learning" (first-order-change) and „Double-Loop-learning" (second-order-change). The former approach is marked by a step by step correction of mistakes that are located within a set of rules or existing behaviour theories. Knowledge is generated about which programmes and behaviours lead to certain results in specific situations (adaptive learning). In this way, a single-loop-learning process will, in the long-term, remain on the same development and observation level (Schreyögg 2002, 79). Within single-loop-learning, goal divergence and adaptation errors are recognised and corrected. This form of adaptive learning which is part of *routine* behaviour in organizations relates to stabile situational and environmental conditions and requires few behavioural modifications (ibid., 81). Dynamic contextual changes, on the other hand, demand "turnover learning" (Hedberg 1981), which overcomes prevailing behaviour patterns and allows new problem-solving techniques and scale comprehensive cognitive interpretation system or "usage theories" to emerge. This form of "learning for improvement", the double-loop-learning, goes beyond simple error correction, it questions underlying causes and it triggers additional learning. It leads to examination and re-development of problem and error causing structures of organisations, processes and operating procedures. (Schreyögg 2002, 81 et. seq.). Additionally, it may be conducive that previous behaviour rules are "unlearned", obsolete patterns and established rules discarded. Such an unlearning process may even be a prerequisite for reframing. In the long-term, this double loop approach which is geared towards change will provide an organisation with greater effect than plain single-loop-learning (ibid., 79).
Argyris and Schön added a third learning format with the focus on the learning process itself. Learning becomes institutionalised and stands as a problem-solving competence in its own right. The prerequisite for this third and "meta–level" of learning, the so called "deutero learning" is the skill in handling and influencing single- and double-loop-learning. The fundamental question is, whether intra- and inter-

organisational and institutional knowledge and knowledge and the form of knowledge acquisition is at all adequate for problem-solving. Is it basically possible to find solutions with the applied techniques (ibid., 80)? “Learning to learn” analyses and questions the existing learning processes within different learning contexts and looks at the learning behaviour as well as the learning successes and failures (Bateson 1983, 378 et. seq., Schreyögg 2002, 80). This kind of “learning to understand” focuses on factors that promote or inhibit learning and secure capacities for self-organised adaptive development. Knowledge of passed failures in practice *and learning* is gathered, its communication encouraged and consequently a process of (self-)reflection of the adequacy of organisational knowledge, structures and rules of behaviour is institutionalised. By this means the response capacity of the organisation or the network of organisations is enhanced with regards to *unpredictable* societal and environmental change.

4.1 Three case studies

The following case studies will emphasise the theoretical considerations above. The focus is not on the empirical description of the case studies (see Wagner 2004), instead on discovering typical patterns for events of different magnitude (see Table 1). Although, since the focus is on flash floods in mountain rivers, the category of small disasters is essentially the main topic. Besides a short description of the natural events we will present the reactions of the following stakeholder groups: people affected by the damaging event, the local stakeholders (emergency services, local authorities, local politicians etc.), the responsible policy subsystem (Watershed Authority[3]) and the Bavarian state politicians. The geographic location of the three mountain rivers is the northern edge of the Alps with an average annual precipitation of 1600 – 2000 mm.

Table 1: Characteristics of the streams and the associated damaging event (Source: Reports by the Bavarian Watershed Authority)

	Lieberhofgraben	Lainbach	Loisach
Community	Tegernsee	Benediktbeuern Ried/Kochel	Eschenlohe
Catchments area	0.05 km²	31 km²	467 km²
Type	Torrent (750-1000 m ASL)	Torrent (600-1800 m ASL)	Mountain river (river km 71)
Damaged houses	5-7 houses each	45 houses	About 300 houses each
Property damage	About € 5,000 – 10,000 each	€ 1.8 million	€ 346 million or € 172 million in southern Bavaria
Cost of structural protection measures built after the event(s)	€ 0.17 million	€ 7.2 million	€ 5.5 million

[3] The spatial planning authorities have, for many years, played a minor role in flood management. The basic concept for flood management in Germany was developed by the watershed authorities (LAWA 1995). Additionally, the strictest legal norm – the declaration of flood zones which induces a building ban – is regulated in the German Water Act (Wasserhaushaltsgesetz).

Example 1: Severe emergency (Category 2 in Fisher’s scale) due to flash floods of the Lieberhofgraben

The town of Tegernsee (roughly 4,000 inhabitants) has many small mountain torrents which often carry no water during the summer. The two damaging events of the Lieberhofgraben after heavy thunderstorm rainfall are typical dangers for Tegernsee: due to the steep gradient a lot of debris is carried down which can lead to blockages of the stream channel. The stream flows over its banks and damages houses situated on the slope. For the people whose property is damaged or destroyed, this is a major disaster or at least a disruption of the normal life/routines. For the other stakeholders, such an event is routine or close to routine. Due to the suddenness of the event, the fire department could not prevent the damage and only provide support during the clearing-up operations. Since no important infrastructure was damaged, the local authority saw no immediate cause for action. On behalf of the Bavarian Watershed Authority, only the regional office took action as the torrent fell under their jurisdictions. They optimized the existing technical protection measures by building a woody debris retention construction above the residential areas and by improving the stream channel. The higher officials of the Bavarian Watershed Authority and the state politicians took no notice of the event.

Example 2: Partial disruption and adjustment in a municipality due to a flash flood on the Lainbach (Category 3 in Fisher’s scale)

The municipality of Benediktbeuern and the district Ried, part of the municipality of Kochel (in total a population of about 3,300) lie on the alluvial fan of the Lainbach. A thundershower, in late June 1990, with a precipitation of over 80 mm in one hour caused a flash flood with a high percentage of debris. The torrent, which had been systematically extended since the 1930’s, overflowed its banks due to blockages in the stream channel at two bridges and flooded 45 houses. A state of emergency was called. Even army units took part in the clearing-up operations; the railway connection was closed for a number of days. The affected people founded a citizen’s group, which initially wanted to sue the Bavarian state for compensation, but then took an active part in critically evaluating the further technical protection planning at the Lainbach. Only a few days after the event, the regional watershed office started planning for an improved flood defence. Innovative solutions were presented such as a woody debris retention construction of unseen proportions. The search for innovative solutions to the problem and the political pressure from the citizen’s group and local politicians meant that all the administrative levels of the Watershed Authority were involved. State politicians, again, took no notice of the event.

Example 3: Massive disruption and adjustment in a municipality (Category 4 on Fisher’s scale)

The big flood events in 1999 and in 2005 caused wide spread damages worth more than half a billion EUR in southern Bavaria. The municipality of Eschenlohe (about 1,600 inhabitants) had 300 houses flooded when the river Loisach broke its banks. Eschenlohe is just one hot spot in this region-wide disaster, a differentiation that is not sufficiently considered in Fischer's scale system. The main reasons for the flooding of Eschenlohe were the massive runoff and the blockage of the stream channel at the bridge in the village centre. As in the first example, the emergency services were local since the event developed at considerable speed. For some time, there was no land connection to the village and the regional railway line was blocked for days to follow. The repeated flooding of Eschenlohe in 2005 gave it unprecedented media and political interest. Federal and state government officials visited the area and tried to get a first hand impression of the situation. The supra-regional importance of the event ensured various programmes for immediate support of the affected people and reconstruction work. Aid came from both federal and state sources. The Bavarian state initiated the flood protection action programme 2020, a programme designed for integrative flood defence, but with a financial bias towards technical protection measures. Annual expenditure for technical measures (including the improvement of the natural catchments area) lay at € 115 million, whereas non-structural measures (flood warning and flood zone mapping) received less than € 5 million.

Media reporting dubbed Eschenlohe in 2005 as the village of the unteachables. Despite the damages of 1999 and 2005, improvements for flood protection were still being controversially debated. At the end, the measures installed in 2007 dated back to plans laid out in 1975. The contention point were not different protection approaches, instead it was the implementation of the technical protection measures, especially the re-design of the bridge over the Loisach. The solution to build a bridge without central columns standing in the riverbed took preference, despite the impact on the town appearance, to transferring the bridge to the south of the municipality.

Interpretation

Despite the particular "real-falsification" of the respective protection solutions – all streams had been technically adjusted before the above-mentioned events – all the stakeholders undertook *routine* measures of mitigation. All the affected people repaired their houses, although in the third case the people received more funding due to the high media attention. Double-loop-learning could be observed only in a few cases. For example, changes in the design of damaged buildings. The majority refrained from undertaking any precautionary measures or resorted to low cost solutions (Wagner 2004). Within the group of the local stakeholders and politicians single loop learning did, at most, occur. They improved the existing emergency management system but did not implement other mitigation measures due to the belief that the state is responsible for flood protection. They thus waited for the technical protection plans by the Watershed Authority who implemented them in a *routine* procedure. Single-loop learning processes only took place on the technical side, such as the technical adaptation of the protection measures to the locally specific dangers. A good example of non-learning by the local stakeholders is Benediktbeuern. After the erection of the new technical protection measures, the local authority designated an area within the flood zone as an industrial estate, despite the warnings by the Watershed Authority. The political system is only activated by region-wide events. Additionally, only single-loop learning occurred, because the discussed examples did not even receive evaluations about the damage causes or negotiations on necessary changes in the protection strategy.

5. Concluding Discussion

The basic question is how systematic learning processes can be initiated through small disasters on a regional and supra-regional level. The difficulties of this task are highlighted by Thomi and Zaugg (2006: 592) who analyzed two flood disasters in Switzerland and came to the conclusion that communities „only rethink their flood disaster management rules and practices when they are directly affected by the event“.

This resistance to learning can be explained by the history of the flood protection policy, described here with the Bavarian examples (other countries such as Austria, Switzerland and France provide similar examples; Wagner 2008, Pottier et al. 2005). Since the Bavarian water law of 1852, the state has clearly taken over the main responsibility for the protection against natural disasters. It includes the protection and maintenance measures along the watercourses. Since 1902, the Watershed Authority provides financial and organisational support to the local communities for torrent control constructions. From 1962 onwards, the Bavarian state was shouldering most costs for maintaining the larger mountain torrents (Proebstle et al. 1981). The planning authority for the spatial and economic development, and therefore the development of potential damages, is usually located with the local authorities of the communities. This institutional setting, along with increasing damage potential, means that the pressure on the Watershed Authority for improved technical protection measures is steadily increasing. Unfortunately, the institutional situation also prevents any effective discussion about damage causing processes within the social system or due to feedback loops between the social system and the natural environment. All levels of the Watershed Authority has employees who are well aware of these processes but the Watershed Authority lacks a system of deutero learning which would integrate the individual perceptions within an organisational perception.

At this point, we make our proposal for an improved learning process. Because of the central importance of the Watershed Authority in relationship to flood protection policy, this administrative body should develop a two tier learning system. The first tier would be a constellation analysis (Meister et al. 2005; Schön et al. 2007), funded and initiated by the regional offices of the Watershed Authority as the prerequisite for all planned protection measures. Up until now, the regional offices provide plans for protection measures after an event that usually only cover natural parameters (precipitation, water processes, return interval of the event, etc.). A constellation analysis, on the other hand, would strengthen a phenomenological perspective and use participative workshops with all relevant local and regional stakeholders and through dialogue gain insights into the human and non-human factors or actants (Latour 1999) that caused the damage. This group would also discuss how best to intervene in this constellation. The analysis differentiates between the actants and the processes between the actants without splitting human and environmental contexts. Instead, joint analysis often provides essential insights into feedback loops that inseparably interconnect these two areas. The constellation analysis alone has the potential to move the local discussion beyond purely technical protection measures thereby improving society’s resilience (see above). The institutional context, the mixed responsibilities of the different actors and the funding schemes should also be analyzed. For example, in Bavaria the state provides support for local technical protection measures but not for non-structural measures.

The second tier of the integrated analysis would be aggregated on a supra-regional level so as to identify important factors for disaster losses and track their changes. A very basic learning system has been established within the Watershed Authority with the task of documenting flash floods and debris flows in torrents. The system is designed to improve the scientific understanding of the magnitude-frequency relationship in flash floods. The basis for this are descriptions of past damaging events in small watercourses with no water level observations. The Bavarian state environment office, a supra-regional administrative department of the Watershed Authority, has realised that even current damaging events are not or not well documented by the regional offices. Important knowledge for protection planning is lost (Huebl et al. 2002). The constellation analysis, with a local yet multi-level approach, could be included into the existing system so as to achieve a region-wide evaluation of driving forces and current trends.

The Watershed Authority would, thereby, gain a tool for influencing policy making processes in the event of a catastrophe. The above-mentioned examples and the analysis by Birkland (2006) in America show that only large-scale disasters reach the political agenda. Unfortunately, mitigation and prevention are seldom discussed. The focus is on the immediate clearing-up operations. Nevertheless, the Watershed Authority experts would have the chance to include the results from the constellation analysis within the ongoing discussion. Kingdon (1974) has shown that a focussing event, such as a disaster, will provide different stakeholders with the opportunity of defining the problem scope (problem string) as well as presenting solution options (alternative string). The experts within an administrative body have a special role to play in the latter by formulating legal texts and guidelines for subsidies. This proposal faces of course considerable implementation barriers. The Bavarian Watershed Authority, unlike its American counterparts, is not trained for participative processes. The employees are usually construction engineers trained in managing protection projects rather than designing and handling social processes.

The proposed learning system is at first glance very specific for the Bavarian situation with a dominant sectoral approach for flood mitigation, but a closer look reveals e.g. the possibility to integrate this approach into the European directive on the assessment and management of flood risks (EU 2007). The directive obligates the EU member states to develop risk management plans for all larger watercourses on the basis of flood zone and flood risk maps. The plans have to be reviewed every seven years. Within this review process a systematic analysis of the occurred small und bigger disasters could be implemented to improve the quality of the management plans. The proposed participatory approach with the involvement of different local or regional stakeholders would fit the idea of the directive which wants to “encourage active involvement of interested parties in the production, review and updating of the flood risk management plans” (EU 2007: Article 10).

6. Conclusion

We have shown that small disasters especially, where the immediate coping with the disaster is not the immediate focus, can provide room for negotiations about specific contexts that caused the damaging event. Because local events usually do not attract high political and media interest, they are able to generate uninfluenced multi-level learning processes. Later on, these can be fed into the political processes at an aggregated level thereby influencing learning processes on a political level. Lessons learned in small disasters would help to reduce possible damage in future disasters. Thus, the implementation of the proposed two-tier learning system would be a highly effective measure for disaster management. We emphasise that the immediate handling of the disasters is not our main focus. Instead, it is the underlying cognitive, social and material factors or actants and their interconnections and interactions that cause or strengthen a disaster. This includes how past crises phenomena have been handled. In other words, “nature” and “technology” are seldom to blame. Failure to learn is the most common prerequisite for future disasters and at least catastrophes.

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