



# Unmastered risks: From crisis to catastrophe An economic and management insight

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## ABSTRACT

In contrast to sociology, economics, and above all, business economics has not yet discovered disaster management as a research topic even though this subject affects many areas of economics due to its interdisciplinary character. The enormous economic losses suffered by private parties, businesses and public institutions in crisis events, the huge amounts of money which are spent in disaster prevention, as well as the challenges that providing emergency management and disaster control present, contain many issues and have an increasing social and economic relevance. This article takes a close look at the concept of disaster from an economic and management point of view to mitigate the impact on human beings and environment. Based on the rational choice approach the study analyzes the state of preparedness that is mainly responsible for good or poor disaster prevention and presents a theoretical framework for a comprehensive disaster management including examples of practical applications. The conclusion outlines several important areas of future research in business economics.

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## 1. Introduction

Due to the enormous impact of disasters on local and global economy, this paper examines the following research questions: what economic theory and research can contribute to the disaster theory? And what can be learned from economics and management to mitigate the impact of disasters on human beings and environment?

This article builds from the theory of rational choice. This theory assumes the existence of costs and benefits for all kinds of actions and focuses on institutions in an inefficient market environment. The first part of the article presents some descriptive statistics about losses evolved from natural disasters and fundamental definitions with respect to disaster follow. The second part presents the concepts of disaster in sociology and economics and concludes with a framework for analyzing and studying issues related to disaster management. The last part of the article discusses perspectives for future research.

## 2. Starting point: impacts

A particularly high number of disasters occurred recently. Whether human-made emissions or altered sun activity caused the disasters is not of importance at this stage. Fact is that almost 270 large natural disasters have appeared since 1955. Approximately 1.8 million people have lost their lives, 80% of them because of storms or flooding. Fig. 1

shows a clearly increasing number of large natural disasters (MunichRe, 2006a,b; Van Aalst, 2006).

Further to that, the last decade has also especially shown a clear increase in disaster-related losses (Fig. 2). This is primarily due to a higher population density and a higher standard of living.

Tables 1 and 2 show the natural disasters with the greatest impact from 1950 to 2006 (Plate et al., 2001), updated with data from the annual statistics of Munich Re and Swiss Re from 1999 to 2006.

As Tables 1 and 2 show, the geographical distribution of the number of deaths and the economic losses from natural disasters are not even. The disasters with the highest number of deaths occur mostly in poor countries (such as Bangladesh, China, or Peru, for example), whereas the disasters with the highest economic impact occur primarily in highly developed countries. Socioeconomic factors thus significantly influence the extent of disaster (Dombrowsky, 2001). The largest losses—approximately US\$ 125 billion—were a result of Hurricane Katrina in the US states of Louisiana (primarily New Orleans), Mississippi, Alabama and Florida in 2005 (SwissRe, 2005).

In addition to losses of human life and property, disasters also cause considerable ecological damages. Damaged soil, destroyed woods and flooded agricultural areas recuperate only very slowly. Oil or stored chemicals often seep into the ground water or explode, in the case of fire or earthquakes, and ruin canalization systems which leads to polluted drinking water and endangers the health of humans and animals (Cruz et al., 2006; Maier, 2006). The effects of these damages may last for years and sometimes for several decades. This outcome is a huge burden for the environment, society, and the economy, particularly in poor countries (Plate et al., 2001). Disasters

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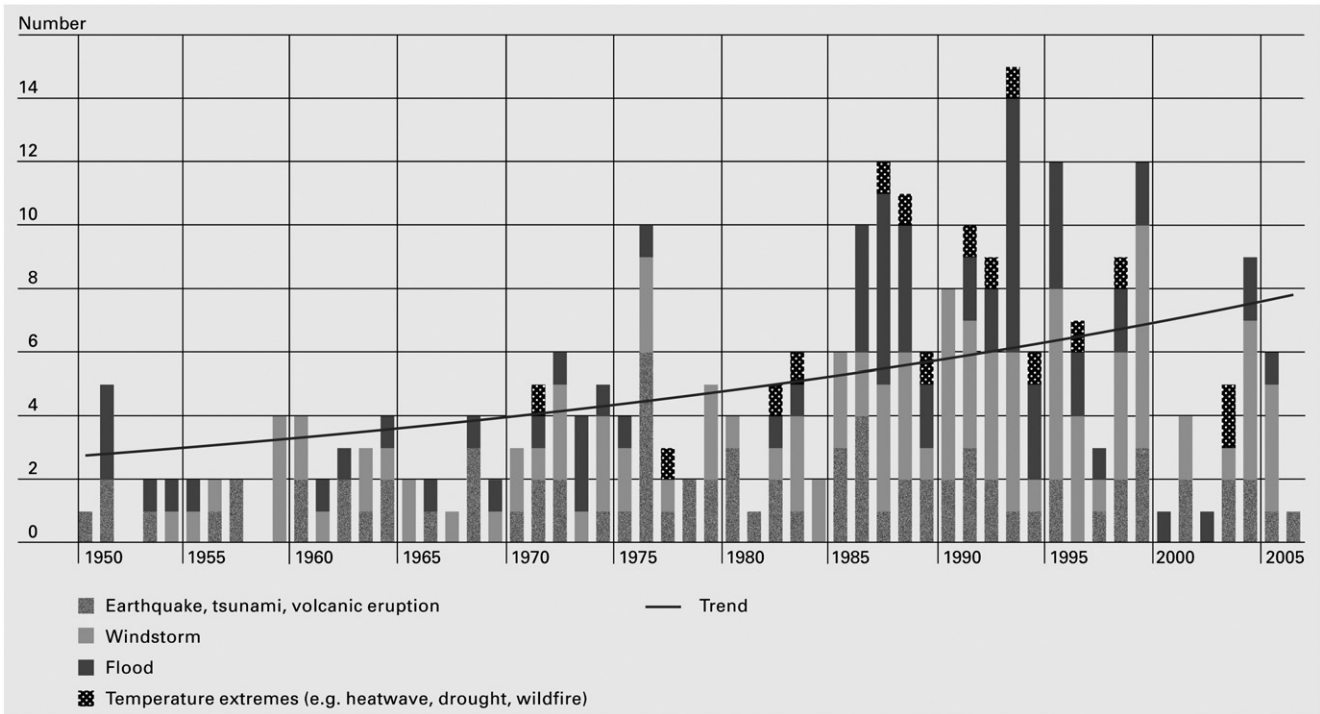


Fig. 1. Number of large natural disasters between 1950 and 2006 (MunichRe, 2006b, p. 47).

impose psychological stress on the victims. Symptoms can range from trauma to depression and can result in collective reactions such as a loss of trust in government and politics (Clausen and Dombrowsky, 1990).

**3. Definitions**

The word catastrophe—often used as a synonym for disaster—has its roots in the Greek word *καταστροφή*. The prefix *κατα* indicates a reverse or downwards direction and the noun *στροφή* means

basically a change or turning (Claessens, 2005). Combined, the two define an event as a catastrophe or a disaster when a downwards spiral is unleashed which basically leads to a collapse of a system.

Under normal conditions, risks are static, continuous, or cyclical. A crisis—as a precursor of a disaster—is an undesirable situation with a significantly increased risk (Mayer, 2003). In contrast to disasters, however, it is possible to restore order in a crisis based on changed steering parameters. A crisis occurs sequentially, in a relatively orderly manner, while during a disaster, processes, which are not controllable, cause permanent and non-reparable damage within a system. Risk,

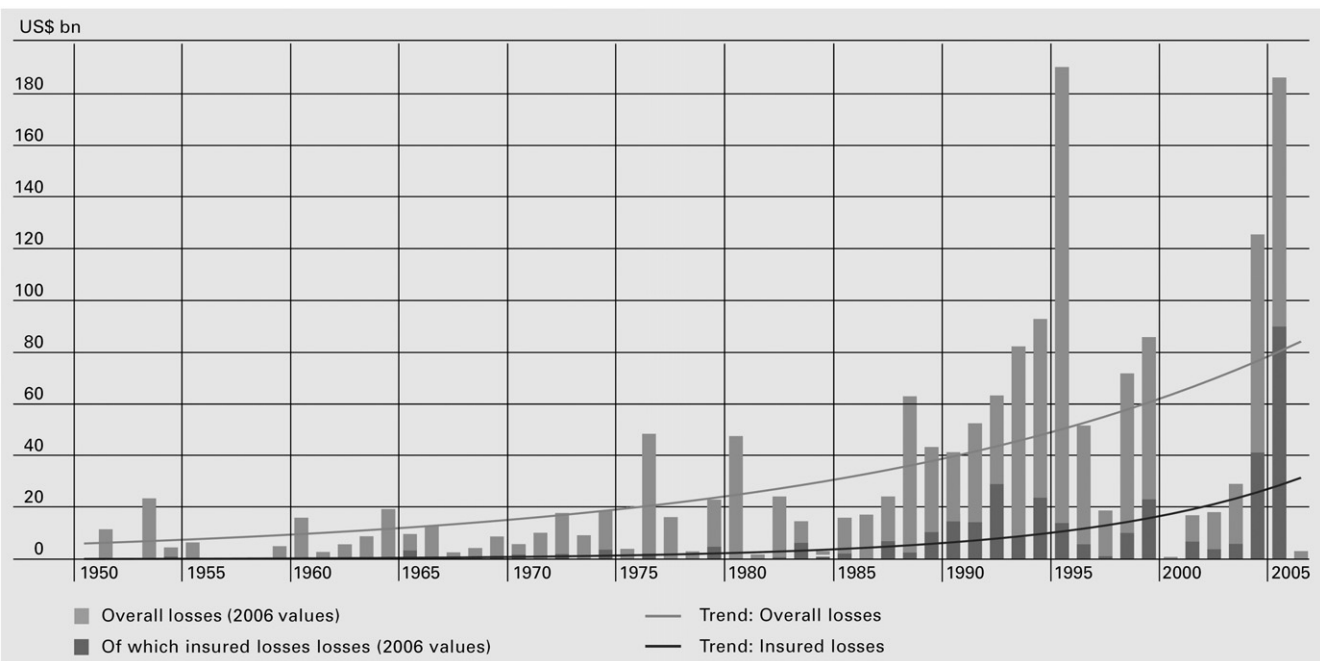


Fig. 2. Economic and insured losses in billions of US \$ (MunichRe, 2006b, p. 47).

**Table 1**  
Number of deaths in natural disasters between 1950 and 2006 (Plate et al., 2001; MunichRe, 2006a,b).

Year	Country or region	Event	Deaths	Rank
1970	Bangladesh	Flooding	300,000	1
1976	China	Earthquake	290,000	2
2004	Southeast Asia	Tsunami	260,000	3
1991	Bangladesh	Flooding	140,000	4
2005	Pakistan	Earthquake	88,000	5
1970	Peru	Earthquake, mud slide	67,000	6
1990	Iran	Earthquake	50,000	7
2003	Iran	Earthquake	27,000	8
1978	Iran	Earthquake	25,000	9
1988	Armenia	Earthquake	25,000	10
1985	Columbia	Volcanic eruption	23,000	11

crisis and disasters are thus possible states of one and the same system (Fig. 3).

Because of the close relationship between crisis and disaster, disaster management can adopt some concepts from the field of crisis management, at least in the beginning phase of an event. These are, in particular, procedures for risk analysis and early warnings.

Besides, to differentiate between an accident (e.g. a reactor leak, an oil spill) and a disaster is often difficult. A strong earthquake in an uninhabited place is hardly a disaster while a weak earthquake in a metropolitan area built without seismic design can have catastrophic consequences (Dombrowsky, 1998).

Research reflects the difficult delineations and the frequent confusion of terms as well. Different interpretations of a disaster exist in sociology, law, and economics. To make the situation even more complicated, sometimes no agreement exists even within a discipline.

The United Nations and the UNDR0 (United Nations Disaster Relief Organization – since 1998 called OCHA/ISDR Office for the Coordination of Humanitarian Affairs), a UN organization defines catastrophe: “A disaster is an event in which a society is pulled into serious danger and suffers human loss or material damage to the extent that the local social structure collapses and all or some of the essential functions of the society can no longer be fulfilled” (UNDR0 1987, in Hanisch, 1996, p. 22).

To illustrate the term disaster, the chart in Fig. 4 shows possible events as well as a classification scheme (Adam, 2006, following Pointner, 1995) that differentiates events as man-made (avoidable) and natural (unavoidable) disasters. Whereas appropriate prevention measures can avoid man-made disasters the effects of natural disasters cannot be completely avoided but mitigated through an appropriate disaster management.

**Table 2**  
Total economic losses in natural disasters between 1950 and 2006 (Plate et al., 2001; MunichRe, 2006b).

Year	Country/region	Event	Total damages (in mill. US\$)	Rank
2005	USA: LA,MS,AL,FL	Hurricane Katrina	125,000	1
1995	Japan/Kobe	Earthquake	100,000	2
1994	USA/Northridge	Earthquake	44,000	3
1998	China/Yangtze region	Flooding	30,700	4
2004	Japan	Earthquake	28,000	5
1992	USA/Florida	Hurricane Andrew	26,500	6
1996	China/Yangtze region	Flooding	24,000	7
2004	USA/Caribbean	Hurricane Ivan	23,000	8
1993	USA/ Mississippi	Flooding	21,000	9
2004	USA/Caribbean	Hurricane Charley	18,000	10
2002	Europe	Flooding	16,000	11

#### 4. The concept of disaster management in sociology and economics

##### 4.1. The concept of disaster management in sociology

Contrary to economists, sociologists have already been studying disasters since the 1920s but exclusively in Anglo-American literature; however, the field of disaster sociology was only established in 1945 as a proper discipline (Müller et al., 1997). Large societies or their larger subunits can respond to disasters in many different ways: they can just absorb the impacts with little or no premeditated action and rely on improvisation or they can use planned and formally directed arrangements. As a result, disaster researchers can draw a variety of social action types before, during and after the disaster (Kreps, 1984).

Critiques on traditional ways of conceptualizing and explaining disasters based on natural sciences and rational calculations have led to a paradigm shift: the constructivism detached the positivism. In this context sociologists developed the socioeconomic and socio-cultural concept of vulnerability where they defined disasters in terms of their impact on a society in relation with human values. If the context includes no human values, the notion of disaster does not apply even if the event was external, no matter what magnitude (Voss and Hidajat, 2002). The socioeconomic concept of vulnerability bases primarily on system theory, decision-analysis as well as structure-theory – approaches and frameworks commonly used in economics, too.

German sociologists include another aspect to the concept of vulnerability and refer to risk societies and intern threats. Whereas a vulnerable society is being aggressed from outside–externally–, a risk society is threatened by itself–internally–for example through the risk of using certain technologies (biotechnology, nanotechnology, internet), energies (atomic energy) or favoring a certain life style (CO<sub>2</sub> emission, travelling) (Rudolf, 2007).

However, the most important change in sociology in the last decade has been a greater emphasis on both organizational and collective social behavior during the whole hazard cycle. This includes the acknowledgement of social solidarity and social conflict in disasters as well as the influence of gender, class and other dimensions of diversity (Tierney, 2007). In that context researchers often used the theory of rational choice to explain social behavior (Frey, 2004). Since the 1990s, realist and event-based perspectives have dominated the field of disaster research (Kreps, 1984; Quarantelli, 1987; Tierney, 2007).

Although disaster sociology is an established research field, in fact, this focus is of small relevance for the whole community of sociologists. Tierney assumes, “the field is unlikely to overcome its

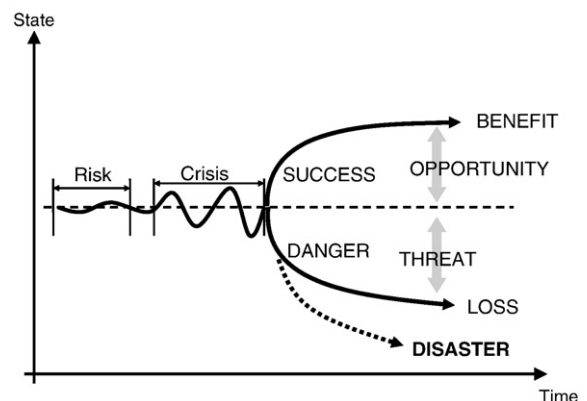


Fig. 3. Ambivalence of a crisis (Saynisch, 1994; Adam, 2006, p. 67).

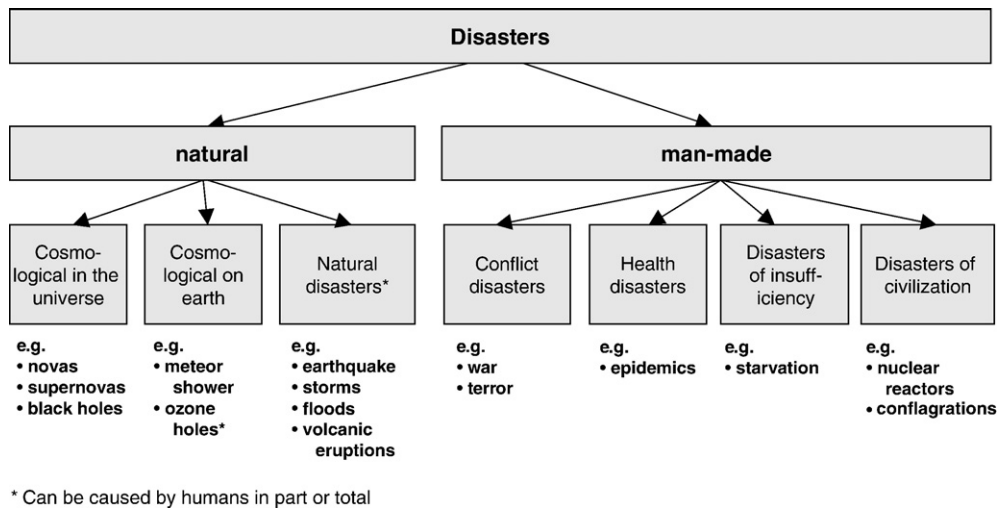


Fig. 4. Classification of disasters (Pointner, 1995; Adam, 2006, p. 70).

marginal status without significant efforts to link the sociology of disasters with the related fields of risk and environmental sociology and, more broadly, to focus on core sociological concerns, such as social inequality, diversity and social change” (Tierney, 2007).

#### 4.2. The concept of disaster management in economics

Contrary to sociologists, economists are much more involved in the area of crisis management than in disaster management. Disaster management is a very rare research topic in business economics. A lot of publications exist with respect to crisis management, whereas most articles analyze business crisis. The reason for the asymmetry in economists' involvement in crisis management versus disaster management is probably because business units have to cope repeatedly with various levels of crises and have learned to deal with them. In contrast and fortunately, disasters (as defined earlier) rarely occur in business units, thus disaster management is not their core competence.

In spite of these limitations, disaster management is not only a sociological problem for sociologists, but rather a genuine business economic problem: Gutenberg describes disaster management as an extreme case of business adaptation, where short-term qualitative and quantitative system modifications are necessary and cooperation is compulsory (Grün, 2005; Flynn, 2007). Disaster management, in other words, is about production functions, and related to substitution processes between capital and work as well as between prevention and intervention measures. The difference between disaster management and a classical production function of a firm, however, is an important one: the framework production conditions for the expected goods and services can radically change and are everything but stable. This is especially true for the intervention measures which the management can only partially anticipate due to the high uncertainties involved.

To better understand the effects of good or poor disaster management from an economic point of view, the study uses rational choice theory, which is also applied in sociology. The basic assumption of the rational choice approach is that different actors behave rationally in a broad sense and tend to increase their benefits. They have goals and preferences and are confronted with constraints such as financial resources, time and mental capacities. The world in which they live is uncertain, but they can cope with this uncertainty and the restrictions from outside and maximize their utility or benefits. Individuals and in an aggregated form, collectives, act in a consistent manner. They are also aware of the constraints and are able to deal with the restrictions in a rational way (Frey, 2004).

#### 4.2.1. General characteristics of disaster management: costs and benefits

Disaster management generally involves two phases: the prevention phase and the intervention phase. To analyze a good or a poor disaster management the authors concentrate on the preparedness of an organization and assume that high prevention leads to a high preparedness and to a good disaster management, whereas few or no prevention measures lead to a weak preparedness and a poor disaster management. Thus, a collective has the choice to invest either in prevention measures or finally pay for intervention.

First, consider the benefits of the prevention activities and assume that the benefit will increase the more activities the state or government undertakes to diminish the potential losses. However, this curve is not linear. From a certain point the benefits to the public get smaller and smaller due to the fact that nearly everything has been done to protect the people and the environment concerned. Additional activities will only have a small impact but will be very costly. Therefore, the curve is concave representing a classical benefit curve with a diminishing increase (see Fig. 5). Normally, political and social environment such as the population, the parliament and the administration highly influence the government which has to decide about prevention measures. Hence, the final shape of the benefit curve results from negotiation processes between government and various political stakeholders and can considerably differ from government to government.

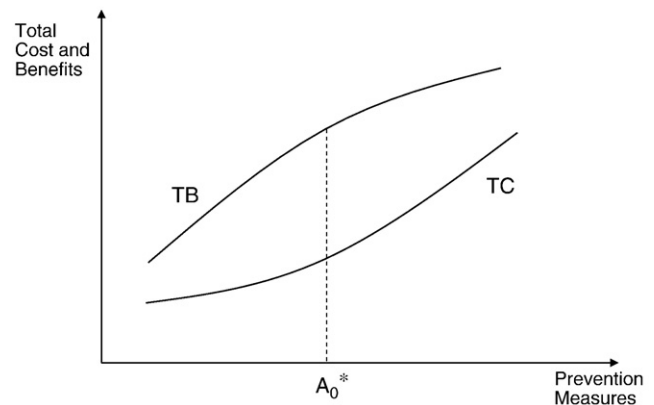


Fig. 5. Curve linearity of total benefits and total costs with  $A_0^*$  as production equilibrium.

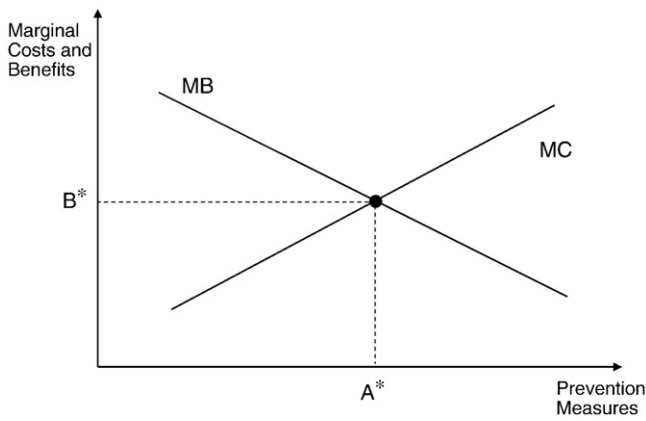


Fig. 6. Equilibrium of marginal costs and marginal benefit curve.

In contrast, the cost curve shows a somewhat different shape. A positive progressive slope exists due to the fact that the costs arise with the amount of prevention measures. First of all, the government or management chooses those activities which are easy to implement and show the greatest impact to protect the people and the environment. After having chosen the most promising prevention measures, to find other ones will be increasingly difficult. If additional measures are taken, they involve much higher costs. The costs for prevention measures mainly involve costs for special buildings, technical instruments and salaries for professional intervention staff.

Based on cost–benefit considerations, rational choice theory allows deriving the optimal bundle of possible prevention measures. Intersecting the marginal cost curve and the marginal benefit leads to the optimal bundle (see Fig. 6). At that point—the production equilibrium—the government gets the highest benefits to the lowest costs, which means that the difference between cost and benefits is as large as possible (Fig. 5). The equilibrium reflects the most favorable extent of prevention activities in disaster management.

4.2.2. Prevention measures and risk assessment

The prevention measures involve risk assessment, risk allocation, risk monitoring and the implementation of early warning systems as well as providing of shelters, evacuation plans and training of staff. The crucial point and the most difficult one is the appropriate assessment of risks. If the risk is not correctly assessed, the government will underestimate or overestimate the benefits from the prevention measures and the level of preparedness will not be adequate for the incident.

If the government underestimates the risk, not enough measures are undertaken to protect the people and the environment. Fig. 7 shows a downwards shift of the marginal benefit curve which results

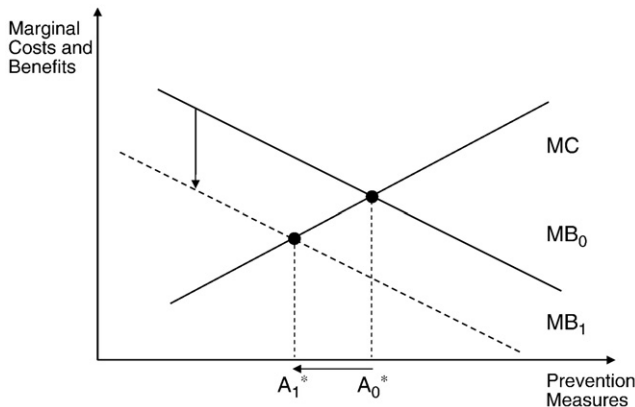


Fig. 7. Equilibrium change of prevention measures under risk underestimation and asymmetrical risk allocation.

in a lower level of preparedness. If the government overestimates the risk, the benefits related to a certain disaster increase, and so the marginal benefit curve shifts upwards (see Fig. 8).

The first case is the most probable one. The tsunami disaster in 2004 that had an enormous impact and harmed people and infrastructure in a tremendous way is an example of an underestimation of the risk and a weak level of preparedness. Another example is the accident of Chernobyl in 1986 that led to an important radioactive contamination in the Ukraine and Byelorussia with consequences for Eastern and Western Europe. In the last case, the risk was underestimated twice: firstly the graphite moderated power plant itself had a construction risk which was not correctly assessed. Secondly, the team responsible for the plant management underestimated the risk related to an experiment they had to carry out and which finally led to the most harmful radiation contamination ever in civil history (Dörner, 2001).

Usually the authorities responsible for disaster response do the risk analyses (Greiving et al., 2006). This process is a very demanding task which can have far reaching consequences for a region. Therefore the leading function is normally not in private hands but with the central or federal government (Jenkins, 2006). Risk analysis is frequently correlated with many uncertainties since the status of research varies depending on the type of event and the probability estimated. For example, during the last decade, the assessment of B-terror risk has changed in the western countries; in particular the probability is estimated to be much higher since September 11, 2001.

4.2.3. Prevention measures and risk allocation

The basic question is whether individuals or the public hand should be responsible for disaster prevention (Adam, 2006). If, for example, the collective or the public sector bears the entire risk in a region, the private sector intends to neglect the individual risks because of false incentives. This was the case in the last decades in many European countries when more and more houses were built in areas where earlier no one would have built due to safety reasons. If the allocation of risks is asymmetric—the public sector adopts all the risks while the private sector ignores them—the possible damages from an incident can be much higher than in case of a well balanced allocation of risks between the public and private sector (Pollner, 2001). The marginal benefit curve shifts downwards because of the negligence of the individual risk and the underestimation of benefits from the individual prevention measures (see Fig. 7). The result shows a weaker level of preparedness.

The business economics literature only casually looks at how to set incentives to guarantee an efficient allocation of the risks between the public and the private sector (Hofman and Brunkoff, 2006). This issue may be an interesting topic for further research.

4.2.4. Prevention measures and organization

Taking prevention measures into account, organization of the emergency is one of the first questions to consider. Should the central

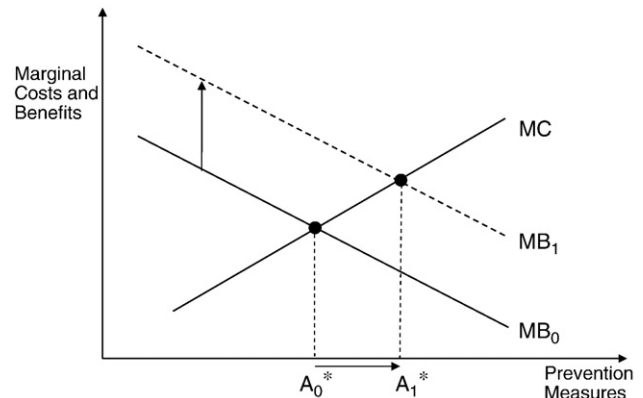


Fig. 8. Equilibrium change of prevention measures under risk overestimation.

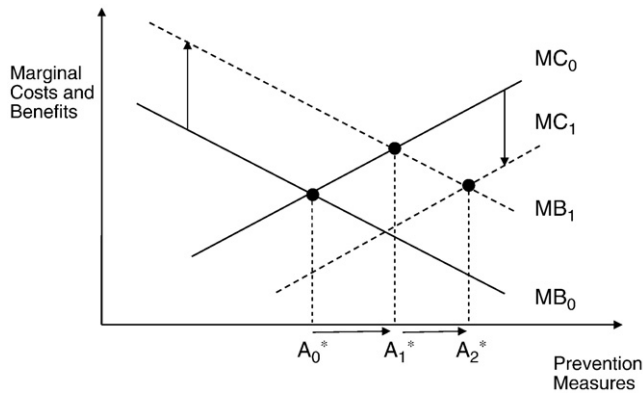


Fig. 9. Equilibrium change of prevention measures for decentralized organisation and a fast response.

state take all the responsibilities and the power, or should the central state delegate responsibility and competences to regional or local authorities? Decentralization seems to lead to higher benefits than centralization, which can also be explained by the rational choice approach. A decentralized organization leads to higher benefits due to the fact that this entity is capable to react much faster than a clumsy central organization. More people and more land can be safe-guarded and a short response time reduces the losses. In that case the harm to the population and the environment will be less important and the benefits will increase. Thus, the marginal benefit curve shifts upwards (see Fig. 8) and allows a greater benefit for the same level of preparedness. At the same time the total cost will be lower due to the fast reaction which shifts the marginal cost curve downwards as well. Fig. 9 shows that both effects lead to a higher state of preparedness and finally to a more favorable equilibrium than in the initial situation.

The same effect is observable with respect to hierarchical and flat organizations. The more hierarchical levels needing consideration in an emergency case, the slower the response will be. In this case hierarchy has the same effects as centralization whereas flatness can be put on a level with decentralization.

5. From economics to management

5.1. Framework

Disaster management has to do with classical management processes such as strategy, leadership, and logistics (Dimitruk, 2005; Johnson, 2007). These areas are core subjects in business economics. Based on Grün (2005) the study here includes a modified version of his framework showing the relationships among the different elements

characteristic for disaster management. The framework helps to get a deeper understanding and a better insight into disaster management.

As Fig. 10 shows, three elements are important. These elements include the event, its specific impact on people, and the environment and the disaster management itself under which prevention and response are subsumed. The event relates directly to the impact whereas impact and disaster management are connected by a feedback loop. The more important an impact is, the more activities are necessary to mitigate the losses; and vice versa, the more activities are prepared or carried out, the lower the losses will be. System theory calls this a balanced causal-loop diagram. The disaster management itself is classifiable in two parts: prevention and the intervention part. Under prevention this article subsumes risk analysis, preparedness as well as monitoring and early warning. Under intervention are subsumed rescue, humanitarian and financial aid as well as reconstruction and reflexion. Both prevention and intervention are substitutes: the more prevention the less intervention is necessary.

5.2. Disaster preparedness/prevention

Reducing potential damage in case of the entry of an event is the goal of disaster prevention. Thus, the desire for more or less security is subjective due to the fact that risks are differently perceived. As a result, the perception of a certain risk has a significant influence on the responses and willingness to undertake prevention. Risk perception itself depends on several factors such as the possibility of personal control, trust into the government capabilities to react in an appropriate way and the habituation to the source of the risk. (Pfeil, 2000).

To obtain a better overview, a risk matrix is useful for classifying different events with respect to the probability of occurrence and vulnerability of a certain collective (see Fig. 11). The risk matrix shows, that for highly risky events appropriate resources to implement prevention measures should be made available immediately.

The correct and systematic analysis of risks and its perception is a task, which should include natural sciences and engineering as well as psychology and political science. While natural sciences and engineering usually determine the objective risks with respect to mathematical and statistical data series, psychology and political science are responsible to evaluate the human aspect of risks; this means the perception of the risk.

In addition to risk analysis, early monitoring and warning systems exist, which both play an important role in minimizing losses. The implementation of such systems represents a classic investment problem: early warning systems typically cost a lot of money since a comprehensive monitoring system is very demanding. However, a good early warning system with alert capabilities can greatly reduce

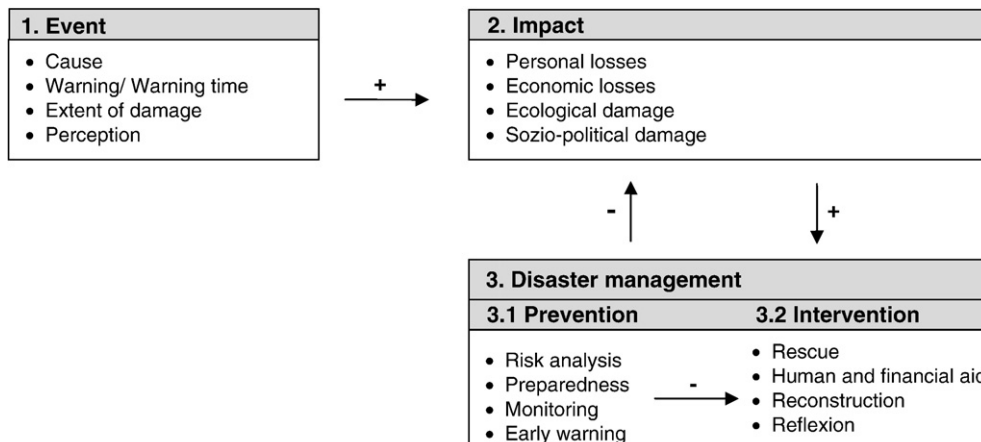


Fig. 10. Modified reference framework for the analysis of disaster management (based on Grün, 2005, p.648).

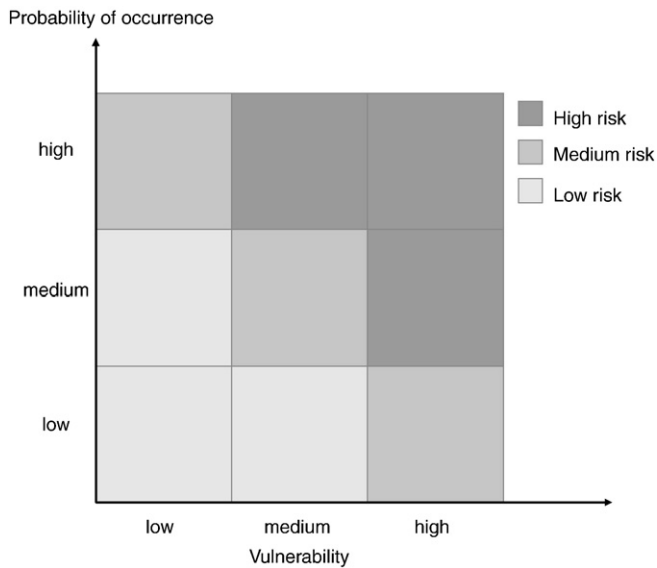


Fig. 11. Risk matrix (Adam, 2006, p. 96).

losses in the case of earthquakes, tsunamis, and tornados, for instance. In spite of modern satellite and radar systems (Voigt et al., 2007), one of the largest difficulties in monitoring is the correct anticipation of a critical development with respect to time (Coates, 2006). Many crises and the ensuing disasters show creeping progressions which are barely perceptible by humans (Alexander, 2004). Reserved or even nonexistent reactions are the consequence. Since the correct anticipation of a systematical dysfunction is very difficult, research—including economic research—is a big challenge. For example, identify possible turning points or thresholds to successfully stabilize a system using the method of reconstructive logic. In that case, starting from the possible impact of a disaster and then going back to the event is the approach to define these thresholds. The discussion of such values—in this context, remember the discussion of radiation protection after Chernobyl in 1986—is a delicate procedure. In 1986 a great debate took place with respect to radiation dose—the damage to the human body—and based on that on the maximum activities of nuclides tolerated in vegetables, milk and meat. The crux of the matter is that always a defined remaining risk must be accepted for any given disaster otherwise preparedness costs would be immense. The publication of such values and the estimation of remaining risks are very difficult, since the risk aversion with respect to collective (involuntary) risks is much higher compared to that of individual (voluntary) risks. “The public is willing to accept voluntary risks roughly 1000 times greater than involuntary risks” (Porter et al., 1991).

### 5.3. Response

The disaster response comprises four phases: alert, rescue, and recovery, reconstruction and victim relief. This includes all services and assistance starting from self-protection and rescue measures during the disaster and until the reconstruction on site after the disaster (Plate et al., 2001). The decisive element in disaster response is the cooperation and correct action of those involved, such as the various organizations and government authorities, the disaster relief agencies (Fcc Plans Public Safety, 2006) and the volunteers. The better the disaster preparedness, the smaller the efforts needed to cope with a disaster (Begley, 2005).

#### 5.3.1. Recovery and rescue

Disaster response, like prevention, takes place at various levels. Governmental and service organizations are active in international

disaster response and have, in part, their own trained professional personnel as well as relief equipment and funding available for these purposes (Godschalk et al., 2003). International support for rescue and assistance are especially important for developing countries affected due to the fact that natural disasters can set them significantly back because of their weak economic development (Dams, 2001). During and immediately after a disaster, victims must first rely on their own resources for protecting their property, which requires the accession to appropriate knowledge and necessary information (Prizzia, 2005). Prevention measures and informational campaigns can assure that the population knows the meaning of a siren, the proper responses or the whereabouts of possible shelters. At the same time, the information communicated during or immediately after a disaster is essential. The media, among others, carry an important responsibility since they can transmit warnings, information and behavior, and can advise the involved population (Peters and Reiff, 2000).

Emergency organizations become active in a second step and begin with the necessary recovery and rescue. For excavations, evacuations and emergency help, they need the proper equipment and appropriate communication possibilities. Crises managers or operational commands are responsible for providing clearly structured leadership and the smooth coordination and cooperation of all involved organizations and institutions (Bittger, 1996). The extreme situation is not only a psychological exceptional situation for the victims who have to endure the helplessness, damage and loss, but also an enormous burden for the responsible people in the emergency organizations and the rescuers (Ungerer, 1997).

Humanitarian and financial aid, the material and financial support and the psychological assistance for the victims, also belong to the disaster response phase (Flores, 2006). In some cases victims need medical care and they as well as the aid workers need the supply of food, water and shelters. Humanitarian aid starts with bottom level, one-on-one activities such as, for example, neighborly assistance or help from family members or friends. The higher the level of aid, the more complex the structures needed for communication, logistics and mission organization (Dombrowsky, 2001).

#### 5.3.2. Reconstruction

The longest and most capital-intensive phase in the disaster response process is reconstruction. Depending on the extent and type of catastrophe, the regions affected, and the reactions from outside, reconstruction takes place very slowly (Kutz, 2007). The pace depends particularly on the level of insurance payment, government aid, international empathy, and money donations.

At all levels of disaster management, experiences need processing, documentation, and examination to achieve effective preparation for future events and/or to respond more efficiently. Awareness of danger rapidly decreases after a disaster and gives way to a subjective (false) feeling of security (Habersack et al., 2004). Initiating a sustainable learning process could avoid this development.

#### 5.3.3. Victim relief

The potential damage claim is an important question after a disaster event. Laying blame is barely feasible for natural disasters. No one can fundamentally be responsible for the consequences of pure natural causes (Kerschner, 2004). Monetary payments to compensate loss and damages are derivable from insurance contracts; every country does not offer protection for natural disasters; such claims become exorbitant for certain risks (Geipel, 1992). Based on this fact, the government and the willingness of others to offer compensation payments play an important role (Walker, 2006).

#### 5.3.4. Management issues regarding the response to a disaster

Management from the beginning (emergency management) till the end (rescue and recovery) is a very important topic with respect to

successful disaster coping. Whereas many principles from classic organization theory are available for managing businesses (from functional ones to institutional economics), no generally accepted management concepts exist in the area of disaster management. The particular challenge of a good emergency and rescue organization is to cope with human mistakes and external pressure. Flexibility and innovative strength are in demand (Webb and Chevreau, 2006). In the same way as jazz improvisation, organizations could train and learn innovation or improvisation (Mendonza and Fiedrich, 2006; Mendonza and Wallace, 2007). However, such buffer-prone and, in a certain sense also stress-resistant, organizational forms still need definition for different kinds of events: Whether hierarchical organizations—with how many levels—flat ones or networks (Denning and Hayes-Roth, 2006), whether as a project organization or based on a permanent and professional staff, each type of event and management is to be considered separately because of the absence of evidence-based research (Choi and Brower, 2006). The reason is that institutional frameworks and cultural influences are linked to each other, and in some cases cultural influences can override institutional framework conditions (Ahrens and Rudolph, 2006). For instance, to establish a disaster management in a bottom-up model in Japan is practically impossible even though in European countries a bottom-up model is one of the most potentially successful ones. The reason for this is that the Japanese and Europeans have completely different understandings of authority and correspondingly deal with authority figures in a very different way. While Europeans are used to handling decision-making under their own supervision, the Japanese have much more difficulty, particularly when supervision is not available and decision makers are not directly accessible.

Logistic processes are also subsumed under disaster response and management (Perry, 2007). However, a disaster management does not mean an orderly process which is successfully carried out via the well known supply chain management models but rather with goods delivered in an unspecified quality and quantity at any time (Altay and Green, 2006); figure donation money which is not assignable to any direct donation purpose or voluntary helpers who do not know the organizational units and begin with autonomous, bottom-up organization work. An example is the police commander in charge of fighting

a fire on a freight train carrying petrol at a train station in a small town in Switzerland who had to integrate 1000 volunteers into an orderly leadership and logistic process. A further example is the problem of donation money collected by the non-profit organizations etc., which gains an increasing importance in a world of growing globalization, especially through the worldwide media reporting. Since donations are a scarce resource, carefulness during dealing is important, which particularly refers to the need of the establishment of an efficient project management without any detour. Mega-events such as the tsunami in Southeast Asia mobilized over 20% more donors. As a consequence other works threaten to end up in the back of people's memories (GFS, 2005). These examples show some issues of the actual core business of disaster management and represent a rich pool of opportunities for business economic research.

**6. Perspectives**

Unfortunately, the topic of disaster management could increase regarding the importance of social and environmental dimensions over the next years. For this reason, business economists are wise to look into urgent research questions in this interdisciplinary area. This includes topics such as risk assessment, risk allocation and principal organization from an economic point of view as well as problem-oriented prevention and relief strategies or business continuity planning from a management point of view, respectively. So, business continuity planning has to do with juxtaposing a regular and an extraordinary situation in the same company and smooth planning (Gibb and Buchanan, 2006). This is already a topic in many countries, for example in connection with the feared Avian Flu pandemic (Zsidisin et al., 2005) this issue impinges on private and public operations (Stackhouse, 2007). For example, banks and insurance companies already prepare for a possible epidemic just as hospitals and communities do.

Another topic which consistently reappears in disaster management is the decision-making process. Decisions made under stress and fear provoke a loss of control and give rise to mistakes. They demand appropriate routines and organizational forms to improve their quality (Schenker-Wicki, 1990). The same is also true for getting

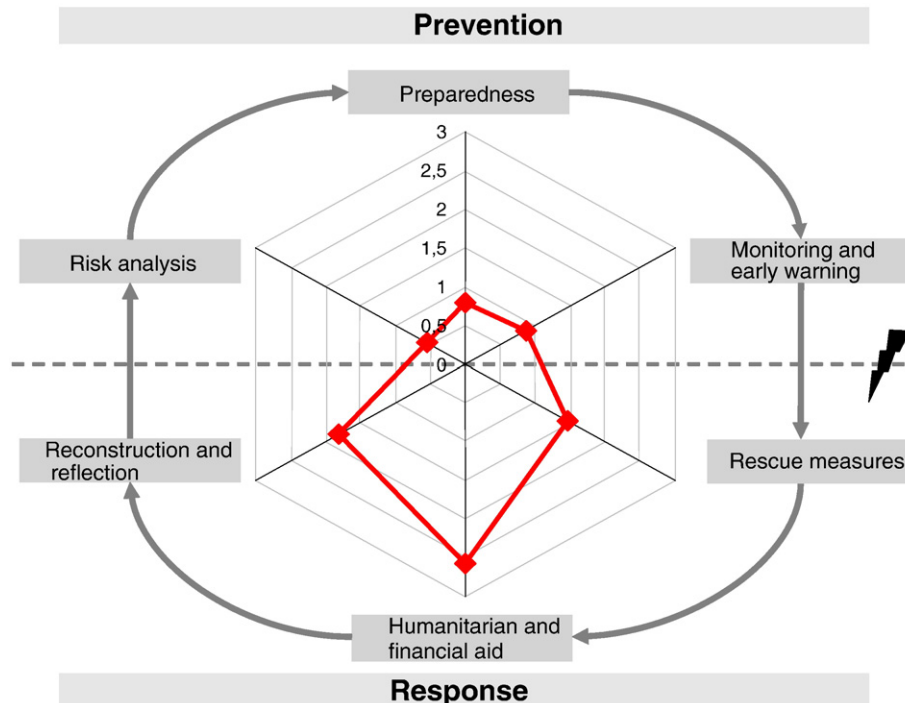


Fig. 12. Standardized concept for evaluating the response fitness for disasters (Adam, 2006, p. 131).



along with the volunteer army which is usually immediately available in a disaster. Interactions between institutions (Gopalakrishnan and Okada, 2007) and with the media, that is information for and communication with the population, are also decisive for responding to a disaster. Credibility, based on objectivity, fairness and consistency of the information is the basis for good communication with the victims and those potentially in danger (Renn and Kastenholz, 1997). Public institutions—especially emergency organizations on different levels—can influence the communication process by building up credibility and reducing uncertainty. Since the transnational dimension of crises and disasters will increase, there must be a synchronization of communication at the domestic and international levels and cultural differences and sensitivities have to be considered.

Monitoring of efficiency, effectiveness and appropriateness in disaster response is a worthwhile research topic. Accountability has an increasingly important role in the course of monitoring the scarce public finances in various countries (Depoorter, 2006). Besides the argument of assuring that the financial resources are efficiently allocated, the need for accountability in terms of whether the desired goals and results are actually achieved in disaster management is highlighted by the enormous damages and suffering caused by disasters. Adam (2006) develops a standardized grid for analyzing resources, processes and results in view of their efficiency, effectiveness and appropriateness using the disaster management of the community authorities for flooding in Austria as an example. She determined the fitness of individual communities regarding their mastering of flooding (see Fig. 12) and developed a series of indicators, which are suited for evaluating non-monetary based facts with respect to the different phases of disaster management. Using the parameter value of each indicator, problem areas are shown. This control concept is a practical instrument, which shows a comprehensive picture of the fitness of the community with respect to flood disaster management. At the same time it is possible to apply this instrument with little additional effort to other disaster types or in other institutional frameworks.

Under the assumption that the existing trend continues, see Figs. 1 and 2, more hazards with losses over US\$ 100 billion will occur in the future. Apart from natural hazards caused by the climate change – an increasing risk emerges from armed hostilities induced by ethnical conflicts, and scarce resources (water, oil), which produce poor living conditions and huge migrations streams. These as well as the accumulation of wealth, the growth of the cities and the settlement in areas where earlier no house was built due to safety reasons are increasing the vulnerability of modern societies. Hence, a need and a major importance of the topic disaster management exist regarding both scientific as well as political debates (Henstra and McBean, 2005).

With respect to the increasing political and social relevance of disaster management, economics and especially business administration should show a great interest to develop models on how to cope successfully with a disaster. Even though the number of articles on the topic has considerably increased in the last years, most of the studies are designed as single cases and are not synthesized. Kapucu et al. (2007) describe the lessons learned from disasters in the past and show the tasks of the national emergency organizations. Sometimes computer models and decision support systems are presented (Levy et al., 2005) by dealing with one or different phases of disaster management such as risk analysis, monitoring, prevention, rescue and reconstruction (Beckmann and Simpson, 2006). In most cases they are designed for one or two phases, and very rarely they support the four phases. This is especially true for natural hazards such as hurricanes (Caruson and MacManus, 2006; Chua, 2007; Chua et al., 2007; Gerber, 2007; Weeks, 2007), tsunamis (Scanlon et al., 2007; Tolentino, 2007) global warming (Anderson, 2003), pandemic flu (Fraser et al., 2004; Achampong, 2007), earthquakes (Jason et al., 2003) and volcanism (Wadge, 2003). Thus, while lots of single studies are available, the

missing synthesis within a normative framework, inhibits evidence based management and benchmarking. The necessary data are often unavailable and most of the cases are handled with respect to plausibility and intuition. Each event seems idiosyncratic and the tendency to repeat inefficient patterns by governmental bodies is high (Lalonde, 2007). However, to ease the impact of a disaster and reduce the suffering of the affected population, efficient and effective disaster management is a necessary condition which takes institutional and cultural parameters into account (Schenker-Wicki, 1990). To make these management systems more efficient and effective, business economics could contribute substantially.

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