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HANDBOOK FOR INSTITUTIONAL RESPONSES TO COASTAL HAZARDS

Itay Fischhendler
Orr Karasin
Ziv Rubin

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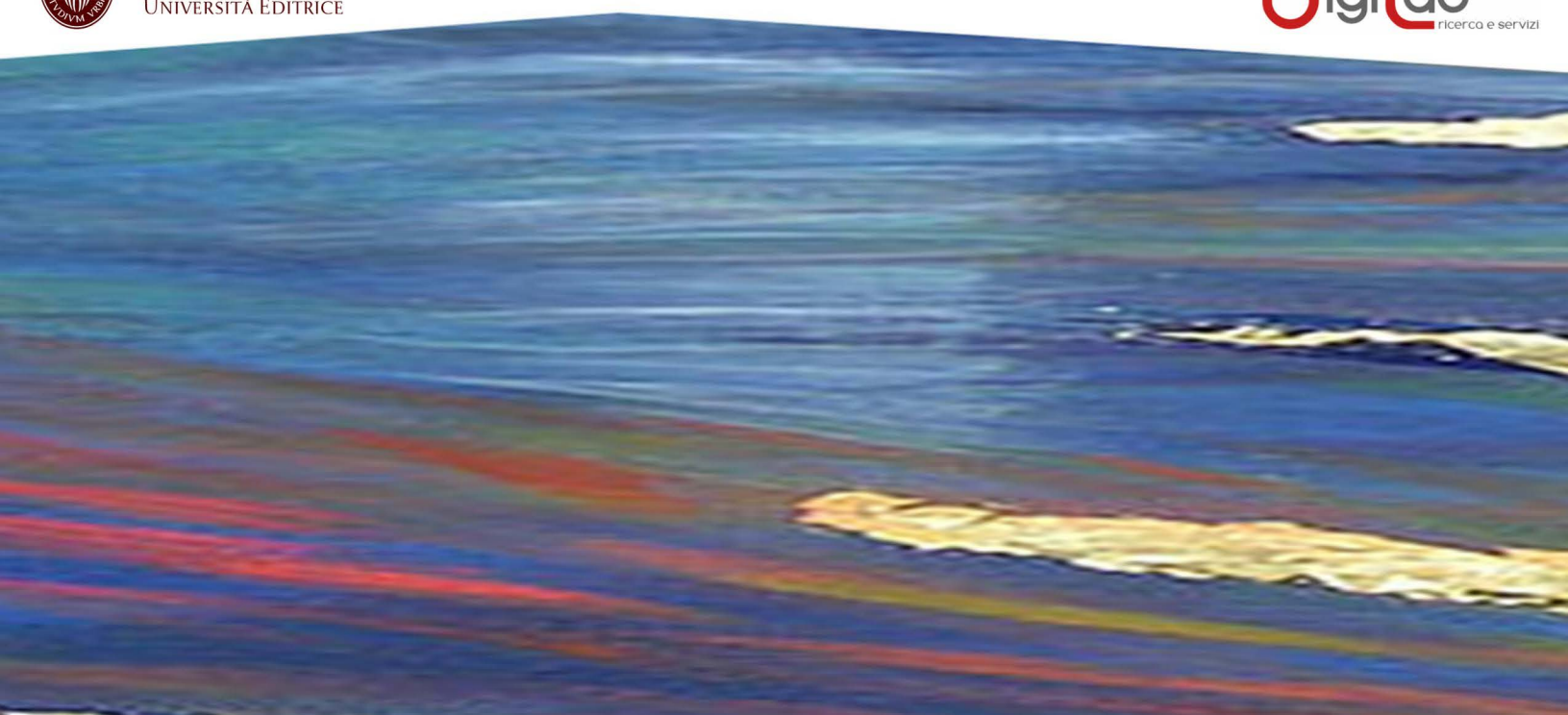

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INTRODUCTION

Aim of Handbook

Weather-related disasters continue to increase in frequency. Over the period of 1993-97, an annual average of 200 disasters was registered. In 1998-2002, this number had increased to 331 (IFRC, 2003: p. 179) and in 2003-2004 to 355 (IFRC, 2005: p. 198). Furthermore the adverse impacts of natural hazards are unequally distributed. Developing countries commonly experience greater losses, at least in relative terms. Ninety-four percent of all deaths from natural hazards in 2002 occurred in countries of low human development (IFRC, 2003: p. 179). In terms of economic losses, many of the less developed regions have experienced relatively low losses because of their lack of infrastructure and economic assets. These low losses do not however reflect a low impact on development. Even a small economic loss can be important in countries with a very low GDP (UNDP, 2004: p. 13).

The belief that disasters are discrete, divine events that have unavoidable impacts on human lives has long been abandoned due to science. Most impacts on human lives and welfare from natural disasters are not necessarily natural or inescapable, but rather are induced through human and institutional vulnerability. It has therefore become a widely held view that there is little value in confining attention exclusively to hazards in isolation from vulnerability and its causes (Wisner et al., 2004: p. 61). Successfully dealing with natural hazards requires an understanding of the underlying vulnerabilities of the society that is at risk, and the willingness to lessen these vulnerabilities. Hence vulnerability reduction is not only a key investment in achieving sustainable development, but in reducing the human and material costs of natural disasters over the long-term as well. It therefore seems clear that vulnerability to extreme events is differential. Differences can be found not only among nations but at much smaller scales, such as the local or social group level for example.

Institutional failure resulting in bad governance has been regarded by some as a root cause of human vulnerability to disasters (Fordham, 2003; Ahrens & Rudolph, 2006). The interdependent relationship between institutions, governance and human vulnerability are multidimensional and complex. However it seems intuitively clear that if a country's governance structure does not enable the implementation and enforcement of public policies conducive to creating sustainable livelihoods, vulnerability to disasters will be exacerbated.

The social construction of natural hazards and the impact of governance structures on vulnerability require an in-depth look at the role institutions play in mediating crises. Two preliminary remarks are required in this context. First, in the context of this research, when referring to 'institutions', the term is not used loosely to include various sociological interpretations of institutions as social and normative mechanisms (see for example Lebel et al., 2006; March & Olsen, 2008). Rather the term is narrowly construed to mean only those formally established agencies of the state or organizations of civil society deliberately and intentionally created to deal with natural hazards risks or those that may indirectly influence vulnerability to natural hazards through their primary activities. Second, 'responses' are interpreted with dual meaning to include both institutional formation and institutional actions in response to natural hazards.

Given the above definitions, the general objective of this handbook is to understand how institutions respond to natural disasters and to identify the non-market costs associated with these responses. This will be conducted through a cross-country comparative case study of institutional responses to vulnerability to natural coastal hazards. The key research questions are:

1. What is social and institutional vulnerability to natural hazards?
2. What institutions are available to address vulnerability to natural hazards and natural coastal hazards in particular?
3. What are the reasons for the formation of the aforementioned institutions?
4. What are the characteristics of the aforementioned institutions and the types of actions taken?
5. What are the non-monetary costs associated with the institutional response to natural hazards?

This handbook is a collaborative effort of many of the SECOA partners. These include Sapienza Università di Roma, Vrije Universiteit Brussel, Universidade de Lisboa, London Metropolitan University, The Hebrew University of Jerusalem, Goeteborgs Universitetu and the Institute of Marine Environment and Resources in Vietnam. A complete list of contributors is listed on page 82.

Structure of Handbook

The first part of the handbook will describe the definitions of individual/social vulnerability and its components as reflected in the literature. The second part will discuss briefly the meaning of social and institutional vulnerability. Subsequently why focusing on institutional vulnerability and institutional response will be outlined along with the unpacking of institutional responses into its contributory components. Among the components described are: Institutional Formation, including Motivating Event, Organizational Form and Establishing Mechanism; and Institutional Characteristics that include Institutional Independence, Degree of Centralization, Inter-Agency Coordination, Institutional Bureaucracy and Community Involvement. Finally, based on the typology created, a cooperative case study will be conducted. The aim of the comparative study is to examine the institutional responses taken by the different SECOA case studies and to identify the non-market costs of these responses. The case studies examined include 8 cases, one from each of the following countries: Israel, Sweden, United Kingdom, Portugal, Vietnam and Italy, and two cases from Belgium. They are presented in a comparative manner. Finally, some general conclusions are drawn based on the comparison of these cases.

PART I: SOCIAL AND INSTITUTIONAL VULNERABILITY TO NATURAL DISASTERS

Part I commences by investigating what is meant by natural disasters and social vulnerability. Different types of vulnerability are explored such as biophysical vulnerability, individual vulnerability and social vulnerability. Finally, the chapter proposes a working definition for institutional vulnerability. Section 1 deals with the notion of natural disasters and suggests shifting the focus from the physical attributes of natural disasters to the social construction of natural disasters. Section 2 commences with investigating the lack of a definitional consensus on the notion of vulnerability. Later in section 2.3.1 biophysical and infrastructural vulnerability are briefly described, and in section 2.3.2 various variables are attributed to individual vulnerability. Section 2.3.3 focuses on social vulnerability and suggests variables for measurement. Section 2.3.4 establishes a working definition for institutional vulnerability based on the broad concepts of vulnerability, among which are sensitivity and adaptive capacity.

1. What are Natural Disasters?

Natural hazards, such as hurricanes, floods, or landslides, are a fraction of the events occurring on earth. Natural hazards are not the same as natural disasters. Natural hazards are commonly redefined as disasters because of human involvement. Hence without humans, hazards would simply be natural events, largely uninteresting and would attract only minor attention (Haque & Etkin, 2007). Indeed the United Nations glossary for basic terms related to disaster management defines 'disaster' as "a serious disruption of the functioning of society, causing widespread human, material, or environmental losses which exceed the ability of affected society to cope using only its own resources" (United Nations, 1992: p. 21).

Coping capacity and the need for organizational response to natural hazards can be used as a proxy for the level of disaster at hand. If only established response organizations are required, then the hazard has created an accident. If an event requires the activation and expanding of latent response organizations (e.g., the Red Cross), then it constitutes an emergency. If in addition to expanding organizations, extending organizations become involved (e.g., utility or construction; organizations providing search and rescue), then it is truly a disaster. And if entirely new groups become involved as part of the response, then the

event can be classified as a catastrophe (Quarantelli, 1987: p. 25). From this perspective this paper will relate to both disasters and catastrophes.

In the past 'natural' signified supernatural or physical forces of nature uncontrollable by humans (Quarantelli, 1989). The physical domain was seen as discrete and separate from human entities and defined natural hazards as those elements of the physical environment harmful to 'man', caused by forces extraneous to him (Burton & Kates, 1964). From a purely physical perspective, natural disasters vary among themselves in the agent of the hazard, the threat of impact and the impact characteristics. Agents of natural hazards typically include climate hazards (i.e. hurricane or cyclones and global warming), geophysical hazards (i.e. volcano eruptions), seismological hazards (i.e. earthquakes) and hydrological hazards (i.e. floods). The threat therefore relates to frequency or likelihood of impact, predictability and controllability of agent. Impact characteristics are usually described by reference to speed and onset of warning, impact magnitude, scope and duration (compare to U.S Committee on Disaster Research, 2006: p.75).

It has become widely recognized that although hazards may be natural in origin, it is the way in which societies have developed that causes them to become disasters (Hewitt, 1996; Wisner et al., 2004, Haque & Etkin, 2007). The evolving conception of 'natural' now recognizes it is no longer 'neutral' to human interference. In fact it is better understood as the interplay of two types of relationships. The first is how humans impact the onset of natural disasters by causing significant changes to natural systems, impacting what was previously perceived as 'acts of God'. Such is the case in the intensifying of extreme weather conditions caused by anthropogenic climate change. The second relationship alters the effects of natural hazards by impact with human vulnerability (Adger & Brooks, 2003). In both cases nonetheless natural disasters are not only a matter of fact but also a matter of judgment. It depends on individual perceptions, cultural and religious biases (Homan, 2003) and institutional definitions of the scale and importance of the problem faced. These perceptions are molded by politics and the media (McConnell, 2003). This prognosis shifts the required focus when dealing with natural disasters from the physical to the socially and institutionally constructed dimensions. It brings to bare a heightened importance to the way in which institutional responses are designed to deal with natural disasters.

Another shift has brought upon the recognition that natural disasters need not be neatly delineated events well defined in time and space (Rosenthal, 1998). They may form extended periods of various levels of threat that disrupt a wide range of social, political and

organizational processes. (Boin & Hart, 2003). According to this view there are three main types of natural disasters that tend to alter the required institutional response in different ways. The first type is a '*sudden' crisis*. This is the conventional view of a crisis situation, occurring in the form of a swift, unexpected event or series of events (McConnell, 2003). A good example of this would be an earthquake. A second type is a '*creeping' crisis*, which does not have the feature of condensed dramatic events to focus our attention. Rather, vulnerable conditions and pressures build up slowly, often over many years (McConnell, 2003) as in the case of droughts. This does not preclude the possibility of creeping crises culminating in a dramatic event or series of events. The final types of crises are '*chronic' crises*. Whilst there may be 'creeping' aspects to them and the occasional sudden onset of extraordinary circumstances, they are chronic because they are ongoing crises with no obvious solution (McConnell, 2003). Certain types of floods answer this description.

2. Vulnerability to Natural Disasters

2.1 Vulnerability – The Elusiveness of a Definitional Consensus

'Vulnerability' is one of those terms that seem to defy consensus usage (Lewis, 1999; Fussel, 2006). Early concepts of vulnerability date back to discussions of stability and resilience in ecology. This work linked the impacts of perturbation on a system with other system characteristics such as diversity, persistence stability and resilience. The study of vulnerability has since its early inception in ecology matured and migrated across many traditions and disciplines, from economics and anthropology to psychology and engineering and to risk management as well. Human geography and human ecology have, in particular, contributed to theorizing vulnerability to environmental change, making significant contributions in various research contexts such as ecology, public health, poverty, food security, development, secure livelihoods, sustainability science, land change, and climate impacts and adaptation (Fussel, 2006). Ironically, although vulnerability has served as the basis for a plethora of academic investigations in these fields during the last two decades, and increasingly so from the mid 1990's, both the explanations, determining factors and measures of vulnerability remain elusive and highly varied (Dow, 1992) (See Table 1 for examples of definitions).

Vulnerability as pertaining to natural disaster can be broadly understood as the predisposition to be hurt should an event beyond a certain threshold occur and impact society, its economic assets and the ecosystem, or its infrastructure. This human-centered approach to

vulnerability engenders many questions, caveats and disagreements, which are all subject to ongoing scientific debate. One aspect however that has grown into relative consensus is that in order to understand human and social vulnerability, we need not only assess the negative side of vulnerability as the predisposition to be hurt, but rather integrate such notions as coping capacity or adaptability, which reflect the potential of a threatened group to overcome its own vulnerability.

Bohle (1994) defined vulnerability as a measure of human welfare integrating social, economic and political exposure to a range of harmful perturbations. Turner (2003) suggested vulnerability should be defined 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 stressor" (p. 8074). Even so, Turner (2003) adds that vulnerability is registered not by exposure to hazards alone or even by the outcomes these exposures may produce, but also resides in the sensitivity and resilience of the system experiencing such hazards. Figure 1 demonstrates the movement from exposure to outcomes that is filtered through the characteristics of the vulnerable system.

Vulnerability has also been described as a function of the 'stress to which a system is exposed (i.e. exposure), its sensitivity and its adaptive capacity' (Yarnal, 2007; Posey, 2009). This kind of definition requires an in-depth inquiry into the definition, characteristics and possible factors that affect sensitivity and adaptive capacity ('adaptivity' or 'coping capacity' that will be used in this work interchangeably) that are beyond the scope of the current article. Even so, a brief description of each concept is needed in order to proceed to conceptualizing 'institutional vulnerability'.

Finally there is the Global assessment report on disaster risk reduction.2009 (UNISDR) definition of vulnerability that put the community at the center. This definition acknowledges the fact that there are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management. Vulnerability varies significantly within a community and over time. This definition identifies vulnerability as a characteristic of the element of interest (community, system or asset) which is independent of its exposure.

Table 1: Overview of Definitions of Vulnerability Approaches

Definition of Vulnerability	Indicators for Measurement	Context	Scale Used	Source
Ability to cope with and adapt to external stresses	1. Material poverty 2. Inequality- quantitative distribution of assets and entitlements. 3. Institutional adaptation	Social vulnerability to climate change in rural, coastal Vietnam	Regional	Adger (1999)
Potential for loss	1. Personal wealth 2. Age 3. Race and ethnicity 4. Density of the built environment 5. Single-sector economic dependence 6. Occupation 7. Housing stock and tenancy (infrastructure and ownership) 8. Infrastructure dependence	Social vulnerability of U.S. counties to environmental and natural hazards	Regional	Cutter et al. (2003)
Factors that magnify or decrease stress to communities' or individuals' impacting ability to rebound	1. Physical coastal vulnerability 2. Combined physical vulnerability and social vulnerability	Vulnerability of U.S counties to coastal erosion	Regional	Boruff et al. (2005)
A function of exposure, sensitivity and adaptive capacity	1. Participation in floodplain management program (proxy for adaptive capacity) 2. Socio-economic aggregates 3. Physical risk 4. Form of government	U.S municipal adaptive capacity regarding response to environmental risks.	Municipal	Posey (2009)
Constraints and opportunities that shape capacity to adapt to the health challenges	1. Economic livelihood- income-poverty 2. Household location 3. Health-awareness education	Health risks associated with household exposure to floods in Viet Nam	Household	Few & Tran (2010)
The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.	1. mortality data 2. economic loess 3. population exposure	global view of natural hazards like floods, earthquakes	Community, System	UNISDR (2009)

2.2 The Components of Vulnerability

Vulnerability integrates at various degrees three different dimensions: exposure, outcomes and characteristics of the system that render it vulnerable (see Figure 1). Various definitions of vulnerability place contrasting significance on each component and have provided different integration models of these various dimensions (see Table 1). In recent years, research has largely addressed vulnerability as a characteristic of systems, often systems pertaining to individuals, societies, ecosystems or technology. Some research accentuates the exposure to an event (or events) that give rise to vulnerability (such as floods, earthquakes, droughts or dependency on energy resources) (Dow, 1992: p. 420; Cutter, 1996: Cutter et al., 2003). Yet others refer to vulnerability primarily as an outcome (O'Brian et al., 2005).

The next section (and Figure 1) describes the main elements of vulnerability.

Exposure is the nature and degree to which a system experiences environmental or socio-political stress (see Figure 1). The characteristics of these stresses include their magnitude, frequency, duration and areal extent of the hazard (Burton et al., 1993). Variations in probability of exposure to hazards may serve as a measure of vulnerability (Dow, 1992: p. 420). This perspective would require assessing the distribution of some hazardous condition, the human occupancy of this hazardous zone and the probability of the occurrence of the natural hazard (Cutter, 1996). Adger (1999: p. 249) suggest that vulnerability can be understood as 'the exposure of groups or individuals to stress as a result of social and environmental change, where stress refers to unexpected changes and disruption to livelihoods'. While exposure is often considered relative to an individual event (*e.g.* floods or hurricanes) the potential for exposure to multiple hazards has become an issue of some interest and concern (Dow, 1992: p. 421).

Sensitivity is the system's susceptibility to impact (Lewis, 1999), or the degree to which a system is modified or affected by perturbations.

Adaptive Capacity is the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope. In some contexts resilience (i.e. the system's capacity to cope or respond) has been differentiated from the system's restructuring after the perturbation (i.e. adjustments or adaptive capacity). For the purpose of this study we need not address resilience but instead

stress adaptive capacity. Also as to the distinction between adaptive capacity and sensitivity, it can be better understood by the following portrayal of opposite forces: while sensitivity acts as a lifting force moving a system away from a previous dynamic equilibrium, adaptive capacity acts as a gravitational force pulling the system back into a steady state. Both attributes are part and parcel of the characteristics of the vulnerable system (see Figure 1).

However, both sensitivity and adaptive capacity are not independent. A system that is more adaptive and can change its managerial features may become less susceptible to impact and vice versa. In addition, adaptive capacity receives input from a variety of contextual variables, such as the variables that relate to the political relations that exist between states and agencies. This explains why the box 'Adaptive Capacity' in Figure 1 has incoming arrows.

Characteristics of a System is the nature of the system that causes it to be sensitive or vulnerable. Thus vulnerability can be identified through a set of attributes of a system that condition certain outcomes. Accordingly the influential work of Blaikie et al. (1994: 9) defines vulnerability as 'characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of natural hazards'. Table 2 outlines the main factors that shape the characteristics of a system.

Outcomes as relating to vulnerability have been defined as the degree of loss resulting from a potentially damaging phenomenon (Cutter, 2003) (see Figure 1). Alternatively they have also been defined by the degree of damage caused (Birkmann, 2006: p. 68). Damage assessment may be based on calculation of real losses, such as fatalities, economic losses and damage to infrastructure (Birkmann, 2006: p. 68). Blaikie et al. (1994) however, suggests a broader definition of loss by defining the outcome of vulnerability as loss of livelihoods. This approach entails addressing not only harm caused to life or property but to the bundle of resources that are used by individuals or societies to satisfy their needs. Resources encompass in addition to monetary wealth, property rights and other legal rights, both social resources, such as information, cultural knowledge, professional knowledge and practical know-how (Blaikie, 1994: p. 9).

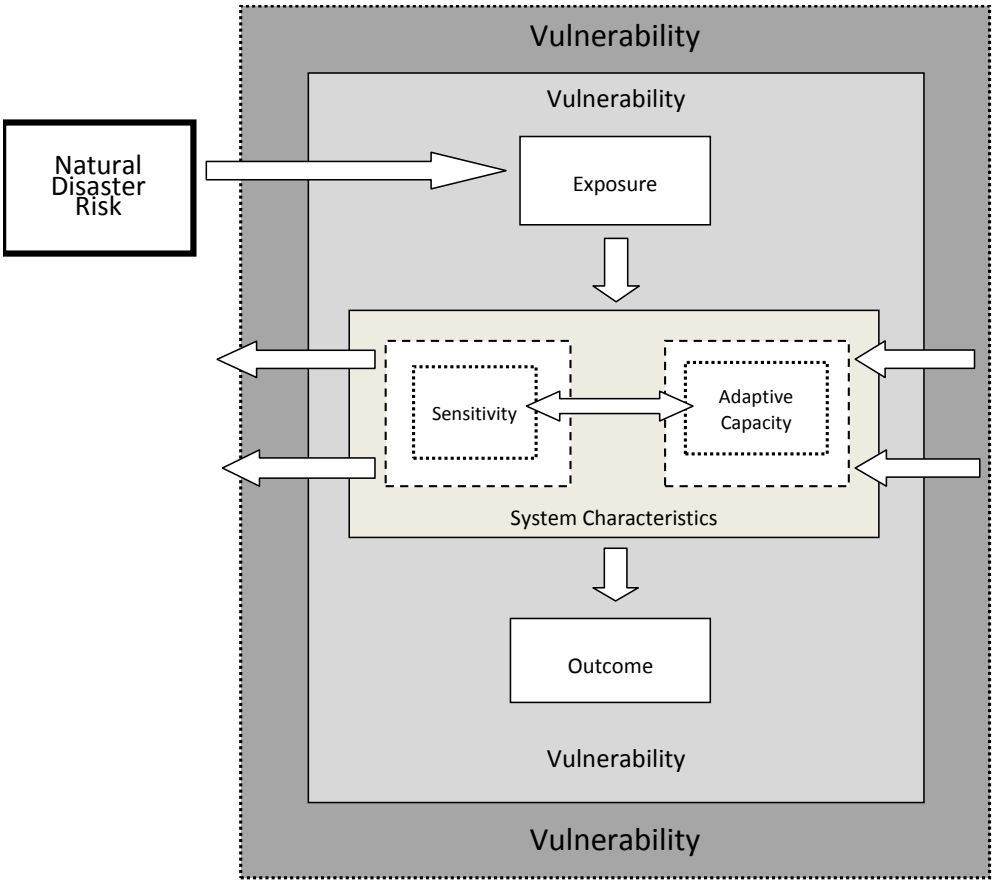

Figure 1: The elements of vulnerability

2.3 The Dimensions of Vulnerability

2.3.1 Biophysical and Infrastructural Vulnerability

Biophysical contributors to vulnerability are ecological or physical conditions that impact ecosystems and environmental resources; hence they indirectly impact those dependent on said resources (Dow 1992). For example, living in arid environments, in lowlands susceptible to flooding, in valleys that suffer from landslides or on cliffs prone to collapsing, all may be considered as biophysical drivers of vulnerability. Most often these drivers are considered when addressing vulnerability as exposure (see Table 2).

Technological and infrastructural conditions contribute a further dimension to vulnerability as exposure. These can be analyzed through an engineering focus on such issues as building types and materials, the existence and functioning of storm barriers or the ability of infrastructure (such as power plants) to function under varying environmental conditions

(Dow, 1992) (see Table 2). However technology and infrastructure can also be regarded as expansions of social and institutional decision making and social conditions, when for example social policies cause the poor to be housed in marginal areas or structurally unsound living conditions (Main & Williams, 1994). Hence resilience of infrastructure can be improved or planned in a way that minimizes vulnerability if institutions and regulations are put in place by society.

2.3.2 Individual Vulnerability

Individual vulnerability is determined by access to resources and the diversity of income sources, as well as by social status of individuals or households within a community. However, individual vulnerability can be viewed as an oxymoron as well. Identifying underlying traits that produce vulnerability within individuals requires generalization and hence ascription of vulnerability to others that share the same traits. Hence individual vulnerability can be differentiated from social vulnerability not so much by the qualities assessed, but more so by the focus on different scales and outcomes of certain personal traits.

It has become widely acknowledged that demographics of the inter-household may determine differential vulnerability, even within households. Gender exacerbates vulnerability (Fordham, 2003; Bolin et al., 1998) as women typically spend more time and effort on care giving than do men. They are often more vulnerable because care giving exposes them longer to vulnerability as they struggle to get their aged parents, children, and sick relatives out of harm's way. Similarly disabilities (Parr, 1987), at old or very young ages, increases sensitivity to risk and decreases coping capacity. Few (2010) found differential vulnerability to health risks among children associated with flooding. Indeed in New Orleans, following Hurricane Katrina, it was the oldest, sickest, and often the poorest that were most vulnerable and most psychologically affected by the aftermath (Bourque et al., 2006).

Moreover, individual status such as class, ethnicity or race can influence perception and individual decision making related to risk on an individual or community level and determine the options available to different groups in relation to risk (Dow, 1992). Individual perceptions, heuristics, biases and past experience with hazards constrain choices made with regard to risk and risk proofing. These personal perceptions are largely correlated with socio-economic status,

levels of education and information, all variables explored in this respect (Drabek, 1986). As such they are closely intertwined with the social context of vulnerability.

2.3.3 Social Vulnerability

The recognition of the social context of vulnerability gained influence in the 1980s, and has been increasingly recognized in 'hazards' literature since the 1990s. Cutter (1996) highlights the social construction of vulnerability, while Pelling (1999) suggests it is the socio-political processes by which people are made vulnerable that are most relevant in policy making. Cannon (2000: p. 46) makes the point strongly: 'It is vital to recognize that vulnerability should be treated as a condition of people that derives from their political-economic position. It is therefore dangerous to use it loosely or as a characteristic of exposure to hazards alone, since this allows the key components of power and income distribution to be played down and prominence given to technical fixes'.

It is widely noted that vulnerability to environmental change does not exist in isolation from the wider political economy of resource use. Understanding the process of the interplay between income-poverty, livelihoods and political economy has been a driving force behind key advances in the social science of vulnerability (Wisner et al., 2004). Empirical economic analysis on vulnerability has identified a number of factors that mitigate the impacts of natural catastrophes on society. There is broad consensus that economic development mitigates the effects from natural disasters. Kahn (2005) and Skidmore and Toya (2007) show that countries with higher per capita income experience a similar amount of catastrophic events but less fatalities result from these events. Anbarci et al. (2005) analyze the effects of income inequality on earthquake fatalities. Their results suggest that a nation's inequality – as a proxy for the nation's inability to adopt preventive measures and policies (e.g. the creation and enforcement of building codes) – increases the number of earthquake fatalities.

Entitlements theory has been used as a powerful explanation of social vulnerability that focuses on the social realm of institutions, well-being and on class, social status and gender as important variables. First developed by Sen, the theory of entitlements focuses not only on monetary wealth but on a broader concept identified as entitlements. Entitlements are defined as sources of welfare or income that are realized or are latent. They are 'the set of alternative commodity bundles that a person can command in a society using the totality of rights and

opportunities that he or she possess' (Sen, 1984, p. 497). This theory suggests that vulnerability of livelihoods to shocks occurs when people have insufficient real income and wealth, and when there is a breakdown in other previously held entitlements. These breakdowns may occur due to exposure to natural hazards that through perturbations disrupt both the natural, technological and social environments.

2.3.4 Institutional Vulnerability

It has become widely accepted that the functioning of institutions in responding to risk is key to understanding and assessing vulnerability (Lebel et al., 2006; Greiving, 2006: p. 224). Institutions define and constrain the set of choices of individuals, determine the wider political economy of resource use, and carry out activities in response to risk. Hence, institutions serve as the link between the narrower perspective on vulnerability of individuals and the broader structural properties of social vulnerability. Burton et al. (1993), argued that hazards are essentially mediated by institutional structures, and that therefore it does not follow directly that increased economic activity will reduce vulnerability.

Defining and assessing institutional vulnerability necessitates several preliminary remarks. First, in the context of this research when referring to institutions the term is not used loosely to include various sociological interpretations of institutions as social and normative mechanisms (see for example Lebel et al., 2006; March & Olsen, 2008). Rather the term is narrowly construed to mean only those formally established agencies of the state or organizations of civil society, deliberately and intentionally created to deal with natural hazards risks or those that may indirectly influence vulnerability to natural hazards through their primary activities.

In applying the aforementioned definition, institutional vulnerability may be viewed from two different perspectives. The first is an assessment of the vulnerability of institutions as systems subject to risk. This perspective combines the narrow definition of institutions and the understanding that vulnerability is affected by the *sensitivity* of a system. In other words this view requires assessing the sensitivities of institutions that relate to natural disasters, their susceptibility to impact, and the degree to which they are modified or affected in times of risk. The second viewpoint considers the role institutions have in mediating social, individual and technological-infrastructural vulnerabilities that are induced by exogenous exposures and social

characteristics. This perspective requires assessing institutional *adaptive capacity* and its implementation. Both institutional sensitivity and institutional capacity are addressed in the following paragraphs. Further elaboration of the concepts they entail will be given in Part II.

2.3.4.1 Institutional Sensitivity

Addressing *institutional sensitivity* requires investigating the concepts of institutional establishment and design, the ability of institutions to coordinate and their ability to change. These variables will be discussed in length in Part II; hence here only preliminary remarks are warranted. *Institutional design* may be addressed through various dimensions, such as institutional formation: whether the organization was formed by a centralized top-down international or national effort or whether it was formed by a bottom-up initiative arising out of local government or local organizations. Another element that affects institutional sensitivity is the degree of institutional innovation. Innovation in this context relates to whether the organization is new or not or has augmented an existing organization. The mechanism for institutional establishment, whether voluntary, legally or administratively established is another element. It could be hypothesized that institutions established by law may be less vulnerable to perturbations then those established by administrative action.

Inter-institutional coordination becomes a major concern as governance of natural hazard risks becomes more complex and segmented. As described above, natural hazards may be dealt with at various levels of action from mitigation to rehabilitation. Although these areas of work seemingly relate to different stages in risk management they are not bounded or unitary and are often interpenetrating and interdependent. A holistic view of risk management therefore requires inter-institutional coordination or a type of network approach to institutions. This view is reinforced by a growing awareness that various agencies and bodies not dealing directly with natural hazard risk management may indirectly impact vulnerability to natural hazards by redistributing risks or reallocating resources (Kasperson & Kasperson, 2001).

The dynamics of *institutional change* require an in-depth look at bureaucracy, flexibility, learning and responsiveness of institutions (March & Olsen, 2008). Institutions dealing with risk will regularly encounter external shocks or perturbations, as natural hazards will often cause large scale socio-economic effects that may strain the functioning of risk management institutions. They place such institutions in the center of public interest and scrutiny. Failures in

responsive action may lead to public outrage and political investigation. In this way, natural disasters may serve as a catalyst for institutional change. These issues will be further explored in Part II.

2.3.4.2 Institutional Capacity

Institutional capacity reflects the flexibility of institutions, their capacity to implement action and cope with challenges and changing circumstances. Three attributes have been identified in the effort to assess institutional capacity. First is the capacity for *community involvement.* Indeed it has been noted repeatedly that vulnerable people are excluded from decision-making processes and from access to power and resources (Dow, 1992; Pelling, 2003; Adger, 2003). Often institutions will place emphasis on adaptive actions that reduce the vulnerability of those best placed to take advantage of those institutions, rather than reduce the vulnerability of those most marginalized and vulnerable (Adger et al., 2005; Yarnal, 2007). This kind of institutional behavior emphasizes the status quo structure of entitlements. By determining which parties to environmental risks bear unwanted costs, political structures in which disenfranchised parties are unable to call upon the power of the state to protect their interests are reinforced (Bromley, 1992: p. 1). Hence institutions may serve not as buffers from vulnerability, but as accelerators of inequity or even causes of vulnerability cycles. It has been suggested that in order to overcome this political reality, it is important to ensure that the interests of socially vulnerable groups are represented. In this way different knowledge can be put forward for discussion so that ultimately fair goals can ensure of a more equitable division of institutional resources and actions on mitigation, preparedness, response and rehabilitation (Lebel et al., 2006).

The capacity to *implement* and carry out the actions required by the goals that were set is critical. This requires among other conditions, a clear definition of goals, institutional will and well-structured work plans, resource availability, professional capacity and the efficient and coordinated use of organizational resources. All of these are highly complex issues especially from an analytical perspective. An effort to measure institutional capacity may require the reduction of some conditions and the use of indicative indices.

The capacity to *learn and respond* is of critical importance as it serves as the basis for continual improvement and for identifying gaps between policy objectives and implementation (Lebel et al., 2006). Assessing the existence of learning and responsiveness qualities requires

addressing both process and outcomes. Addressing process requires analyzing whether reflexive organizational processes exist and to what degree they are implemented. Addressing outcomes entails analyzing whether there is organizational integration of lessons learned into actual changes in types of actions, decision making process and institutional structures. As institutions dealing with natural risk need to constantly deal with complex, changing and unpredictable realities, it would seem that learning and responsiveness is a natural precondition for increased adaptive capacity. These dimensions will be addressed in detail in Part II. Table 2 outlines the factors contributing to vulnerability as a characteristic of a system.

Table 2: Factors Contributing To Vulnerability as a Characteristic of a System

Biophysical/Infrastructural	**Individual**
Biophysical Aridity Flood or land prone Cliff collapse Technology and infrastructure Building types and materials Availably of technological 'fixes'	Class, gender, age, disability Perceptions and decision making; Past experiences and biases
Social	**Institutional**
Socio-political process Social relations (class inequality, ethnicity and race) Resources and income distribution Limited access to political power and representation Marginality	Institutional sensitivity deriving from Institutional design Inter-institutional coordination Flowed ability to change Institutional capacity determined by Community involvement Capacity to implement Institutional learning and responsiveness

PART II: INSTITUTIONAL RESPONSES TO NATURAL DISASTERS

1. Introduction

The institutional environment effecting natural disaster management and vulnerability reduction is wide and varied. The connection between institutions and natural disasters has been recognized in much of the natural hazards and vulnerability literature that has adopted a political-economy approach to vulnerability (see, for example, Burton et al., 1993; Adger et al., 2001; Kasperson & Kasperson, 2001; Wisner et al., 2004). Institutions play substantial and numerous roles in disaster management. They determine much of the political and administrative culture, economic policy and enforcement systems (North, 1990; Pejovich, 1999; Trujillo et al., 2000). As such institutions affect vulnerability on multiple levels. They determine policies for mitigation, preparedness response and recovery and play an important role in their implementation. Institutional choices impact and largely determine both exposure to hazards, sensitivity and coping capacity during disasters and recovery forthwith.

Institutions play vital roles in mitigating exposure to risk by designing and enforcing land use policies and implementing infrastructural defenses (e.g. coastal defenses). Land use policies predetermine exposure to natural hazards and in particular coastal hazards, by way of the requirement that human habitation withdraw from hazardous zones (e.g. coastal areas prone to seawater inundation). Infrastructural defenses may help in reducing exposure by controlling or redirecting the natural hazard, such as flood levees or sea barriers.

Institutions also affect sensitivity and coping capacity on different levels and in distinctive ways. As demonstrated in the previous chapter, social vulnerability is not determined solely by personal attributes but largely by societal factors and especially livelihoods. Institutions, through macro-economic policy and micro aid programs (such as career training programs) have a potentially significant effect on livelihoods. Furthermore, coping capacity both prior and post natural disaster emergency, can be greatly altered and improved through programs, policies and actions directed towards hazard preparedness and response taken by various institutions. Long-term recovery is usually directed by institutions through resource allocation, predetermined community relocation, rebuilding aid and more.

Institutions partaking in policy formulation and implementation that directly or indirectly affect natural disaster management exhibit countless forms. They are located at

various levels of government, employ innumerable mechanisms and take a wide range of possible actions. In a single country the number of relevant institutions is both potentially and practically extremely large, while various institutions are of different importance in different countries. For example, in any one country tens of agencies may be involved in natural disaster management and vulnerability reduction: planning and building bodies at different government levels; various governmental ministries such as national security and finance; natural hazard research and risk assessment organizations; local government; search and rescue forces such as the army, police and fire fighters; media and communication networks; and national and local voluntary organizations, NGOs and more.

The broad range of bodies that compromise the institutional community of disaster management, their diversity in forms, methods and actions, all require creating a typology that would aid in analyzing their *modus operandi*. Conceptual approaches and cross-country studies need to rely on relatively broad dimensions to assess the efficacy of a country's institutional structure of disaster management in a comparative way. In order to systematically find basic institutional forms and patterns, the complexity of actual governance structures needs to be reduced by identifying particular attributes reflecting the areas of institutional mandate, the reasons for institutional formation and the characteristics which may determine the quality of institutional responses.

The following sections will shape a typology of institutions that deal with natural risk management. The following are the relevant research questions that are addressed in the typology:

1. What is the institutional mandate (or responsibilities) of institutions dealing with natural hazard management?
2. What types of institutional arrangements and establishing mechanisms exist for natural hazard institutions?
3. What are the characteristics that effect institutional vulnerability and the effectiveness of policy formulation and implementation?

Section 2 will discuss institutional mandates and responsibilities for hazard management and will employ the well-known distinction between mitigation, preparedness, response and recovery. Section 3 will briefly discuss institutional formation and suggest a few distinctions that should aid in defining the parameters of the institutional response typology concerning institutional establishment. Section 4 will outline various characteristics of instructions which

may contribute to or abate institutional vulnerability and affect the effectiveness of institutional efforts in hazard management.

2. Institutional Mandate: Responsibilities and Implementation

Classic disaster management discourse identifies four stages that require policy formulation and implementation, namely mitigation, preparedness, response and rehabilitation (see Table 3) (Awasthy, 2009). ***Hazard mitigation*** provides passive protection at impact (Lindell & Perry, 2000), which is intended to produce long-term loss reduction for natural disasters (Newton, 1997). These measures include both structural and non-structural measures. Structural mitigation involves the design, construction, maintenance and renovation of physical structures and infrastructures to resist the physical forces of disaster impacts. Sea levees or sea walls are an example of infrastructural measures taken in coastal areas to mitigate the effects of coastal hazards. These engineered structures are built on or near the shoreline with the purpose of absorbing storm wave energy to protect the land or an area of water behind the wall from erosion. Non-structural mitigation involves a twofold effort. The first is to decrease the exposure of human populations and physical structures to hazardous conditions (Awasthy, 2009). The second requires a reduction in social vulnerability among those exposed (See part I). Non-structural mitigation approaches to coastal hazards include enacting land-use measures that regulate development or prevent settlement in high hazard zones prone to storm surges or sea level rises.

Mitigation, both structural and non-structural, relies on long-term planning. It may also require significant technical expertise and potentially large financial investment. For these reasons mitigation will rarely occur spontaneously or autonomously without institutional direction and regulation. On the other hand mitigation, which requires alterations of public infrastructure or changing land-use policy, can only be accomplished by governmental policy.

Disaster preparedness supports active response after impact through actions planned and executed in advance of the disaster. These actions are directed at anticipating problems of emergency response and disaster recovery after impact (Awasthy, 2009). Preparedness actions may include such initiatives as: the development of formal disaster contingency plans; communicating plans across institutions and communities; establishing a clear division of institutional authorities; training first-responders; public education and information programs for households, firms and public agencies and finally setting in place early warning systems. In

managing coastal hazards such mechanisms as early warning systems are considred crucial in evaluating the occurrence and impact of such hazards as Tsunamis (Saita Jun & Yutaka, 2003). Early warning and forecasting systems provide a well-established way to help to reduce the effects of hazards by allowing people to be evacuated from areas at risk. Hazard insurance, designed to provide financial protection from economic loss caused by disaster events, is another possible tool in disaster preparedness that may also assist in the recovery from disasters.

Some preparedness actions may occur spontaneously with no institutional or regulatory intervention (such as the placement of sandbags to prevent water entering before floods), however most actions will require institutional planning and intervention both at the policy formulation and implementation levels. Insurance coverage may be taken autonomously by private parties. In cases of public property, insurance will be bought by public funding, hence institutional intervention and funding is requisite.

An example of an organization that enjoys relatively wide authorities dealing with natural disasters but focuses its efforts on preparedness is the Honduran COPECO – Permanent Contingency Commission. Honduras is a country relatively prone to natural hazards and has routinely suffered from hurricanes, landslides, floods and droughts (Segnestam, 2006). COPECO has directed most of its efforts to setting a national contingency plan, establishing and improving the early warning system, and training emergency personnel. A different organization more specifically dedicated to providing scientific monitoring and early warning on lahar hazards has been established in the Philippines (the Zambales Lahar Scientific Monitoring Group - ZLSMG). This formal organization grew out of a spontaneous gathering that immediately followed the Mt. Pinatubo eruption in 1991. It integrated the expertise of national governmental bureaus and scientific institutions as well as foreign research groups and agencies.

Emergency response takes place immediately on the onset of natural hazard impact. It includes such activities as: issuance and dissemination of predictions and warnings; evacuation; other forms of protective actions such as mobilization and organization of emergency personnel and material sources; search and rescue; care of casualties and survivors; damages and needs assessment; damage control; restoration of essential services; and public information and maintenance of legal and political systems (Awasthy, 2009). Although a certain degree of emergency response actions are taken spontaneously by individuals, communities and the private sector, larger-scale action, or those requiring significant expertise or extensive

coordinated effort, will involve institutions at different scale levels (see for example: Leone & Gaillard, 1997). Likewise successful emergency response, which usually requires a contingency plan developed at the policy formulation stage (Prater & Wu, 2002), is more crucially evaluated at the 'policy implementation' stage (see for example: Heller, 2010). This is true in particular where there is insufficient planning, but some success in emergency response can be achieved due to improvised measures (Prater & Wu, 2002). One example of improvisation in emergency response was the Taiwanese central government's response following the 921 (Chi Chi) earthquake. Although Taiwan's emergency response to earthquakes was managed by the Central Hazards Mitigation Council, composed of senior representatives from all relevant governmental ministries and agencies, its response to the earthquake was far from immediate or sufficient. This was due mainly to inadequate preparation at the mitigation and preparedness stages, inadequate division of authorities among ministries, and not enough trained and dedicated personnel to manage large-scale disasters, especially on issues of supply and sheltering.

Definitions of ***disaster recovery*** vary in the literature. The term is commonly used in the sense of 'bringing the post disaster situation to some level of acceptability [which] may or may not be the same as the pre-impact level' (Quarantelli, 1999). The recovery process is considered to be complex, multidimensional and nonlinear. It concerns the rebuilding of people's lives and livelihoods alongside the rebuilding of buildings and infrastructure. Recovery encompasses both objective measures such as reconstruction and assistance measures, reestablishment of routines and subjective measures aiding disaster victims' processes of psychological and social recovery (Awasthy, 2009). Reestablishment of routines may include the reestablishment of such socioeconomic activities as education, cultural activities, and industrial production, distribution and consumption. Reconstruction requires the replacement or repair of damaged and destroyed housing, business properties and infrastructure.

Recovery has been portrayed in the literature as an uncertain, conflict-laden process where outcomes are characterized by social disparities, strongly influenced by decision making, and conditioned on institutional capacities (Berke et al., 1993; Bolin, 1993; Bolin & Bolton, 1983; Mileti, 1999; Rubin & Popkin, 1990). Non-formal social institutions and social capital have been found to be important determinants of effective recovery (Aldrich, 2010). Even so, state and governmental institutions, with their human, financial and organizational resources, remain central players in post-disaster operations and in shaping post-disaster recovery outcomes (May, 1985; Kamel & Loukaitou-Sideris, 2004).

3. Institutional Formation

Investigating institutional formation refocuses attention away from the essence and quality of the actions taken in response to natural hazards, and to the political and administrative aspects of response mechanisms. This requires analyzing such dimensions as the motivating event, the political will creating the impetus for organizational establishment and persistence, the organizational form and what mechanism was used in order to establish the institution (see Table 3). Institutional formation also necessitates some discussion of the degree of innovation that is represented by the institution established (see Table 3). Innovation will be discussed in section 4.4 as part of the institutional characteristics.

3.1 Motivating Event and Political Will

The motivating event for institutional formation can be understood as the event or series of events that provide the impetus for the formation of the hazard management institution. One well accepted theory of the conditions giving rise to new institutional arrangements suggests that the impetus for institutional creation is the development, recognition and naming of a recurrent problem to which no existing institution provides a satisfactory repertoire of responses. This is very similar to the notion of framing suggested by Kingdon (1984) in the area of policy formulation, whereby the naming of a natural disaster institute can occur as a result of an internal impetus, such as the inception of the natural disaster crisis itself, a change in governmental composition or policy, or through an external impetus provided by the availability of foreign aid or support. For example, the inception of ZLSMG, an independent scientific monitoring and early warning unit responding to lahar hazards in the Philippines, was set up shortly after the eruption of the Mt. Pinatubo in June 1991 as the consequent lahars placed the local population in peril.

The creation of any institution and its persistence will require sufficient political will and support. Political will and support provide both impetus to institutional formation and create the necessary environmental conditions for the institution to implement its mandate. Organizations that suffer from political or public illegitimacy will be hard pushed to implement policy and will most likely suffer from inadequate resources. It seems likely that political will may play an even larger role in natural hazard institutions then in others. Actions such as hazard mitigation and preparedness affect the long term. They require a great deal of foresight

and a willingness to plan and invest in an area that doesn't necessarily have immediate political payback.

3.2 Organizational Form and Establishing Mechanism

Institutions dealing with natural hazard management can take on a variety or organizational forms, from government to local government departments, inter-governmental committees, specialized disaster agencies, research institutions or emergency response organizations such as the Red Cross or even the army. Institutional form will depend on the institutional mandate, but also on such variables as past institutional history, professional capabilities and experience. Consequently, it may be found that responsibility for emergency response to natural disaster may rest with the Red Cross (or a similar organization) or the army because they have the best available professional capabilities and experience. Likewise, the establishment of an inter-governmental committee may be attributed to the fragmentation of institutional mandates between various governmental bodies and agencies (i.e. institutional history) dealing with various aspects of mitigation, preparedness and response. The typology in Table 3 differentiates the following possible institutions that may work in the field of natural hazard management: national or local governmental department; specialized inter-governmental committee; specialized disaster agency; research institution; volunteer organization; Red Cross and similar; and army. These institutions may be mandated with one or more of the topical disaster management responsibilities and may appear alone or in addition to other organizations working in a similar field.

Broadly speaking there are three different categories of mechanisms that may provide the regulatory basis for the establishment or persistence of institutions dealing with natural hazard management. These are described in the typology in Table 3 as: a legal mechanism or law, an administrative decision, or a voluntary action. A legal mechanism or law refers to any kind of law (primary or secondary, national or state) that formally establishes the organization or establishes certain hazard management authorities for an existing organization. The law may or may not delineate the exact mandate of the organization, its bureaucratic structure, the degree of its fiscal independence, the standing of its decisions, and the tools that are available to it for implementation and enforcement.

An administrative decision is a governmental decision taken either at the national or local government level by a governmental ministry or by the government itself, as to the authorities or the establishment of a hazard management organization. It is often argued that

natural hazard management organizations are more likely to be set up through an administrative decision (rather than law) when they do not have well-defined bureaucratic structures (such as an inter-governmental committee), or when they do not have broad authorities (i.e. research institution) or a dedicated budget. It is also often suggested that organizations set up by administrative decision will be less independent than those set up by law.

Voluntary organizations may also be pervasive in hazard management by deploying and training local populations and conducting various activities, especially in the fields of emergency response and recovery, but also in emergency preparedness. Organizations like these do not require formal mandate by law or administrative decision.

4. Institutional Characteristics

Institutional characteristics will determine institutional vulnerability, the way in which actions are performed and the effectiveness of implementation. We suggest that institutional characteristics can be categorized according to several dimensions: whether the institutional effort is decentralized or centralized; as institutional "customers" of institutional actions; by institutional independence and inter-institutional cooperation; by institutional bureaucracy, flexibility, innovation and learning; and by community involvement (see Table 3).

4.1 Institutional Independence

It is suggested that institutional independence (or autonomy) relates to the ability of an institution to take substantive decisions that do not require additional approval and at the same time to implement those decisions. Consequently, autonomy depends on the authorities of the institution and its financial capacities and resources. Both aspects of institutional independence may be predetermined by organizational form and the establishing mechanism (See section 3.2). If the institution is established by the legislature, the ordaining law may determine the degree of dependence by predetermining authorities and budgeting sources (Horn, 1995). On the other hand NGOs and voluntary organizations, which are not dependent on any law to confirm their authorities, may find themselves significantly independent in comparison to other organizations, especially if they do not receive any form of financial support from the government and have their own financial resources.

Budgeting rules are influential components of autonomy. An institution with no independent budget that depends on budgeting from its partnering governmental ministries is not likely to be autonomous in its decision making and implementation capacities. Where the organization is not a governmental ministry, but an agency or public body, parent ministerial control largely affects agency independence. In some cases agencies may experience tight ministerial control over appointments, policy and budgeting. Yet, in other cases agencies may experience only formal control in the sense that the organization takes all decisions and the ministry only formally confirms them (Antonsen & Jorgnesen, 1997).

4.2 Degree of Centralization

There has been little research on the relationship between the levels of governmental centralization and emergency response systems. Two early works explicitly addressed this issue. Anderson (1969) reported that centralized systems tend to produce higher levels of military involvement in emergency response. In these centralized systems, local governments are often quite weak. Therefore the military, often the best-organized and best equipped institution in a country, is called upon to use its resources and personnel in a national crisis provoked by a large-scale disaster. McLuckie (1975) on the other hand found that decentralized systems are associated with an increased role for the private sector in emergency response, reflecting a wider distribution of resources throughout society and greater openness in decisions about resource allocation.

Several studies have focused on the importance of local mitigation and preparedness especially as a means of reducing a community's vulnerability to disasters (FAO, 2003; Briceno, 2004). It is common that institutional activities directly affecting vulnerability take place at the local level. Education, welfare and livelihoods, which determine social vulnerability, are services and activities usually undertaken at the local level. The compliance and enforcement of building codes and regulations, which greatly impact infrastructural vulnerability, are also usually conducted at the local level. Gopalakrishnan & Okada (2007) identify local autonomy as a key feature of effective and efficient disaster management institutions. They claim that time is of the essence in disaster response, as local agencies must have the authority to make immediate decisions based on available information without having to get permission from higher-level authorities.

This report suggests the application of a three-tiered model for the assessment of the degree of centralization vs. decentralization in institutional response to natural disasters: a centrally-focused pattern; a locally-focused pattern; and an integrated pattern.

In the centrally-focused pattern, the central government's objective is to obtain uniformity between central governmental hazard management policies and responses at the local level. Central government agencies strive to dictate priorities for mitigation and preparedness. They control local hazard management practices through such mechanisms as subordination of local institutional authorities, regulatory restrictions (e.g. through national mitigation or preparedness plans) or through the control of local disaster management budgets.

In the locally-focused pattern, the objective is reversed to obtain responses that are tailored to local vulnerability (both needs and conditions). Local institutional response is characterized by wide discretion available to local authorities for designing policies and plans for hazard management. Local organizations are assigned authorities and responsibilities independent from central government and control budgeting. Lastly, the integrated pattern combines elements of the two patterns. Integration can be specific to various levels of action; for example, if hazard mitigation responses are locally oriented, while disaster emergency responses are centrally-oriented. Alternatively, centralized and localized patterns can be integrated into one action field. This would be the case, for example, if both centralized and localized objectives are simultaneously sought after in emergency response. The Honduran COPECO Hazard Management Authority is an example of what was planned as an integrated governance model.

4.3 Inter-Agency Coordination and Institutional "Customers"

Disaster environments require simultaneous action by different organizations at various scales and jurisdictions. Authorities and jurisdictions may be spread across numerous organizations creating a complex, fragmented institutional environment. When disaster threatens a community, various levels of action (as detailed in section 2) are required as well as responses from different organizations at different locations (Comfort et al., 2001). Complexity and fragmentation of relevant hazard management roles and authorities creates interdependency among institutions. This problem intensifies for public organizations which interact with the private and volunteer organizations in order to provide disaster response services. Also, coordination under uncertain conditions requires an understanding of shared risks. When risk is shared, actions taken by one organization may increase the risk to others, creating an

escalation in the impact of disaster (Comfort 1994; 1999). For these reasons disaster settings can pose an extraordinarily difficult context for inter-organizational and inter-jurisdictional coordination.

It is assumed organizational performance repeatedly declines in environments of increased complexity (Comfort et al., 2001). Increases in complexity require significant increases in information flow, communication and coordination in order to integrate multiple levels of operation into a coherent program of action. Information processing capacity has been viewed as a limiting factor in the performance of complex organizational environments as large amounts of information are needed to make timely and informed decisions essential for adequate coordination among the multiple components of the response system.

Multi-agency collaboration is crucial to effective decision making in all aspects of disaster risk management. Such cooperation should occur horizontally (intra-agency) as well as vertically (inter-agency).

A category related and possibly affecting coordination and vulnerability of hazard management institutions is the identity of the "customers", or for whom the organization is meant to serve. While some organizations service the public directly (such as organizations dealing with emergency response), others work with organizations and governmental bureaus responsible for policy formulation or research institutes (that collect data).

A distinction can be made between institutions that work with institutions of the same jurisdictional level (horizontal) and institutions working with lower (vertical) level institutions. Horizontal institutions are those functioning at the same level of government (such as two national governmental ministries working separately on different aspects of hazard management).

Table 3: A Typology of Institutional Response to Natural Hazards

Institutional Mandate		Formation				Characteristics	
		Motivating event	**Organizational form**	**Degree of innovation**	**Establishing mechanism**	**Degree of centralization**	**Institutional independence**
Mitigation	Structural	Physical trigger	Central or local governmental body	New temporary institution	Law	Centrally-focused pattern	Fiscal independence
	Non-Structural	Institutional trigger	Specialized inter-governmental committee	New permanent institution	Administrative or governmental decision	Locally-focused pattern	Regulatory independence
Preparedness		Foreign directives or other	Specialized disaster agency	Augmenting existing institution	Voluntary action	Integrated pattern	
Emergency response			Research institution	Using existing institution			
Rehabilitation			Volunteer organizations, Red Cross or similar				
			Army				

PART III: THE COSTS OF INSTITUTIONAL RESPONSE

1. Background: Conflicts over Institutional Response

Our theoretical understanding of the relations between society and the environment could not be complete without a deep understanding of the organizations constituting the institutional response to natural disasters. They constitute one explanation of how features of the environment come to be perceived as threats and how social organizations then emerge as a response to those threats (Bogard, 1988). Traditionally, natural disasters have been seen as the prototype of consensual emergencies, but in fact they often turn out to encompass considerable conflict. As the number of players aware of the costs, benefits, and the distribution of those costs and benefits within the institutional response increases, the greater the potential for conflict (Rosenthal & Kouzmin, 1997). In this section we try to analyze the main reasons for conflicts in the process of institutional response to natural disasters and its associated costs and options for reconciliation as portrayed in the literature.

In theory, the best response to natural disaster is to avoid all danger. In practice, this is impossible due to development pressures on land. Even after severe disasters, political and economic inertia encourages rebuilding on the same – or nearby – site (Smith & Petley, 2009). This rebuilding process requires future institutional response to take it into account and try to plan ahead for severe circumstances. While consensus usually prevails in the immediate emergency period of a disaster, this stage is usually followed by one of considerable conflict. Old conflicts resurface, while new ones related to the disaster emerge. As a result of these conflicts, long-term recovery objectives are often unclear and frequently contradictory as they reflect various interests of different actors involved in the recovery process. Thus, in the post-disaster period, there are those who push for a restoration of the pre-disaster status quo, and there are those who see the disaster as an opportunity to bring about change (Quarantelli, 1977; McConnell & Drennan, 2006). Lundqvist, for example, identified the political system as either "closed and consensus-oriented" or "open and conflict-oriented" and then predicted the speed and the elements of the response policy and their success in implementing it (Lundqvist, 1978). The former approach would involve lowering threat warnings, trying to cope with current tools and capabilities, and resisting in investing limited resources in planning and training for events which may never happen. The latter would identify the real threats that an emergency can pose,

recognizing the real possibility that the organization may be unable to cope with and show willingness to engage in all the sorts of preparations and planning that conservatives are more likely to resist. The first or conservative approach will lead to a less active response, done mostly with current tools and institutions. In order to delay and minimize the response, players representing this approach will try to promote some kind of ad-hoc committee or research team, whose lengthy activity will weaken other players' resistance. The second, or the reformist approach, will lead to the creation of new designated institutions and the enacting of relevant laws and regulations to a more complete and pro-active response.

Another reason for conflicts in the institutional response process to natural disasters is the uncertain environment in which the process operates (McConnell & Drennan, 2006). Institutional response to disasters always acts under constraints imposed by uncertainty and imperfect knowledge (Bogard, 1988). These uncertainties are either physical -uncertainty regarding the physical parameters of a future environmental event (duration, location, magnitude, etc.)- or social -uncertainty regarding the event's social impacts (economic loses, psychological damage, community vulnerability, etc.). The problem is that these uncertainties prevail as each actor interprets the data differently and has different ideas and methods for the response.

A third major reason for conflicts in the institutional response process is some form of denial. Community members do not like to think about the possible negative consequences of future disasters. Unfortunately this attitude does not skip public servants and elected officials (McConnell & Drennan, 2006). In many cases a widespread objection to institutional response raised by officials is that it consumes resources which may be spent on issues that seem much more pressing at the moment (Perry & Lindell, 2003). In addition, there is the allocation of power and resources as another reason for conflicts. Even when a public official decides to accept the need to allocate resources to emergency planning, it does not ensure the elimination of conflict. Emergency planning involves the distribution of power and resources (especially human and budgetary) and every department, authority and organization relevant to the process wants its 'proper role' recognized and a proper budget allocated. Indeed no level of government is immune to such conflict (Perry & Lindell, 2003).

There are a number of main implications or costs caused by the conflicts over institutional response. The principal and most dangerous implication is a complete interruption to the response process. Where a very intense conflict with powerful players holding contradictory interests exists, the institutional response effort may be completely destroyed. The

most common cost to an institutional response created by these types of conflicts is a delayed or slowed down response, including slow recovery processes, delayed policy changes, sluggish budget allocation processes and more.

Figure 1 outlines the potential cost of institutional response. It differentiates between monetary costs and costs associated with conflicts that may erupt depending on the institutional choice of players.

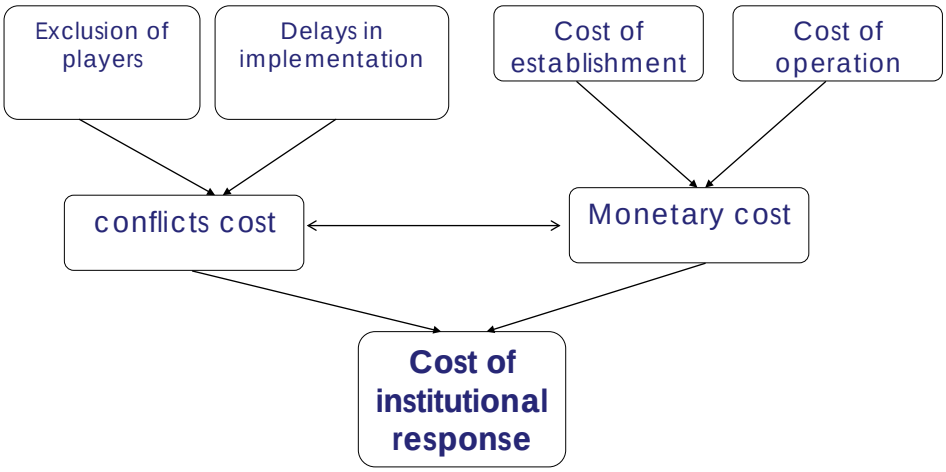

Figure 2: The cost of institutional responses

2. Ways to Reconcile the Conflicts

Although conflict can significantly limit and delay the institutional response, it can also be a constructive, integrative and sharpening force, and thus a positive element that brings people together and systems forward. In order to achieve a "good" conflict which produces positive results, governance must consist largely of reconciliation, making compromises and building (temporary) consensus (Jentoft, 2007). In the literature, the main ways to reconcile conflicts over institutional response to natural disasters are:

- Coordination – natural disasters are complex events that occur in complex biophysical and social environments. When things are complex, it is not possible for people to independently do what they desire, some kind of coordination is needed (Jentoft, 2007). In many conflicts, there is significant potential and opportunity for cooperation. The level to which the opposing players exploit the cooperation potential is crucial to the success of the institutional response. According to Quirk (1989) numerous important policy conflicts are

nonzero-sum, meaning they have both complementary and conflicting interests between opposing players. Those situations present an opportunity for cooperation and joint gain not only for a majority coalition but for all the players involved in the conflict (Quirk, 1989).

- Public and stakeholder participation - adds legitimacy to institutions by including diverse stakeholders and public views, encouraging compromise and reducing conflict. Through a participation process a coordinating structure may be developed that can adapt to the nature and scale of a disaster and promote efficient responses (Baker & Refsgaard, 2007).
- Dynamic modeling - a relatively new method of conflict reconciliation. These methods are used to collect and organize data, synthesize knowledge, and build consensus about the administration of complex systems. Dynamic modeling methods include stakeholders in all phases of conflict resolution and consensus building, from initially defining the scope of the problem to developing the relevant model (Costanza & Ruth, 1998). A good example of dynamic modeling used to reconcile conflicts can be found in Gurung et al. (2006) in which a multi-agent modeling systems was used as a method to facilitate negotiations, resolve conflicts, achieve concrete agreements and create management institutions.

PART IV: METHODOLOGY OF EMPIRICAL ANALYSIS – CASE STUDIES COMPARISON

The first part of the work discusses what a natural hazard is and how it can lead to the vulnerability of individuals, communities and institutions. The second part of the work details the various properties of the institutions responding to natural hazards. In this part a detailed typology of institutional response to natural hazards is developed, through which an analysis of the different case studies is provided. After establishing the typology, all SECOA partners requested to operationalize the typology by a case study are presented. This allows us to conduct a comparison of the national case studies on institutional response to natural hazards.

1. Creating the National Case Studies

Each of the SECOA partners wrote a case study report based on the typology defined in the previous part, as described in Table 3 above. In order for the partners to know exactly the structure and content of the case study they needed to submit, we first created a template and an example of a case study; for this the Israeli case study was chosen. Each case study is composed of text describing the institutional response creation, operation and major characteristics from tables summarizing the text. By arranging the case attributes into tables according to the previously defined typology, we were able to compare all the cases in a coherent and systematic fashion.

The main sources for the case studies were protocols and official reports of local and central government authorities, but they were also based on academic papers, NGO reports, news and media coverage and interviews with relevant officials. The cases are based on empirical results gathered by each team, though primary sources are used in abundance. For example, in the Israeli case protocols from the implementation team meetings were used, alongside Knesset (Israeli parliament) committees and plenum protocols. In the United Kingdom case, two EA (Environmental Agency) reports and two Portsmouth City Council official reports were used.

Another primary source was a large number of executive governmental and municipal authorities' decisions, laws, bills and decrees in their original form. In the Vietnamese case for example, 5 decrees and official authorities' decisions were used; in the Israeli case, 2 official governmental decisions were used.

2. Comparing the Case Studies

Case study comparison and analysis were made in two parts, the first dealt with the typology of the cases set in Table 3, and the second dealt with the different conflicts arising from the response process. From each case study we extracted the relevant data and arranged it into comparison tables. The data from case studies in the comparison tables was clustered to fit the typology presented in the previous part. For each comparison table a figure was created for better analysis and presentation of the data.

2.1 Typology of Institutional Responses

The first part of the comparison was conducted according to the typology defined in Part II of the report, which is summarized in Table 3. The typology divided the comparison of the response into 7 parts: Institutional mandate, Motivating event, Organizational form, Degree of innovation, Establishing mechanism, Degree of centralization and Institutional Independence. In each part of the typology we summarized and categorized the different cases by up to four categories representing the possible options for the response in that part of the typology:

- Institutional mandate:
  - Structural mitigation - design, construction, maintenance and renovation of physical structures and infrastructures to resist the physical forces of disaster impacts.
  - Non-structural mitigation - decreases in the exposure of human populations and physical structures to hazardous conditions and the reduction of social vulnerability for the exposed populations.
  - Preparedness – support of active responses after impact through actions planned and executed in advance of the disaster.
  - Emergency response - takes place immediately on the onset of natural hazard impact. It includes emergency activities dedicated mainly to saving lives and minimizing

structural damage, such as: predictions and warnings, evacuation, search and rescue, care of casualties and survivors, damage control, restoration of essential services and more.

- Rehabilitation – actions aiming at restoring the pre-disaster situation and returning lives back to normal. No case studies in the current work had any rehabilitation mandate.

- Motivating event:
  - Physical trigger – inception of natural disaster at a small or large scale.
  - Institutional trigger – political or institutional action which pushed for institutional response, such as a report detailing possible hazards, or a new regional or national plan dealing with natural hazards.
  - Foreign directives or other – national foreign or international directives such as EU or UN directives regarding natural hazards.
- Organizational form:
  - Central or local government body – a governmental authority dealing with the institutional response to natural hazards among other things.
  - Specialized inter-governmental committee – a committee involving a number of governmental authorities or branches at the national, regional or local level. The committee is specially created to deal with the response at an ad-hoc base.
  - Specialized disaster agency - a governmental authority dealing only with the institutional response to natural hazards.
  - Research institution – a research institute, either governmental, NGO or academic, researching applicable issues to natural hazards.
  - Volunteer organization, Red Cross and similar – a volunteer organization involved in the institutional response. The Red Cross and similar organizations are volunteer or semi-volunteer organizations having the best available professional capabilities and experience dealing, for example, with search and rescue operations.
  - Army – national army or regional or local armed forces, mostly as emergency response forces to natural hazards.
- Degree of innovation:
  - New temporary institution – creation of a new ad-hoc or temporary institution as a response.

- New permanent institution – creation of a new permanent institution as a response.
- Augmenting existing institution – changing an existing institution in order to adjust it for the response.
- Using existing institution – using an existing institution as it is, with no change.

- Establishing mechanism:
  - Law - a legal mechanism or law refers to any kind of law (primary or secondary, national, regional or local) that formally establishes a new authority or establishes certain hazard management responsibilities for an existing authority.
  - Administrative or governmental decision - a governmental decision taken either at the national, regional or local levels by a government ministry or by the government itself.
  - Voluntary action – voluntary organizations deploying and training local populations and conducting various activities, especially in the fields of emergency response and recovery but also in emergency preparedness. No case studies in the current work had any voluntary establishing mechanisms.
- Degree of centralization:
  - Centrally-focused pattern – institutional response whose objective is to obtain uniformity between central governmental hazard management policies and responses at the local level.
  - Locally-focused pattern - institutional response whose objective is to obtain responses that are tailored to local vulnerability, both needs and conditions.
  - Incorporated central and local patterns - combines elements of the two previous patterns.
- Institutional Independence (measured in three levels of low, medium and high):
  - Fiscal independence –independence regarding budget and financial issues; for example, the authority to collect dedicated taxes is regarded as high fiscal independence.
  - Regulatory independence – independence regarding regulation and policy, such as the authority to regulate other agencies, firms or individuals.
  - How binding are decisions – a part of regulatory independence, asking to what extent can other agencies, firms and the public violate or ignore the institutional regulatory decisions. Institutional response whose decisions are the same as laws or governmental decisions is regarded as high binding decisions.

2.2 Typology of the Conflicts Occurring During the Institutional Response

The second part of the comparison was conducted in light of the literature review in sections 1 and 2 of Part III of the work, regarding conflicts which arose from the implementation of the institutional response and their costs. In this part we analyzed for each case study what the major causes for conflict were and for each conflict what its implications were. This part is divided into two sub divisions, the first is a comparison of a number of different causes for conflict and their implications, and the second is a focused analysis of conflicts regarding funding of the response.

The main conflict typology is divided into 4 causes:

- Overestimation vs. underestimation of costs – conflicts arising from estimation of response's future costs. Long-term costs of the response are subject to many unknown factors, while response success is dependent on the estimation of future costs (and it's a large cause of conflict in many cases). In a case where an underestimation of costs was made, a shortage of resources is likely to happen. On the other hand overestimation of costs can result in severe conflicts arising over the implementation of the response, and between financing parties and implementing parties, which may endanger the response as a whole.
- Rapid vs. slow implementation – conflicts on the speed of response implementation and its order. In some cases several actors called for rapid implementation of certain measures while others called for a more thorough approach.
- Central vs. local authority – conflicts on the centralization level of the authority of institutional response. The conflicts for example are on whether to create a local authority or a national one.
- Central vs. local response - conflicts on the centralization level of the response itself (not the authority or institution). The conflicts for example were on whether to implement the response in even intensities across the whole hazard area or to focus the implementation to certain areas, an action which creates a response with changing local intensities.

In the focused analysis of conflicts which revolved around funding issues of the response, we grouped the various conflicts into two major groups:

- Who pays? – conflicts regarding who pays for the response is a question with many possible answers: the national government, regional government, local municipalities, special response authorities, the public, land owners, land users and more.
- Funding period – conflicts on the question of when funds will be allocated to the response. In many cases of institutional responses with low fiscal independence the timing of the transfer of funds is a matter of great debate. Most conflicts are on two major issues: timing of the commencement of funding and the duration of funding.

PART V: INSTITUTIONAL RESPONSE TO NATURAL DISASTERS AND ITS COST: EMPIRICAL RESULTS

After the meaning of vulnerability was defined, a typology for institutional response to natural disasters was established and its costs identified (see Parts I, II and III). The next chapter outlines the results of eight case studies. In each case study the partners for the project had to provide a detailed case study of institutional response to natural hazard. They had to organize the case along the typology identified in Part II, according to the methodology presented in Part IV. The detailed case study of the Israeli team which was used as a template appears in appendix I. In order to identify the non-market costs of the response, a template was provided where each case study had to fit into the various options for conflicts and costs. The template based on the Israeli case study appears in appendix I (p. 83).

1. Results

The results presented in the following section are comprised of two parts, the first is an analysis of the case studies according to the typology set in Part II, and the second is an analysis according to the issues dealt with in Part III.

The first part of the results section is divided into seven issues, defined in the typology as: Institutional mandate, Motivating event, Organizational form, Degree of innovation, Establishing mechanism, Degree of centralization and Institutional Independence.

The second part of the results section is divided into three parts: Conflict causes, Conflict implications and Funding Conflicts (causes and implications).

1.1.1 Institutional mandate

Table 4 –Institutional mandate, typology table

Case study	Mitigation		Preparedness	Emergency response
	Structural	Non-Structural		
Israel	Protection infrastructures	Planning affected areas		
Sweden		Greenhouse gas emissions decrease	Emergency response plans	
United Kingdom		Risk management strategy	Emergency response plans	New emergency pumping station
Portugal	Protection infrastructures	Authorities coordination	Emergency response plans; Promote public awareness	
Belgium – GKVP2050	Protection infrastructures	Monitoring coastal areas	Managing a storm tide monitoring system	
Belgium – flood predictor			Early warning system	Water diversion to flood basins
Vietnam	Protection infrastructures	Risk management strategy	Emergency response plans; Early warning system; Promote public awareness	Coordination of response; Evacuation; Repair of protection infrastructure
Italy	Protection infrastructures	Monitoring coastal areas; Planning affected areas;	Emergency response plans; Early warning system	Coordination of response

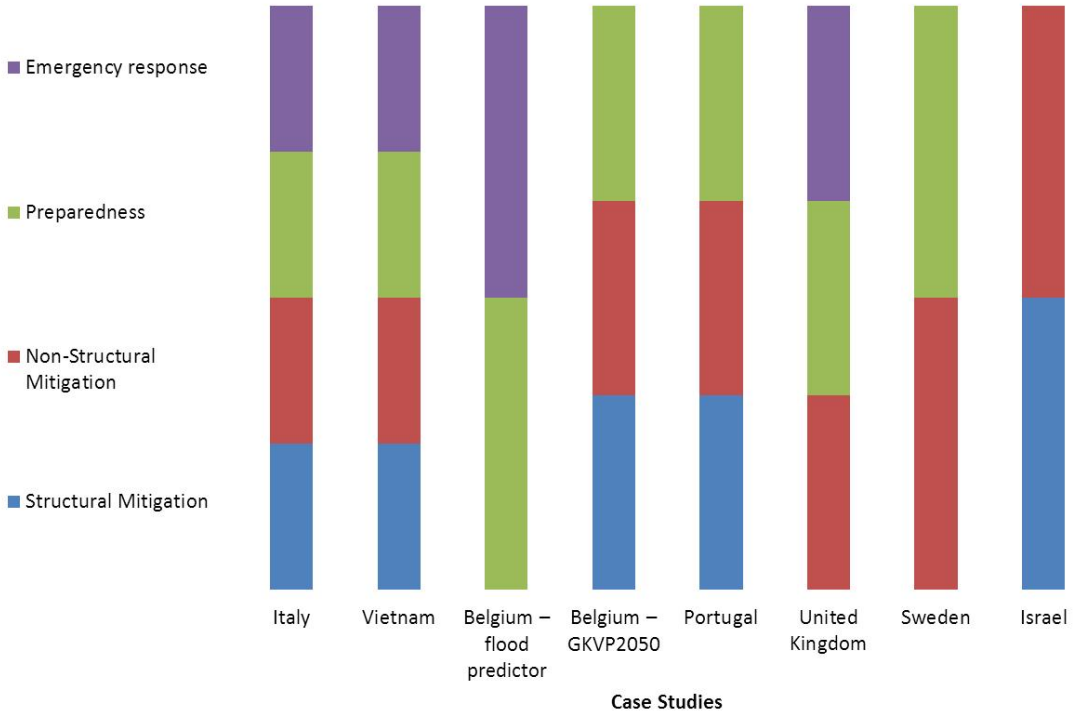

Figure 3 – Institutional mandate, typology graph

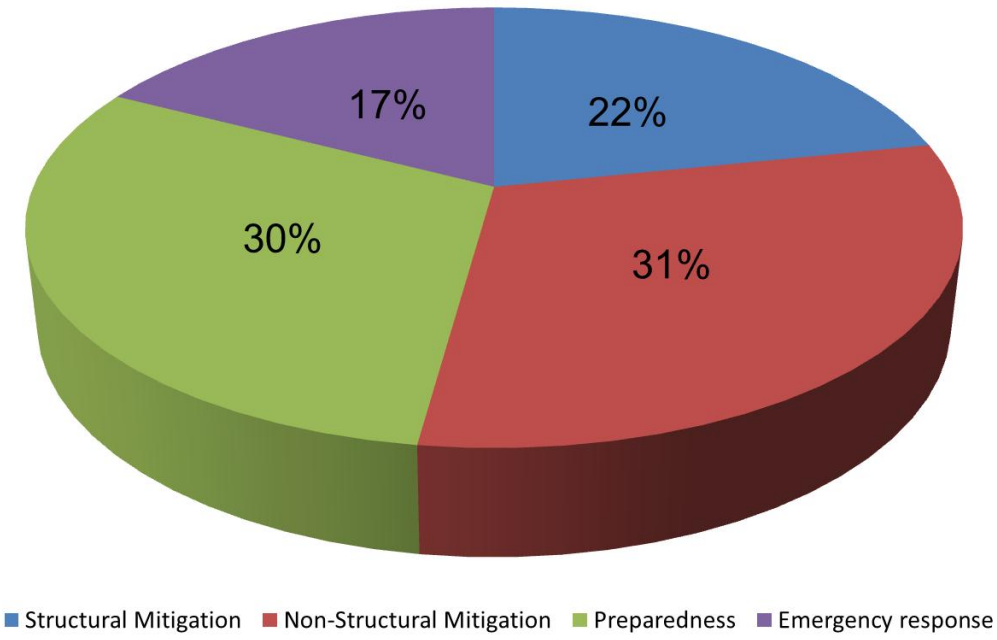

Figure 4 – Institutional mandate, distribution

- The case studies we examined have a more pre-disaster nature, evident by their focus on mitigation and preparedness.
- The most common institutional responses are mitigation, with 53% of the responses and preparedness, with 30%. Non-structural mitigation is the dominate response mandate, with 31% of the responses.
- None of the cases studied have a recovery response.
- Four of the cases studied had an emergency response mandate.
- The only case with four different mandates (structural and non-structural mitigation, preparedness and emergency response) is the Vietnamese case.

1.1.2 Motivating event

Table 5 – Motivating event, typology table

Case study	Physical trigger	Institutional trigger	Foreign directives or other
Israel	Casualties from cliff collapses	State Comptroller report	
Sweden	Flooding	National plans for climate change policy and natural hazards planning	EU flooding assessment and management directive
United Kingdom	Summer floods	National law for flood and water management	EU flooding assessment and management directive
Portugal	Intense coastal erosion		
Belgium – GKVP2050		National plans for coastal safety	
Belgium – flood predictor	Flooding		
Vietnam	Several typhoons and tropical storms		
Italy	Sequence of natural hazards	Transfer of responsibility from national to regional and local authorities	

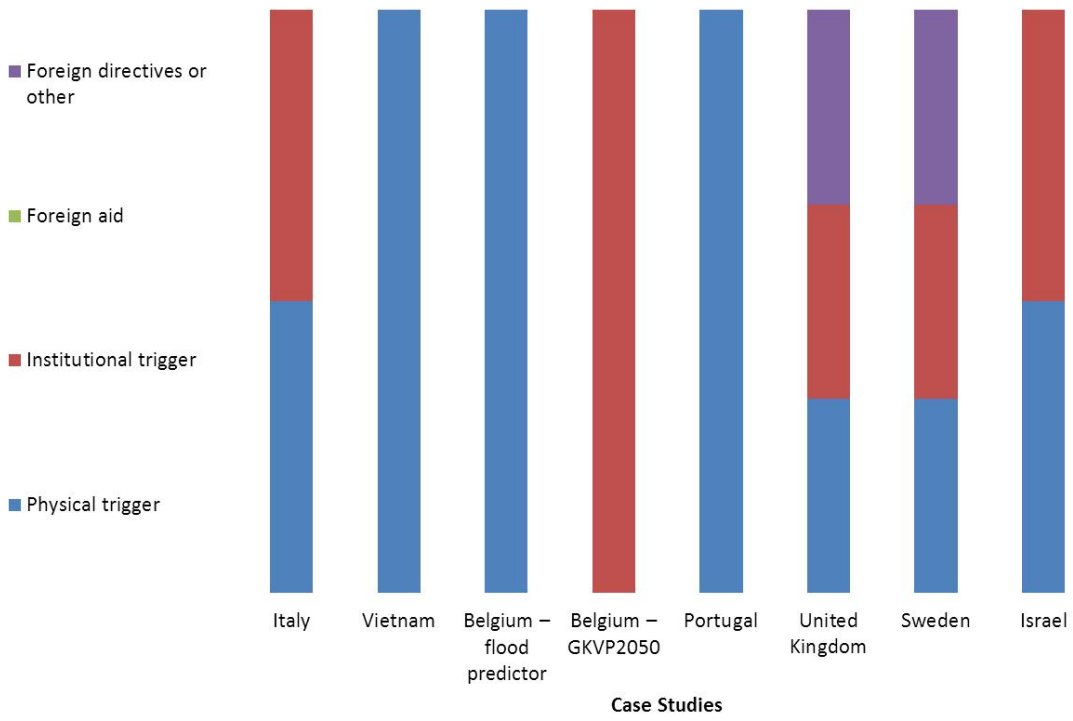

Figure 5 – Motivating event, typology graph

- The major motivation for institutional response in the cases studied was a physical trigger (i.e. the inception of a natural disaster such as coastal cliff collapse, flooding or tropical storms). All cases but one (Belgium GKVP2050) were motivated by a physical trigger.
- The second most important motivation, which impacted four of the cases, was the institutional trigger (i.e. state comptroller report, new national plans or transfer of responsibilities between authorities). All four cases were also motivated by a physical trigger.
- Foreign directives (EU) had a motivating impact on two of the cases, United Kingdom and Sweden.

1.1.3 Organizational form

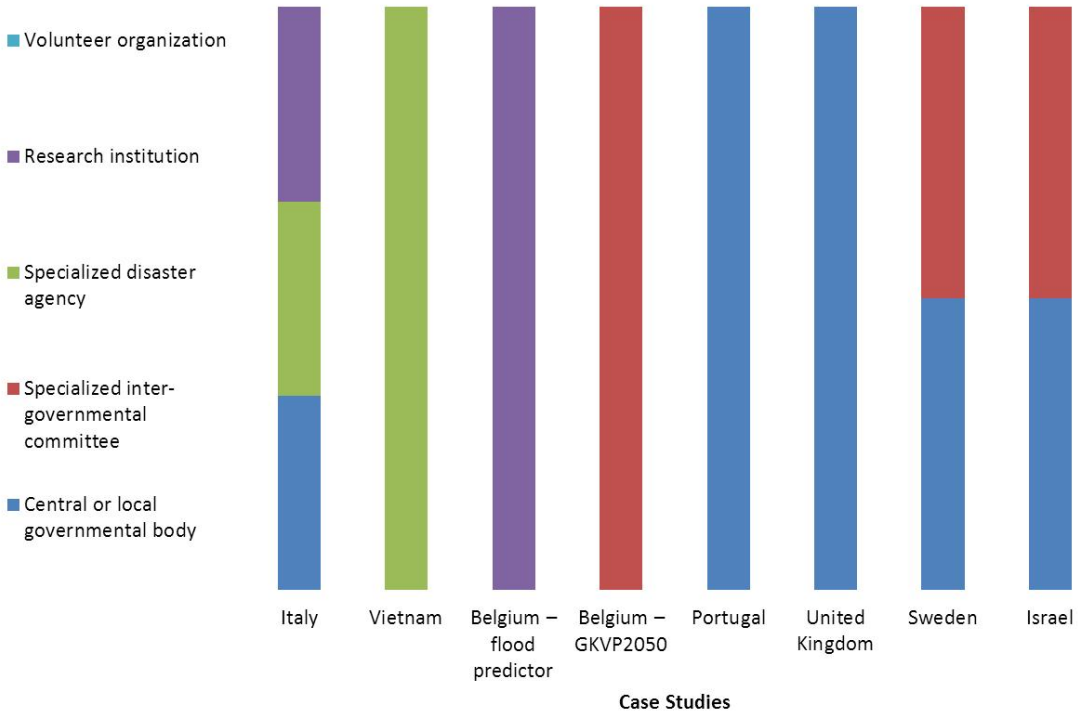

Figure 6 – Organizational form, typology graph

- Five of the cases involved had an organizational form, the most common being a local or central governmental body; specialized inter-governmental committee was second most common.
- Both specialized disaster agency and research institute appeared only in two case studies.
- In the studied responses there were no volunteer organizations.

1.1.4 Degree of innovation

Table 6 – Degree of innovation, typology table

Case study	New temporary institution	New permanent institution	Augmenting existing institution	Using existing institution
Israel	Inter-governmental ministerial teams	Designated administrative authority		
Sweden	Local cross-departmental risk- and vulnerability assessment			Local government
United Kingdom				Local government
Portugal				Government designated administrative authorities
Belgium – GKVP2050				Specialized inter-governmental division
Belgium – flood predictor				Independent research institute
Vietnam			Local disaster agencies	
Italy		Coordination agency; Independent research institute	Local government department	

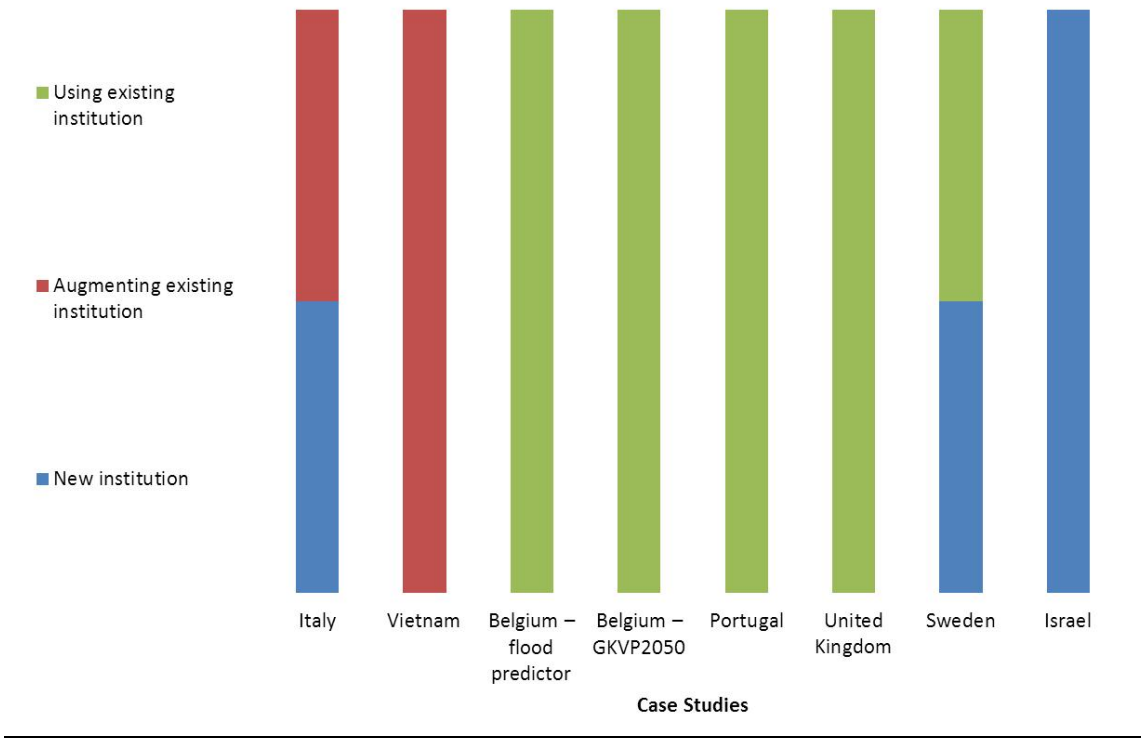

Figure 7 – Degree of innovation, typology graph

- Most of the responses studied had a small degree of innovation, as 5 of the cases used only existing institutions for their institutional response.
- Only the Israeli case had a completely new institutional response with a new temporary institution and a new permanent institution.
- The Vietnamese and Italian cases had a moderate level of innovation, having augmented existing institutions.

1.1.5 Establishing mechanism

Table 7 – Establishing mechanism, typology table

Case study	Law	Administrative or governmental decision
Israel		Appointed official by the Prime minister's office and two government decisions (1620 and 3097)
Sweden		City council appointed several assessment studies; City council adopted a comprehensive flood management plan
United Kingdom	The flood and water management act	
Portugal	Coastal Zone Plans (POOC, Law n. 309/1993); Civil Protection Basis Law (Law n. 27/2006)	
Belgium – GKVP2050	Approved by the parliament making it legally binding (June 2011)	Regional government decision (decision to create the plan in 2006)
Belgium – flood predictor		Regional government decision (regarding agreement with the research institute)
Vietnam		A number of national and local government decisions and decrees
Italy	A number of national and regional laws	A number of national and regional government decisions

- Most of the cases involved governmental decisions as their establishing mechanism.
- In four of the cases the institutional response was established by a legislative action, two of which had governmental decisions as well.
- There were no cases in which the establishing mechanism was on a voluntary basis.

1.1.6 Degree of centralization

Table 8 – Degree of centralization, typology table

Case study	Centrally-focused pattern	Locally-focused pattern	Incorporated central and local patterns
Israel	Nationally-focused		
Sweden		Locally-focused (municipalities, counties)	
United Kingdom		Locally-focused (municipalities)	
Portugal	Nationally-focused		
Belgium – GKVP2050			Regionally-focused
Belgium – flood predictor	Regionally-focused		
Vietnam			Centrally-focused
Italy			Regionally-focused

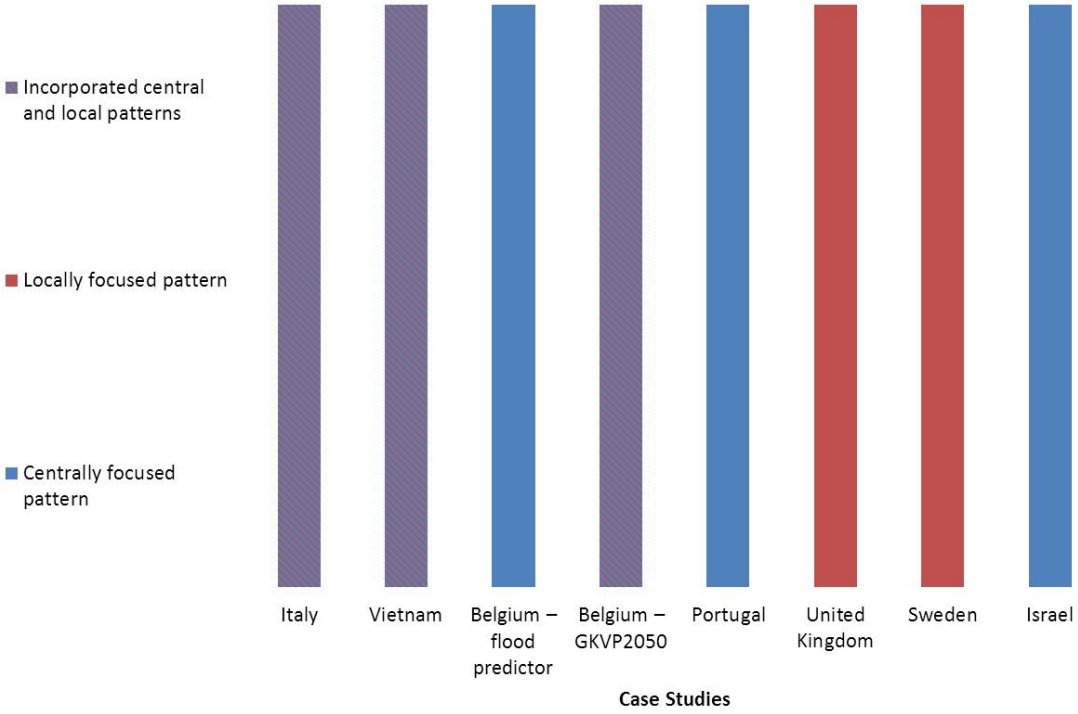

Figure 8 – Degree of centralization, typology graph

- The degree of centralization of the response in the different cases is dispersed evenly with 3 centrally-focused patterns, 2 locally-focused patterns and 3 incorporated patterns.
- The three case studies that had an incorporated pattern had a response which incorporated a central focus with either a local or regional focus. In the Vietnamese case the response includes all levels of government.

1.1.7 Institutional Independence

Table 9 – Institutional Independence, typology table

Case study	Fiscal independence	Regulatory independence	How binding are the decisions?
Israel	Low, fiscally dependent	High, central government authority	High, central government authority
Sweden	High, fiscally independent	Low, planning is controlled by regional planning authorities	
United Kingdom	Medium, fiscally dependent but with autonomy on allocation of funds		
Portugal	Medium, part national and local government budget and part fiscally independent	High, central government authority	High, central government authority
Belgium – GKVP2050	Medium, fiscally independent but no tax collection	Medium, power of regional government needed for major decisions	Low, decisions binding only with approval of regional government
Belgium – flood predictor	Low, regional government budget	None (has no regulatory power)	None, decisions not binding
Vietnam	Low, national and local government budget	Medium, local government authority (chaired by high ranking local official)	?
Italy	High, fiscally independent with tax collection	Medium, regional government authority	Medium, regional government authority

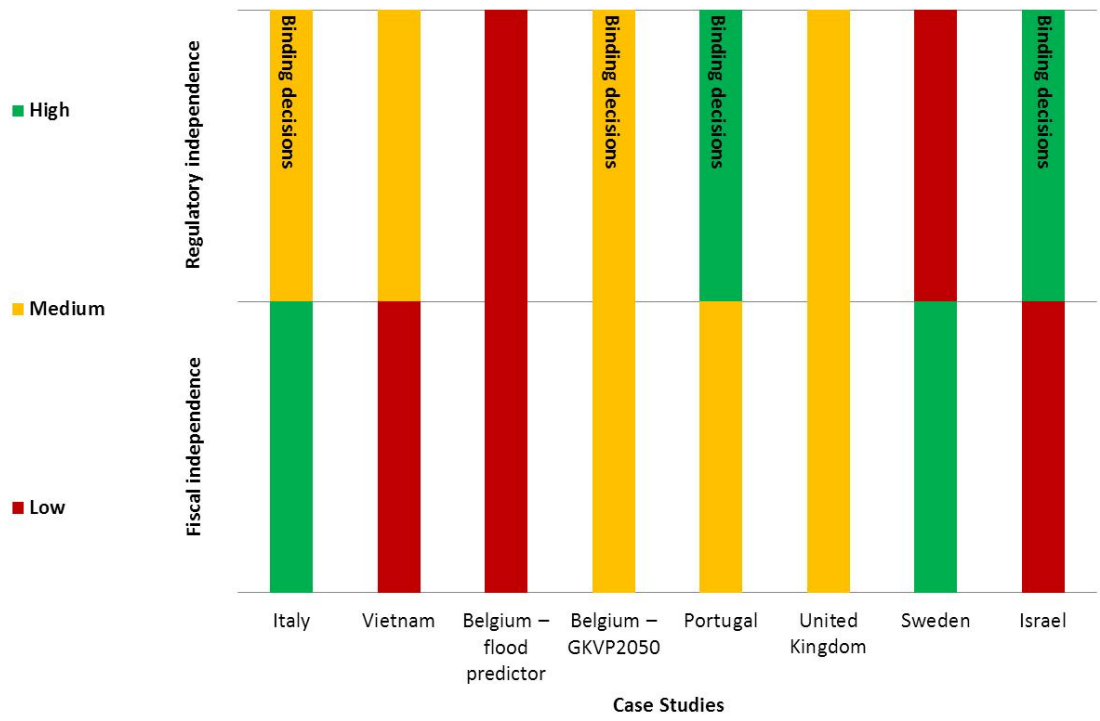

Figure 9 – Institutional Independence, typology graph

- In general the levels of fiscal institutional independence were relatively evenly dispersed with 3 cases of low, 3 cases of medium and 2 cases of high independence.
- Regarding regulatory independence the situation is similar, with 2 low cases, 4 medium and 2 high cases.
- None of the cases have both fiscal and regulatory independence at a high level; only the Italian case and the Portuguese case have a combination of high and medium levels.
- The Vietnamese and Belgium flood predicator cases had the lowest regulatory levels. This is attributed to their orientation to preparedness and emergency response which naturally has less regulation than mitigation-oriented responses.
- The Israeli and Swedish cases have a complicated situation with one independence indicator high and the other low. In the Israeli case there is low fiscal independence and in the Swedish low regulatory independence. In the Israeli case it results from the strength of the Ministry of Finance and in the Swedish case it results from the strength regional authorities possess in planning issues.

1.2 Typology of the Conflicts that occurred during the Institutional Response

1.2.1 Conflict causes

Table 10 – Conflict Causes, typology table

Case study	Overestimation vs. underestimation of costs	Rapid vs. slow implementation	Central vs. local authority	Central vs. local response
Israel	Diverse estimates about future costs	Rapid measures or long-term broad measures	Central government authority or local authority	National with different local intensities
Sweden	Uncertainty about problem magnitude and mitigation strategy		Local government authority or cross-sectorial local authority	
United Kingdom	Diverse estimates about future costs			Local with national/regional scope
Portugal	Diverse estimates about future costs	Rapid measures or long term broad measures	Central government authority or a local authority	National with different local intensities
Belgium – GKVP2050				National with different local intensities
Belgium – flood predictor	High costs for complete response coverage	Response coverage is partial	Regional authority dependent on national data system	
Vietnam				
Italy				Regional with different local intensities

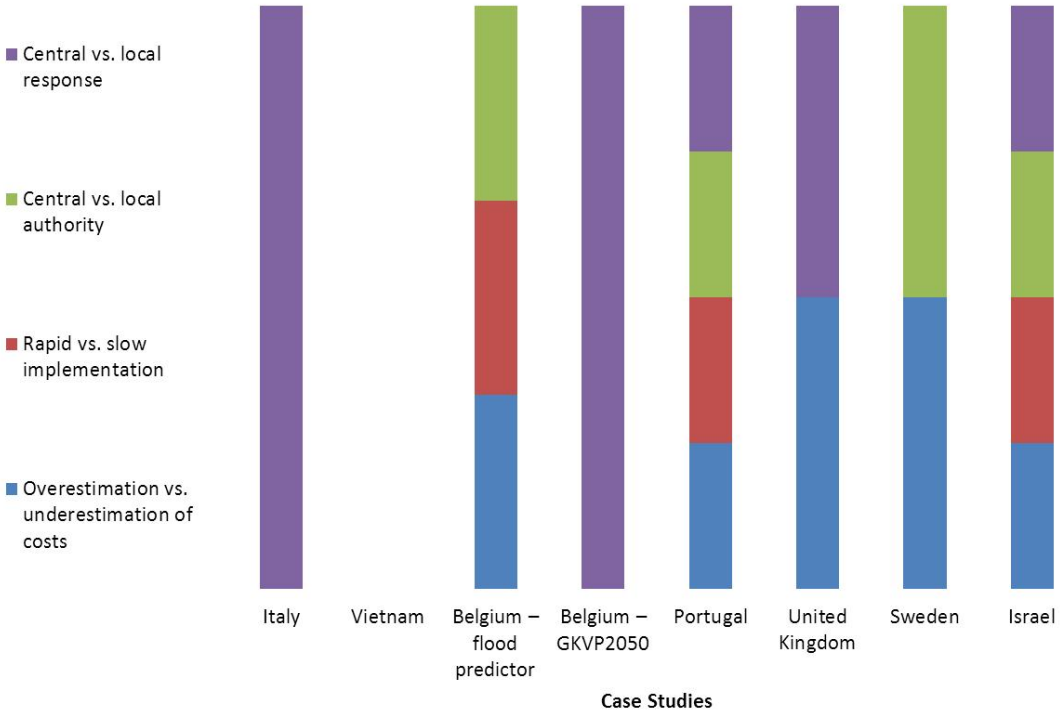

Figure 10 – Conflict causes, typology graph

- The most common conflicts in the examined responses were both overestimation vs. underestimation of costs and the central vs. local response.
- The less common conflict in the cases examined was rapid vs. slow implementation, since this conflict appears mostly in cases where there is an immediate shortage of resources for rapid response.
- According to the literature the major conflict in institutional response to natural hazards revolves around the question of change vs. remaining in the current status quo (Quarantelli, 1977; McConnell and Drennan, 2006; Lundqvist, 1978). This question does not appear in the examined case studies because they deal with cases in which action for change was already taken.

1.2.2 Conflict implications

Table 11 – Conflict implications, typology table

Case study	Overestimation vs. underestimation of costs	Rapid vs. slow implementation	Central vs. local authority	Central vs. local response
Israel	✓	Risk to people and structures because of slow response	Lack of local representation	Uneven levels of response
Sweden	✓		Lack of local representation	
United Kingdom	✓			Unsuitable abilities at the local level
Portugal	✓	Only rapid measures, mitigation incomplete & superficial	Lack of local representation	Unsuitable funding and abilities at local level
Belgium – GKVP2050				Uneven qualities of response
Belgium – flood predictor	✓	Risk for people and structures because of slow response	Slow and inaccurate predictions	
Vietnam				
Italy				Uneven qualities of response

- For the evaluation of the cost conflict, the main implication is the risk of insufficient funds, mostly in the long-run. In many response cases problematic evaluation of costs resulted in a lack of funds after the first year of implementing the response. In other cases the problem may have resulted from the uncertainty regarding the severity or scope of the hazard, not from the length of the implementation. Some physical aspects of the hazard are not yet known, so it may be much worse than evaluated.
- The most common implication of the central vs. local conflict is the lack of local representation in the response implementation.
- For the central vs. local response, most cases are implicated by the uneven quality of response, mostly as a result of unsuitable local capabilities or funding. This is a result of the wide scope of the response, sometimes even at a national level while the problems at the

local level are not fully addressed or are addressed by a local authority with unsuitable capabilities.

1.2.3 Funding Conflicts (causes and implications)

Table 12 – Funding Conflicts: causes and implications, typology table

Case study	The conflict	Conflict implications
Israel	Who pays?: Local municipalities vs. central government	Local funding capacity insufficient
Sweden	Who pays?: Local municipalities vs. central government	Local funding capacity insufficient
United Kingdom	Funding period: problems with funding of beginning and end of responses	Difficulties in the implementation of long-term response
Portugal	Who pays?: Local municipalities vs. central government	Local funding capacity insufficient
Belgium – GKVP2050	Who pays?: Local municipalities vs. central government Funding period: problems with funding at the beginning and end of the response	Local funding capacity insufficient Difficulties in the implementation of long-term response
Belgium – flood predictor		
Vietnam		
Italy	Who pays?: Local municipalities vs. central government	Difficulties in the implementation of long-term response

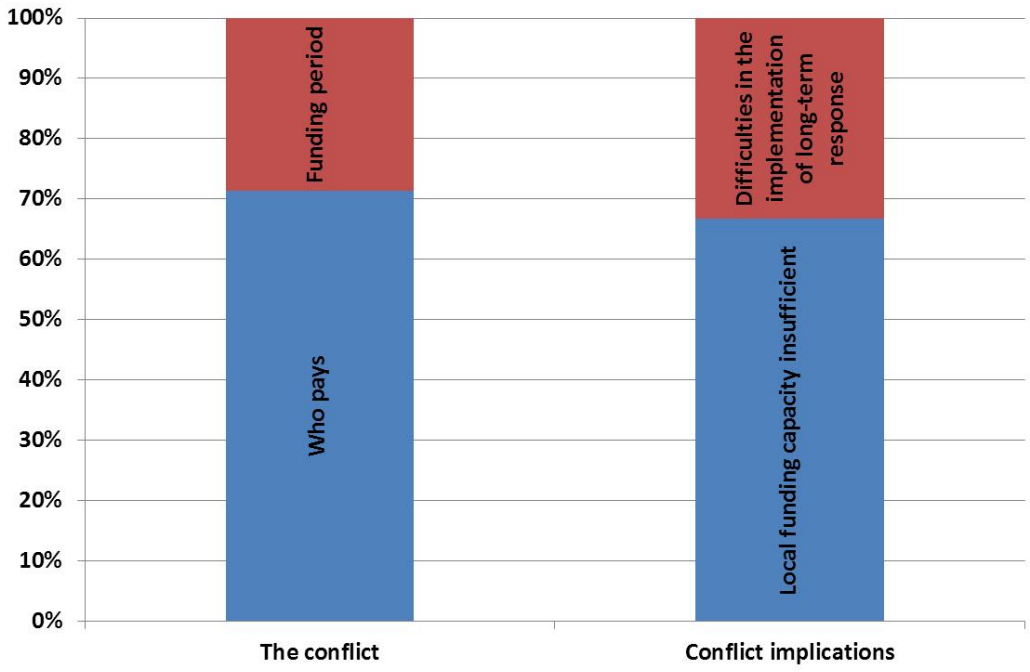

Figure 11– Conflicts regarding funding, distribution

- The most common conflict regarding funding in the examined responses was 'who pays', which impacted five of the cases, while the funding period impacted only 2 of the cases.
- Regarding conflict implications, the result is much the same with 4 of the cases having insufficient local funding, and 3 of the cases having difficulties in long-term response implementation.

PART VI: Conclusion

- The impetus to create an institutional response stems from a physical trigger (inception of natural disaster) or an institutional trigger (official report on hazard condition, foreign directives and more).
- The creation of institutional response mechanisms is gradual and difficult; in the case studies a delay between response incentive and response implementation was frequently apparent.
- The inception of the natural hazard is often limited in scale, thereby serving as a 'wake-up call' to the public and the authorities to respond. This 'wake-up call' results in a response before the major disaster happens, so most cases are of a pre-disaster nature, evident by their focus on mitigation and preparedness and less on emergency response and recovery.
- Given the political cost of dismantling existing institutions, the organizational form most likely to be established is a local or central body that coordinates the activities of existing institutions.
- Given the cost of institutional response, we should not expect an ideal setting where institutions have both fiscal and regulatory independence at a high level.
- Institutional response to natural hazards requires the involvement of a wide array of governmental bodies in various fields (infrastructure, emergency response, planning regulation, local municipalities). In light of this fragmentation of institutional mandates between various governmental bodies and agencies, we are likely to have a specialized inter-governmental committee as the most widespread organizational form.
- Due to the high costs (both financially and other) of creating innovative institutions, we would expect most of the responses to have a small degree of innovation. Of the eight cases, five used only existing institutions for their institutional response and only one case had a completely new institutional response.
- We should expect that governmental authorities will have a higher degree of independence, both fiscal and regulatory, due to the idea suggested by Horn (1995) that both aspects of institutional independence may be predetermined by the organizational form and the establishing mechanism of the institution.
- While an atmosphere of consensus is common in the immediate emergency period of a disaster, this stage is usually followed by one of considerable conflict. These conflicts are

likely to erupt because of the unpredictable situations, both of physical and social matters, in which the institutional response operates.

- Conflicts over institutional responses are likely to erupt over budget allocation, between those who overestimate the cost of the project versus those who underestimate its costs, and over the implementation speed (rapid vs. slow) of the response.
- The ultimate conflict implication to an institutional response is as expected, a complete termination of the response process. This kind of implication was not apparent in the cases examined, but some conflicts may lead to it later in the implementation process.

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APPENDIX I - Institutional Response to the Collapse of the Coastal Cliff in Israel

Formation

Natural Hazard and Motivating Event

The Israeli Mediterranean coastline stretches along 190 km, of which some 60 km are made of a thin 10 to 30 meter wide sandy beach with a limestone cliff on its rear. Out of those 60 km of cliffy coastal zone, about 45 km of the cliffs are 10 meters tall or higher[1]. The cliff's sandstone is made of sediments (mostly sand) driven through the Mediterranean from the Nile Delta. The limestone cliff is steadily deteriorating while retreating to the East through a dynamic natural process driven mostly by the sea wave's impact on the shore. However, in the past century the deterioration process has accelerated due to increased human activity in the coastal zone in addition to rising sea levels.

The Israeli coastal cliff retreated around 20 meters during the 20th century, at an average rate of some 20 to 30 cm a year[2]. Recent studies are estimating that the retreat rate may reach a rate of up to 1 meter a year. This worst-case scenario estimation is based on a sea level rise prediction of 1.4 meters until the end of century; if a more moderate prediction of around 1 meter is taken into account than the collapse rate may be between 40 and 60 cm a year, twice than the average 20th century rate[3].

If the cliff and shoreline regression continue at the estimated pace of between 0.5-1 meters a year in the next 50 years (a total regression of about 25 to 50 meters), than the state of Israel might lose up to 7,000 dunams (700 hectares) of land (including non-cliff shores). The total estimated costs to the Israeli economy from the cliff collapse are between 250 million NIS for a yearly regression rate of 0.5 meters, and 800 million NIS if the rate reaches 1 meter a year. The estimated costs include direct and indirect costs, including intangibles such as archaeological sites and natural resources, but do not include the estimated national loss of land[4].

The deterioration of the cliff is causing dirt and rock slides and collapses at unknown frequencies, causing damage to infrastructures and property and in several cases injuries and

[1] Eidelman et al. (2010), pp. 34.

[2] Katz et al. (2007), pp. 13.

[3] Eidelman et al. (2010), pp. 19-20.

[4] Eidelman et al. (2010), pp. 27-28.

loss of human lives. Recent serious events include the cliff collapse at Netanya on May of 2009, which killed one man and injured another[5], and on April of 2008 at Giv'at Olga which injured six men[6]. The two serious incidents in 2008 and 2009 created a growing public debate on the problem. The debate led to an investigation by the State Comptroller, which in turn forced the government to take a more proactive approach to the problem. This resulted in the institutional response at hand – an inter-ministerial "Implementation Team for Dealing with the Collapsing Coastal Cliff".

Organizational Form and Establishing Mechanism

In the last three decades the collapse of the coastal cliff has been a publicized concern in Israel. Although the magnitude and risk of the problem were well known to municipal and central government bodies, not much was done. Indeed a strong emphasis on the lack of institutional response was made by an acute report by the Israeli State Comptroller and Ombudsman, published in October 2010[7].

Within the central government, initially the problem was officially addressed in 1992 when the Geological Survey of Israel published a thorough report commissioned by Israel's Land Administration. In 1999 the Ministry of Environmental Protection offered to formulate a governmental policy document as a joint project with the Ministry of Interior, Israel's Land Administration and relevant municipalities. The project was rejected by the Ministry of Interior, which cited the National Master Plan of Mediterranean Beaches (National Master Plan 13) as the relevant statutory directive pertaining to the project. Other than a number of unproductive discussions and small corrections to the National Master Plan however, the Ministry of Interior and the relevant planning institutions did nothing to deal with the coastal cliff problem[8]. The Knesset did deliberate on the subject a number of times in the past 20 years, both in the plenum and in the different committees, but no direct action was ever taken. Although Knesset members were aware of the problem, its importance and urgency, no legislative bills were presented and no direct pressure was put on the government to urgently deal with the problem[9].

On the municipal level little has been done as well, as financial and bureaucratic difficulties often prevent adequate responses. The city of Herzliya for example has invested

[5] Haaretz Service (2009).

[6] JPost.com Staff (2008).

[7] The State Comptroller and Ombudsman Israel (2010).

[8] The State Comptroller and Ombudsman Israel (2010), pp. 347 and pp. 371-372.

[9] The Knesset (1989), The Knesset (2004a), The Knesset (2004b), The Knesset (2005), The Knesset (2009).

resources in studying the problem and its potential solutions. In November of 2004, the city adopted the breakwater alternative as a prospective solution, but since July of the following year their planning proposal remains under inspection and discussions at the national level, mostly under the National Committee for the Preservation of the Coastal Environment[10]. The main reason for the delayed planning process at the national level is the lengthy process of creating a governmental policy and authority that would deal with the coastal cliff issue. Hence governmental ministries, planning institutions and local municipalities have all waited for a national policy to be created before deciding on local level[11]. In addition to the municipality of Herzliya, the municipalities of Netanya, Ashkelon and Hadera are also waiting for a governmental decision to be taken in order to promote their local response. Nevertheless some local municipalities have taken steps aimed at lowering the immediate risks of the cliff and at preserving the present situation. Some have decreased water run-off reaching the cliff (municipalities of Tel-Aviv, Bat-Yam, Netanya and Ashkelon), while others have limited access to danger zones (municipalities of Netanya and Hadera)[12].

Response attempts to the cliff problem by governmental and municipal authorities:

Year	**Authority**	**Response**	**Impediments/obstacles to the response**
1992	Israel Land Administration	Geological Survey of Israel report	Report completed with no practical implementation
1999	Ministry of Environmental Protection	Formulation of a governmental policy document	The Ministry of Interior sought to address the issue in National Master Plan 13
1989-2009	The Knesset	Plenum and committees' discussions	No concrete Knesset member's obligation to address the issue
2002-2011	Municipality of Herzliya	Construction of breakwaters	Lengthy planning process at the national level (still not completed)

In 2005, under local municipality pressure and a new initiative by the Ministry of Environmental Protection, the Israeli government decided to create an inter-ministerial

[10] The National Committee is a national level planning institute that was formed in 2004 as part of the Beach Protection Act. The committee is in charge of all planning matters in a distance of up to 300 meters from the coastal waterline.

[11] The State Comptroller and Ombudsman of Israel (2010), pp. 348-351 and Davidovich, F. K. (2009).

[12] Davidovich, F. K. (2009), pp. 6-10.

committee, which would steer the writing of a complete and thorough policy document on the coastal cliff problem. The document was written by a group of professionals, while representatives from relevant ministries directed the work and approved of its conclusions. The committee started its work in October 2005 with an estimated period of endeavor of 12 months; the submission to the government was planned for the beginning of 2007. According to the State Comptroller's report on the response of Israeli authorities to the coastal cliff collapse, the first draft of the policy document was submitted to the Prime Minister's Office only in May of 2009 and officially presented to the government in April of 2010. The report states that in the time between October 2005 and January 2010, the inter-ministerial steering committee met only 5 times in its full composition, with an additional 4 in partial configuration that included representatives from only 5 ministries. In its report, the State Comptroller commented that the lengthy work period of the inter-ministerial steering committee created a situation in which the local municipalities and planning institutions were in a state of uncertainty regarding the coastal cliff protection issue. This uncertainty made both passive (closing of and evicting places at risk) and active (creation of protection infrastructures) responses to the problem unachievable[13].

In April of 2010, the Israeli government adopted the policy document that was ultimately offered. The document illustrated the problems and possible responses to the coastal cliff collapse issue and the economic, public and environmental implications. As an initial response, the government decided to create another inter-ministerial team, this time a professional implementation team whose mission would be to advise the government on how to implement the document's proposals on the ground. The implementation team consisted of representatives from the following ministries: Environmental Protection, Interior, Finance, Justice and Land Administration[14]. The team was given 120 days to complete its mission, and in April of 2011, a year after its inception, the team presented its conclusions to the government. The government therein decided to adopt the implementation team's proposals and to create a designated administrative authority for the management and administration of all coastal cliff issues, while prioritizing the construction of a physical barrier within the coastal waters. The new authority is to be established inside the Ministry of Environmental Protection[15].

[13] The State Comptroller and Ombudsman of Israel (2010), pp. 375-377.

[14] Government Secretariat Office (2010).

[15] Government Secretariat Office (2011).

The organizational form of the institutional response at hand is a newly formed administrative authority designated for the protection of the coastal cliff. The new authority will be created either as a new governmental company or as an authority inside an existing one. The final composition of the new authority is not yet clear, but the stake holders most involved are the Ministry of Finance, the Ministry of Environmental Protection and the Israel Land Administration[16].

In its currently-approved structure, the organizational form of the institutional response is significantly vulnerable, as seen in the conflict which revolved around its conception. During the inter-ministerial team's work, local municipalities feared that their interests would not be sufficiently heard within the new administrative authority option, since no permanent representation exists. Furthermore the lack of local representation may well hinder the authority's working process with the local municipalities, in both day-to-day work and long-term cooperation[17].

The establishing mechanisms of the responses to the cliff collapse in the Israeli case were three administrative decisions made by the Israeli government in the past decade:

- Inter-Ministerial Report Team - the first decision made in 2005 to create an inter-ministerial team whose mission would be to write a report on the coastal cliff collapse problem and its solutions.
- Inter-Ministerial Implementation Team - the second decision made in April of 2010 was to create an inter-ministerial team to implement the report.
- New, Designated Administrative Authority - the third decision made in April of 2011, was to approve the implementation team's suggestions and to anchor them within a governmental decision, creating a new, designated administrative authority which will administrate all coastal cliff issues.

The establishment of the two inter-governmental committees is attributed to the fragmentation of relevant institutional mandates between various governmental bodies and agencies, a fact that for a long time delayed the government in taking any action on the coastal cliff issue.

In addition to the administrative decisions made by the government, the response - according to the implementation team's suggestions that was approved by the government- has

[16] Government Secretariat Office (2011).

[17] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d).

a legal (mechanism) aspect to it as well. Indeed a new National Master Plan, which holds statutory status in Israel, will be planned for and in due course approved[18].

Institutional Mandate (Responsibilities)

The institutional mandate of the examined response is primarily mitigation and subsequently preparedness. The new authority will be responsible for marine (in-water) protection, including planning, construction, maintenance and monitoring. The implementation team's recommendations approved by the government include protection infrastructures to be built only on cliff segments at a total length of 13 km, leaving the remaining 40 km to naturally change[19].

Responsibility for dry land protection will be shared by the new authority and relevant municipalities. A 10 year work plan will be devised jointly by the new authority and local municipalities. Local municipalities will handle detailed planning and construction and maintenance of dry land cliff protection. In addition, the municipalities will handle all regulatory measures such as expropriation, evacuation, advertising (of warnings) and signposting. The new authority will have the power to enforce the execution of plans on local municipalities and will have residual power in coastal cliff issues. What's more, the new authority will be in charge of monitoring the conditions of the cliff and the applicable land protection infrastructures[20].

The inter-ministerial professional implementation team's responsibility was to submit to the government, within 120 days (the team's final report was approved by the government almost a year later), its recommendations on how to implement in practice the recommendations depicted in the policy document adopted by the government in April of 2010. The recommendations should include a work plan for all relevant ministries, municipal authorities and other organizations according to the policy document's recommended priorities. The recommendations should also detail the needed coordination between relevant institutions and financing sources[21]. Accordingly, both the two inter-ministerial team's mandate and the new, designated authority's mandate are based on mitigation. The team's mission was to advise

[18] Government Secretariat Office (2011).

[19] Israel Land Administration (2011).

[20] Government Secretariat Office (2011) and Implementation Team for Dealing with the Collapsing Coastal Cliff (2010c).

[21] Government Secretariat Office (2010).

the government on how to minimize the possible losses and damages that might occur, while the new authority's mission was to put into practice those recommendations. The three institutional responses are mostly structural mitigation responses especially when dealing with possible infrastructures for the protection of the cliff. In addition, the debate about a new planning scheme for the cliff area can be considered as a non-structural mitigation response, made mainly by the two inter-ministerial teams.

Only in one matter did the inter-ministerial implementation team have a small part of preparedness work: the immediate protective measures taken by local authorities. Since the team encountered claims made by local municipalities regarding the legal constraints on their ability to take urgent protection actions, the team suggested to the government to order the local municipalities to take whatever means possible to ensure of public safety until long-term protective measures are in place[22].

Institutional Characteristics

Institutional Independence

The major factors affecting institutional independence in the coastal cliff response issue are the costs and funding, as seen through the implementation team's work on the evaluation of possible damages and mitigation costs. In one of the discussions a relevant local municipality (the municipality of Netanya) officially estimated the total costs for the protection of the cliff at around 2 billion NIS (400 million Euros)[23], a much higher figure than the implementation team's estimate of 600 million NIS (120 million Euros)[24]. Thus the debatable nature of total cost levels may risk the institutional independence because project costs may vary significantly in the long run and may be much higher than originally estimated and planned for. Ultimately the government sided with the implementation team's estimate, and the total funding allocated for the project will stand at 500 million NIS over a period of 10 years.

With regards to funding, local municipalities feared that they would not be able to afford the very expensive protection infrastructure. In addition, some municipalities saw the problem as a national one, thus requiring government funding. All municipalities even agreed

[22] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d).

[23] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d), pp. 2.

[24] Eidelman et al. (2010), pp. 27.

that the government should fund the entire protection infrastructure, marine and terrestrial[25]. The implementation team thereby recommended that the most expensive part of the mitigation costs will be funded by the government. The government decided that as the owner of most of the land, it will finance the in-water infrastructures, and will help eligible municipalities in funding the land (dry) infrastructure. The funds will come from three sources over a 10 year period: the Israel Land Administration will transfer 360 million NIS (72 million Euros) to the Ministry of Environmental Protection; the Ministry of Environmental Protection will finance a further 50 million NIS (10 million Euros) from its own budget; and local municipalities will finance the remaining 90 million NIS (18 million Euros)[26]. Local municipalities will also be allowed to collect dedicated fees for this purpose, while the government will assist municipalities in financial difficulties, both in the collection of these dedicated fees and by governmental grants[27].

The consequences of the cost estimation and the 'who will pay?' issues are threefold. The first consequence is that uneven cost estimates may cause long-term funding problems. Missing costs and the costs of intangibles may cause the outlay of the total project to vary significantly in the long run and to be much higher than originally estimated and planned for. The second consequence pertains to the short and long-term financial burden placed on local municipalities already struggling with financial problems even without the additional expenses of the coastal cliff protection issue. Indeed funding problems might risk the mitigation process as a whole. The third consequence is a result of the first two, which can be labeled as the institutional independence consequence. Since the new authority's funding is dependent on the Israel Land Administration and the Ministry of Finance, and because long term costs are vague, its institutional independence is jeopardized. The situation for the local municipalities is similar since they depend on governmental funding and are at risk to unknown future costs.

Institutional Bureaucracy, Flexibility, Innovation and Learning

In the Israeli coastal cliff response issue, institutional bureaucracy and flexibility were core problems for almost 20 years, as portrayed in detail in previous sections. To be sure, a lengthy work period for the first inter-ministerial team made nearly all mitigation and

[25] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d), pp. 4-6.

[26] Israel Land Administration (2011) and Government Secretariat Office (2011).

[27] Government Secretariat Office (2011).

preparedness work bureaucratically impossible, as all relevant institutions waited for the completion of a comprehensive governmental policy.

During the work of the second inter-ministerial team (implementation), additional bureaucratic and flexibility issues surfaced. Urgent mitigation was raised as an issue by local municipalities' officials during the implementation team's discussions, highlighting how local municipalities are very limited in their current mitigation abilities, thus preventing them from taking proactive measures that could reduce the possibility of damage to property and loss of human lives. Since local municipalities are confined by their current, valid plans, they are limited in their ability to issue building permits in hazardous zones. The municipalities were therefore confronted by legal issues whenever they tried to take prompt, proactive measures. Indeed until a new National Master Plan is approved in conjunction with new, approved local plans, several hazardous buildings will still be standing, while structural mitigation actions will still not be performed. Three of the ten local municipalities stressed the urgency of the matter; all the same the Ministry of Interior stated that after the approval of a new National Master Plan, building permits would be issued[28]. The implementation team thus recommended to the government to help the local authorities in the planning aspect of urgent mitigation, thereby relieving some of the conflict costs[29]. The government's decision in the end compelled the Ministry of Interior to order local municipalities to take measures to protect public safety in places where immediate danger to human lives or property exists. The measures may include issuing building permits from the power of the currently valid detailed plan[30]. This conflict shows the institutional response's vulnerability around institutional bureaucracy and flexibility, that long bureaucratic processes damage the flexibility of the mitigation process.

Degree of Centralization

The Israeli cliff collapse case of institutional response is characterized by a high level of centralization. The implementation team, much like the policy document itself, addresses the problem at the central governmental level. The problem at the municipal level is considered and addressed as well, but most of the solutions and implementation mechanisms are at the central government level, as seen with the new, designated administrative authority. Both in

[28] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d), pp. 3-6.

[29] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010a), pp. 3.

[30] Government Secretariat Office (2011)

the new authority and in the two inter-ministerial teams, municipal and public representation is very limited, a fact that made it a highly-centralized institutional response as well.

There are two main reasons for this centralized attitude. The first is the high costs of possible infrastructure solutions, a financial burden that can be handled only by the central government. The second is the cross-jurisdictional nature of the problem, which exists in a number of municipal authorities along the Israeli Mediterranean coast. This spread characterization of the problem therefore demands a central government solution or at least a governmental solution policy. Thus in order to cope with the problem and to try and solve it completely, a more systematic and extensive approach must be taken. Indeed the problem cannot be solved by each municipal authority for its own area, since the natural characteristics are not bound by geopolitical demarcations; indeed sand flows from one municipality may totally change the cliff situation in another municipality.

Another centralization issue that arose during the work of the implementation team is whether the planning mechanism will be implemented through the National Infrastructure Committee or through a new National Master Plan. On the one hand the National Infrastructure Committee may be granted the authority to plan for a completely detailed plan for the entire cliff problem. On the other hand the government can approve a National Master Plan which will define in advance all relevant planning issues, from which local municipalities will be able to approve detailed plans for cliff protection[31]. The implementation team and most of the relevant municipalities favored the National Master Plan option while one municipality, Netanya, favored the National Infrastructure Committee option[32]. The conflict implication is that planning is a lengthy process that is in need of wide agreement. Without agreement on the suitable planning process, mitigation might be slow and fragile. The option that was selected and ratified by the government is the National Master Plan option[33], which affects the institutional response through its degree of centralization. Since a National Master Plan is a centralized and not detailed planning strategy, there is a balance of centralization between the less detailed central plan and the more detailed local plan. Both the central and local agents have planning power and none has full control over the planning process.

[31]Implementation Team for Dealing with the Collapsing Coastal Cliff (2010a), pp. 1-3.

[32] Implementation Team for Dealing with the Collapsing Coastal Cliff (2010d), pp. 1-6.

[33] Government Secretariat Office (2011).

A Typology of Institutional Response to Natural Hazards

Institutional Mandate	**Formation**				**Characteristics**		
Responsibilities/Actions	**Motivating Event**	**Organizational Form**	**Degree of Innovation**	**Establishing Mechanism**	**Institutional Bureaucracy, Flexibility, Innovation and Learning**	**Degree of Centralization**	**Institutional Independence**
Mitigation	State Comptroller report; several casualties from cliff collapses (2008 and 2009).	Two inter-ministerial teams created under a governmental decision and a new, designated administrative authority inside the Ministry of Environmental Protection.	New institution (authority); a new national master plan; and a set of new local detailed plans.	Appointed Official by the Prime Minister's Office from the end of 2005; government decisions No. 1620 from April 25, 2010; and No. 3097 from April 3, 2011.	Core problems for almost 20 years: lengthy planning process and lengthy inter-ministerial teams working process.	High level of centralization because of the high costs of possible infrastructure solutions and the cross-jurisdictional nature of the problem.	Jeopardized because most of its funding is dependent on the Israel Land Administration and the Ministry of Finance, and because long term costs are vague.

Main Conflicts and Costs

The most debatable and tense issue in the implementation team's work was the evaluation of the possible damages and mitigation costs related to coastal cliff collapse. In one of the discussions a relevant local municipality (municipality of Netanya) officially estimated the total costs for the protection of the cliff at around 2 billion NIS (400 million Euros)[34], a much higher figure than the governmental team's estimate of 600 million NIS (120 million Euros)[35]. Regarding the funding issue, local municipalities fear that they will not be able to afford this very expensive protection infrastructure. In addition, some municipalities see the problem as a

[34] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp.2

[35] Eidelman, A, Bein, A and Cohen, G. (Eds.) 2010, pp. 27

national one, thus requiring government funding. The municipality of Tel Aviv was therefore given as an example of a wealthy urban center that is able to cope with such expenses, as opposed to all other municipalities that don't have sufficient funds. All municipalities nevertheless thought that the government should fund the entire protection infrastructure, both marine and terrestrial[36]. The implementation team recommended that the most expensive part of mitigation would be funded by the government. The government however decided that as the owner of most of the land, it will finance the in-water infrastructures, only helping eligible municipalities in funding the dry (out of water) infrastructure, allocating to the project 500 million NIS (100 million Euros), of which the Israel Land Administration (the main land owner) will pay 360 million NIS over a period of 9 years. Local municipalities will fund dry land protection, at an estimated cost of 90 million NIS (18 million Euros) and will be allowed to collect dedicated fees for this purpose. The government will assist municipalities in financial difficulties, both in collection of the dedicated fees and directly via governmental grants[37].

The implications of the estimated costs and the 'who will pay?' conflicts are twofold. The first implication is that uneven cost estimates may cause long-term funding problems. Unforeseen costs in the long term and the associated intangibles may also cause the project costs to vary significantly in the long run and be much higher than originally estimated and planned for. The second implication is the short and long-term financial burden placed on local municipalities, which already face financial problems even without the expenses of the coastal cliff protection project. Thus funding problems might risk the mitigation process as a whole since several municipalities are afflicted by funding issues.

With regards to urgent mitigation, local municipalities are very limited in their current mitigation abilities, thus preventing them from taking proactive measures that can reduce the possibility of damage to property and loss of human lives. Since municipality power is defined by current, valid plans, their capacity to issue building permits in hazardous areas is highly limited. Thus municipalities were confronted by legal action whenever they tried to take prompt, protective measures against cliff collapse. In the time until a new National Master Plan (NMP) is approved and new local plans are approved, several highly-unsafe buildings will still be standing, while structural mitigation actions will not be performed. Three of the ten local

[36] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp.4-6

[37] Government Secretariat Office 2011

municipalities stressed the urgency of the matter, yet the Ministry of Interior stated that after the approval of a new National Master Plan, building permits will be issued [38]. The implementation team thus recommended to the government to help the local authorities in the planning aspect of urgent mitigation, thereby relieving some of the conflict costs [39]. The government's decision in the end stipulated the Ministry of Interior to order local municipalities to take measures to protect public safety in places where immediate danger to human lives or property exists. The measures may include issuing building permits from the power of the currently valid detailed plan[40]. This conflict shows the institutional response's vulnerability around institutional bureaucracy and flexibility, that long bureaucratic processes damage the flexibility of the mitigation process.

In addition to these two main conflicts, some other struggles arose around the issue of what planning mechanism will be implemented, whether through the National Infrastructure Committee (NIC) or a new National Master Plan (NMP). The NIC may be granted the authority to plan a complete, detailed plan for the entire cliff problem. On the other hand the government can approve a NMP which will define in advance all relevant planning issues, from which local municipalities will be able to approve detailed plans for cliff protection[41]. The implementation team and most of the relevant municipalities favored the NMP option, while one municipality, Netanya, favored the NIC option[42]. The conflict implication is that planning is a lengthy process that is in need of broad consensus and without this consensus mitigation might be slow and fragile. The option that was selected and ratified by the government is the NMP option[43], which affects institutional response through its degree of centralization. An NMP is a centralized but not detailed planning tool. In this case there is a balance of centralization between the less-detailed central planning process and the more-detailed local planning process. However it must be stressed that both the central and local agents have planning power and none has full control over the planning process.

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[38] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp. 3-6

[39] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010a, pp. 3

[40] Government Secretariat Office 2011

[41] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010a, pp. 1-3

[42] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp. 1-6

[43] Government Secretariat Office 2011

A fourth issue discussed was the institutional form of the administrative authority that will deal with the coastal cliff problem. The options discusses were a new, designated administrative authority (DAA), a new governmental company (GC) or a new regional association (RA) of the related municipal authorities with governmental participation. Some municipalities favored the regional association option (Netanya and Herzliya), while the new governmental company option was raised but with no serious support[44]. The implementation team recommended the new, designated administrative authority option, to be established in the Ministry of Environmental Protection, which was approved by the government[45]. The approved organizational form of the institutional response is problematic as seen through the conflict which revolved around it. The local municipalities feared that their interests would not be sufficiently heard in the DAA option because they have no permanent representation in the new authority. In addition, the lack of local representation may hinder the authority's working process with the local municipalities, in both day-to-day work and long-term cooperation.

Another conflict is at what scale this problem is viewed socially and financially. The Israeli Mediterranean coastal zone is used by the whole country and by tourists from around the world, making it a national natural resource. Some local municipalities therefore view the coastal cliff problem as a national issue, not a local one[46], as stated in the State Comptroller and Ombudsman's report[47]. Yet local authorities are considered responsible for the coastal zone situation. Consequently local municipalities are burdened by maintaining a national tourist and recreation resource, a conflict interrelated to the 'who will pay?' issue; the ensuing institutional response therefore pertains to its institutional "customers".

[44] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp. 1-6

[45] Government Secretariat Office 2011

[46] Implementation Team for Dealing with the Collapsing Coastal Cliff 2010d, pp. 4

[47] The State Comptroller and Ombudsman Israel 2010, pp. 352

The Conflict	Players and their views	Decision	Conflict implications	Typology
Evaluation of costs: Government estimated costs vs. Higher estimates	Pro government estimates: The implementation team evaluated the costs at 600 million NIS. Pro higher estimates: One municipality evaluated the costs at around 2 billion NIS.	Governmental cost estimate is 600 million NIS.	Costs may vary significantly in the long run.	Cost
Coastal cliff protection funding: Full government funding (FGF) vs. Local and government funding (LGF)	Pro FGF: All municipalities. Pro LGF: The implementation team and government ministries.	Governmental funding of 500 million NIS. Local funding of 90 million NIS, with some governmental assistance.	Funding problems might risk the mitigation process as a whole.	Cost
Legal constraints on urgent protection action: Rapid unplanned mitigation vs. Waiting for the NMP	Pro rapid mitigation: 3 municipalities raised this issue. Pro Waiting: The Ministry of Interior.	Local municipalities were ordered to urgently take safety measures where needed.	No urgent mitigation actions can be taken, risking people and property.	Institutional Bureaucracy and Flexibility
Planning mechanism: National Infrastructure Committee (NIC) vs. A new National Master Plan (NMP)	Pro NIC: Only one municipality (Netanya). Pro NMP: The implementation team, government ministries and 4 (out of 10) municipalities.	A new NMP will be created and specific planning will be made by the municipalities.	Slow planning process which leads to slow mitigation.	Degree of Centralization
Organizational form: A newly designated administrative authority (DAA) vs. A new governmental company (GC) vs.A new regional association (RA)	Pro DAA: The implementation team Pro RA: Two municipalities Pro GC: No strong support.	A new DAA inside the Ministry of Environmental Protection.	Lack of local representation, resulting in a lack of cooperation.	Organizational form
Scale of the problem: National vs. Local	Pro national: Some of the local municipalities. Pro local: The implementation team and government ministries.		Local municipalities are under the burden of maintaining a national tourist and recreation resource.	Institutional "Customers"

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ABSTRACT: Weather-related disasters continue to increase in frequency, many of which occur along the coast. These events claim the lives of many and have a detrimental effect on the quality of life of others. To address these risks, institutions are established with the aim of enhancing the resiliency of vulnerable coastal communities to natural disasters. Given the role of these institutions, the objective of this handbook is to understand how such institutions respond to natural disasters. This will be conducted through a cross-country comparative case study of institutional responses to vulnerability to natural coastal hazards. In particular the study asks: What is social and institutional vulnerability to natural hazards?; What institutions are available to address vulnerability to coastal hazards?; What are the reasons for the formation of the aforementioned institutions?; and What are the non-monetary costs associated with the institutional response to natural hazards?

The study reveals that the incentive to establish an institutional response stems from a physical or institutional trigger and that the formation of institutional response mechanisms is gradual. Given the political cost of dismantling existing institutions, the organizational body most likely to be established is a local or central governmental body that coordinates the activities of existing institutions by establishing specialized inter-governmental committees. This implies that newly-established institutions (with both fiscal and regulatory independence) are to be expected, which is not always the case.

Once it is decided to establish a new institution, its design leads to considerable conflict. These conflicts are most likely to erupt over budget allocation, cost estimation, and the eventual implementation speed (rapid vs. slow) of the response. The ultimate repercussion of such conflict is as expected, the complete termination of the response process.

KEYWORDS: natural disaster; costal hazards; ICZM; coastal institutions

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