EMERGENT PHENOMENA IN INDIA AFTER

THE INDIAN OCEAN TSUNAMI

By

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CHAPTER I

INTRODUCTION

Overview

This chapter begins by briefly reviewing the concept of emergence under study, followed by the practical benefits that are hoped to arise out of this work. The chapter then briefly reviews the State of Tamil Nadu within the broader context of the country. It will then outline the event under study, namely the Indian Ocean tsunami that struck India on December 26, 2004. This chapter will then move from a broad description of the effects of the tsunami on India to a narrower focus on the State of Tamil Nadu. It will then narrow the focus even further to the effects on the District of Nagapattinam, within the State. This chapter will then identify the major disasters that have taken place in India followed by the major events that have affected the District of Nagapattinam. This comparison will help the reader understand the history of disasters in the area and hence the context under study.

Introduction

Justice has not been done to the concept of emergence in the disaster literature. Studies have documented volunteers arising out of the need of the hour, performing life saving work, clearing debris, feeding the survivors and managing the processes involved

in caring for the injured, dying and deceased. Yet no study has documented the emergence of volunteers or the tasks that they perform; the conditions which persuade their appearance, or the consequences of their activity after a disaster in India. This thesis hopes to fill the lacuna in the literature.

The purpose of this study is to examine a behavior known as "emergence," defined as new behaviors, tasks and structures that appear to meet or manage massive disaster needs (Dynes, 1970). Several kinds of emergence can occur from individuals who form search and rescue parties to newly-appearing organizations that manage relief and reconstruction. A number of emergent search and rescue groups formed in the aftermath of a tsunami that hit the Indian coastline. The tsunami was generated by an 8.9 magnitude earthquake in the Indian Ocean, on December 26, 2004, at approximately 6:33 a.m. My research was based in the District of Nagapattinam in the State of Tamil Nadu, an area worst-hit in India by the tsunami. This district appeared to witness emergence among the administrators at the State level, officials at the district level, and fishermen at the local level, all of whom were instrumental in handling the situation that day.

The research questions for this study are: (1) why and (2) under what conditions did emergence take place in Tamil Nadu after the tsunami?

Practical benefits

Several practical benefits should arise out of this work. First, in a nation that experiences repetitive and massive disasters (Gujarat earthquake for example) emergent behaviors represent crucial resources during response and recovery. Second, understanding how, where and under what circumstances emergent groups appear as well as what activities they perform provides valuable information to Non-Government

Organizations (NGO's) and disaster relief organizations. Consequently, training schemes can be devised to take advantage of these crucial human resources prior to the next disaster. An analysis of the conditions that spur emergence in India will benefit planning and response to disasters in the future. Thus, the main justification for this research is to document emergent groups in order to harness their capacities in service to fellow citizens. In addition, this study hopes to produce, a draft of the characteristics of emergence, and the conditions that spur emergence at all levels of association in India, so that emergency plans can account and plan for emergent behaviors.

Tamil Nadu

Tamil Nadu is located in the extreme south of India (see map 1, p. 4). It has an area of 50,215 square miles. It is bounded by the Indian Ocean to the East and South. On the mainland, it is bounded by the States of Kerala to the west, Karnataka to the north-west and Andhra Pradesh to the north. The capital of the state is the city of Chennai, formerly known as Madras (Britannica, 2003).

Although Chennai is a large industrialized city, the State of Tamil Nadu is mostly agricultural. The state is mostly composed of alluvial soils and the climate is tropical. The average range, for rainfall within the state, falls between 25-75 inches (635 -1905 mms) per year. Due to its coastal location, the State of Tamil Nadu affords a vast fishing industry as well (Britannica, 2003).

Map 1: Tamil Nadu Districts and Coastline

The Tsunami

On December 26, 2004, a massive 8.9 magnitude earthquake (aka Sumatran-Andaman), at a convergent plate boundary, occurred in the Indian Ocean. This boundary, between the Indian plate and the Burma plate, moves at a rate of 5 mm per year. Stresses within the plates caused the Indian plate to be subducted beneath the Burma Plate (Jain, Agarwal & Hirani, 2005). This subduction caused a massive movement of the crustal plates. The energy generated from the resulting earthquake created an immense tsunami that killed approximately 300,000 people in 12 nations, primarily, Indonesia, Thailand, India and Sri Lanka.

India and the State of Tamil Nadu

The earthquake struck the Indian plate at 6:33 a.m. Indian Standard Time; shaking was noted only on the Andaman and Nicobar Islands. However, the tsunami arrived on the Andaman and Nicobar Islands at the recorded time of 7:15 a.m. and hit the southeast coast of the States of Tamil Nadu and Andhra Pradesh at approximately 9:03 a.m. Two hours later it reached the State of Kerala on the south-western coast (Jain et al., 2005). According to official statistics, a 187 km survey of the Eastern coastline revealed extensive damage (Dr. J. Radhakrishnan, personal communication, May 9, 2005). The total number of fatalities in the country reached at least 10, 805 leaving approximately 5, 640 missing (Jain et al., 2005). Within the State of Tamil Nadu, the tsunami left 8,018 dead, of which 1,769 bodies remained unidentified, and 1,126 went missing in this State (Dr. J. Radhakrishnan, personal communication, May 9, 2005).

Photo 1: Destruction in Nagapattinam

Nagapattinam District within the State of Tamil Nadu

The tsunami of December 26, 2004, left 6,065 dead, of which 1,733 remained

unidentified, accounting for 76% of the death toll in the state. In addition, 791 went

missing in the District of Nagapattinam. Photo 1 shows the destruction to concrete homes

in Nagapattinam from the tsunami. In short, this district bore the brunt of the Indian

Ocean Tsunami (Dr. J. Radhakrishnan, personal communication, May 9, 2005). Most of

the deaths occurred among the local fishing community, particularly among the locals

living along the coast and the tourists who had come to visit the famous Shrine at

Velankanni. Male casualties appeared much lower than casualties among women and

children (Jain et al., 2005). This can be understood within the context of the Indian

culture where men usually sleep outdoors and women and children indoors. Usually rural

homes in India are small and do not afford enough space for all family members to sleep.

In addition, the men allow the women and children to sleep indoors to respect female

privacy as well. Sleeping outdoors affords a faster escape for men rather than women and

children (Maithreyi, 1997). In another instance, fisherwomen out on the coast, waiting

for the fishermen to return with the catch, left themselves vulnerable to the tsunami

waves (Oxfam, 2005). Linked to this vulnerability are the impediments posed by the

traditional dress of India, the saree (see photo 2), that inhibits them from running fast.

Women are also unlikely to be able to climb trees and escape. Children experience

vulnerability to the high waves as they cannot run fast (Jain et al., 2005).

Photo 2: Sarees prevented women from running fast

Major Disasters

India

Indians are very aware of the most recent tragedies in their country. Disasters

have affected many friends and family in the past, a regularity that will be experienced

again. The Bhopal Gas tragedy on December 3, 1984, was one such disaster which stirred

not only the Indian community but the International Community as well. This section

briefly reviews major disasters within India to understand the frequency of disasters, and

the extent of damage and loss of life, in the past. This section provides a reference as well

as a comparison to the tsunami disaster.

The Marathwada or Latur earthquake which occurred on September 29, 1993,

claimed 20,000 lives (Jain, 1998; Gupta et al., 1998). The Marathwada area is prone to

droughts and is considered aseismic. Therefore an earthquake occurring in this area took

the people and the administration by surprise (Jain et al., 1994). A super-cyclone impacted the coastal areas of Orissa and Andhra Pradesh, north of Chennai, on October 29, 1999 and took 9, 885 lives (De, Dube & Rao, 2005; De, Khole & Dandekar, 2004; Salagrama, 1999). The Bhuj-Gujarat Earthquake occurred two years later on January 26, 2001, and claimed 20,000 lives, injured 167,000, left millions homeless and resulted in $10 billion in damages. It was by far one of the costliest disasters India had seen, until the tsunami of 2004 (Rastogi et al., 2001; EM-DAT, 2005; UNDP, 2005).

The first recorded tsunami to hit the Indian coastline dates back to April 2, 1762, according to a report by the National Information Center for Earthquake Engineering at the Indian Institute of Technology at Kanpur (Jain et al., 2005). An earthquake at the Bangladesh-Burma border triggered a tsunami in the Bay of Bengal which caused waters in the Hoogly River in Calcutta to rise by 2m in 1762. In 1881, an earthquake around Car Nicobar Islands generated tsunamis in the Bay of Bengal at a 0.8m height. The eruption of Krakatoa in 1883 caused tsunamis that were felt in India. In June, 1941, an earthquake at Andaman (Indian Islands off the East coast of India) generated a tsunami of 1m height. In 1945, an 8.0 earthquake at the Mekran Coast of Pakistan also generated tsunamis that were felt in India. Waves reached a height of approximately 12m in Kach and 2m in Bombay. Fifteen people reportedly died in Bombay from this tsunami (GoI, 2005; Jain et al., 2005).

Nagapattinam

The District of Nagapattinam protrudes into the confluence of the Bay of Bengal and the Indian Ocean (see map 1, p. 4), leaving it vulnerable to the onslaught of cyclonic

disturbances and oceanic turbulence. The effect of these oceanic disturbances on Nagapattinam is discussed below.

In 1952, four hundred deaths occurred in Nagapattinam on account of a Very Severe Cyclonic Storm (VSCS). In 1977, the southern states were badly affected, again, by a cyclone which claimed 14, 204 lives and left 5,432,400 homeless. Five hundred and sixty of those deaths occurred in Nagapattinam alone (EM-DAT, 2005). In November 1991 another 300 persons died due to heavy rainfall in this district (Dr. J. Radhakrishnan, personal communication, May 9, 2005). In October of 2004, The District of Nagapattinam received an extensive amount of rainfall over and above the normal average for the district. The most recent rainfall emanated from the south-west monsoons that occur regularly in India. While the State annually receives an average of 16cms of rainfall during each monsoon season, the District of Nagapattinam, historically experienced average amounts, until it received 29cms of rainfall in 24 hours in 2004 (Ramakrishnan, 2004). Local respondents to this study, after the 2004 inundation, felt that the rainfall saturated the ground and suggested that the tsunami water residue could not be absorbed.

Conclusion

This chapter enables the reader to develop an image of the area under study and understand the history of events in Nagapattinam. Having given an introduction to the area under study and the historical impact of the tsunami on Nagapattinam, within the larger context of the country of India as a whole, I will now proceed with a review of the existing literature. Following the literature review in Chapter two, is a chapter on the methods used to undertake this study. The disaster history of India, Chapter four provides

a hazard assessment of India, Tamil Nadu and Nagapattinam and examines the risks and vulnerabilities of each area. Chapter four thus enables the reader to gain a broader understanding, historically, of the risks and vulnerabilities in Nagapattinam. Chapter five follows with the presentation and analysis of the data. Chapter six concludes the study with a discussion of the findings, questions that remain unanswered, and recommendations for future research.

CHAPTER II

REVIEW OF LITERATURE

<u>Overview</u>

  This chapter will begin with an introduction to the early works on emergence followed by a definition of emergence. The chapter then discusses the characteristics of emergence and provides U.S. and Non-U.S. examples of each. The chapter continues by discussing the conditions that generate emergence. Theoretical and empirical examples are offered. The empirical studies section discusses conditions of emergence based on U.S. and Non-U.S. examples. The chapter concludes with a summary and a discussion.

<u>Defining Emergence – Early works</u>

  Perhaps the most pivotal works on emergence, and the idiosyncrasies of defining it, were initially undertaken by Quarantelli (1966), Dynes and Quarantelli (1968), and later published by Dynes (1970). A four-fold typology of old and new organizations, based on tasks and structures of emergence, is examined here.

  The disaster event affects different organizations in varying ways. Some organizations invariably become involved in it as a part of their job, but the demands of the event may exceed their capability to provide the necessary resources. Some other organizations may find that their pre-disaster tasks are no longer relevant in the post-disaster time period. Disasters place stresses on the community and push emergency organizations beyond their capabilities to provide. Furthermore, the need for additional

resources changes the nature of the organizations and compels community organizations to adopt unusual functions during the emergency. An adoption of unusual functions produces the need for new methods of coordination and control among all involved organizations. Thus, a condition of unplanned change develops in the relationships between organizations (Barton & Merton, 1963; Barton, 1969. p. 38; Dynes, 1970. p. 81, 206). Nonetheless, all responding organizations, whether old or new, are resources. Learning how responding organizations become involved, and adapt to the impact period, is important for the literature on disasters (Dynes, 1970, p. 4, 84).

In any disaster, organizations carry out familiar tasks. Yet, sometimes organizations engage in new tasks generated by the disaster. Therefore, it is possible to differentiate old and new organizations based on their tasks (regular and non-regular), and structures (old and new). Dynes (1970, p. 138) laid out the following typology.

Figure 1: Dynes' Typology

		Tasks	
		Regular	Non Regular
Structure	Old	Type I (Established)	Type III (Extending)
	New	Type II (Expanding)	Type IV (Emergent)

From: Dynes, Russell, R. 1970. Organized behavior in disasters, p. 138.

In the above Figure 1, Type I is an established organization that carries out regular tasks. A simple example of an established organization is a fire department that

puts out fires that are caused by short circuiting after a hurricane. Type I organizations tend to get involved because of public expectation to do so, their pre-disaster structure and tasks, and their ability to mobilize resources quickly (Dynes & Quarantelli, 1968; Dynes, 1970, p. 139, 150-157). Type I is a delineated type of organization with a definitive structure, clear lines of authority, good communication networks, and visible decision makers. Police and fire departments fall under this category, as well as public utility companies, general hospitals, and many other administrative city departments. Type I organizations, during impact periods, tend to revert to traditional tasks and their own personnel (if in fact they have made use of volunteers) as soon as possible, instead of dealing with new tasks or people (Dynes & Quarantelli, 1968; Dynes, 1970, p. 141-142, 150-157).

An example of a Type I organization is revealed in a case study on a tornado and flash flood in Bunkus, in which the police and fire departments responded to the disaster. The police officer's tasks remained limited to traditional tasks of search and rescue, security and patrol, and medical transportation. Firefighter's tasks included search and rescue and fire suppression (Wenger, Quarantelli & Dynes, 1989, p. 77-78).

Type II is an expanding organization that accommodates a new structure, but performs regular tasks after a disaster. An expanding organization is usually referred to as voluntary organizations or Non-Government Organizations (NGOs). During pre-disaster time periods, only the permanent members of an expanding organization appear to be working. The organization's daily activities may include feeding the poor or housing the homeless. A disaster expands these tasks as it generates homelessness of a greater magnitude and pressurizes expanding organizations to assemble volunteers. The

organizations' tasks remain the same, but the organization expands to accommodate the new volunteers. The new group becomes much larger than the old one and consists of people that are not prior members of the permanent core. Members, who generally enjoyed some form of supervision when the core performed its pre-disaster activities, may be subjected to a different line of authority during the disaster time period (Dynes & Quarantelli, 1968; Dynes, 1970, pp. 142-145, 157-160). A Red Cross chapter with an increased work load when helping victims to find shelter is a typical example of an expanding organization. Type II organizations undergo tremendous stress as they change their structure and expand their functions, their boundaries weaken, and their disaster time functions are vague (Dynes & Quarantelli, 1968; Dynes, 1970, pp. 142-145. 157-160).

An example of a Type II organization with expanded membership was witnessed in the aftermath of the Flint-Beecher, Michigan (U.S.), tornado, investigated by Form and Nosow (1958). The Salvation Army set up aid stations and encouraged new volunteers to be a part of their operations. The operation of the organization was not threatened, as volunteers knew one another. Therefore, while the organization witnessed a new structure, tasks merely expanded to accommodate the volunteers (Form & Nosow, 1958, p. 183).

Type III is an extending organization that performs non-routine tasks in the impact time period, while retaining its pre-disaster structure. Type III organizations assign new tasks to employees instead of regular ones (Dynes & Quarantelli, 1968; Dynes, 1970, pp. 145-146, 160). After the flood in Fort Wayne, Indiana (U.S.), businesses and restaurants provided assistance with food and supplies. Employees of

businesses continued in their usual roles only with an extension or expansion of their activities. Women's groups retained their structures, but witnessed a change in the type and magnitude of service to be provided. For example, women's groups supplied food to the volunteers (Phillips, 1984).

Type IV is an emergent group that performs non-routine tasks and displays a new structure after impact. Type IV groups tend to emerge in two situations. In the first situation, people are isolated from traditional responding agencies. In the second situation, there is a lack of knowledge about the magnitude of the disaster and lack of coordination and control among responding agencies. In both these situations, emergent groups appear to fill the gaps not being filled by other organizations. Within this larger category, three distinguishable groups form to collect information about the extent of damage, to control the emergency activity and coordinate the activities within the community, and to discover the loopholes and allocate authority and responsibilities where it feels fit. In short, Type IV groups have no pre-disaster structure, but exhibit new structures and tasks after a disaster, only to dissolve soon after the response period is over (Dynes & Quarantelli, 1968; Dynes, 1970, pp. 146-149, 161-164; Stallings & Quarantelli, 1985).

The Flint-Beecher, Michigan (U.S.), tornado response phase in 1953 was marked by emergent groups of primarily local residents or survivors. Emergent groups performed most of the search and rescue activities within the first few hours of the disaster. In addition, the rescuers displayed an emergent structure based on sociologically defined age and sex roles (Form & Nosow, 1958, pp. 38, 68-72).

<u>Summary</u>

A summary of the classic four-fold typology reveals that Type I and II are community organizations with emergency resources that are either available, or have the potential to be available upon short notice. Since the tasks and structures of a Type I organization may remain the same after a disaster, emergence is not witnessed. Similarly, since only the structure changes in a Type II organization after a disaster, emergence is not witnessed here either. Type III organizations are those that become aware of the resources they possess and its potential to assist the community in the post-disaster period. However, Type III organizations experience new tasks and not new structures after a disaster, therefore, Type III organizations are not considered emergent. Type IV groups have no pre-disaster existence and lack any sort of form or structure in the pre-disaster time period. However, a Type IV group typically appears after impact. Type IV groups emerge with new tasks and new structures to handle disaster-generated needs (Dynes, 1970). Therefore, to establish the conditions that generate emergent tasks and structures, a Type IV group is under study after the Indian Ocean Tsunami. In summary, emergence can be defined as a process that occurs in which new tasks *and* structures emerge in disasters in new or old groups that are fulfilling those needs of the community/event which are beyond the capacity of the pre-existing tasks or structures (Dynes, 1970, pp. 136-149).

<u>Definition of Emergence</u>

The above sections have provided a description of organizational response to disasters. Since this study is based specifically on emergence, I will now focus on Type

IV organizations and issues related to it. I begin this section with a definition of emergence.

Based on the literature, I define emergence as new tasks and structures that emerge after a disaster to meet the unfulfilled, disaster-generated needs of a community. Prior studies of emergence have examined it as a dependent variable. The two most important characteristics of emergence under study are tasks and structures of organizations (Dynes, 1970, pp. 136-137). Indicators of the dependent variable have been identified by specifying the characteristics of emergence. Characteristic indicators include new structures (i.e. division of labor) and tasks that may arise in established organizations, new structures and tasks in newly formed groups that respond to the emergency, composition of the emergent groups, and the longevity of the emergent group. A section describing these characteristics follows. Independent variables that foster the appearance of emergence have also been examined in prior studies. Independent variables are generally described as conditions that spur emergence. A section on the independent variables follows the section on characteristics.

Characteristics of Emergence

Emergence has been studied in the U.S. for a number of years. While some studies have reviewed the concept as its sole purpose, other studies have documented cases of emergence as a subset of more comprehensive work. This section reviews the characteristics of emergence, namely, emergent tasks and structures (i.e. division of labor), composition, and duration, based on U.S. and Non-U.S. examples of each.

U.S. Cases of Emergence

Emergent Tasks and Structures

Emergent tasks and structures are key characteristics that help to define emergence. Emergent tasks, in the immediate post-impact phase, can range from fire fighting and search and rescue to body handling. Therefore, to handle emergent tasks, emergent structures tend to arise in departments involved in the official response during critical times. Forrest (1974, p. 40) describes tasks as the arrangement of work activities so that there is efficient use of manpower and resources in the groups' pursuit of their goals. Tasks are any observable activity carried out by a group member. Structure, according to Forrest (1974, p. 35), is specific arrangement of positions, tasks, and relationships that are interdependent and recurrent through time. Therefore, structural differentiation refers to the process by which these components become identifiable. However, after a disaster, identifying the components of structural differentiation is not always easy. Therefore, position, specifically leadership position, is used as a variable to understand the division of labor that surrounds emergence after a disaster (Forrest, 1974, pp. 38-39, see also Forrest, 1978). In most cases with emergent groups, the leaders tend to be familiar with structural mechanisms and have organizational ties that they apply to the emergent group. Also due to previous socialization, some type of formal training, or prior involvement in the social system in question, individuals enter into the group with numerous skills, knowledge, and experience. These attributes become resources for the group and are then used to sort individuals into specific positions (Forrest, 1974, p. 52; 1978).

Division of labor takes place in the emergency time period of a disaster, just as it does during normal times, and is based on socially defined roles. If an environmental change is gradual, the social system adapts to the change through normal adaptive

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responses over time in order to restore equilibrium. On the other hand, if the environmental change is rapid, it creates new processes in a relatively short time and an 'emergency social system' sets in to meet the change (Barton & Merton, 1963, p. 19; Barton, 1969, p. 65). Therefore, after a disaster, an emergent structure (i.e. division of labor) appears based on socially defined roles and adapts to the 'emergency social system'.

Form and Nosow (1958) studied emergent groups in responding agencies after the tornado that struck Flint-Beecher, Michigan. In one instance, the study described how agencies that arrived on the scene believed that local efforts should be integrated into the official response. However, the scene upon arrival was quite the opposite. The agencies found that they had to integrate their actions into the local response setting. This exemplifies the fact that local emergency organizations will face emergent tasks and, perhaps, an emergent structure upon arrival in the field (Form & Nosow, 1958, p. 113).

Taylor, Zurcher, and Key (1970) studied group formation and behavior in the aftermath of the tornado at Topeka, Kansas, in 1966. Their study discusses ways in which a single work crew formed after the tornado, became a unit, and then dissolved after the work was done. Simultaneously, a volunteer center set up 24 hours after the tornado coordinated volunteer activities. Many volunteers chose the type of work they would like to perform, such as desk work, counseling, or kitchen tasks and some others chose manual labor. One group formed a work crew and removed fallen trees and limbs from damaged houses. The group consisted of a heavy equipment operator, a civil defense employee, an undergraduate student, and one of the authors of this book, Dr. Zurcher (Taylor, Zurcher & Key, 1970, pp. 80-83). The emergent groups' coordination and

volunteer behavior after the Topeka, Kansas, tornado bears testimony to the emergence witnessed after disasters.

Emergent structures appear as soon as emergent tasks become visible. Organizations interact with the community from the pre-impact phase, and the interaction is heightened in the immediate post-impact phase. After impact, hierarchical relationships appear in organizations. In large scale disasters, structuring is based on authority. Emergent leadership in the emergency period is generally based on the possession of relevant disaster skills and knowledge (Wenger, 1978, pp. 34-37). Similarly, Neal and Phillips' (1995) study on effective emergency management principles accounts for dimensions of emergent structures. Dimensions include a new division of labor, a new hierarchy, and a new set of relationships (Neal & Phillips, 1995).

Structurally, emergent local groups appear to have no relative differentiation. Their hierarchy is flat, with little distance between the top and the bottom, but a division of labor exists. In emergent groups, roles are not highly specialized, and no clearly designated leaders exist. The structure of emergent groups is closely related to the tasks they may undertake. Emergent groups have no formal element of organization, no clear lines of authority, and their members are primarily volunteers. Hence, emergent groups appear to have new structures and tasks after a disaster (Stallings & Quarantelli, 1985).

Some studies have established that tasks and structures of public officials may change after a disaster. Police departments, during normal times, are concerned primarily with patrol, traffic, and detective work. However, during post-disaster time periods, protection of life and property, and search and rescue become important tasks for them as well (Wenger, Quarantelli & Dynes, 1989, p.17). In addition, officers deployed to the

field may exercise some amount of personal discretion. But sometimes they may receive directives from local emergency managers. Therefore, not only do police officers witness emergent tasks in the field, but they have to accommodate emergent structures (i.e. division of labor) as well (Wenger, Quarantelli & Dynes, 1989, pp. 17-29). Also, public officials (police officers) already engaged in search and rescue continue to help the local citizens until formal response arrives. Thus, they abandon their routine tasks under their rigid structures (Kennedy, 1970; Wenger, Quarantelli & Dynes, 1989, pp. 22-23).

Fire departments tend to exclude themselves from any tasks not related to fire suppression, but they do take on assistive roles in the emergency phase and withdraw as soon as possible. The involvement of fire departments takes place due to the availability of resources. Emergence, however, takes place in the form of structures in fire departments as they coordinate with emergent citizen efforts. Police and fire departments face emergent structures in terms of decision making, communication channels, and logistics (Warheit, 1970; Wenger, Quarantelli & Dynes, 1989, pp. 48-49).

In addition to this study, multiple studies conducted after the 1983 flood in Salt Lake City, Utah, describes how a number of normal operating procedures changed and how officials undertook tasks quite different from their job descriptions. For example, at the pre-planned command center, an informal group of experts from different levels of authority provided technical advice. In another example, the public works department directed police personnel and emergent groups to sandbag and channelize the river. Communication lines also changed considerably (Ireland, 1984; Neal, 1985; Quarantelli, 1983, 1994). Therefore, due to the disaster-generated needs of the moment, official response patterns and behaviors change to accommodate new patterns of behavior, and

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emergent tasks and structures appear (Ireland, 1984; Neal, 1985; Quarantelli, 1983, 1994).

Search and rescue activities, as documented by the study on emergence done by Drabek (1981), calls upon all emergency managers to recognize the fact that responding to disasters in the United States is multi-organizational and emergent. Emergent multi-organizational networks are loosely coupled systems. Managing such networks must be viewed as a legitimate problem for which existing theories may be inapplicable (Drabek, 1981, p. 243). Citizens and local agencies are bound to respond, and this unofficial response needs to be planned and prepared for and incorporated into the entire response scenario.

Composition

Composition of emergent group/s is another characteristic of emergence that throws light on the concept. Most of the residents of Flint-Beecher, Michigan, were either volunteers with the local Red Cross or the civil defense authorities. Hence, volunteer activity was easily born after the tornado because they functioned by virtue of being individuals and not as members of their respective organizations (Form & Nosow, 1958, p. 114). After the tornado in Topeka, Kansas, in 1966, groups and individuals volunteered from the community, and yet others were strangers. A manual labor group that formed comprised of strangers, those that had not been affected by the tornado, and those that had no relatives or friends who were in need of help (Taylor, Zurcher & Key, 1970, p. 80). Therefore, volunteer groups do not necessarily include members from the community, but may be complete strangers (Taylor, Zurcher & Key, 1970, p. 80).

Forrest (1974) studied groups in terms of 'core' and 'associate' participants. Core participants typically form the nucleus and seldom exceed 30 people. Associate participants, on the other hand, could range anywhere up to 100 members who perform the necessary tasks and then withdraw their services (Forrest, 1974, p. 47).

Studies have established that groups may be comprised of public officials or private citizens (Mileti, Drabek & Haas, 1975, p. 72). Some studies have intentionally left out the role of public officials in disaster time periods as they are believed to perform their regular roles (Quarantelli, 1983, p. 3, 1984). The role of public officials is intentionally included in this study to display the differences that exist between a Western and Eastern cultural context and, hence, the handling of the situation. The role of public officials is also included to document what public officials in other nations do in these disaster events and how their tasks and structures may change in the emergency time period.

In short, emergent groups may comprise complete strangers to the area who are willing to assist the search and rescue effort. The number of members of the groups may also vary depending on how the group formed and who the leaders are. Likewise, the composition differs in terms of the type of people that form the members, i.e. public officials or ordinary citizens.

Duration

The existential duration of emergent groups is under-studied. Researchers have noted that emergent citizen groups during the impact period deal specifically with saving lives and coordinating community response. Citizen groups appear to be short lived, exist only during and after the immediate post-impact period, and very seldom become

institutionalized (Dynes, 1970, p. 46; Taylor, Zurcher & Key, 1970; Forrest, 1974; Mileti, Drabek & Haas, 1975, p. 75; Stallings & Quarantelli, 1985; Tierney, 2001).

A manual labor group discussed in the study by Taylor, Zurcher, and Key (1970), stayed together for three days. In the first day the group grew to 6 members, by the next day it had 14, and on the third day it was reduced to 9 members. The group, however, stayed together for at least the first two days, on account of the 10 core members. When the volunteers were asked what motivated them to form the group and do the work, their answers bordered on the need to do something, to be active, to counter the sense of frustration, and their innate concerns for the problems within the low income area. This crew dissolved after the third day, but assisted with the psychological recovery of the individual and the social recovery of the community after the disaster (Taylor, Zurcher & Key, 1970, pp. 80-84).

'Core members' that form the nucleus of the group stay together for a much longer duration than 'associate' members. Associate members generally dissolve or withdraw services from the emergent group after the tasks are accomplished or goals achieved (Forrest, 1974, p. 47). Also, emergent groups show marked variations in their timing of arrival and the tasks they perform. Some emergent groups appear in the post-impact period, some in the pre-impact, and yet others in the post-recovery time period (Quarantelli, 1984). What makes some groups dissolve and others institutionalize is beyond the scope of this study.

Non U.S. Cases of Emergence

After examining the U.S. cases of emergence, it is also necessary to discuss emergence in other countries as well, in order to identify the similarities and differences

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that may exist between countries. Disasters can be handled very differently from one country to another depending on the political structure of the country. Hence, it is necessary to review the existing literature in order to achieve a broader understanding of emergence that occurred in India. The Non-U.S. characteristics of emergence are discussed below.

Emergent Tasks and Structures

After a disaster, new tasks and structures in emergent groups are equally apparent outside the United States as they are within the U.S. Structural changes appear in terms of division of labor. After the explosion at Halifax, Canada, Prince (1920) observed that refugees preferred plural leadership and decision-making. Initially, work started hastily and haphazardly until the responders realized that they required coordination. Groups formed, went in different directions to scourge the area, and kept a record of the searched area (Prince, 1920, p. 60). Disaster Research Center field workers noticed emergent groups after the earthquake in Chile in 1965. However, officials controlled the influence of emergent groups (Kennedy, 1971; Quarantelli, 1984). Likewise, after the earthquake in Italy in 1968, visitors handled emergent tasks of search and rescue and body handling (McLuckie, 1977).

Similarly, after the Mexico City Earthquake in 1985 at the local level, emergent groups handled disaster-generated tasks of search and rescue, debris clearance, and the provision of supplies. Some volunteers also assisted emergency relief organizations with translations. Other volunteers provided medical help and assistance. Although studies indicate that only 9.8% of the population volunteered, considering the overall population of Mexico, the percentage amounts to 2,000,000 volunteers. Volunteers organized

themselves based on their capabilities. When someone made a suggestion about the type of task to be undertaken, volunteers organized themselves with those people who had practical knowledge of that particular task (Dynes, Quarantelli & Wenger, 1988, p. 68). The government, on the other hand, created *ad hoc* committees in the immediate post-impact period to deal with disaster-generated tasks that involved search and rescue and the provision of aid (Dynes, Quarantelli & Wenger, 1988, pp. 48-49). Therefore, emergence occurred after the Mexico City earthquake in the form of emergent tasks and emergent structures at the government and public levels (Dynes, Quarantelli & Wenger, 1988).

After the Guadalajara, Mexico, gasoline explosion, studied by Aguirre, Wenger, Glass, Murillo and Vigo (1995), the division of labor among emergent groups proved extremely important. Local people allocated searchable areas because they had the knowledge of potential victims. This appeared to be a very important form of division of labor in Mexico (Aguirre et al., 1995). Aguirre et al. (1995) documents that neighbors and kinfolk performed rescue work in the first hour of the post-disaster response phase. Search and rescue activities began immediately after impact. Rescuers used knowledge interchangeably. When formal organizations arrived, they used the local information to reach victims, while local search and rescue groups used the formal organizations' knowledge to extricate and transport victims (Aguirre et al., 1995). Therefore, local rescuers handled emergent tasks of search and rescue and body handling in the first few crucial hours after impact. Later, when formal rescue crews arrived, they integrated their action into the local response, thus generating an emergent structural change.

Composition

Researchers frequently observe that outsiders and strangers assist with the relief and rescue efforts. People with no family ties and visitors to the area handled the first phase of the work in Halifax, Canada. The others first went home to check on families, but soon joined the rescue activities. Prince (1920, p. 60) describes that people responded voluntarily to the disaster. Likewise, in Sicily, Italy, in 1968, volunteers handled the dead and the initial search and rescue. However, for the most part, visitors from other parts of Italy or from other countries volunteered, rather than people from the local area (McLuckie, 1977, p. 58).

Duration

Studies conducted after the Mexico City earthquake indicate that nearly half the amount of all the volunteers worked for more than 4 days. Many volunteers spent more than 10 days handling disaster-related tasks. On average, volunteers claimed to work 9 hours a day, while some claimed a 17 hour work day that involved disaster-generated tasks (Dynes, Quarantelli & Wenger, 1988, p. 21; Wenger & James, 1994). Emergent groups performed critical life saving tasks in the first two hours after the gasoline explosion in Guadalajara, Mexico, as well. Rescuers, after the explosion, performed a considerable amount of search and rescue tasks within the first 2 days before dissolving (Aguirre et al., 1995).

Summary of Characteristics

To summarize the key characteristics of emergence in the U.S., it can be stated with empirical evidence that structures and tasks change during the response phase. Rigid bureaucratic organizations, such as police and fire departments may experience a change

in their tasks and structures due to a disaster. After a disaster, police and fire officials engage in search and rescue and body handling. They receive orders from authorities already in the field. Local emergency managers may guide the search and rescue operations in the field and police and fire officers are compelled to take instructions from them. Therefore, emergent tasks and structures appear in the field. Sometimes local people, who possess local knowledge of the whereabouts of victims, guide the search and rescue activities. In these instances, police and fire officers integrate their response into the local one. Thus, emergent tasks generated by the disaster are handled through emergent structures. In the U.S. and abroad, divisions of labor follow socially defined roles after a disaster. Socio-structural factors that pre-existed the disaster are responsible for a new division of labor in the response phase. First responders are not necessarily local residents, but may be complete outsiders to the community with the desire to do something. At the same time, first responders may not be local people, but may also be local officials who initiate search and rescue in their communities until formal response arrives. Thereby, local officials set aside their regular tasks.

In studies outside the U.S., the community dominates one's lifestyle during normal times. When disaster strikes, the community's cohesive force leads to emergent behavior. Emergent tasks of search and rescue and body handling emerge after a disaster. Emergent tasks are handled by volunteers who may be complete strangers to the affected community. Structural changes emerge through a division of labor based on sociologically defined roles. Emergent groups outside the U.S. are similar to emergent groups within the U.S., in that their presence is ephemeral. Given this summary of key

characteristics of emergence, I will now discuss the conditions that foster emergence within and outside the United States.

<u>Emergence in India</u>

To understand emergence in India it is necessary to comprehend the cultural context of the country. In most cases, it is this cultural setting which provides a protective network in the first few critical days after a disaster (Shrivastava, 1987). It is also typical in the Indian context and culture to exhibit a remarkable display of altruism on a daily basis even in small-time crises. For instance, injured people are generally transported to hospitals by volunteers or the general public using non-medical vehicles such as bullock carts in India (Sethi & Tyagi, 1999).

Roth (1970) noted that in developing countries, the National Government assumes all responsibility for the disaster because it possesses extensive personnel and resources. In a developing country like India, therefore, one may assume that the National Government's responsibility and involvement begins with the first alert and terminates only after restoration. After the Industrial crisis at Bhopal in 1984, the victims initially expected the government to fulfill all their relief needs. However, when government aid was shortcoming, the victims resorted to demonstrations and used dominant groups and discourse to express their discontent. Immediately after the disaster, citizen groups organized and provided relief to victims even before the government mobilized aid. Citizens groups collected and distributed food from door-to-door. Citizens also welcomed strangers into their homes and provided them with shelter and medical relief (Shristava, 1987).

After the Gujarat earthquake in 2001, newspapers reported that volunteers cut across communal lines to assist with the relief efforts. After the disaster, volunteers handled the dead and appeared actively involved in mass cremations in Gujarat (Venkatesan & Swami, 2001). IBM also requested volunteers to assist with database management as they needed people who spoke the local language in Gujarat. Approximately 50 people volunteered their time and effort (Comfort, 2003). Indian newspaper reports have cited a number of instances where church volunteers and other locals provided valuable assistance after the tsunami (Venkatesh, 2004).

Conditions of emergence

Theoretical Works

Researchers have examined emergence from a theoretical standpoint and empirical studies have simultaneously supported theories on emergence. In this section, I will review the theoretical works offered by researchers, on conditions that foster emergence. In addition, I will support these theories with empirical works from within and outside the United States.

Unmet needs

Disasters generate stresses within a community. A collective stress is said to occur when "members of a social system fail to receive expected conditions of life from the system" (Barton, 1969, p. 38). Therefore, unmet needs occur. Sudden climatic and environmental changes, for instance any type of disaster, may cause collective stress. Research on collective stress situations show that when the onset of stress is sudden and preparation and planning is low, unmet needs are generated and self-help may be expected (Barton & Merton, 1963, pp. 5, 125; Dynes, 1970, p. 53). In addition, emergent

groups form in situations where people are isolated from traditional responding agencies. When these agencies are not available, emergent groups tend to fill the gaps (Dynes, 1970, p. 146; Stallings, 1978; Drabek, 1986, pp. 157-172).

When the needs of the members of the social system exceed the capability of the same system, then organizational capabilities are compromised and questioned (Barton & Merton, 1963, p. 3; Barton, 1969; Dynes, 1970, p. 81). A breakdown in organizational ability to respond and meet disaster-generated needs is a condition that spurs emergence. Therefore, new forms of a social system emerge. Organizational breakdown occurs when there is a lack of any form of pre-planning (Parr, 1970; Drabek, 1968; 1981, p. 17; 1986; Mileti, 1999, p. 222), lack of authority (Parr, 1970; Drabek, 1968; 1981, p. 17; 1986; Stallings, 1978; Drabek & McEntire, 2002), collapse of authority (Parr, 1970; Drabek, 1968; 1981, p. 17; 1986; Drabek & McEntire, 2002), and challenging tasks (Parr, 1970; Mileti, 1999, p. 222). In addition, a lack of prior experience and unclear definitive information also leads to emergence (Drabek, 1986). Therefore, conditions are generated where needs are left unmet and administrative shortcomings are apparent, thus emergence is facilitated (Dynes, 1970, p. 81; Mileti, Drabek & Haas, 1975, p. 72).

Magnitude and Proximity

Collective stress situations are studied by sociologists to understand behaviors of individuals and groups after a disaster. Collective stress is studied in terms of speed of onset and scope, in order to understand why self-help or emergent behavior occurs after a disaster. When the magnitude of the stress is large, communities adapt accordingly and make use of their own resources to cope with the collective stress situation (Barton & Merton, 1963, p. 5, 125; Dynes, 1970, pp. 81-82). When the magnitude of impact exceeds

the response capacities of formal organizations, then informal mass action plays an important role in minimizing loss and suffering (Barton & Merton, 1963, p. 123, 168; Dynes, 1970, pp. 81-82; Kreps, 1978; Drabek, 1981, p. 17) The sudden occurrence of a disaster coupled with the magnitude of the event could give rise to emergent behavior among affected individuals. Emergent behavior occurs as a form of adaptation to the altered social setting (Barton & Merton, 1963, p. 148).

Theory indicates that distance from the impacted area, magnitude of the impact, and the availability of resources may demand that local citizens, NGOs, and caring organizations get involved in the response (Wenger & Parr, 1969; Roth, 1970; Forrest, 1974, 1978). They get involved because they have resources and manpower available, or they are able to procure it in a short duration of time (Roth, 1970; Forrest 1974, pp. 54-58, 1978; Mileti, 1999, p. 222). Also, populations in the impact area are involuntarily involved in the disaster. However, populations in the fringe areas of impact are the primary suppliers of volunteers and materials after a disaster as they have suffered lesser damage and destruction (Dynes, 1970, p. 58). Proximity to the impact area, therefore, is a condition that spurs emergence.

When the geographic scope and number of affected people are large, established organizations are unable to routinely meet disaster demands. Therefore, the social system generates adaptive social structures because the deaths and damage are extensive in such situations (Kreps, 1978, p. 78). Kreps (1978) hypothesizes, "the greater the intensity and scope of impact, the greater the disparity between demands and capabilities for responding groups and organizations; thus, the greater the non-routine organized disaster response" (p. 80). Also, "the greater the size, density, and proximity of community

populations to the impact area, the more complex the milling processes and the greater the development of emergent groups which perform disaster-relevant activities" (Kreps, 1978, pp. 80-81). Therefore, with a large magnitude disaster and greater proximity to the impact area, emergence is more likely to be observed.

Pre-existing networks

Pre-existing social networks are a primary condition that facilitates emergence within and outside the United States. Emergent or adaptive behavior is expected in close knit communities where pre-established social networks exist (Barton & Merton, 1963, p. 148). In communities dominated by personalized relationships and strong pre-existing social networks, formal response organizations are ignored and considered irrelevant (Dynes, 1970, p. 103). Community members tend to cope with the disaster with their pre-existing structures (Dynes, 1970, p. 103; Forrest, 1974, p. 84; Tierney, 2001, pp. 113-114, 174-177).

Roth (1970) conducted a cross comparative study on emergent groups within and outside the U.S. His study noted that emergent groups formed outside the United States in countries where kinship and community involvement have a high value. Community and kinship values tend to dominate one's lifestyle and social standing. Hence, these values dictate individual involvement in myriad activities. Activities include search and rescue, helping victims, and handling and burying the dead (Roth, 1970).

Prior social networks and community interaction provide the stimulus for emergent group participation. In a crisis situation, individuals seek out those who they are familiar with to determine a course of action. These individuals in turn recruit others to join the collective emergent group effort that confronts them (Forrest, 1974, p. 98, 1978).

Due to pre-existing social networks, local people have prior knowledge about the probable locations of victims. Therefore, this local knowledge may serve to reduce time and energy during the emergency period.

Also, pre-existing social networks have inherent leaders within the community who continue to maintain their leadership roles during the disaster time period as well (Forrest, 1974, p. 27, 1978). Fire departments that consist primarily of volunteers attest to the fact that pre-existing connections and broader familiarity with one another make the tasks at hand easier to perform with less controversy (Wenger, Quarantelli & Dynes, 1989).

Pre-existing networks also facilitate the exchange of information and resources. Pre-disaster occupational contacts lead to easier procurement of resources required for disaster operations. Similarly, individuals who represent two or more organizations help to bring about coordination between the organizations. Coordination is achieved because the individuals possess knowledge of procedures and personnel in both organizations. Likewise, people who have lived in the community for a long time and have friendship networks, assist with communication between organizations (Dynes, 1978). Therefore, pre-existing networks help to facilitate emergence in the emergency time period following disasters.

Quarantelli (1983) also hypothesized that "while a perceived need for action is a necessary condition; the sufficient condition for emergence is a facilitating social context" (p. 23). Individuals will engage in new behaviors if their pre-disaster social setting warrants the means for new action; thus, pre-existing social networks facilitate emergence (Quarantelli, 1983).

Drabek (1986, pp. 132-197) identifies pre-existing social networks, among others, as a key condition that spurs emergence. Individuals that are embedded in social groups feel a responsibility toward the well being of others and, therefore, engage in adaptive responses that may be emergent. Following large-scale natural disasters, emergent friendship patterns, kin relationships, and new interaction patterns are common among neighbors and friends. Social networks that pre-exist the disaster are primary causes of emergent behavior after disasters and emergency planners must be aware of this strong social bond (Drabek, 1968, 1986, pp. 115, 153, 1987).

Neal and Phillips' (1995) study on effective emergency management procedures, supports the notion that pre-existing networks facilitate emergence. Their study suggests that emergence, facilitated by prior social networks, provides innovative solutions to assist victims of a disaster (Neal & Phillips, 1995). Mileti (1999, p. 222) purports that a strong supportive social climate generates group emergence after a disaster. A recent study, on community as social capital, by Dynes (2005), also supports the existing theoretical literature that pre-existing social ties spur emergent behavior.

Summary of Theoretical Works

In summary, conditions that generate emergence are unmet needs, pre-existing social networks, magnitude of the disaster, and proximity to the impact area. Communities also experience a heightened sense of solidarity and altruism after a disaster. A summary of findings on human systems response to disasters by Mileti, Drabek, and Haas (1975) suggests, "all other things being equal, following impact there will be a heightened sense of 'morale' and organizational solidarity (p. 84). A theoretical study of emergent functions and structures by Wenger (1978) concurs with the altruistic

behavior of individuals after a disaster. After impact, high priority is placed on support

and 'helping behavior'. Altruism and cooperative behavior are common and competition

is condemned (Wenger, 1978). I will now support the theoretical premises above with

empirical examples from within and outside the United States.

Empirical Works

The following section discusses the key conditions that facilitate emergence.

These conditions include unmet needs, magnitude of the disaster, proximity to the impact

area, and pre-existing networks.

U.S. Cases

Unmet needs

Researchers have listed unmet needs as an important condition that must be

present for emergence to take place. Disasters create stress situations which in turn push

responding agencies beyond their response capacities. As a result the community is left

with needs that remain unmet and, hence, emergent behavior serves to fill the gaps.

Form and Nosow's (1958) empirical work after the 1953 tornado which struck

Flint-Beecher, Michigan, identifies unmet needs as the condition which may perpetuate

disasters, and trigger emergence. Unmet needs are community needs which are not being

met by responding organizations and individuals. The situation will continue to persist if

the responding individuals and the organizations do not cooperate with each other or

complement each other's tasks. This situation will lead to further emergence as outside

agencies respond to fulfill the unmet need (Form & Nosow, 1958, p. 18-39).

Another instance of emergence is observed after the 1964 floods in Great Falls,

Montana. Official response failed due to a lack of authority, responsibility, and overall

coordination issues. Radio units of the police and fire departments proved insufficient for coordination. Therefore, citizens band radio units supplemented the response effort. Thus, emergence was spurred because of unmet needs (Yutzy, 1964).

A study on the Indiana Coliseum Explosion, Indiana, by Drabek (1968) reports on operational problems that occurred. The Indianapolis police department faced leadership issues, communication failures, and problems related to the lack of prior planning in the immediate post-impact period. Communication lines overflowed and officers appeared ill-equipped to handle the situation. Convergence of individuals and materials added to the shortcomings of the administration. The civil defense authorities in Indiana, faced problems in terms of overlapping functions with other departments, and employees lacked clarity of purpose and intent (Drabek, 1968, p. 31-70). Therefore, to handle the above unmet needs (coordination deficiencies), organizations resorted to emergent processes of interaction to handle the response. The above examples lead to the conclusion that unmet needs are apparent, therefore, emergence occurs.

Forrest (1974) studied emergent groups after the California bush fires and concluded to further fortify theoretical works that unmet needs serve to generate emergence. Administrative shortcomings stem when there are discrepancies about who is overall in-charge of operations, lack of communication, lack of pre-planning, and wrongly allocated resources (Parr, 1970; Drabek, 1986; Drabek & McEntire, 2002).

Studies on police and fire departments in the U.S. concurs that lack of coordination, lack of knowledge of the impact, and the lack of information about the needs of the community may lead to the emergence of groups in the affected area. Group

emergence takes place to fulfill unmet needs of the community (Wenger, Quarantelli & Dynes, 1989).

Magnitude of the disaster

Emergence is linked to the severity of the disaster. The greater the devastation to a community in the aftermath of a disaster, the greater is the likelihood that emergent groups will form to help during the response. The scope of the impact determines if the responding organizations can handle the disaster without emergent groups. If only a small part of the social system is affected, organizations can concentrate their services to meet disaster generated needs of the system. If a large portion of the social system is affected by the disaster, it will exceed the capacity of the formal organization to respond and, thus, necessitate small group help (Barton & Merton, 1963; Barton, 1969, p. 127). A study conducted on the World Trade Center, New York, attacks in 2001, is testimony that the magnitude of the disaster proved far more than what New York response officials had ever planned for. Thus, emergent groups formed and assisted with the response (Tierney, 2003).

Proximity to impact area

"The closer an individual is to the area of impact; the more likely he is to have direct contact with the victims" (Barton, 1969, p. 218). An analysis of quantitative data from the Arkansas tornado, led Barton and Merton (1963) to the conclusion that residents from the impact area provided considerably more aid in terms of search and rescue, rather than residents from non-impact areas (Barton & Merton, 1963, pp. 80, 127).

The proximity to the impact area also facilitated emergence at Flint-Beecher, Michigan. First responders appeared to be the ones closest to the impact area. They

initiated rescue operations of others as soon as they rescued or confirmed the whereabouts of specific family members (Form & Nosow, 1958, pp. 72-76).

Pre-existing networks

Form and Nosow's (1958) study after the tornado in Flint-Beecher, Michigan, perpetuates the notion that pre-existing networks tend to save a great number of lives. The local residents' knowledge of the whereabouts of victims enabled them to find all potential victims (Form & Nosow, 1958, p. 18-39). Similarly, after the tornado in Topeka, Kansas, a group of local people formed the first response group, which also involved the author of the book, Taylor (Taylor, Zurcher & Key, 1970).

After the Coliseum Explosion at the Indiana State Fairgrounds, Indiana, in 1963, pre-existing friendship networks and personal relationships appeared significant for organizations handling the response. Personal relations between officials built up over the years in public service facilitated emergent coordination between organizations. Therefore, due to pre-disaster relationships, civil defense authorities coordinated their actions with other groups. Similarly, since the Executive Director of the Red Cross, sought advice from the telephone company, he called an employee of the company who appeared to be an ex-member of the Red Cross. Thus, inter-personal relationships facilitated emergence after the Coliseum Explosion. Pre-disaster relationships and friendship networks, therefore, had an effect on how public officials performed their roles during the response (Drabek, 1968, pp. 72, 174-175).

At the local level, after the 1983 flood in Salt Lake City, Utah, a number of emergent groups appeared. Emergence is believed to have taken place due to the strong socio-structural factors that pre-existed the flood. Pre-existing complex religious

networks allowed easier mobilization of a large number of volunteers. For instance, a number of volunteers helped to channelize a river and prevent the inundation of the central parts of the city (Ireland, 1984; Neal, 1985; Quarantelli, 1994).

After a bomb exploded in the World Trade Center, New York, in 1993, employees and tenants from the twin towers displayed emergent evacuation behavior consistent with the literature. Their evacuation from the towers was orderly, cooperative, and due to pre-existing social networks, evacuees concerned themselves with the safe exit of others before themselves. Therefore, pre-existing social ties play a role in emergent behavior following a disaster (Aguirre, Wenger & Vigo, 1998).

Non-U.S. Cases

Unmet needs

After the Mexico City earthquake on September 19, 1985, a number of emergent groups appeared to meet and manage massive disaster needs. A study conducted by Dynes, Quarantelli, and Wenger (1988) of the Disaster Research Center reinforced the idea that unmet needs generated emergent behavior. The initial image of the organizational response after the earthquake was characterized by lack of pre-planning, lack of coordination, duplication of efforts, organizational conflict, and in general a state of 'chaos'. A duplication of efforts occurred because one organization did not know what action another organization was taking. The response, nonetheless, appeared to be a highly complex, yet massive assault by the Mexican public and private sectors. The problem of military control in the central civilian parts of the city created the need for two *ad hoc* emergent civilian multi-departmental commissions. Furthermore, unmet needs in terms of needed resources and the sheer magnitude of the event facilitated the

creation of these emergent civilian commissions. The President created another two *ad hoc* committees to manage the governmental response in areas outside Mexico City (Dynes, Quarantelli & Wenger, 1988; Wenger & James, 1994). Emergence, therefore, took place due to the lack of pre-planning by the federal and metropolitan agencies. The government created an emergent structure to handle emergent tasks generated by the disaster.

In the time it took for the government to organize themselves and establish the above mentioned *ad hoc* commissions, the public and other organizations initiated search and rescue. The public engaged in disaster-generated emergent tasks of search and rescue, delivery of medical aid, provision of shelter, and handling the dead. A lack of prior planning provoked the locals to initiate their own search and rescue and body handling tasks based on what appeared to be the priorities at the moment (Dynes, Quarantelli & Wenger, 1988).

Magnitude and Proximity of Impact

In theory, magnitude of the disaster and proximity to the impact area are conditions that spur emergence. However, after the Earthquake in Mexico City in 1985, emergent behavior occurred more from individuals residing moderate and distances far from the impact area, rather than from the immediate impact area (Dynes, Quarantelli & Wenger, 1988; Wenger & James, 1994). On the other hand, after the Guadalajara, Mexico, gasoline explosion, more emergent behavior was noted from individuals in the immediate impact area. The local people initiated search and rescue in the immediate impact area and later moved outward toward the fringes of impact (Aguirre et al., 1995).

The severity of the earthquake in Kobe, Japan, also spurred emergent behavior among community residents. Volunteering is not widespread in Japan due to the cultural history of the country. Yet, due to the magnitude of the impact volunteer activity appeared greatly heightened and emergence took place after the earthquake (Tierney & Goltz, 1997).

Since the evidence for proximity as a condition of emergence is contradictory outside the U.S., further research is required internationally to provide conclusive evidence for proximity.

Pre-existing networks

Pre-existing networks played a role insofar as helping neighbors after the bombing in Hiroshima in 1945. Rescuers primarily helped family members and nearby neighbors (Barton, 1969, p. 28). After the Mexico City earthquake in 1985, emergent groups handled disaster-generated tasks of search and rescue, provision of medical aid, and body handling. Networks that pre-existed the impact facilitated the emergence of collective behavior immediately after impact (Dynes, Quarantelli & Wenger, 1988; Wenger & James, 1994).

The Guadalajara, Mexico, gasoline explosion further fortifies theory as a Non-U.S. case of emergence. Family, friends, and relatives initiated initial search and rescue based on pre-existing social networks and the transfer of knowledge to formal organizations. Search and rescue parties formed in accordance with the need of the hour. Local citizens who knew where to locate victims acted as a catalyst in terms of division of labor. This knowledge allowed the integration of additional volunteers into the search and rescue activities and facilitated the efficient allocation of new responders who

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entered the field. The survival of victims was connected to the information that locals provided of their whereabouts, and appeared grounded in pre-established networks. These pre-established networks consisted of people who were either family or neighbors, people who worked together in the same establishment, or people that had religious relationships with the victims (Aguirre et al., 1995). Aguirre et al.'s (1995) study on emergence documents how the initial search and rescue took place in the immediate impact area. Rescuers later moved outward to the periphery of the disaster area. This movement toward the periphery of impact depicts cohesiveness as people moved out from the regular, normal time areas of interaction (Aguirre et al., 1995).

Summary of Empirical Works

In summary, it is possible to infer that unmet needs, pre-existing social networks, magnitude of the disaster, and proximity to the impacted area are key conditions that foster emergence. In addition, community altruism is also observed within and outside the United States after most disasters. Within the U.S., after the tornado at Flint-Beecher, Michigan, and Topeka, Kansas, community altruism facilitated emergence (Form & Nosow, 1958; Taylor, Zurcher & Key, 1970). Also, following the blizzard in Ohio in 1978 (Perry, Hawkins & Neal, 1983) and the Northridge, California, earthquake in 1994 (Tierney, 1995), altruistic tendencies spurred emergent behavior. Likewise, outside the U.S., after the explosion in Halifax, Canada (Prince, 1920), community altruism generated emergent behavior. In addition, after the earthquake in Chile in 1965 (Dynes & Quarantelli, 1968; Kennedy, 1971), Mexico City in 1985 (Dynes, Quarantelli & Wenger, 1988), and Kobe, Japan, in 1995 (Barton, 1969, p. 29; Tierney & Goltz, 1997), altruism at the community level spurred emergence.

Summary of Conditions

To summarize the key conditions of emergence, it can be stated that emergence occurs due to the peoples' perception that their needs are not being met by responding agencies. The term perception can be used to fully understand the scope of why emergence takes place, because formal response may not be seen as serving local needs. Serving local needs, therefore, is the primary element which fosters emergence and failure to do so can be referred to as an administrative shortcoming. Pre-existing social networks are a key condition that fosters emergence. Social ties and bonds, local leaders and technical experts pre-exist the disaster. While social ties tend to dominate the formation of groups, local leaders and technical experts provide the division of labor during the response phase. Lastly, the magnitude of impact fosters emergence as not only local citizens emerge as first responders, but outsiders to the community as well. Outsiders arrive at the impacted area with the inherent need to help.

Summary and Conclusion

The study of this topic is, therefore, important because disasters and emergence seem to go together. The 'need of the hour' and the 'need to do something', calls upon all individuals to respond to the urgency of the situation. They selflessly devote their energies to the rescue and relief operations. The social breakdown of a community does not occur as it is apprehended. Instead, social norms and values are held in place, but may experience new demands upon them as the disaster situation may provide.

Based on the literature, I define emergence as "new attributes that appear in completely new or historically old organizations to handle disaster-generated issues of the moment". Therefore, the key characteristics of emergence generated by a disaster are

emergent tasks and structures (i.e. division of labor based either on sociologically defined roles or pre-disaster leadership potential) that deal with disaster-generated priorities, the composition of emergent group/s (consisting of private individuals or public officials), and the duration of the emergent group/s.

The key conditions that trigger emergence are: unmet needs (inadequate fulfillment of community needs on the part of responding agencies); the magnitude of impact (the enormity of the disaster); proximity to the impact area (the relative distance from the impact area); pre-existing social networks, which displays not only a U.S. trend, but an international trend as well; and community altruism.

CHAPTER III

METHODOLOGY

Overview

This chapter describes the methods used in gathering and analyzing the data. The

chapter begins with a justification of the site selection for data gathering. The chapter will

then provide a description of the State of Tamil Nadu and the District of Nagapattinam

followed by justification of the research methodology. Next, I will describe the main

data-gathering procedures followed by the fieldwork process, the sampling technique,

efforts to protect the rights of human subjects, and ways in which the credibility and

trustworthiness of the data were assessed. Finally, I describe the data analysis

procedures.

Site Selection

The tsunami impacted a 1,076 km stretch of the eastern Indian coastline from the

southern tip of the nation to Chennai along the coastline of the State of Tamil Nadu (see

map 1, p. 4). Approximately 376 villages in 13 districts and 900,000 people were directly

or indirectly affected. Consequently, site selection for this study proved both promising

and challenging. According to the literature, emergence takes place after a disaster due to

the magnitude of impact (Barton & Merton, 1963; Barton, 1969; Dynes,

1970; Roth, 1970), proximity to the impacted area (Barton & Merton, 1963; Dynes, 1970; Roth, 1970; Forrest, 1974, 1978; Kreps, 1978; Drabek, 1981), pre-existing social networks (Barton & Merton, 1963; Dynes, 1970; Forrest, 1974; Drabek, 1968, 1981, 1986; Mileti, 1999), community altruism (Prince, 1920; Barton, 1969; Dynes & Quarantelli, 1968; Roth, 1970; Kennedy, 1971; Aguirre et al., 1995) and unmet needs (Barton & Merton, 1963; Parr, 1970; Dynes, 1970; Forrest, 1974; Drabek, 1986; Mileti, 1999; Drabek & McEntire, 2002). The research question being - why and under what conditions did emergence take place in Tamil Nadu after the tsunami, potential sites were evaluated by examining these criteria: magnitude of impact, known involvement of the local people, and geographical distance from the impact area.

Magnitude of impact can be defined in various ways. For example, Babbie (2004) suggests that being "hard hit" is relatively subjective. For the purposes of this study, I included areas that experienced a disproportionate impact in terms of loss of habitation and loss of life. According to news reports, the State of Tamil Nadu was considered the hardest hit area in India ("Toll reaches 2500 in TN," 2004; "Tsunami toll in TN, Pondy touches 7000," 2004; "9749 confirmed dead in India," 2005). Within this state two districts, Cuddalore and Nagapattinam, fit the 'hard hit' criteria mentioned because they absorbed more than two thirds of the entire death toll of the region. In addition, both districts within the Tamil Nadu State have a large number of fishing villages. The fishing industry was particularly hard hit given that most of the boats were destroyed. Considering that the tsunami occurred within the fisherfolks' industrial and dwelling sectors it was likely that the local fisherfolk would become involved in the response. In addition, due to the high incidence of community altruism in India even in

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small time crises, it was likely (and subsequently confirmed through analysis of news documents) that the fisherfolk and many other locals did become involved in a variety of ways.

Finally, the "geographical distance" criteria was used in that the Cuddalore and Nagapattinam districts were 334 km away from the state capitol suggesting that emergence would occur (as based on the review of relevant literature in chapter two, see Form & Nosow, 1958; Barton & Merton, 1963; Barton, 1969; Dynes, 1970; Roth, 1970; Forrest, 1974; Wenger, Quarantelli & Dynes, 1988 and Wenger & James, 1994). This distance from the state capitol suggested that it was highly unlikely that the administration could enter the field immediately, thus generating unmet social needs at the community level and spurring emergent behavior among the locals. In addition, the tsunami destroyed a key bridge and thereby disabled access to Nagapattinam. This inaccessibility, theoretically, produces more cases of emergence because unmet community needs are generated by the disaster.

Therefore, since the research question states: "why and under what conditions did emergence take place," the magnitude of impact, involvement of the local people, and geographical distance criteria, made Nagapattinam emerge as the most appropriate locale for this study. In addition, the availability of funding and time increased the appropriateness of Nagapattinam. Therefore, it appeared as a site suitable for rich data collection, available to the researcher, and appropriate to the research problem (Spradley, 1980).

Description of Tamil Nadu and Nagapattinam

The State of Tamil Nadu is made up of 30 districts and is located along the south-eastern coastline of India. This state, formerly known as Madras, extends as far south as Kanyakumari which is the southern most point of India where the Bay of Bengal, Indian Ocean and Arabian Sea converge (see map 1, p. 4). Nagapattinam is a district within this state and occupies its south-eastern tip which protrudes into the Bay of Bengal (Government of Tamil Nadu).

The District of Nagapattinam appeared the worst affected with 73 habitations inundated, 6,065 persons dead and 1,922 injured. Therefore, it emerged as a promising field site to study emergence. This district has a total coastline of 187.90 km with a population of 1.48 million (100,000). Out of this population, 196,000 persons along a 10 km stretch of the coastline were severely affected and faced the highest death toll. The main industries in this area are fishing and agriculture. Trade and commerce are also prominent in some parts of the district and are facilitated by the presence of the Basilica of the Virgin Mary located on the coast in the southern part of this district. It is also relevant to mention here that this village suffered one of the highest death tolls in the district.

Selection and Justification of Research Methodology

Although some literature exists on the behavioral phenomenon of emergence, many questions remain. In addition, emergence has not been studied within the context of developing nations and has never been examined within the Indian context or specific to a tsunami event. However, given that India is a developing country with high incidences of altruism and community solidarity exhibited on a daily basis, I

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hypothesized that pre-existing social networks and community altruism were likely to be key conditions spurring emergence in Nagapattinam. At the same time, given the fact that a tsunami has rarely occurred in this region in the recent past, I also hypothesized that this case study may reveal situations and behaviors that are rare or exceptional.

Accordingly, the study was shaped as one that was primarily descriptive and exploratory although influenced by the literature on emergence. Qualitative research, a tradition within the field of disaster studies (Phillips, 1997), was selected as a methodological strategy consistent with the goals of descriptive and exploratory research. Qualitative methods offer rich, deep insights into a given location or event and provide the contextual and cultural content necessary to interpret statements, documents and observations gathered during the study. Thus, this study aims to identify, document and describe the role of the local people as potential resources in crucial life-saving activities immediately following the tsunami. To further bound the study, I concentrated on the behavioral activities of the locals during the first week after the tsunami. Behavioral activities included search and rescue, burial and cremation, emergency housing, first aid, distribution of relief supplies, and other activities. These activities are important when studying emergence as they reflect the primary forms of emergent tasks that are apparent after a disaster. The initial behavior of the locals appeared to be their own initiative, but at times they appeared to join their efforts with others. These behavioral phenomena will be analyzed as a form of emergence, defined as new behaviors, tasks and structures that appear to meet or manage massive disaster needs (Dynes, 1970).

I will now discuss the data gathering methods used in the field and sampling techniques that I employed. This section of the chapter will be followed by a segment that discusses how the credibility and trustworthiness of the data is maintained.

Data-Gathering Procedures

Four data-gathering procedures typical of qualitative research were used: open-ended, semi-structured interviews, document collection, visual data collection, and observations.

Interviewing

Interviews constituted the primary procedure for gathering the bulk of the data. In qualitative interviewing, the researcher attempts to construct a "guided conversation" with the respondent (Rubin & Rubin, 2005). Interviews are relatively open-ended in order to allow the respondent to contribute fully to the research topic (see Appendix I for interview instrument). In all, I conducted a total of 29 interviews with key government officials and local people over a period of four weeks in the field.

For this study, I constructed a semi-structured interview guide that initially focused primarily on search and rescue activities as illustrative of emergent behavior. As the research began, it became clear that search and rescue activities appeared relatively minimal in that the tsunami tragically killed most that it touched. In short, one either lived with relatively few injuries or died. Consequently, the interview guide expanded beyond simply search and rescue to consider the full range of emergent behaviors engaged in by the administration, voluntary organizations and the locals.

Initially I used the interview guide much like a "checklist," (as suggested by Richardson, 1985). The "checklist" method allowed me to check off relevant questions as

the participant provided answers. However, it soon became easy to move from a semi-structured checklist to a more conversational style. The interviews took place in English, Hindi and Tamil with assistance provided by native Tamil speaker and Oklahoma State University student Aswin Subanthore. The conversational style, informal interactive approach, and use of native languages facilitated a rich sense of rapport between the researchers and the participants as expected within a qualitative strategy.

In addition, local participants appeared eager to share their story and offered information freely and voluntarily. Thus, although I anticipated including only formal participants, the fact that a number of locals approached me casually on the street meant that literally dozens of persons acted as voluntary informants. Since I was in the villages which experienced great damage, it appeared that most of the inhabitants of the village, suffered some loss in some way or the other. In addition, the inhabitants of the village were present there at the time of the event. The day of the tragedy being a Sunday, most citizens were at home or around the area. Therefore, informants being close to the zone of impact became involved (Stallings, 2002).

Interviewing continued until the point of saturation occurred, defined as the point at which one can predict the next individual's response (Glaser & Strauss, 1967; Richardson, 1985). As one illustration, this occurred first when interviewing Tamil Nadu government officials. Eleven Indian Administrative Service (IAS) officers led resource teams into the affected areas. By the time I had interviewed the fourth IAS officer, I realized that I was hearing the same thing and could predict the next response. After considering this, I moved on to more local officials in order to diversify and enrich the interview data. I tape-recorded nearly all interviews, which did not prove to be a problem

with participants. In a few cases where individuals seemed a little nervous, I chose not to record but took careful notes and immediately wrote up the interview summary so as to not lose crucial information.

Document Collection

As described in this chapter, triangulation is used to build credibility and trustworthiness within a qualitative study. Triangulation is the process by which statements of respondents are checked against observed behavior, records, and documents. Different sources of information provide information about the same event or relationships (Erlandson et al., 1993). Thus, to supplement the interviewing and to examine the responses from alternative perspectives, I gathered relevant documents. For example, news accounts and web sites provided descriptive information. The Tamil Nadu web site (www.tn.gov.in) posted Situation Reports on the tsunami including injuries, deaths, relief efforts, links to Non-Governmental Organizations (NGO's), locations of relief camps and other information. Respondents frequently offered copies of reports, PowerPoint® presentations, maps and other data at the conclusion of the interview (see Appendix II for a complete listing of relevant documents). Finally, I was able to collect several books and publicly-issued reports while conducting this research within India. These items included government reports on the tsunami as well as the first books and articles on the event.

Documents are a form of unobtrusive or non-reactive measure (Webb et al., 1981) meaning that they do not directly impact upon a human subject. They are items that are left behind or created either intentionally or not. Documents must be assessed for a number of potential biases including the reason for their origin. For example, news

accounts may have been generated sensationally to spur purchases (Gans, 1979). Organizational reports may have been issued to place that agency within a favorable light. Because of these potential biases, it is important to identify the source and its potential limitations, a procedure that will be done in the coming chapters.

I also gathered other potential unobtrusive measures while in the field. I purchased items made by local fisherfolk in a relief camp, and made available for sale within a government office. In addition, I took photographs of documents in various offices (always with permission) and of public displays (for example, of relief efforts).

Visual Data Collection

Although visual data can prove quite useful, such a data gathering procedure remains underused in field research (for exceptions see Collier, 1986; Curry & Clarke, 1977). Several visual data collection strategies can be used within a qualitative field context. I considered photo-saturation and photo-documentation as the most appropriate here (Blinn & Harrist, 1991). Photo-saturation occurs when the researcher photographs frequently, intensively and without prior criteria. I used this strategy during the first part of May for an initial exploratory trip to Nagapattinam. I photographed everything that seemed relevant to the tsunami: damage to the boats, portions of the shoreline, damaged buildings, vacated villages, relief camps, churches, government buildings, and grave sites. Out of concern for human impact, I did not photograph individuals and carefully excluded any identifying features or marks that might compromise human dignity.

On a second trip to Nagapattinam I used the photo-documentation procedure. This strategy is used when the researcher begins to identify themes emerging from the data and tries to record them visually. For example, although I had photographed a

heavily damaged bridge during the earlier visit, I returned to photograph this bridge again. I did so because I realized that the bridge had compromised access to the tsunami-stricken area by outsiders. This inaccessibility to the impacted area may have created a condition that potentially could facilitate emergence. Interview participants commented on this bridge access problem thus confirming the presence of a theme that could be visually documented (for a complete list of visual documents see Appendix III).

Several final sources of visual evidence became available as well from news accounts, web sites and PowerPoint® presentations provided by participants. Because these items represent documents as well, they are mentioned here only briefly.   It is worthwhile to mention that the PowerPoint® visuals provided by participants were presented during the interview process and thus carry narrative descriptions by the creator and/or user of that visual image.

Observational Data Gathering

Observation can be used to gather data on non-verbal behavior, interactions, relationships, and culture (Spradley, 1980).   For the purposes of this study, I observed the response of the participant to the interview questions for several reasons. Primarily, I wanted to insure that the participant felt comfortable with the interview questions and that the study did not produce additional trauma in a community already devastated by the loss of thousands of citizens. As another form of observation, I visited the temporary relief centers and villages erected to house those affected by the tsunami. I also wandered the commercial sectors of several villages in order to see the extent of the water line and the influence of various relief organizations (NGO's in particular) on the affected area.

I also walked down the beaches of Nagapattinam. I observed a once thriving fishing economy now barely had a few boats sent out to sea. Consequently, the daily fish selling business was also sparse to non-existent in some places which is consistent with the locals informing me that there were no fish and that they were afraid to go back to the sea.

The NGOs appeared active in their offices with district maps displayed on the walls and temporary shelters demarcated. They also displayed every government official or IAS officer's contact details on their office walls.

Interestingly, I also noted the sense of cohesiveness and solidarity in the community that existed despite the disaster. I observed locals still sitting together and talking in groups. This suggests a pre-existing social network. According to the literature, pre-existing social networks are a key condition spurring emergence. Therefore, community solidarity and cohesiveness suggested that pre-existing social networks are apparent in Nagapattinam. In this way neighbors and friends joined hands in their community recovery and reconstruction efforts.

Fieldwork Procedures

I identified possible respondents prior to contact and cleared the respondents by a faculty member before initiating contact. This clearance was a part of the fieldwork protocol that I adhered to in the field. I used IRB (Institutional Review Board) protocol for contact (see Appendix IV for IRB forms).

I presented and explained IRB informed consent procedures to participants. In addition, I obtained their written consent before asking any questions or conducting any

interviews among government officials. I made the possible risks and benefits of the study clear to all respondents before and after they signed the consent forms.

To safeguard their rights and minimize risks I offered (in the Tamil language where necessary): a) voluntary participation, b) informed consent forms, c) the right to refuse questions, d) the right to stop at any time, e) a list of NGOs offering counseling. If any participant felt uncomfortable I repeated their options and reminded them that they could stop the interview or continue at another time.

Since I have discussed fieldwork procedures, I will now discuss the historical significance of disaster field research and the methods and problems associated with it. In this section I will describe the processes used to gain entreé and establish rapport with the respondents.

Disaster Field Research

Going to the field is a time-honored tradition in disaster studies, dating back to the time of the 1917 Halifax, Canada, explosion (Prince, 1920; Scanlon, 1988, 2001). Qualitative disaster field research was institutionalized by the Disaster Research Center (formerly of The Ohio State University, now at the University of Delaware) and the work of E.L. Quarantelli and Russell Dynes. Such studies range from the "firehouse research" where one goes to the field immediately upon impact, to studies that extend longitudinally (though rare in existence). Because funding for international work can be difficult to secure, it is not unusual to go to the field months after an event, which occurred in this case.

Qualitative fieldwork requires that the researcher attend to the circumstances, needs and context of the participants (Stebbins et al., 1991). In this case, I was quite

concerned that the tsunami being a catastrophic event deeply influenced the lives, futures, livelihoods, and viability of not only individuals but entire families. Foremost in my mind was the impact that my research could have on the potential participants. I found that, consistent with what other disaster researchers have found, participants and informants appeared eager to share their story.

The process of entering the field began "Indian style" (in India, a 'source' is needed to gain entrée to government officials) by which I mean that I contacted a fellow OSU student from Chennai, Atith Kotcherlakota, and asked him for suggestions. He put me into contact with his father, Mr. Suresh Kotcherlakota, who directs a tea company in Chennai. His considerable connections to the Tamil Nadu state government proved invaluable in that one of his contacts provided entrée and even set up appointments for the interviews in Chennai. His act of sponsorship, described in the literature as one who opens doors and vouches for the individual (Burgess, 1982) made this study possible. Other cultural factors also proved useful. For example, Indians are very supportive of students and are typically enthusiastic in providing data for a student's master's thesis. Other OSU faculty and a student accompanied me on several of the field trips, which provided a further level of legitimacy. To solidify legitimacy, I offered each participant a letter of introduction on OSU letterhead. When I completed each Chennai interview, I asked for referrals to the Nagapattinam area, "snowballing" (described later) into the area. The Chennai interviews in terms of entrée and access could only be described as exceptional and rare. The rare and exceptional description is appropriate because in India gaining access to the bureaucracy, in the manner in which I accomplished, is unusual. It is not a common occurrence for students to be able to conduct so many interviews, with

key government officials directly involved in the entire response efforts in Nagapattinam, in a period of two weeks.

Initially, I had been given an open door to return to Nagapattinam by a key government official, normally a person that might prevent a researcher from further study (Burgess, 1982). However, upon my return I discovered that he was out of town. So, I contacted the key government official's second-in-charge (also an important government official involved in the response at Nagapattinam) and continued the snowball process from there.

Qualitative researchers try to establish rapport or a sense of a connectedness with their interviewee. This can be done by trying to find common ground with the participant, or by motivating the interviewee to join the study. Possible methods to motivate bureaucrats include providing them with a letter of introduction which persuades them to lend academic respectability to the researcher by granting approval (Erlandson et al., 1993). Rapport evolved in several ways. I gained rapport with Government officials due to the fact that I had a 'source' on the inside, as it is called in Indian terminology, which allowed me to gain entrée in the first place. I also provided government officials with a letter of introduction on OSU letterhead to gain their respect and facilitate rapport. These small steps assisted my snowballing process as I was able to prove my purpose for being there and asking those questions made one official recommend me on to the other and so forth.

Sampling

Emergent behavior in disasters offers tremendous theoretical and practical significance for disaster research. However, identifying the sample population is

problematic. Sampling in this case involved using the snow ball technique, a type of non-probability sampling. Snow ball sampling is a process in which the researcher collects data on the sample population that the researcher has been able to locate, then asks the same respondents to provide information to locate other members of the sample population (Babbie, 2004). Therefore, I identified key individuals through secondary sources of data and used these individuals to provide additional sources of information or additional informants. Using the snow ball form of sampling, almost all leads for the emergent groups that may have appeared after the tsunami, were covered if not exhausted (Stallings, 2002). Interviews were of a personal nature and open-ended offering far more practicalities in the disaster field setting as it allowed the respondents to arrive at exactly what information he/she tried to convey (Stallings, 2002).

As stated earlier I gained entrée into the field through a 'source' and continued to use this 'source', who in turn used another, to get me an appointment with officials at the higher end of the Indian bureaucratic hierarchy. Using the snowball technique of referrals I continued my interviews until I began hearing the same story repeated. Thus, I realized my data gathering had reached saturation among Government officials, who were mostly IAS officers and part of the IAS teams deployed to the devastated area.

My next quest began with a referral to the District Collector's office in the Nagapattinam area. The District Collector was unfortunately out of the country at the time and I had to interview his 'second-in-charge', the Additional District Collector. Once again I snowballed down to the locals from this office beginning with the local Panchayat leaders and village elders. I used the referral technique at this stage as well

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until once again my data gathering reached saturation and I began hearing the same story over (Glaser & Strauss, 1967).

Credibility and Trustworthiness of the Data

While quantitative research demands reliability and validity, qualitative researchers prefer to focus on truth-value, trustworthiness and potential transferability of the findings (Lincoln & Guba, 1985; Erlandson et al., 1993). For example, persistent observation and prolonged engagement are used when the researcher focuses intently on the research problem while remaining in or returning to the field for as long as possible. I began gathering documents on December 26, 2004, the day the tsunami hit the Indian coastline and continued that process while securing grant funds and arranging to go to the field. The first field trip took place in the early part of May 2005, during which I was accompanied by a thesis committee member, Dr. David Neal. Our interviews took place within the state government capitol city of Chennai, Tamil Nadu, India. During the first two weeks of June, I returned to Chennai and then went on to Nagapattinam with fellow student Aswin Subanthore and thesis supervisor Dr. Brenda Phillips. After Dr. Phillips and Mr. Subanthore departed for the U.S., I continued to gather documents, to analyze photographs, and to conduct telephone follow-up interviews with selected respondents. Thus, it can be suggested that persistent observation and prolonged engagement in the field occurred to some extent.

As discussed previously, triangulation is another credibility-building strategy. In short, I used interviewing, documents, observation, and visual data to support efforts to examine the phenomena from various perspectives. Triangulation is a commonly used field research method for disaster studies (Stallings, 2002).

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Peer debriefing is a fourth recommended strategy. Peer debriefing is the process in which the researcher steps out of the context under study and reviews perceptions, insights, and analyses with professionals who have a general understanding of the nature of the study and who can provide feedback that will consequently assist the researcher in redirecting the process of inquiry (Erlandson et al., 1993). I benefited from peer debriefing due to having thesis committee members and a fellow student in the field with me. We met several times during the day to share notes and discuss issues, followed by a nightly debriefing session where we jointly planned the next few days' activities. While in Chennai, I was able to participate in a series of virtual debriefings using Blackboard's chat room features. We archived these virtual debriefings for later use. Peer debriefings are considered key to helping the researcher stay focused on the research problem and to generate data that are considered thorough and precise (Erlandson et al., 1993).

While conducting data analysis, a strategy that can be used is negative case analysis. This occurs when the researcher deliberately looks for anomalies in the data, specifically cases that do not fit or that contradict the emerging interpretation of the data. The researcher then assesses, with the help of peer debriefers, whether that anomaly amounts to just that—or is in fact an indicator of a problem with the interpretation. The general goal of negative case analysis is to insure that the majority of the data are explained in a parsimonious fashion and that any evidence to the contrary is accounted for or explained. Negative cases may also indicate a need for further data collection. In short, anything inconsistent with saturated findings is acted upon. To summarize, I used a variety of efforts to insure that the data emerged sound and that the interpretations could hold up under scrutiny by the more general scientific community.

<u>Data Analysis</u>

Qualitative data analysis begins while the researcher is in the field (Erlandson et al., 1993; Lofland, Snow, Anderson & Lofland, 2006). Initially, the researcher begins by gathering data through interviewing and writing summaries of the participants' comments. While doing so, I used the memo-writing technique by identifying the types and forms of emergence that I heard participants describe. Identifying "types" of behavior is a common technique that jump-starts the analytical process (Lofland et al., 2006) and allows the researcher to compare preliminary findings with that found in existing research literature. Thus, when I left the field, I had an extensive set of participant and informant summaries supplemented by a field journal that recorded methodological choices taken in the field. For example, I recorded my methodological choice to continue the snow ball process uninterrupted, by interviewing the second-in-charge to the key government official who was out of town. I generated approximately a dozen memos.

Upon return to the university, I immediately created full and complete transcriptions from key interviews using procedures recommended by Yow (1994). I paid particular attention to how participants phrased their comments, and solicited the support of Mr. Subanthore in matters of word interpretation or problems with accents (or, in the case of a few interviews, where sounds obscured the clarity of the tape recording).

Qualitative data can be assessed through a number of analytical styles. Bogdan and Biklen (1992) recommend the use of coding schemes that focus on activities, tasks, or structures to name a few. Conversely, grounded theorists prefer to read the data extensively and allow themes to emerge from the data (Glaser & Strauss 1967; for a more

detailed approach, see Strauss and Corbin 1990). In yet another approach, one can identify domain, componential and taxonomic analyses from the data (Spradley 1980). Finally, Lofland, Snow, Anderson and Lofland (2006) recommend the use of a "question series" that require the researcher to look for types etc. within the data. The primary differences between these approaches are the terms and the ways in which they are presented. For example, the typologizing suggested by Lofland and Lofland (2006) is similar to the "strict inclusion semantic relationship" domain analysis offered by Spradley (1980).

What is important in qualitative data analysis is the process of spending time immersed in the data: reading and re-reading interviews, comparing with documents, visual and observational data, looking for patterns and anomalies and comparing bits of data to each other. Thus, in reality I used a number of these approaches in order to explore fully the data. I began with the more structured approaches of Lofland and Lofland (2006) as well as Spradley (1980) while in the field, and then moved to more theoretical analyses as guided by Glaser and Strauss (1967).

To do so, I started by comparing participant summaries with each other and identifying the types of emergent behavior. I used Spradley's (1980) developmental research sequence and conducted domain analyses on the transcribed interview data. I used primarily Strict Inclusion and Sequential analyses to establish recurring emergent themes in the data at the State, District, Local and NGO levels. The data are easily focused when domain and taxonomic analyses are done. Based on the developmental research sequence I identified a primary emergent task as the single cover term and related all subsequent tasks, required to achieve the primary task, as subsets to the cover

term. This enabled me to establish the process/es used in achieving the means to an end. The cover term acts as the primary task to be accomplished while the other tasks, required to achieve the primary task, are listed as a function of the cover term.

Summary and Conclusion

The process of data gathering appeared relatively easy due to the access to internal sources that generally prevent entrée. In India it is usually difficult to gain access to government officials on a daily basis. But due to the connections I had, I gained the necessary access required to meet with government officials. Visual and observational data gathering are also extremely useful and I realized their importance when I analyzed the data and triangulated transcribed interviews with photographs and observational notes taken in the field. Credibility and trustworthiness of the data is also achieved by staying in the field for a long period of time and persisting with follow-up telephone interviews. Peer debriefing sessions, held online at appointed times with my thesis committee members and a fellow student, helped me to maintain credibility and trustworthiness of the data.

Finally, Spradley's (1980) developmental research sequences further helped me to identify easily the recurring themes at different levels of analysis and draw conclusions about emergence from the data gathered. I used primarily strict inclusion and sequential domain analyses to identify and analyze the data. Strict inclusion methods enabled me to identify the type or kind of a specific emergent task or structure. Sequential domain analyses enabled me to identify a sequence or pattern in emergent tasks at different levels of the analysis. In this way, themes emerged from the data and allowed me to provide taxonomies of emergent tasks and structures as necessary. Using these methods, I found

it easier to analyze emergent structures and tasks and hence draw conclusions about why and under what conditions emergence took place in Tamil Nadu.

After discussing the methods used to gather and analyze data I will now proceed to discuss the disaster history of India. This discussion will set the stage for the Indian Ocean tsunami that occurred and will help the reader understand the vulnerabilities of the Indian subcontinent. The following chapter will provide the reader with a description of the risks and vulnerabilities of India. The chapter will also include a hazard analysis of India, the State of Tamil Nadu, and the District of Nagapattinam. Therefore, the chapter will lay out a contextual framework to understand, in greater depth, the peculiarities of the perception of risks and vulnerabilities in a developing nation.

CHAPTER IV

DISASTER HISTORY: INDIA

<u>Overview</u>

This chapter identifies potential hazards within India and provides a hazard analysis of India, the State of Tamil Nadu, and the District of Nagapattinam. A hazard analysis provides information on the location and extent of possible risk and vulnerabilities to a specific area. Risk is the probability of hazard occurrence (Drabek & Hoetmer, 1991). Vulnerable people, according to Bolin (1998), are those with the fewest choices, the ones who are discriminated against through politics, the physically challenged, those that lack education and employment, those who are in some way ill, or those who have been marginalized due to historical patterns of domination or subordination.

Identifying the risk and vulnerability of an area is essential to mitigate against and protect citizens from potential hazards (Drabek & Hoetmer, 1991). This chapter does not provide a comprehensive list of risks and vulnerabilities of the areas under study, but delivers a cursory overview of them. Therefore, this chapter allows the reader to develop an understanding of the perception of risk and vulnerability within India related to disasters.

<u>Introduction</u>

Natural or technological disasters are not uncommon to anyone in this world, least of all to anyone from India. Every day the newspapers carry accounts of a landslide in the Himalayas, a flood in the deltas, or a storm along the coast. We keep hearing accounts of famines, epidemics, extremes of temperature, or drought in some corner of our country. India is a country teeming with more than one billion people; it is the second largest populated country in the world (Census of India, 2001; CIA World Fact Book, 2005). With a huge industrial and technological base, it is prone to human mishap. Coupled with the active setting for technological problems, it has approximately 7000 km of coastline, the world's highest mountain range, The Himalayas, a few active faults, and an active monsoon season. As a result, monsoons, floods, cyclones, and storms are embedded in our world we call India (CIA World Fact Book, 2005).

Historically, India has witnessed destruction by storms and floods that constitute the majority of its natural calamities. Earthquakes, which are far less common, are nevertheless devastating and take many lives in towns located in tectonically unstable parts of the country. A slip along a fault line may lead to fears of dam ruptures on the Ganges River and other major rivers. In addition to the natural calamities that plague the country are calamities caused by human failure. Rail, road, and other transport related incidents are not uncommon at all to the layman and account for a significant number of deaths, per year, in the Indian subcontinent (Sinha, 1998).

Some of the major disasters that have taken place in the country are as follows. The Bhopal Gas Tragedy occurred on Monday, December 3, 1984 (Shrivastava, 1987a, 1987b). The Latur Earthquake shook the state of Maharashtra and killed approximately

9,000 people on September 29, 1993 (Jain, 1998; Gupta et al., 1998). A few years later, the Orissa Cyclone on October 29, 1999, killed 9,885 people (De, Dube & Rao, 2005; De, Khole & Dandekar, 2004; Salagrama, 1999). Two years after the Orissa cyclone, the Gujarat earthquake occurred on India's Republic day, January 26, 2001, and killed 20,000 people. On December 26, 2004, the Indian Ocean Tsunami event left 10,872 killed, 6,898 injured and is by far the worst tsunami disaster in world history (Rastogi et al., 2001; EM-DAT, 2005; UNDP, 2005; WHO, 2005).

A Hazards Assessment of India

This section identifies potential hazards within India. Hazard identification provides an overview of potential hazards faced by a particular community (Drabek & Hoetmer, 1991, p. 139). In this section, I review the different types of disasters that have occurred within India. I have grouped hazards according to their characteristics and impacts. In this section, I have also provided a hazard analysis of India, which discusses potential risks and vulnerabilities of India.

Hazard Identification: Types of Hazards

Natural Hazards

Earthquakes

One of the most destructive earthquakes in the 20th century occurred on April 5, 1905, in the State of Himachal Pradesh (north India) in Kangra, an event that killed approximately 20,000 people (Bilham & Ambrayses, 2000; Bilham, 2001; EM-DAT, 2005). On September 30, 1993, a 6.4 magnitude earthquake shook the State of Maharashtra (west India) in the Latur and Osmandabad districts and killed 9,000 people, making it one of the deadliest earthquakes in the continental region (Jain, 1998; Gupta et

al., 1998). In 2001, India's foundation shook once again with a devastating earthquake that rocked the town of Bhuj in the State of Gujarat (north-western India). This earthquake occurred on January 26, 2001, left 20,000 dead, approximately 167,000 injured, and totaled $10 billion in damages (Rastogi et al., 2001; EM-DAT, 2005; United Nations Development Program, 2005). Map 2 represents the earthquake zones in India. It is very noticeable that many parts of India lie in a high to moderate risk zone.

Map 2: Earthquake zones in India (Source: undp.org.in)
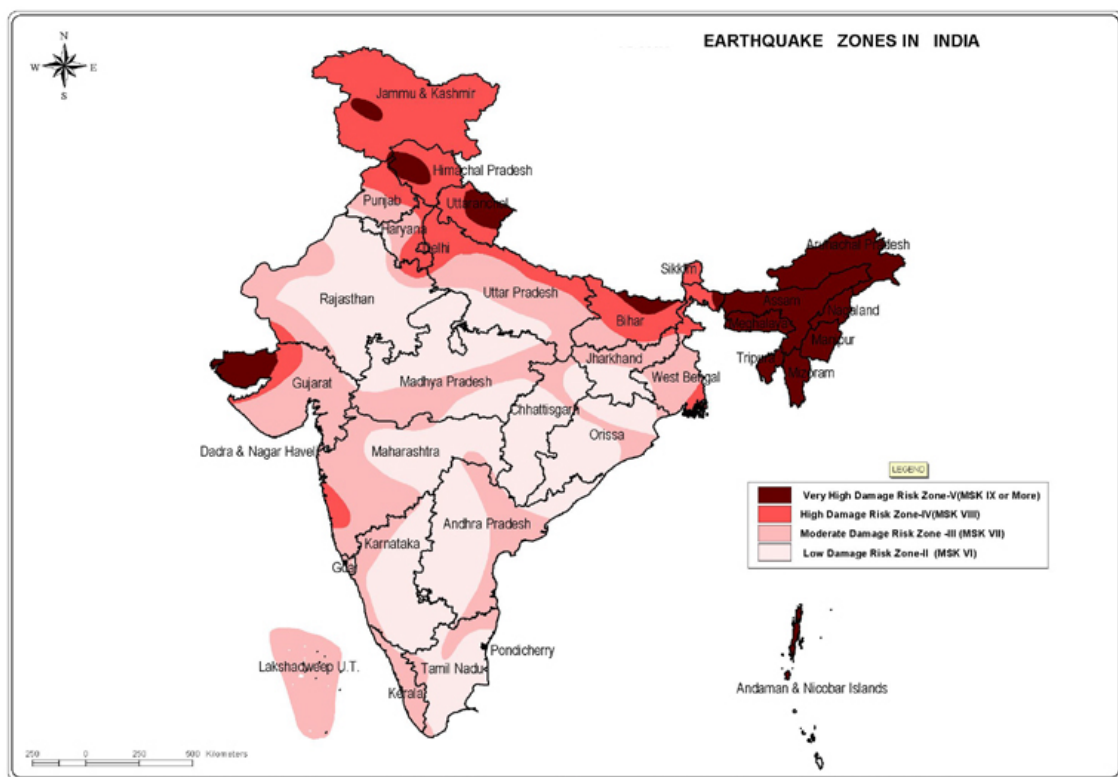
Landslides/Dam collapse

The collapse of the Machhu dam in 1979, in the State of Gujarat, killed approximately 10,000 people (Dhar, 2003). Landslides occur in mountainous regions due to stresses within tectonic plates and the constant collision of the Indian Plate with the Eurasian plate. The debris carried by rivers and the rainfall from the monsoons also

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produce landslides, which result in a significant number of deaths within the Indian subcontinent (Sinha, 1998).

Extreme Climate

Disparities in weather, with extremes of heat and cold, have a tendency to occur quite frequently in India and are related to a substantial number of deaths annually. Cold waves become a nation-wide concern when the numbers of deaths increase due to deterioration in air quality. In the States of Uttar Pradesh and Bihar (east India), cold waves accounted for 957 deaths in 1978, and 2,307 deaths in 1999 (De, Dube & Rao, 2005). The maximum number of heat waves occurs in June (De, Dube & Rao, 2005). For example, a heat wave in 1998 killed approximately 1,300 Indians (De, Khole & Dandekar, 2004). In April 2002, abnormally high temperatures led to 1,000 deaths in India (De, Dube & Rao, 2005).

Floods

Almost 40 million hectares of land in India are flood prone, while yearly, 8 million hectares are affected by floods (De, Dube, Rao, 2005; Government of India [GoI], 2004). In the year 1924, due to flooding in the Ganga and Yamuna rivers (north India), 1,100 people drowned and 242,400 houses washed away. In July 1943, the cities of Ajmer and Merwara experienced more than 50 inches of rainfall in a single day at a cost of 5,000 lives. In October 1955, floods in the Yamuna River claimed 1,500 people and flooded 7,000 villages. In October 1968, due to flooding in the Trista-Brahmaputra river basins, 2,700 people lost their lives in the Darjeeling area (north-east India). In the year 2000, floods in the Godavari and Tungabhadra rivers (south India) caused a loss of 131 lives in Andhra Pradesh and left 98,000 people homeless (De, 2005). Map 3

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represents areas in India that are flood prone. Areas along the Ganges, Brahamaputra and Yamuna rivers appear more likely at risk.

Map 3: Flood zones in India (Source: undp.org.in)
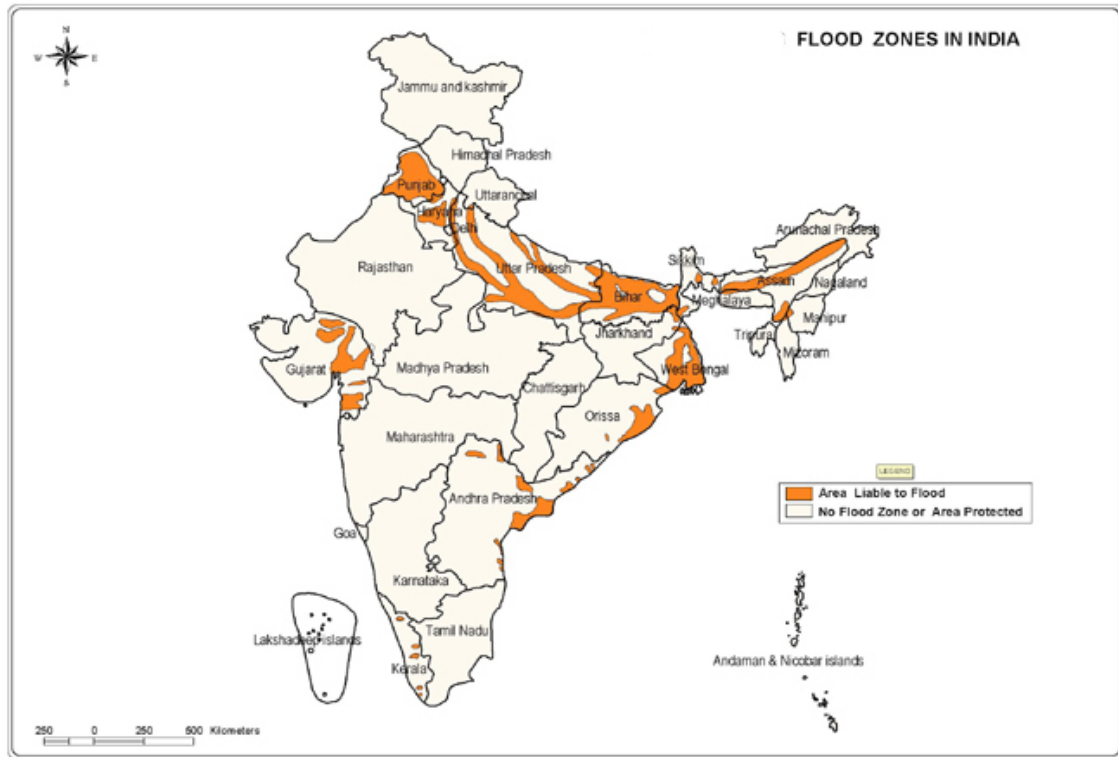
Cyclones/Storms

India's disaster history reveals that storms and cyclones killed approximately 20,000 people in 1942, in the States of Orissa and West Bengal (east India). The tropical cyclone of 1970 killed about 200,000 people, with storm surges of 13–17ft (De, 2005). In 1971, one year later, a cyclone hit the State of Orissa again and killed approximately 10,000 people (De, Dube & Rao, 2005; Indian Meterological Department, 2005; Salagrama, 1999). In 1998, due to cyclones once again, 10,000 deaths occurred, with half of these deaths concentrated in the State of Orissa (De, Khole & Dandekar, 2004). In 1999, a cyclone with wind speeds up to 250 km/hr once again affected Orissa. The cyclone killed 9,885 people, injured 3, 312 people, and affected another 12,625,000

people (De, Dube & Rao, 2005; De, Khole & Dandekar, 2004; EM-DAT, 2005; UNDP, 2005). This area is especially prone to such severe weather due to its location near the Bay of Bengal, and because cyclonic disturbances originate in the Indian Ocean (see map 4). Death due to cyclones appears to be decreasing due to advances in forecasting and warnings (De, Dube & Rao, 2005; De, Khole & Dandekar, 2004). For example, the cyclone in 1977 had fatalities pegged at 10,000, while the cyclone of 1996 showed a marked decline, with deaths approximated at 978 (De, Khole & Dandekar, 2004).

Map 4: Wind and cyclone zones in India (Source: undp.org.in)
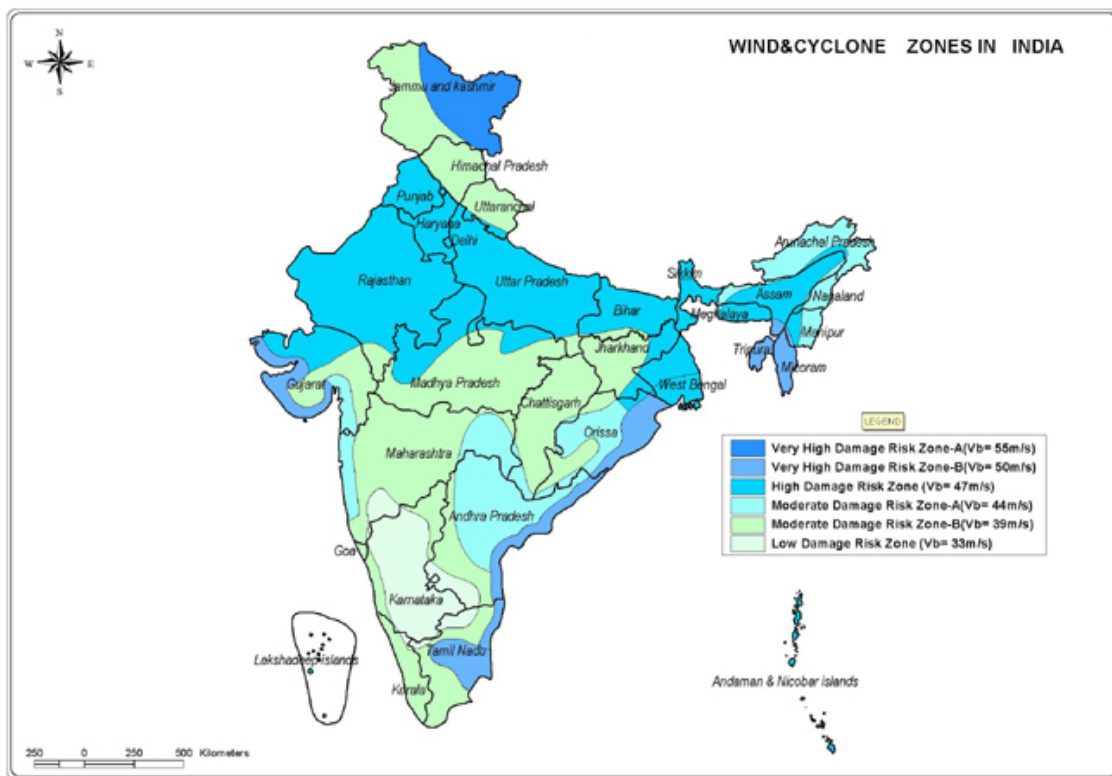
Tsunamis

On December 26, 2004, a tsunami devastated 14 nations in South Asia, caused billions of dollars in damage, and left approximately 300,000 dead or missing. The tsunami slammed into the eastern coast of India leaving 10,872 killed, 6,898 injured, 3

million people affected, and caused damage worth $ 1.56 billion (WHO, 2005). Other tsunamis within India are detailed on pages 84-106 in chapter six.

Technological Hazards

Transport Accidents/Human Failure/Technological Disasters

Technological hazards include power plant failures and incidents involving hazardous materials. One of the worst technological disasters of the 20th century was a gas leak at the Union Carbide Plant in Bhopal, Madhya Pradesh, on December 3, 1984. The gas leak killed approximately 3,000 people, injured 300,000, and claimed 2,000 animals (Shrivastava, 1987a).

In the year 2001, road accidents killed 80,000 and injured 382,700 people. Between the years 1970 and 2001, the number of fatalities from road accidents increased from 114,000 to 394,000 (Valli, 2005).

Slow onset hazards

Drought

Droughts have always plagued India and have been responsible for an uncontrollable amount of deaths due to various socio-economic factors that are prevalent in developing countries. In 1987, India experienced a 19% deficit in average rainfall. In addition, it was an El-Niño year and the monsoons arrived late, which set the stage for one of the worst drought conditions the country had faced. The drought affected 58.6 million hectares of land (De, Dube & Rao, 2005; De, Khole & Dandekar, 2004). The first all-India drought since 1987 occurred in 2002. In this year again, India experienced a 19% deficit in average rainfall rates and record lows of rainfall in July, at 51% below normal (De, Dube & Rao, 2005).

<u>Epidemics/Diseases</u>

Epidemics like dengue, malaria, cholera, encephalitis, bubonic plague and other enteric diseases contribute to a number of deaths annually and have the capacity to spread extremely fast. The Indian Ministry of Home Affairs recorded 488,619 medically certified deaths, representing 15.4% of the registered number of deaths in the country.

Hazard Analysis

Risk and Vulnerability

Risk is the probability of hazard occurrence (Drabek & Hoetmer, 1991). In India, 60% of the landmass is prone to earthquakes (see map 2, p. 70), 8% to cyclones (see map 4, p. 73), 68% to drought, and 40 million hectares of land is susceptible to floods (see map 3, p. 72). Statistically, this makes India a country with a high risk of natural disasters. On average, every year between the years 1990 and 2000, disasters killed approximately 4,344 people and affected 30 million (De, Khole & Dandekar, 2004; GoI, 2004). Studies conducted by the Center for Hazards and Risk Research at Columbia University revealed that floods and droughts are prominent in the northern and north-eastern parts of India. The north of India is also prone to earthquakes, and death rates are high when they do occur. Cyclones impact a much smaller area compared to floods, droughts, and earthquakes, but tend to be responsible for a greater number of deaths. The Center came to the conclusion that the entire country was at risk from at least one type of hazard, and mortality rates appeared higher in the north and north- eastern parts of the country (Center for Hazards and Risk Research, 2005).

Shanties and slums tend to crowd in and around hazardous industrial areas because this is the land that no one wants to live on, and land that the poor can afford. As

advanced technology for these industries becomes increasingly hazardous, and the number of people living in these areas steadily increases, the stage is set for people at risk. The Bhopal incident should be used as an example (Kapoor, 1992).

Following the Yokohama Strategy for a Safer World in 1994, the Government of India created an expert group to assess the vulnerability of housing and infrastructure in India. The assessment was based on vulnerability to earthquakes, floods, and cyclones and the risk to housing associated with these natural hazards. This report used the Medvedev-Sponheuer-Karnik (MSK) scale of seismic intensity and revealed that 12% of the land is at risk from severe earthquakes (Jain, 1998). Eighteen percent of the land is liable to MSK VIII, which is damaging, and 25% to MSK VII, which is defined as Very Strong (Building Material and Technology Promotion Council [BMTPC], 1997).

In 100 years, between 1891 and 1990, India witnessed 262 cyclones, of which 93 of the severe ones affected a 50 km strip on the east coast (BMTPC, 1997). With a 7,600 km coastline, India is vulnerable to cyclones. The country's vulnerability results from its low-lying coastal areas, a high frequency of cyclones and storms, density of population, and high rates of coastal erosion. Out of the 80 tropical storms in the world, 6.5% of them originate in the Indian Ocean. The rate of occurrence of the tropical storms is 5 or 6 times higher in the Bay of Bengal than in the Arabian Sea. In short, the East Coast experiences a relatively high level of vulnerability (Aggarwal & Lal, n.d.)

The tsunami risk in India is relatively low, and tsunamis have rarely been reported or documented. During earthquakes in 1819 and 1845, near the Rann of Kutch in Gujarat, rapid movement of water in the sea was reported, but no tsunamis were generated. The 1945 Mekran earthquake, however, generated tsunami waves in the Gulf of Cambay, near

Gujarat, at a height of 15m and at 2m in Mumbai. In Mumbai, boats were unmoored and casualties were recorded. Therefore, the vulnerable areas to tsunamis are the Gujarat Coast and the Andaman-Sumatra region where the December 26 tsunami occurred (GoI, 2005).

A Hazards Assessment of the State of Tamil Nadu

The State of Tamil Nadu is located in the southern half of India and accommodates 1,076 km of India's coastline. Tamil Nadu's coastline covers approximately 12% of the total coastline of the country, and 50-75 million people dwell in this state (Dr. J. Radhakrishnan, personal communication, May 9, 2005). Tamil Nadu's economy is primarily based on agriculture and fishing, with some parts reliant on domestic tourism.

Earthquakes are quite unusual in the State of Tamil Nadu, although side effects or remote earthquakes may damage the vulnerable coast, as witnessed by the recent tsunami. The Government of India's Statistical Handbook (2004a) lists 9,012 accidents in the year 2002, which account for 9,939 deaths. In the year 2003, 8,393 accidents accounted for 9,275 deaths. Industrial accidents also claim a number of lives per year. The State of Tamil Nadu suffers a number of deaths due to illnesses alone, standing at 369,065 in the year 1999 (Statistical Handbook, 2004b).

Tamil Nadu has also been seriously affected in terms of drought and extremes of temperatures, especially heat waves, which kill hundreds and affect thousands as a consequence. Due to its location, this state has also been harassed by the monsoon winds, cyclones, and floods, which lead to a number of deaths per year. In 1964, a severe cyclone killed approximately 900 people in the state. In 1977, a cyclone that affected the

southern states, claimed approximately 10,000 lives, and left 1 million people homeless. Tamil Nadu was severely affected as the cyclone crossed the coast 10 km south of Nagapattinam, left 560 people dead and caused damage worth 1.55 billion. Once again, in November 1984, a cyclone passed close to Nagapattinam, affected 35,000 people and inundated 50,000 acres. In 1991, a cyclone in the Bay of Bengal left 185 people dead. In 1992, yet another cyclone event in Tamil Nadu left 175 people dead and 160 people reportedly missing (IMD, 2005).

In this State, even though the number of deaths may not be reported because the numbers are insignificant, nonetheless, a substantial amount of deaths occur due to floods, heavy rainfall, and cyclones. Tamil Nadu is vulnerable to the onslaught of the monsoons due to its close proximity to the confluence of the Bay of Bengal and the Indian Ocean.

Hazard Analysis

Risk and Vulnerability

An assessment done by the United Nations Development Program revealed that Tamil Nadu is not an area prone to floods, but 5 places, namely, Chennai, Kancheepuram, Kanniyakumari, The Nilgiris, and Thiruvallur, lie in earthquake zone III, which is a moderate damage risk zone. Cuddalore lies in zone II, which is a low damage risk zone (see map 5).

Map 5: Tamil Nadu earthquake zones
(Source: Dr. J. Radhakrishnan, personal communication, May 9, 2005)
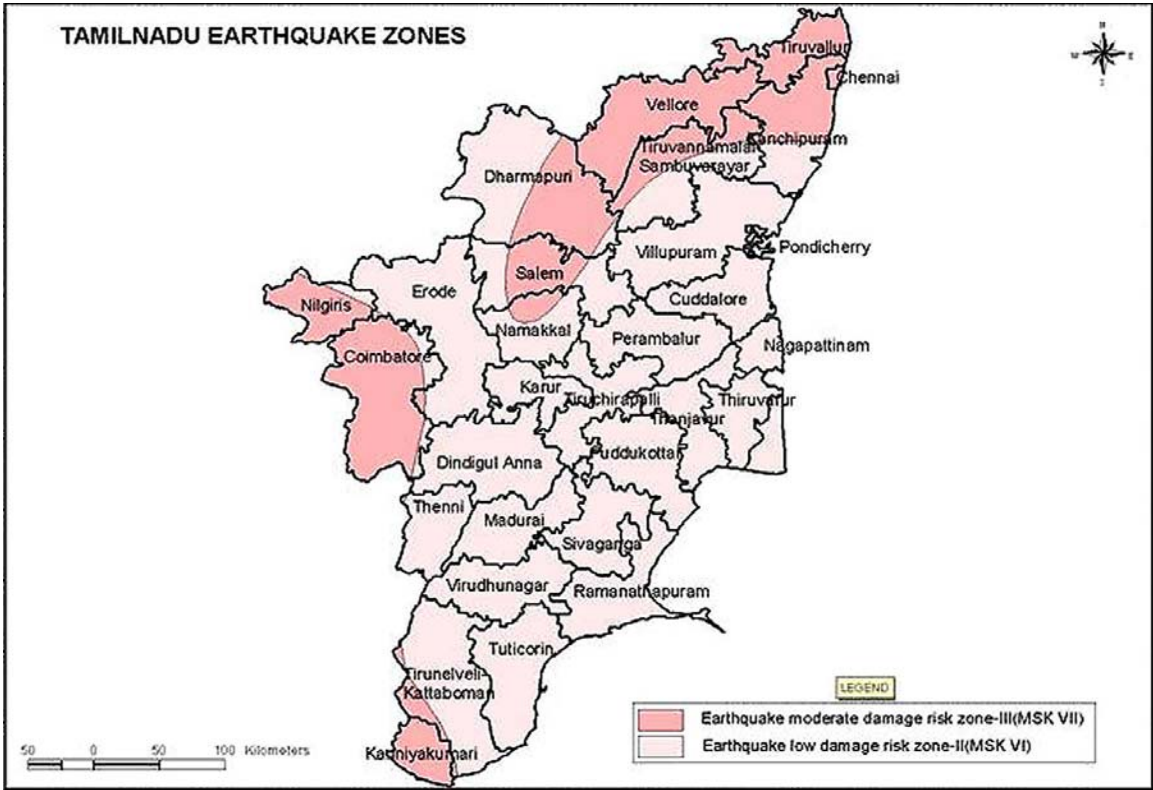
Map 6: Tamil Nadu wind and cyclone zones
(Source: Dr. J. Radhakrishnan, personal communication, May 9, 2005)
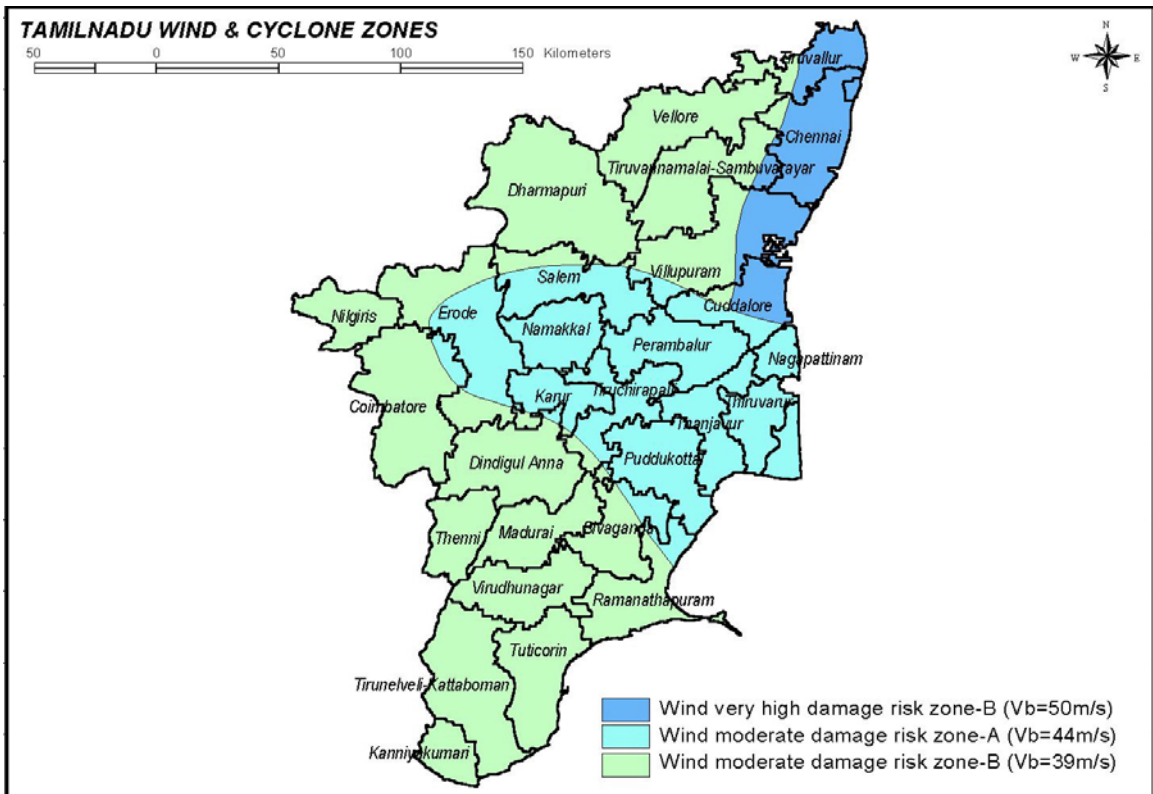
On the other hand, in terms of cyclones and winds, Chennai, Cuddalore, Kancheepuram, and Thiruvallur lie in a very high damage risk zone, whereas Kanniyakumari and The Nilgiris lie in a moderate damage risk zone (see map 6 above) (Arya, 2005; GoI, 2001; GoI-UNDP, 2005).

In this State, 480 people live per sq. km, which is 25% of the population (Statistical Handbook, 2004c). Therefore, a significant loss of lives may take place in the event of an earthquake or cyclone. In addition to the geographical position of the state and its physical location on the coast, the high density of population along the coast makes it a high-risk area for considerable damage and loss of life in the event of a disaster.

This State also houses 1,642,497 disabled people, of which 945,019 are from rural areas (Statistical Handbook, 2004d), which in all probability are rural areas around the coastal regions. In addition, 26% of the population of Tamil Nadu is below the age of 14 years, and 8.52 % is above the age of 60 years (Statistical Handbook, 2004e). These populations are vulnerable during a disaster due to their inability to move away from areas of danger.

A Hazard Assessment of Nagapattinam

The following analysis will reveal the high degree of risk to people and the vulnerability of the District of Nagapattinam. In 1952, 400 deaths occurred in Nagapattinam on account of a VSCS (Very Severe Cyclonic Storm). In 1977, a cyclone left 1 million homeless and accounted for 560 deaths in Nagapattinam (IMD, 2005; EM-DAT, 2005). Heavy rainfall in November 1991 left 300 persons dead (Dr. J. Radhakrishnan, personal communication, May 9, 2005). The District of Nagapattinam

recorded 996 accidents with 115 deaths for the year 2004 (Statistical Handbook, 2004f).

The tsunami of December 26, 2004, left at least 6,065 dead, 791 missing, and 1,733 injured in this district, accounting for 76% of the death toll in the state. In short, the District of Nagapattinam bore the brunt of the Indian Ocean Tsunami within India (Dr. J. Radhakrishnan, personal communication, May 9, 2005).

Hazard Analysis

Risk and Vulnerability

The District of Nagapattinam lies in earthquake zone II, which is a low risk zone, but it lies in a zone VI in terms of intensity. According to the MSK intensity scale, this means that the force would be strong and may induce fright into individuals (Jain, 1998). It would also be strong enough to damage masonry and cause cracks in soft ground. This district lies in a moderate damage risk zone in terms of winds and cyclones, as well (Arya, 2005; GoI-UNDP, 2005). It is considered at low risk for earthquakes, but lies in a moderate damage risk zone in terms of cyclones due to its position on the Eastern Coast of India and its susceptibility to the onslaught of the monsoons (Arya, 2005; GoI-UNDP, 2005). This district has an area of 2,715 sq. km and 1-2 million people live here (Government of Tamil Nadu, 2005). With a low to moderate risk of a natural disaster taking place, people are extremely vulnerable.

When a total population of 1,487,055 persons is compared to the total number of beds in the hospitals in the district, the ratio of persons to the number of beds is 1,533. The ratio of people in the area to the doctors is more than 29,000 (Statistical Handbook, 2004g). This ratio places people at high risk in the event of a disaster, because it means that medical attention may be insufficient. In addition, close to 51,000 people in this

district are disabled (bind, deaf, orthopedically handicapped and/or mentally challenged) (Statistical Handbook, 2004d).

The pilgrim town of Velankanni in Nagapattinam attracted 333,645 tourists from within India and 7,372 tourists from abroad during the year 2004 (Statistical Handbook, 2004h). Tourists are considered vulnerable populations during a disaster because of their limited knowledge of the local availability of resources and their inability to speak the local language (Drabek, 1996). Another group of populations that lie in the vulnerable zones of disasters are the scheduled castes and scheduled tribes. This district has a population of 44,123 scheduled castes and 3,420 scheduled tribes (Statistical Handbook, 2004c). Scheduled castes and scheduled tribes are the historically disadvantaged sections of society in India. They are commonly called 'dalits' or 'adivasis' within the Hindu Caste System and are relegated to menial labor. Their limited knowledge of available resources, primitive ways of living, and lack of education leads to their vulnerability.

Summary and Conclusion

Populations at risk from natural hazards are disproportionately vulnerable based on socio-economic levels of subsistence and the areas in which they reside. Flood plains and deltas offer cheaper housing facilities and lower land values and represent places which the poor can afford. Inhabiting these areas leaves them vulnerable to the forces of nature and hence at a higher risk during a natural disaster. Vulnerable populations also include children and women who cannot escape fast enough, and the disabled and elderly, who experience difficulties moving to places of safety. India is a country where the pressure of population on land, coupled with significant disaster risks, places large numbers of people at considerable risk.

We now turn to a specific event, the Indian Ocean Tsunami of 2004. The following analysis of the tsunami will reveal instances of emergent behavior that appeared to meet and manage massive disaster needs. Emergence is analyzed at the State, District, Municipal, Local and Non-Government Organization levels in the following chapter.

CHAPTER V

FINDINGS

<u>Introduction</u>

In this chapter I have used Spradley's Developmental Research Sequence (DRS) to identify the process of emergence. The DRS requires the researcher to develop domain and taxonomic analyses as a way to focus the data. In order to focus the data, I examined the transcripted interviews, documents, and other materials gathered during the field research. The developmental research sequence directs the researcher to examine the data for domains that may exist relevant to the research topic. For instance, I searched for strict inclusion domains within the data. Strict Inclusion domains reflect categories of similar items, described by Spradley as "kinds" or "types" of activities or behaviors. For example, I searched the data to look for kinds of tasks. Similarly, a "rationale" domain analysis seeks to understand the reasons why a particular action was taken. In short, domain analysis is a way to search for patterns and regularities in the data under certain rubrics. Taxonomic analysis shows how the domains relate to each other. A taxonomic analysis may collate several related domains into a form, not unlike an outline organized topically.

This chapter examines emergence in terms of new structures and tasks at the State, District, Municipal, Local, and Non-Government Organization (NGO) levels. The process of emergence is illustrated through examples related to search and rescue and

mass fatality management. A number of examples will look specifically at body handling due to the magnitude of this effort and because body handling was designated as the top priority in the first seven days after the tsunami.

State Level Emergence

Introduction to the IAS

Emergence at the State level can only be understood once a clear understanding of the Indian Administrative Service (IAS) is achieved. The IAS officers are the finest members of the Indian Civil Services with advanced knowledge in all fields from literature to medicine. They are highly qualified individuals with advanced degrees and outstanding managerial skills. Due to their capacity to make informed and independent decisions, IAS officers are a powerful arm of the executive government. Their daily routine is primarily concerned with supervision. They hold high ranking positions as policy makers within the bureaucracy. IAS officers are routinely transferred from one department to another based on their seniority in the services. They hold positions from District Collectors to Cabinet level Secretaries within the Indian bureaucratic system. A disaster with the magnitude of the tsunami had never occurred in the State of Tamil Nadu. Therefore, the role of IAS officers in disasters was not defined prior to the tsunami. Disaster management activities in terms of cyclones, droughts, and floods in Tamil Nadu, are generally handled by the Joint Revenue Commissioner of the State and not IAS officers.

Emergent Structure

Overview

The Indian Ocean Tsunami brought about an unprecedented need to rearrange the structure of the IAS officers and place them in charge of officials from the District and Municipal levels. The State placed IAS officers in charge of these officials to tackle the sheer size of the problem, even though the IAS officers may never have had prior relationships with them.

In the State level of analysis I will discuss the new structure of IAS teams introduced three days after the tsunami. I will discuss the steps taken (a sequential domain analysis) and the rationales for (a rationale domain analysis) the new structure. In this section I will describe emergent tasks and the division of labor that emerged among team members. Next, I will describe the priorities of IAS teams. Then, I will identify the emergent relationships and communication network due to the new structure and tasks. Finally, I will conclude this section with an analysis of the process of emergence at the State level. Thereby, I will provide significant evidence for emergent phenomena at the State level after the Indian Ocean Tsunami.

Developing a New Structure

Figure 2: Emergent IAS Teams

Cover Term	Emergent IAS Team	Normal Tasks	Emergent Tasks
Included Terms	Project Officer District Rural Development Agency	Implements the various schemes of the government for rural welfare in the district	Assisted Team Leaders and ministers
	Deputy Collector	Assists the Collector with revenue distribution	Logistics functions

Electricity Board Officials	Deals primarily with supervision of electrification issues of villages and towns	In charge of Electrical special task force in the field
Water and Drainage Board	Deals with supervision of water and drainage issues of villages and towns	In charge of Water task force in the field
Public Work Department water resources	Maintenance, Repair and Preservation of public assets like roads, highways etc	Brought in earth movers for body recovery and debris clearance
Block Development Officer	Deals with development issues related to blocks within the districts	In charge of restoration of villages
Municipal Commissioner	In charge of maintenance of all public access roads and highways, registers births and deaths, water and sanitation issues	Dead body disposal and sanitation
Highways Officials	In charge of maintenance and repair of roads and bridges	Assisted with debris clearance
Doctor from Public Health department	Works in government hospitals	Lead a medical task force for triaging in the field
Fisheries Inspector	In charge of fishing related activities	Dealt with issues relating to damaged boats and nets
Deputy Superintendent of Police and Fire and rescue official.	Responsible for maintaining law and order	In charge of police strike teams; to photograph bodies

Figure 2 provides a descriptive analysis of the new structure that formed three days after the tsunami. The new structure appeared emergent in nature because it emerged without prior planning and dissolved after the crisis ended. In order to understand why this structure emerged, who formed team members, and why they were chosen, it is now necessary to explain the steps (a sequential domain analysis) taken prior to the formation of IAS teams. Following the sequential domain analysis is a description of the tasks of each team member as outlined in Figure 2.

<u>Step 1 – Recognizing the problem</u>

On the day of the impact, senior IAS officers conducted air reconnaissance to visualize the extent of the devastation. Initially, the State Administration identified the areas of Cuddalore and Kalpakkam (which houses a nuclear power plant) as the worst affected. As one interviewee put it, *"…we thought Cuddalore was the worst affected because I think that's the first place where the news started coming in…"* But when the State Administration received reports of bodies numbering in the thousands in Nagapattinam, they realized that Nagapattinam suffered greater damage than Cuddalore.

Three days into the disaster, the State continued to receive reports that huge boats weighing 10-15 tons blocked all access to villages through the main roads and bridges. In addition, the District Administration reported to the State government that the enormity of the problem exceeded the capacity of the District Administration to handle alone. As one interviewee stated,

> *"Then after 3rd day it was found that all though disposal of bodies was going on all this was not being done satisfactorily because it was such a huge place 1-2kms across, So that was the scale of the tragedy and with it solely upon the District Administration, it was very difficult to ensure each and every place."*

The District Administration called upon the State government's resources because a) the district hospital (General Hospital) lacked the capacity to accommodate the bodies, b) the district lacked earth movers to clear the debris, c) they lacked a sufficient amount of fire fighters and police forces to handle the disaster, and d) they lacked authority to make quick and independent decisions. Finally, by December 29, when the State government identified the full scale of the disaster, they decided to send in high level teams that consisted of senior officers to deal with the relief activities.

Therefore, by conducting a sequential domain analysis it can be stated that air reconnaissance, damage assessments, reports from the district, and death reports received by the State government spurred the need to form teams to enter the field. Thus, in accordance with the literature, emergence initially took place due to the severity of the disaster, the magnitude of impact, and the inaccessibility to the area most badly affected.

Step 2- Centralizing authority

After the State government received wireless reports from the District Administration (cell phone services were restored in 2-3 hours), they authorized a senior level IAS officer as the overall Incident Commander. As a Team Leader said,

> *"...the way in which the organization of the Incident Command took place was quite interesting in the sense that the Nagapattinam Collectorate had a senior officer sitting there and she was the Incident Commander."*

Then the State assembled 11 teams with an IAS officer as Team Leader. The State appeared to select IAS officers as Team Leaders due to their ability to make spontaneous and independent decisions. As one interviewee said,

> *"...Then it was decided that to reach each and every village, we need senior officers at each and every place to coordinate relief, who can take on the spot decisions instead of taking instructions from the district headquarters."*

A rationale domain analysis reveals that Team Leader selection at the State level also occurred because these IAS officers previously held District Collector positions in the Nagapattinam district. Hence, they knew the local domain, geography, and people. As interviewees said,

> *"People who have been collectors in the past in those areas were picked up to go in these areas and work because of their prior familiarity of the domain and the terrain."*

"...I was asked to proceed to Nagapattinam district since I know the geography and the people and the schemes of the Government and also let's say the strength and weaknesses of the system…"

Step 3- Mobilizing personnel

A number of officials/experts from various other departments formed team members. A Minister or Board chairman supervised the teams sent to various locations across the state (see figure 2, p. 86). Team Leaders had complete freedom to choose the people to work with in their teams. They chose members in accordance with the tasks at hand. As one official said, *"...we then in terms of choosing the organization, selecting people to work with us, mobilizing resources, we had absolute freedom."*

Step 4 – Decentralizing authority

The Incident Commander divided the affected 73 villages between the 11 IAS teams and placed each team in charge of approximately 7 villages. The Incident Commander gave each team Rs 500,000, and the power to use the money as needed, but reminded the teams to keep the objectives in mind. The Incident Commander then placed the complete restoration of services and relief activities, in the assigned 7 villages, to the IAS team. As interviewees said,

> *"...government did a superb job in decentralizing authority… it was brilliant, authority, people, budget, everything at the district level so the people on the spot could make the decisions."*
>
> *"...11 teams were made about 7 villages per team and they were taking decisions pertaining to those 7 villages without going up the ladder trying to get clearances."*
>
> *"So I was sent to Nagapattinam along with a batch of about 12 officers and I was an area supervisor and I was given about 5-6 villages and ask to be completely in charge of the relief and restoration of those areas."*

Step 5- Division of Labor

Division of labor and supervision followed the formation of teams. Ministers and

Team Leaders supervised the teams in the field. Project officers of the Rural

Development Agency assisted Team Leaders and Ministers in all field operations of the

entire team. Team Leaders placed team members in charge of special task forces specific

to their line of work (discussed further in emergent tasks section). For instance, water and

drainage board officials led a water task force, and a doctor from the public health

department led a medical task force. As one interviewee described the teams,

> *"We had an interdisciplinary team; that means each area officer had a team*
> *working with us and it was interdisciplinary. We had a medical team; we had*
> *dead body disposal and sanitation team under the charge of our municipal*
> *commissioner and his team of sanitary officers. Then we had our block*
> *development officer who was in charge of the restoration activities so they*
> *adopted rural development and building roads. Then of course the Public Works*
> *department and highways department were good at earth moving."*

Step 6 - Feedback

At 5:00 p.m. every evening, the Incident Commander held a debriefing session at

the Collectorate. During this time, Team Leaders or Ministers reported the needs of their

teams to the Incident Commander. The Incident Commander related the team needs to the

NGOs and the Press. The Press then related the needs to the rest of the country or the

world, and the NGOs related the needs to their donors for sponsorship. The Incident

Commander also worked closely with the District Collector. In this way the feedback

process led to the establishment of an emergent communication network in Nagapattinam

(see figure 3 below).

Figure 3: Channel of Communication - Nagapattinam
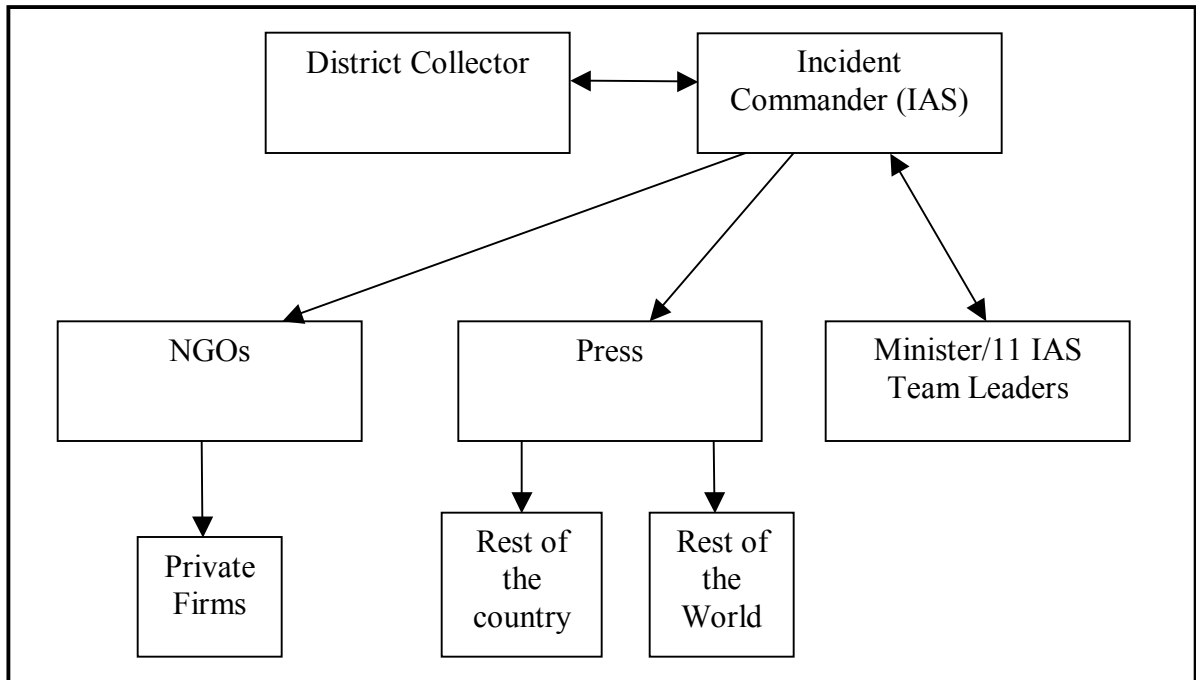
In summary, the formation of IAS teams took place due to the officers' power to make quick and independent decisions, their prior experience with the local geography and people, the enormity of the problem beyond what the district could handle alone, and unmet needs in the field. I will now discuss the emergent tasks of each team.

Emergent Tasks

An explanation of new tasks and/or structures (listed in figure 2, p. 86) for each team member will now be discussed. Daily tasks, familiar structures, and routines of all IAS officers involved changed as they took on new roles and assignments. Authority appeared centralized initially but decentralized in the field. As stated earlier, IAS officers generally set policy and supervise tasks, but in this situation they acquired a new form of supervision through direct field experience. As one interviewee said,

> *"We are a State level Office who set policy and supervision not direct action...that was an interesting piece of work, wherever we got direct field experience and opportunity to work in the field, directly."*

Even though tasks of body disposal, debris clearance, and handling a catastrophic disaster the magnitude of the tsunami, appeared new to the IAS officers, they felt that their knowledge and managerial skills enabled them to deal with the situation. As one interviewee said, *"….these were non-routine tasks outside the job, but training equips us to handle the tasks; we should be able to deliver the goods…"*

Routinely, Project officers are in charge of implementing the schemes of the government in rural welfare issues. However, in this context they primarily assisted the Team Leaders. The Deputy Collector at the District level usually assists the District Collector with revenue distribution. But he received logistics tasks after the new structure emerged. Experts from individual departments supervised special task forces. For example, electricity, water and drainage board officials led task forces into the affected area to deal with emergent electrification, water and drainage tasks generated by the tsunami. On a daily basis these officials perform supervisory functions from their offices, but in this case they supervised their respective task forces in the field. With the new structure and task arrangement, Team Leaders placed a Public Works Department (PWD) officer in charge of procuring earth movers for body recovery and debris clearance. The PWD is usually responsible for maintenance, repair, and preservation of public access roads and highways. Team Leaders placed the Municipal Commissioner, and his team of sanitary workers, in charge of dead body disposal and sanitation issues. On a daily basis a Municipal Commissioner is concerned with all issues that pertain to the public, e.g. roads and highways, births and deaths.

Highways Department officials experienced emergent unplanned tasks in terms of debris clearance. Highways department officials are usually involved with maintenance

and repair of roads and bridges. A doctor from the health department led medical task forces to deal with on-the-spot triaging of patients. The task appeared emergent because the doctor, instead of tending to patients, actually supervised the medical task force in its operations. Team Leaders placed a Deputy Superintendent of Police in charge of overseeing the operations of police strike teams. Police strike teams photographed the body upon recovery, an emergent disaster-generated task for these teams.

The above description summarizes the emergent tasks of team members in the IAS teams. Now I will discuss emergent processes used to deal with the emergent tasks generated by the disaster.

Emergent Processes

As an example of new tasks consider how the IAS officers handled the body disposal process. As soon as they found a body, sequential domain analysis reveals that a) the police member photographed the body, b) a doctor conducted the post mortem (post mortems were stopped by the hospital during the first two days, but began again after the third day), c) a revenue official handled the compensation, and d) sanitation workers buried the body and recorded the location. As one interviewee said,

> *"Wherever they see the body, the doctor will identify, police will take the photograph and revenue people they do the compensation, the municipal; they dig the graves and bury…"*

IAS teams established priority tasks in the field in addition to the emergent processes to deal with bodies. Next, I will discuss the tasks of IAS teams, in what appeared to be their priority during the first few days after impact.

Priorities of IAS Teams

The Incident Commander and Team Leaders formulated the priorities of each team in the field. They considered disposal of bodies as the primary task, followed by debris clearance as a second priority, and NGO coordination as the third priority. Debris clearance appeared to be a necessary step to dispose of bodies. NGO coordination appeared paramount because NGOs provided the necessary resources for teams in the field. I will now discuss emergent tasks in what appeared to be their order of priority.

Disposal of Bodies

The primary task of all teams was to dispose of the dead. As one interviewee stated, *"…our first priority was in terms of the dead…how do we dispose of those dead bodies…?"*

Figure 4: IAS Team Emergent Body Handling

Cover Term	**IAS Team Emergent Body Handling**
Included Terms	Identify the dead • Photograph the identified • Record the identified in a database

	Photograph the unidentified
	• Record the unidentified in a database
	• Trace the unidentified
	   • Display photographs in kiosks
	   • Display photographs on police websites

	Body disposal • Mass graves • Cremations

The above taxonomic classification of body handling in figure 4 is important for purposes of compensation. The taxonomy outlines a newly prioritized emergent task,

within an emergent structure at the State level. As one interviewee said, *"The government was very keen on maintaining a database as every person who dies has to be given compensation."*

In order to accomplish the primary emergent task of body disposal, IAS officers developed a procedure to identify and record the recovered bodies. This procedure is outlined below.

Procedures for Body Identification

1) Kiosks (usually set up with colored cloth and bamboos into a tent-like structure) set up by the State Administration, displayed photographs of the unidentified so that people from out of town could identify their loved ones.

2) The State Administration created a specific web address, located on the Nagapattinam Police website. The web address served to trace the dead, missing, and injured people.

3) Anna University assisted the government's Information Technology Department and set up a database to record the dead and unidentified. Unidentified bodies suffered intense putrification and turned black, placing them beyond recognition. But software offered by Anna University, matched any photograph to the dead person with a 99% success rate. This technology greatly assisted the body identification process for all teams in the field. It facilitated the efficiency of the relief operations as bodies could be identified immediately and handed over to relatives. As an interviewee said, *"A very large percentage of people we were able to identify by the help of this technology…"*

Therefore, while the Police website facilitated body identification of people from out of town, the software of Anna University facilitated body identification in the field. A

marked division of labor is visible in terms of body identification and handling by the State Administration. I will now discuss the emergent task of debris clearance, identified by the IAS teams as their second priority.

Debris Clearance

In order to accomplish the primary task of body disposal, the State Administration had to clear debris because access roads and bridges into the villages remained blocked. Boats weighing ten or fifteen tons had lodged on primary roads and bridges and blocked all access into the villages. As one interviewee said, *"…boats were packed like sardines on access roads and there was no way you could go in…"* Therefore, the State Administration mobilized resources from NGOs and requested earthmoving equipment in the field. Finally, the State Administration engaged 30 Poclains, 69 JCBs (a type of excavator), 64 lorries, 14 bulldozers, and 13 cranes in the entire operation, primarily for the extrication of mangled bodies from the debris. As one interviewee said,

> *"Some of these areas were so jam packed, like, a whole lot of boats crushed together. And we knew that there are like, 7-8 dead bodies there because we could see a little bit but there was no way you could go there, I mean even if you went there, there was no way to put the boats apart."*

Following debris clearance, IAS teams identified coordination of NGOs as another priority. Next, I will discuss the third priority of IAS teams, NGO coordination.

NGO Coordination

The District Administration established an NGO coordination center at the Collectorate from the day of impact. Once the IAS teams arrived in the field on the third day, they coordinated their efforts with NGOs. They made the NGOs responsible to procure the necessary relief materials from around the country and abroad. As one interviewee discussed some of the field requests that NGOs received,

"...in the very early stages there was the need for earth movers, ours was the first one there to help with the removal of bodies ...and the other thing was the requests for white cloth to wrap the bodies."

In the same week, NGOs that worked in Gujarat after the earthquake assisted the response effort and the IAS teams too. They brought their experience and knowledge to the field. For example, NGOs brought chemicals called Cellrich to Tamil Nadu to speed body decomposition in mass graves because it proved helpful in Gujarat. As another interviewee said,

"We got this component called cellrich, it's a chemical which helped them decompose the bodies at a faster rate we learned from Gujarat."

NGOs also maintained databases of the relief supplies received and dispatched to various areas for logistical purposes. The databases helped to avoid the duplication of relief materials and effort. As another interviewee described the process,

"...we created a web based inventory here, so as and when material was coming in, we were sorting it out and updating inventories, collectors were able to see it in the districts and what they wanted they could just take..."

The new structure and tasks that appeared at the State level spurred new forms of communication between officials and, therefore, new relationships developed as well. Next, I describe the emergent relationships and new communication network.

Emergent Relationships

New and emergent relationships formed at the State level between and among officers due to the formation of the IAS teams. An attributional domain analysis revealed the following relational characteristics of the emergent IAS teams, outlined in figure 5. It is worth noting that these were unprecedented types of work relationships in a magnitude and type of event not seen before in this setting.

Figure 5: Emergent Relationships in IAS Teams

Cover Term	Emergent Relationships in IAS Teams
Included Terms	Incident Commander and IAS Team Leaders
	IAS Team Leaders and Team members
	IAS Team Leaders and District Officials • District Level Task Forces
	IAS Team Leaders and Municipal Officials • Municipal Level Task Forces
	IAS Team Leaders and Police Officials • Police Task Forces
	IAS Team Leaders and NGOs

New Forms of Communication

Information flowed freely up and down the channel of communication (see figure 3, p. 92) between IAS teams, team members, and the Incident Commander. Each team assembled each night for a debriefing session and related their needs to the Incident Commander in charge of all 11 teams. As one interviewee stated,

> *"...daily there used to be review meetings where we used to come back and report back on what were the needs for the day, resources, manpower, money which required intervention…"*

The Incident Commander communicated these needs to the Press and to NGOs who procured the material required in the field. Therefore, the Incident Commander, through the emergent channel of communication, handled the emergent tasks and structures. The Incident Commander, by virtue of seniority and experience as well as number of years in the services, received the anticipated respect from junior level officers. Respect for seniority allowed the smooth flow of information and an emergent authority structure.

Next, I will discuss what appeared to be the process of emergence. I have used

sequential domain analyses to delineate the process below.

The Process of Emergence

Figure 6: Process of Emergence

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│                                     │
│            ┌─────────────┐          │
│            │ Recognition │          │
│            └─────────────┘          │
│                   │                 │
│            ┌─────────────┐          │
│            │Centralization│         │
│            └─────────────┘          │
│                   │                 │
│            ┌─────────────┐          │
│            │ Mobilization │         │
│            └─────────────┘          │
│                   │                 │
│            ┌──────────────┐         │
│            │Decentralization│       │
│            └──────────────┘         │
│                   │                 │
│            ┌─────────────┐          │
│            │  Feedback   │          │
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│                                     │
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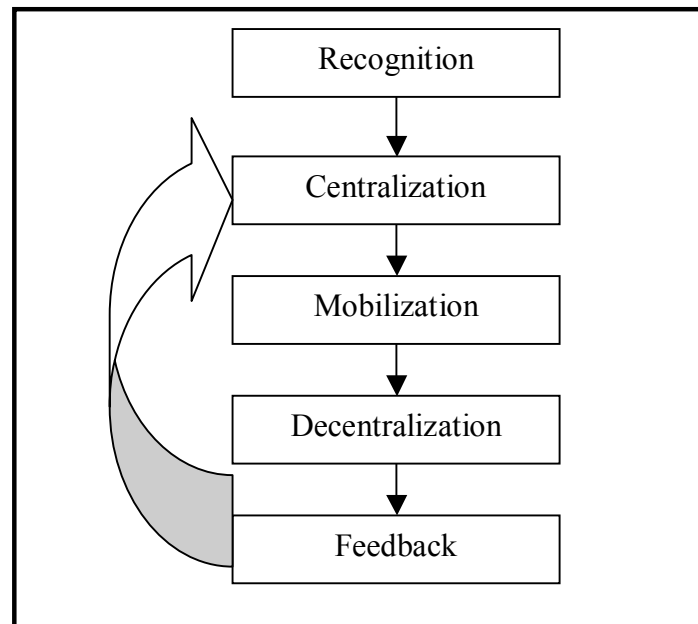
Recognition

In figure 6, sequential domain analysis reveals that the process of emergence

seemed to involve a series of steps or stages. In the first stage, the State Administration

recognized the extent of the situation. The State assessed the situation through air

reconnaissance, damage assessments, district reports, and death reports. The District

Administration facilitated air reconnaissance and damage assessments, conducted by

senior IAS officers on the same day as the disaster, by identifying the worst hit areas in

the district.

Centralization

In the second stage, the State Administration centralized authority. The State government placed the response effort under a senior level State Secretary named the Incident Commander (discussed in Step 2, p. 89). The Incident Commander doubled up as operations chief and planning chief and provided for a single management system for all multi-jurisdictional efforts. The State then divided the affected 73 villages into 11 zones with approximately 7 villages in each zone. Then the State government created 11 IAS teams, comprising of senior IAS officers as Team Leaders, to handle each zone under the Incident Commander.

Mobilization

The third stage involved the mobilization of resources and personnel for each of the self-contained IAS teams. The Incident Commander mobilized resources before the teams could enter the field and even along the road into the affected areas. The mobilization of resources occurred from various sectors. The State provided equipment and materials. NGOs mobilized resources through their external connections. Neighboring districts supplied earth moving equipment, and private firms also supplied materials. IAS teams mobilized resources, such as earth movers, excavators, cranes, and bulldozers in order to clear debris and recover bodies.

Team members brought in their experience and capacity along with manpower and resources under their control. The Incident Commander mobilized funds to each team. Each team received Rs 500,000 in cash to make necessary monetary decisions in the field. Team Leaders also had flexibility and freedom while mobilizing their team members. As an interviewee stated,

> *"So we had absolute freedom, we then in terms of choosing the organization, selecting people to work with us, mobilizing resources with the financial resource around to play around with. We had absolute freedom and if at all anything had to be faulted it was only us."*

Decentralization

The fourth stage involved decentralizing authority to each Team Leader to ensure that on-the-spot decisions could be made. As one interviewee said,

> *"...government did a superb job in decentralizing authority… it was brilliant, authority, people, budget, everything at the district level so the people on the spot could make the decisions."*

In order to accomplish on-the-spot decision making, the Incident Commander empowered each team with Rs 500,000 in cash and autonomy of utilization. During normal times, the Indian Bureaucracy must ensure transparency of all monetary issues. In this context, however, transparency was not the issue. The Incident Commander instructed Team Leaders to spend the allocated money freely and bring the situation back to normal as soon as possible. As another interviewee said,

> *"normally when you spend public money you ought to follow some procedures about you know transparency and you know you have to get an allocation, you have to protect the project, this being a natural disaster, funds were just given to spend it, make sure things get back to normal."*

Generally, policy, decision-making, and delegation are difficult in a bureaucracy because paperwork absorbs an enormous amount of time. In addition, rules and regulations hinder effective and efficient government. However, in Nagapattinam each Team Leader possessed the authority to make independent decisions pertaining to their team and assigned villages. I interviewed mostly Team Leaders and they remarked that they had never seen the government work as efficiently as they had seen in Nagapattinam. As one interviewee said,

"...the bureaucratic response was enormous, generally in government, delegation is slightly difficult, you are stuck in rules and regulations but this didn't happen this time, we were given a free hand like each team was given Rs 500,000 cash and said do whatever you want to do but keep the objectives in mind then go ahead."

Feedback

The fifth stage involved feedback at the end of every day to the Incident Commander, who in turn procured the necessary goods and services through various channels of communication (see figure 3, p. 92). For example, the daily debriefing every night allowed Team Leaders to return their field requests to the Incident Commander. The Incident Commander then, facilitated by NGOs and the Press, procured the items requested for body disposal and debris clearance.

I will now discuss emergence at the District level. In this level of analysis I will first provide an overview. Next, I will discuss the emergent structure and tasks that appeared at the District level.

District Level Emergence

This section of the analysis deals with emergence that occurred at the District level. I analyzed data gathered at the General Hospital, police and fire stations. This section begins with an introduction and recognition of the problem. Next, I discuss the emergent structure that appeared when the District Collector took charge of the overall response and directed the actions of all responding organizations. Under normal circumstances the Municipal authorities report to the District authorities and the District authorities report to the State government. The local General Hospital reports directly to the Director of Medical Services in the Capital city of Chennai. Police and fire officials in Nagapattinam report to the District Administration for supervisory advice.

This section also identifies emergent tasks handled by the General Hospital and police and fire personnel. It also identifies emergent processes that occurred at the General Hospital to deal with the emergent tasks. This section will lead into emergence at the Municipal level.

Introduction

The Municipal Commissioner declared to the District Collector that the tsunami had struck. Initially district officials thought that mainly animals had died. But after 30 to 40 minutes, they received reports about the numerous bodies delivered to the General Hospital. In addition, district officials realized that boats weighing ten to fifteen tons had lodged on roads and bridges and cut of all access to villages. Therefore, the District Administration realized that due to the extent of the damage and the lack of accessibility to the badly affected areas, the initial response was left up to them for the first few days. The State government could not gain immediate access to the area because a primary bridge that links the north of the area to the south, had collapsed. In addition, the State governments' head offices are located at the Capital city of Chennai, 334 km away from the District of Nagapattinam. As one interviewee remarked,

> *"...there is bridge which connects this part of Nagapattinam to the northern part of the district, that bridge also got washed away in tsunami."*

The present District Collector of Nagapattinam then traveled from Thanjavur district (a neighboring district to the west of Nagapattinam) to Nagapattinam and reached the affected area by 12 p.m. on December 26. The District Collector immediately took over all District level coordination. As District level officials said,

> *"...District Collector from Thanjavur who is now the present collector, he also rushed by 12 o'clock it seems immediately after hearing this news and joined with our Collector they took over the whole District Administration and was effectively*

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coordinating in between departments like if there is the transport corporation, fire service and local public started coming for help."

"Collectors basically acted as the nodal, relief and rescue operations coordinating with the police, the fire and rescue services, medical and health services and other departments."

After providing an overview, I will now discuss the emergent structure that

appeared to develop at the District level in Nagapattinam.

Emergent Structure

Figure 7: District Collector Coordination
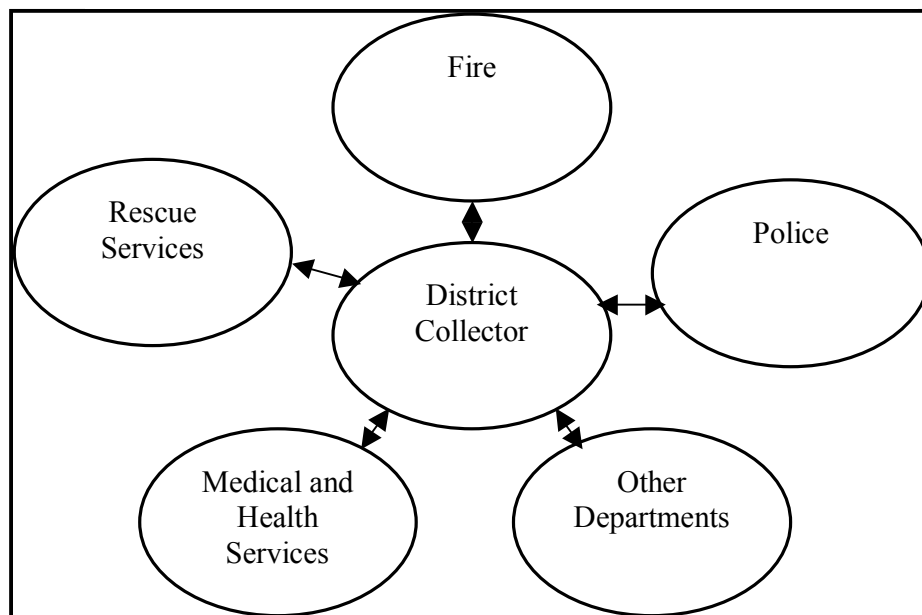
Figure 7 illustrates the overall coordination procedure adopted by the District

Collector from Thanjavur once he reached the affected area. Generally, the responding

departments, such as police, fire, rescue, health and other departments, function

independently and the District Collector coordinates them. However, in this instance the

newly-arriving District Collector did not only coordinate the responding departments, but

directed their actions. The District Collector provided direction to the responding

departments in search and rescue work, and body recovery during the first few days after

impact and before the IAS teams arrived in Nagapattinam. Thus, along with a new

structure, new relationships also developed on the day of impact between the responding

departments and the newly arrived District Collector.

Nonetheless, the District Administration soon realized that the magnitude of the

disaster exceeded the scope of the emergent structure discussed above, because the

district lacked resources. Furthermore, because fire, police, and search and rescue

officials received instructions from the district headquarters, the rescue effort slowed

down. Therefore, since IAS officers possessed the capability to make on-the-spot

decisions, their presence in the field became imperative. As another interviewee said,

> *"...So that was the scale of the tragedy and with solely upon the district*
> *administration, it was very difficult to ensure each and every place. Then here it*
> *was decided, that to reach each and every village, we need senior officers at each*
> *and every place to coordinate relief, who can take on the spot decisions instead of*
> *taking instructions from the district headquarters."*

Once IAS teams arrived in the field, three days after the tsunami on December 29,

Superintendents from the fire and police departments joined the IAS teams. Team

Leaders made Superintendents of these departments members, while police officers,

constables and fire fighters constituted strike teams under their Superintendent.

Therefore, a structural change emerged as Superintendents reported to the Incident

Commander at each daily debriefing session, and to the Team Leader while in the field.

Figure 2 (p. 86) illustrates the emergent structure that appeared when IAS teams entered

Nagapattinam and took over all District and Municipal level response. I will now discuss

emergent tasks at the General Hospital, and police and fire departments. I will also

discuss emergent processes used at the General Hospital to handle the magnitude of the

event.

Photo 3: Nagapattinam Hospital sustained extensive damage

Emergent Tasks

The General Hospital

The Nagapattinam General Hospital sustained damages due to its nearness to the coast, but continued functioning in its available capacity (see photo 3). Within hours from the impact, police, fire, revenue officials, and locals brought bodies into the hospital. The doctors initiated post mortems, but when bodies numbered in the hundreds, post mortems became difficult and doctors stopped them. As another official said,

> *"Nagapattinam General Hospital was also badly hit, lot of water has come inside and it has suffered very heavy damage in spite of that a part of it was functioning and people were coming in with bodies and then post mortem was done and it was being handed over to relatives. Then it was found that there are so many bodies that post mortem is not an option, its better not to be done…"*

Figure 8: Hospital Level Emergent Body Handling

Cover Term	**Hospital Level Emergent Body Handling**
Included Terms	Receive bodies in large numbers
	Find space to lay out bodies
	Post mortem if body appears injured
	Declare Dead

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Hand over to relatives or municipal authorities

Figure 8 describes the emergent body handling tasks faced by the Hospital Administration. Their primary tasks included: a) receive bodies, in numbers far beyond the capacity of the hospital to accommodate; b) find space to lay out the bodies, because the morgue proved insufficient; c) conduct post mortem if the body appeared injured; d) declare the body dead; and e) hand it over to the relatives or the municipality.

Next, I discuss emergent tasks of the police and fire departments. This section is followed by a section on the emergent processes developed by the General Hospital to deal with the large numbers of bodies.

Police and Fire Departments

Immediately after impact, police personnel arrived with bodies at the Nagapattinam General Hospital. When bodies numbered in the hundreds, it became virtually impossible for the 7 doctors on duty to handle the numbers. So police personnel, using police jeeps, went to the neighboring districts to each doctor's house and brought the doctors in to the hospital. Therefore, they experienced a non-regular task. Fire personnel removed slush from inside the hospital wards because they possessed the necessary equipment for the task.

When IAS teams arrived in the field on December 29, they absorbed police and fire personnel into strike teams under their respective Superintendents on the team (see figure 2, p. 86). The priorities for police and fire personnel then became handling and burying hundreds of dead people. Therefore, police and fire personnel experienced another non-regular task.

Emergent Processes

A number of new processes emerged to deal with the unprecedented scale of the disaster. The following is a sequential domain analysis of the emergent triage system, post mortem system, temporary morgue development, and handing over of body systems utilized.

Triage System

The hospital had 3 teams, 1 spot (field) team, 1 mobile (transportation) team and 1 static (fixed) team. Each team consisted of a surgeon, an anesthetist, a physician, a gynecologist, staff nurses, and male and female nursing assistants in charge of triaging victims. The spot teams triaged bodies on-the-spot with black for dead and red for serious conditions. If the body looked black and bloated, doctors declared the person dead due to the tsunami. But if the body had head injuries or other bodily injuries, the doctors carried out post mortems. Once the doctors declared the person dead or completed post mortems, the hospital staff handed over the body to relatives or the municipality.

While hospital teams triaged persons in the field, rescuers continuously brought bodies into the General Hospital. I will now discuss the emergent post mortem system that appeared to handle the bodies delivered to the General Hospital.

Post Mortem System

Due to the magnitude of the disaster, 750 bodies arrived at the hospital on the first day. The Hospital Administration consulted their superiors because it became physically impossible to conduct normal post mortem procedures on every single body. After consultation, officials decided to stop post mortems unless the body appeared injured or if

doctors suspected foul play. Doctors declared the bodies dead through emergent post mortem procedures. Emergent post mortem procedures are discussed below.

Normal post mortem procedures changed in terms of identification of the cause of death. Generally, post mortems involve medical techniques of identification. However, because bodies numbered in the hundreds, the color, the structure, and the shape of the body emerged as the new post mortem method. As one respondent said, "*…so post mortem was met like this handling the bodies, color of the bodies, structure of the bodies and from the shape of the bodies…*"

Along with emergent post mortem procedures, the General Hospital also initiated the development of a temporary morgue system. This system, while emergent, enabled the storage of bodies for later identification and burial. I will now discuss the emergent temporary morgue development process.

Temporary Morgue Development

The Nagapattinam General Hospital is located approximately 1 km from the sea shore. The tsunami destroyed 50 out of its 55 buildings, leaving only 5 buildings standing to accommodate patients and bodies. In addition, the hospital has a carrying capacity of approximately 350 patients, but on the day of impact the hospital received 750 bodies. Therefore, the Hospital Administration converted the steam laundry into a temporary morgue because there was no room available to keep the bodies. As hospital officials said,

> "… There is no place to keep the bodies; the steam laundry is a very big area so we kept the bodies there. By 6 o'clock 750 bodies were received."

> "There is one big hall in our hospital which was created for steam laundry, which was under construction, the building was vacant so we kept all the bodies there."

Due to shortage of space, the staff laid out bodies temporarily in the general

pathways inside the hospital, in offices, and outside the residence of the hospital

Superintendent. The General Hospital handed over unidentified bodies to the municipal

authorities, a procedure that appeared emergent in Nagapattinam. This procedure is

discussed next.

Handing over bodies

Routinely, the General Hospital hands over bodies to relatives, once the cause of

death is identified, or to the police in the event of any foul play. On the day of impact,

however, the hospital handed over identified bodies to the relatives when they declared

the person 'dead due to natural disaster'. The hospital handed over unidentified bodies to

the municipality (sanitary workers handled bodies). Figure 9 below, illustrates to who and

how the hospital hands over bodies during normal and disaster times.

Figure 9: Hospital Level – Handing over of bodies

Hospital Level Handing Over of Bodies	
Normal Times	**Disaster Times**
Relatives – once cause of death is identified	Relatives – once bodies are identified and declared 'dead due to natural disaster'
Police – If post mortems reveal foul play	Municipal authorities – if unidentified

Next, I will discuss emergence at the Municipal level. I will provide an

introduction and then discuss emergent structures and tasks that appeared.

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Municipal Level Emergence

This section begins with an introduction of emergence at the Municipal level. The emergent structures will be discussed, followed by emergent tasks experienced by municipal officials in terms of body handling and disposal.

Introduction

As stated before, the Municipal Commissioner conveyed the message to the District Collector that a tsunami had struck the coast. The municipal authorities then received reports that the number of bodies at the Nagapattinam General Hospital had exceeded the capacity of the hospital to accommodate. So municipal authorities activated sanitary workers present in the area to help with body disposal. For the municipal officials, body disposal appeared to be the primary emergent disaster-generated task. Therefore, along with emergent tasks, emergent structures also appeared. Next, I describe the emergent structure that appeared at the Municipal level in Nagapattinam.

Emergent Structure

Each district usually has its fair share of sanitary workers for removal of bodies in normal situations. But the tsunami disaster brought about an unprecedented need to mobilize sanitary workers from neighboring districts. The municipal authorities requested that the neighboring districts send sanitary workers and lorries to assist with recovery, disposal, and transportation of bodies because the resources within the state proved insufficient. Therefore, the district appeared to be overwhelmed by the situation which led to emergence. As a result, the influx of sanitary workers from neighboring districts placed the Municipal Commissioner in charge of workers with whom he may never have

had prior contact. Therefore, emergent relationships developed at the Municipal level. Next, I describe the emergent tasks handled at the Municipal level.

Emergent Tasks

Municipal officials are usually not concerned with the operations of the local General Hospital, other than in relation to policy issues of the district that may pertain to the hospital. However, in this situation, municipality officials received unidentified bodies from the General Hospital, photographed the unidentified bodies, and instructed sanitary workers to bury them in mass graves. These tasks appeared emergent as they are not consistent with the daily functioning of municipal authorities.

Figure 10: Municipal Level Emergent Body Handling

Cover Term	**Municipal Level Emergent Body Handling**
Included Terms	Procure Sanitary Workers
	Procure Lorries for transportation
	Procure JCBs for digging of mass graves
	Procure chemicals for fast decomposition
	Identify bodies and hand over to relatives
	Bury unidentified bodies
	Record all burial locations

Figure 10 describes the various steps that emerged to manage the task of body handling as performed by the municipality. The municipality procured sanitary workers, lorries to transport the bodies, and JCBs (excavators) to excavate bodies mangled in the

debris. The municipality also procured chemicals to decompose bodies faster. Normally, municipal workers do not handle the process of turning bodies over to families, nor do they dig mass graves or record burial locations. These tasks fell upon them in the aftermath of the tsunami and, therefore, spurred a new set of relationships and activities.

To address these emergent tasks and to accomplish their new activities, the Municipality of Nagapattinam requested sanitary workers and earth moving equipment from the neighboring municipalities. Sanitary workers manually dug the graves once they entered the affected areas. They buried 270 bodies under municipal supervision on the first day; another emergent task undertaken by municipal officials who are rarely concerned with direct field action. By nightfall, municipal authorities realized that JCBs may expedite the digging of mass graves because manual digging appeared to be a slow process. Therefore, once again the municipal authorities alerted the neighboring districts and asked them to send in excavators. Even though the municipality activated its own trucks and lorries for transportation of bodies to mass graves, they requested lorries from neighboring districts to supplement the effort.

The primary emergent task for municipal authorities appeared to be handling and disposing of dead bodies. Therefore, to accomplish this primary task municipal officials procured equipment from neighboring districts and managed the influx of sanitary workers. A secondary task involved debris clearance (see figure 10, p. 113, for emergent municipal level tasks).

On December 29, the third day since the disaster, the State level IAS teams reached the affected area. The IAS teams then took charge of all operations at the Municipal level. Hence, emergence in the form of designated structures changed as

municipal officials reported to the IAS Team Leaders, members, and specifically the Incident Commander (see figure 2, p. 86).

Through taxonomic analyses, a summary of the District and Municipal levels' primary emergent task of body handling in terms of division of labor can be delineated below:

Figure 11: Emergent Body Handling Tasks

Emergent Body Handling Tasks	
Task	Emergent Division of Labor
1. Locate the bodies	Sanitary workers and Local officials
2. Use earth movers to extricate the bodies	Local officials
3. Physically remove the bodies	Sanitary Workers
• Bury *in situ*	Sanitary workers and Locals
• Hand over to relatives	Hospital Staff or Municipal officials
a. Identify	Relatives
b. Bury/Cremate	Sanitary workers of Relatives
• Transport to the hospital	Truck drivers from neighboring municipalities
a. Lorries	Drivers
b. Mortuary Vans	Drivers
c. Ambulances	Hospital Staff
4. Lay out bodies at the hospital for identification	Sanitary workers and Hospital Staff
5. Post mortem if there are appearances or injuries	Doctors
6. Declare the person dead	Doctors
7. Hand over the body to the municipal authorities	Hospital Staff

Given the above taxonomic analysis of emergent body handling tasks managed by the District and Municipal levels, I will now discuss emergence at the Local level.

<u>Local Level Emergence</u>

In all villages where I gathered data, it appeared that locals did almost all the rescue and relief work for the first three days after the tsunami. The fishing community and local volunteers began instantaneous search and rescue and body recovery activities within the first few hours after impact. Local volunteers consisting primarily of local fishermen, vendors, and community folk undertook the primary tasks of body recovery, removal, and disposal. During the first 3 days, specifically, in the villages of Akkrapettai and Keechankuppam, it appeared impossible for the administration to gain access to the area because huge boats weighing 10 to 15 tons blocked all access. In many instances it has been stated that,

> *"...fishing communities work close, hand in hand with each other and in many districts they came forward in spite of having lost their houses, their belongings, their dear ones, they really came forward to help find out where the people were, to rescue any marooned people, to clear debris..."*

> *"...villagers at least realized that it would be impossible for the District Administration to individually attend to each dead body...they decided that, we just have to start doing the burials ourselves...' '...in the first 48 hours whatever burials actually took place...85-90% were private initiative."*

> *"...I think the awesomeness of the tragedy was so much that people were just allowed to take care of their dead themselves."*

I will now discuss the structure and cultural context of local fishing communities in India. It is perhaps this structure, based on cultural ideals and friendship networks, that formed the basis of the local response at Nagapattinam.

Introduction

Local fishing communities in India are highly structured with authority delineated at all levels. As one interviewee said,

> *"...one thing which is very strong about the fishermen community is that they exist as a community; they have a strong organization which is both federate, they have a local village committee, they call Panchayats. They have some financial resources also."*

Pre-existing social networks are the backbone of Indian society. People that are a part of these social networks respond to the call for help even on a daily basis. An extension of this network appeared in the villages at Nagapattinam as the scale of the disaster warranted group cohesion and community altruism. The villages of Akkarapettai and Keechankuppam are located to the south of Nagapattinam and are connected to the northern part of the district by a single bridge. This single bridge suffered intense damage by the tsunami which deterred all access into villages to the south of the district.

The next section will discuss how local elders and Panchayat leaders led the emergent structure, with specific examples from the three hardest hit villages in terms of the number of dead. This section will discuss how emergent groups formed under the leadership of local elders and handled emergent body handling tasks. This section will also discuss the role of the church and the local merchant sector in body handling tasks. This section will be followed by a section that describes the emergent body handling and recovery tasks performed by the locals in the three hardest hit villages.

Emergent Structures - Selected Examples

Role of Local Elders and Panchayat Leaders

During normal times fishing communities are highly structured, as stated earlier, with a distinct hierarchy. Fishermen are very organized with village committees called Panchayats who report to area committees. Area committees in turn report to a central committee. Leaders of village committees along with the local village elders emerged as overall leaders of the emergent activities in the villages.

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After the tsunami waves hit the villages, initially people ran away and hardly anyone stayed to do anything. However, after a few hours, locals started getting organized. With instructions from local elders and the heads of the local fishing Panchayats, the local males recovered bodies. The local males recovered bodies from streets, transported them to temporary locations, allowed relatives to identify and remove bodies, and buried the unidentified in mass graves. As an official said,

"The very initial disposal of the dead which took place was by the people, of the people themselves." "The actual physical act of burial was done a) by the villagers which is of course all 100% fisher people."

Another interviewee remarked,

"...and of course when there is a major calamity of this nature lot of support comes from within the community like collecting the bodies and the burials."

The locals in this area had no prior search and rescue training and undertook the task of body recovery, removal, and disposal for the first time ever. As one respondent stated, *'...in the last 60 years he has never seen any such training...'* The local people organized a mass team effort among themselves because they realized that it appeared impossible for the District Administration to reach their villages. As one official stated, *"villagers at least realized that it would be impossible for the District Administration to individually attend to each dead body."* Therefore, with advice from the village elders and fishing Panchayat leaders the locals coordinated and handled body recovery and disposal. As another official stated,

"They have elected fishermen Panchayat leaders who control their affairs so the organization of immediate relief and restoring some kind of normalcy in the villages has been quite fast..."

Role of the Parish and Youth Section

Parishes in India generally organize the youth sections of their parishioners into groups for church related work on a daily basis. Church related work involves social work in villages, visits to the old age homes, and volunteering to feed the poor among a few. After the water receded in Velankanni, bodies lay strewn around on the streets. The youth sections of the diocese soon acted and recovered and collected bodies. Forty-five youths from the diocese used local tractors and church vehicles to collect bodies and brought them back to the temporary morgue, established in pandals (large structures built of bamboo and brightly colored cloth used as a venue of worship during festival times in India. Pandals are usually built on busy streets or thoroughfares). On December 27, a day after the disaster, this local assistance proved inadequate as volunteers felt tired and began fainting. The Rector of the local church, who had led the response of volunteers until this time, requested help from the neighboring dioceses. Youth sections of the neighboring dioceses then came forward to assist with emergent body handling tasks on December 27 and supplemented the efforts at Velankanni.

Role of the Merchant Sector

Local merchants in Velankanni consist of sea-shell vendors, vendors selling religious items, and small eatery owners. As soon as the water receded after the tsunami, local sea shell vendors and shop owners began rescue work. Rescuers used vendor carts (a type of two-wheeler push cart usually to display goods or serve food) to transport bodies from the sea shore to a temporary resting place further inland. A local sea shell vendor organized his team of friends and rescued bodies from the shore. This local sea shell vendor has been a life guard along the shore for 12 or 13 years. His livelihood along

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the coast makes him and his friends automatically respond to the need of the hour, even during normal times. His team retrieved 18 bodies from the water and placed them at a distance from the shore. A second wave consumed the bodies. Once again they retrieved bodies from the shore, but this time they transported them (on vendor carts) to the nearby pandal designated as a temporary morgue. They continued their search for friends and family tirelessly until the District Administration arrived.

I will now focus the analysis of the Local level of emergence specifically on the 3 hardest hit villages in terms of the number of dead. The villages of Akkarapettai, Keechankuppam and Velankanni are discussed next.

Emergent Tasks

Akkarapettai and Keechankuppam

In the villages of Akkarapettai and Keechankuppam emergent tasks of search and rescue and body handling occurred in the first few days after impact. The local villagers realized that the District Administration could not reach them and, therefore, coordinated body recovery and disposal activities among themselves. As one interviewee said,

> *"Villagers at least realized that it would be impossible for the District Administration to individually attend to each dead body, they decided that we just have to start doing the burials ourselves."*

After impact, the local males, under the advice of their local elders, retrieved bodies from the streets. They also recovered bodies that lay mangled in debris and took them to temporary locations. Local elders designated the nearby petrol pump (gas station) and the nearby bridge as temporary locations. Rescuers used bare hands, in some cases, to remove bodies and transport them to temporary locations. While some local rescuers used bare hands, simultaneously, some other local rescuers made stretchers out of sacks

and wooden poles. Rescuers used these makeshift stretchers to transport bodies from the place where they had been recovered to the designated temporary location, and then to final resting places. Local people also dug mass graves and buried bodies as well during the initial days after impact, without identifying or meeting any sanitation requirements. As one official put it,

> *"The initial disposal of the dead which took place, the very initial disposal of the dead which took place was by the people, of the people themselves…" '…push carts were being used to carry dead bodies, carts which are otherwise used for vending vegetables and fruits…and a man pushing what could probably be his mother and two children, he is just carrying them on the street…"*

Velankanni

In Velankanni, immediately after the tsunami on December 26, bodies of mostly women and children lay strewn along the streets. Local shops near the church had washed away with the waves and bodies lay mangled in the debris. The youth section of the diocese used local tractors and church vans to locate bodies. They temporarily kept the bodies in pandals where locals then identified the bodies. The youth teams then photographed the bodies for documentation purposes and issued certificates for those declared dead. The youth then dug mass graves across the main road, and buried bodies on the first day. On the second day, due to putrification, the youth teams buried bodies *in situ.* However, around the second day of the local response, volunteers felt tired and began fainting. Then the Rector of the local church called for help from the neighboring parishes.

Rescuers used a number of *ad hoc* resources to recover and transport the bodies. In the next section, I discuss the resources used by local rescuers in handling emergent tasks that arose from the disaster.

Resource Acquisition to Manage Emergent Tasks

Locals used their bare hands in some cases or makeshift stretchers in some other

instances to handle body recovery, removal, and transportation. Locals used vendor carts

(usually used for the sale of vegetables and fruits), tricycles, and 4 wheelers or whatever

was available, to transport the dead and injured. Local rescuers conducted individual

cremations (based on Hindu customs) *in situ* on putrefied bodies, because the bodies

could not be removed from the debris. They used old tires as a substitute for firewood

because most of the firewood remained soaked with water.

The emergent tasks at the Local level, primarily body handling tasks, are

taxonomized in Figure 12 below. As one interviewee stated,

> *"The actual physical act of burial was done a) by the villagers which is of course*
> *all 100% fisher people and b) which was done by NGOs."*

Figure 12: Village Level emergent body handling

Cover Term	Village Level Emergent Body Handling
Included Terms	Body Recovery • From streets • Mangled in debris • Lodged in boats
	Body Removal
	Transportation of Bodies • Bare hands • Ad Hoc Stretchers (wooden poles & sacks) • Auto Rickshaws • 4 Wheelers • Hand carts/Vendor carts • Tricycles
	Assemble bodies at temporary locations • Petrol Pump • Bridge (under construction)

Body Identification

Burial and Cremation
  • Mass graves/cremations
    • Near the coastline
    • In the village
    • *In situ*
  • Individual graves/cremations
    • Near the coastline
    • In the village
    • *In situ*

Following the Local level of analysis, I will now discuss emergence at the Non-Government Organization level in Nagapattinam. I will provide an introduction and then discuss the emergent tasks that NGOs handled after the tsunami.

Non-Governmental Organizational (NGO) Level Emergence

NGOs play a significant role in developmental, educational, and gender issues in India to name a few. Given this context, it is not surprising to note that NGOs played a major role in the Indian Ocean Tsunami disaster as well. This section of the chapter will provide an introduction of NGOs in the aftermath of the tsunami, followed by a description of the emergent tasks they performed. I will also summarize the emergent relationships that developed between NGOs and the IAS teams.

Introduction

The enormity of the situation at hand had overwhelmed both the District and the State Administration. The State required NGO assistance to supplement the efforts of IAS teams because the State's material resources proved equally insufficient to handle the emerging needs at hand. Therefore, NGOs are described here as the primary resource

mobilizing agents because they provided the IAS teams with material in the field. As another interviewee stated,

> "…lot of NGOs came in to help with lot of aid from within the country and from outside the country so we formed coordination centers at the state and the district level to ensure proper distribution of relief material coming from different sources."

The convergence of NGOs on the affected area initially posed a problem as everyone appeared to want to help with the rescue efforts. As one interviewee stated, "*NGOs came with this notion that the government is not doing anything…*" Gradually, from the third day onwards, once the State assumed proper coordination of NGOs and as the formal system of response began to evolve, NGOs became one of the government's greatest strengths. As another interviewee said, *"our greatest support strengths that we got was from NGOs." "NGOs were a great help."* The next section describes the emergent tasks handled by NGOs in the field and as an agent for resource acquisition.

Emergent Tasks

In the immediate post-impact phase of the disaster, local officials, local people, and NGOs present in the field immediately began body recovery and burial. They began body recovery and disposal because blocked roads and bridges limited the extent of state intervention in the affected area. As one interviewee stated, *"in disposal of bodies also several NGOs were there."* Another interviewee stated,

> "The actual physical act of burial was done a) by the villagers which is of course all 100% fisher people and b) by NGOs."

As stated earlier, NGOs primarily mobilized material resources into the field and met requests made by IAS teams. For instance, teams asked for earth movers to assist

with debris clearance. NGOs met the teams' requests by getting donors (private firms) to provide the necessary material. As interviewees said,

"In the very early stages there was the need for earth movers as there was nothing available – we had a contract with TTC and you know, it's a big company here and they immediately sent us their earth movers."

Teams asked for white cloth to wrap the bodies and cellrich for quick decomposition of bodies. As interviewees said, "*…reports from the field were, for a lot of requests for white cloth to wrap the bodies."* NGOs also brought their prior knowledge (quick body decomposition methods) and experience to the field. One respondent stated that NGOs who had direct experience with the earthquake in Bhuj, Gujarat in 2001, brought their expertise to the field in Tamil Nadu as well. NGOs suggested the use of Cellrich in Tamil Nadu. Cellrich is a chemical that they used after the Gujarat earthquake to decompose bodies faster in mass graves. As an NGO interviewee said, *"...the stuff we got from Gujarat to decompose the bodies, we got this component called cellrich…"*

Based on semantic relationships of analysis and using the strict inclusion method, the following tasks, outlined in figure 13, appeared emergent for NGOs after the disaster.

Figure 13: NGO Level emergent body related tasks

Cover Term	**NGO Level Emergent Body Related Tasks**
Included Terms	Recover and Bury bodies
	Procure material requested in the field by IAS Teams for dead body disposal • Earth movers • White Cloth • Cellrich
	Bring prior knowledge to the field
	Attend daily debriefings for material requests

Emergent Relationships

Photo 4: NGO Coordination Center in an *ad hoc* hut in Nagapattinam

An NGO coordination center established at the District Collectorate from the day of impact, coordinated converging NGOs to the disaster area (see photo 4). Emergent relationships developed once the IAS teams entered the field from the third day onwards. For example, NGOs attended daily briefings every evening where IAS teams requested material needed in the field. NGOs assisted the teams by meeting these requests. This process led to emergent relationships between the Incident Commander, IAS Team Leaders, and NGO representatives in the field.

Summary and Conclusion

This descriptive analysis reveals emergence at all levels of government, State, District, Municipal, Local as well as NGO levels. Emergence occurred in structures and tasks in the aftermath of the tsunami and was necessitated by the magnitude of the event. Emergent structures led to emergent forms of communication, emergent processes of

involvement of officials, as well as emergent relationships between and among officials, locals and NGOs. Emergent tasks occurred in the form of new processes required to meet and manage the massive disaster-generated needs.

The Indian Ocean Tsunami warranted an unprecedented need for emergent behavior among all people involved and affected. This disaster was severe and unknown to this part of India and brought about a number of instant deaths in a short period of time. The lessons that may be learned from this disaster are numerous and should be accounted for when creating new disaster management plans.

CHAPTER VI

CONCLUSION

Overview

This chapter provides a summary of the thesis and discusses characteristics and conditions of emergence. The chapter begins with a discussion of characteristics and conditions that are explained in the literature review. The chapter will then discuss the characteristics and conditions revealed through the research conducted on the Indian Ocean Tsunami. Similarities and differences between literature review and thesis findings will be highlighted and recommendations will be added at the end of the chapter.

What is a Characteristic?

According to the Dynes (1970) typology, emergence is described as new tasks and structures that emerge to deal with the disaster situation. A Type I organization is characterized by regular tasks and an old structure. A Type II organization is characterized by regular tasks and a new structure. A Type III organization is characterized by non-regular tasks and an old structure. A Type IV group is characterized by entirely non-regular tasks and new structures. A Type IV group emerges to meet the needs of the community and may dissolve soon after the emergency period is over.

Given the Dynes (1970) typology, characteristics of emergence are new tasks and structures (i.e. division of labor). Composition of emergent groups and duration of their existence are also key characteristics. This study is limited to studying emergence only in

the emergency period of the tsunami disaster. The study is also limited to the emergent

tasks that appeared to be priorities of response teams in the field. I have discussed the

Dynes (1970) typology in order to illustrate a difference in the Indian context.

What is a Condition?

A condition of emergence is a pre-requisite for emergence to occur, a situation

required to generate emergence without which emergence is somewhat unlikely.

Conditions emanate from and reflect local context (Phillips, 2002). For example, a

community that is isolated from responding agencies will develop methods to assist each

other.

The literature suggests the following as major conditions that cause emergence, a)

unmet needs, b) the magnitude of the disaster, c) proximity to the disaster, and d) pre-

existing social networks. Therefore, the literature suggests that in order for emergence to

take place the above-mentioned criteria must be evident. Next, I examine each one

individually.

a) Unmet needs occur when disasters create needs that surpass the capability of

responding organizations (Form & Nosow, 1958; Barton & Merton, 1963; Barton, 1969;

Dynes, 1970; Parr, 1970; Forrest, 1974; Wenger, Quarantelli & Dynes, 1989; Drabek &

McEntire, 2002). According to the literature, when people are isolated from traditional

responding organizations emergent groups tend to fill the gaps (Dynes, 1970, p. 146;

Stallings, 1978; Drabek, 1986, pp. 157-172). Therefore, we can infer that blocked access

to the affected area leaves people isolated and spurs emergent group formation. Some

disasters cause entire communities to be blocked off for a while until the proper

equipment arrives to clear the debris. Debris may block access roads and bridges and

prevent responding agencies from entering the affected area. This inaccessibility creates a situation where locals are compelled to respond to their own immediate tasks. Immediate tasks could range from search and rescue for victims to handling the dead (Form & Nosow, 1958; Taylor, Zurcher & Key, 1970; Dynes, 1970). According to the literature, unmet needs are also generated when there is a break down in organizational response. Organizational breakdown occurs due to lack of prior planning, lack or collapse of authority, and challenging tasks (Parr, 1970; Drabek, 1968; 1981, p. 17; 1986; Mileti, Drabek & Haas, 1975; Stallings, 1978; Mileti, 1999, p. 222; Drabek & McEntire, 2002). When organizational breakdown takes place emergence is facilitated.

b) When the magnitude of a disaster is far beyond the scope of local responding agencies, emergence takes place (Barton & Merton, 1963, pp. 5, 125; Barton, 1969; Wenger & Parr, 1969; Dynes, 1970, pp. 81-82; Roth, 1970; Drabek, 1981; Wenger & James, 1994; Tierney & Goltz, 1997; Tierney, 2003). Established organizations are unable to handle the response when the magnitude of a disaster is considerably large. In these situations, the social system adapts to the altered social setting and emergent groups perform disaster-relevant tasks (Kreps, 1978, p. 78-80). Therefore, the magnitude of a disaster spurs emergent groups.

c) The greater the proximity to the affected area, the more the likelihood of emergent groups forming to handle disaster-relevant activities (Kreps, 1978, pp. 80-81). According to the literature, distance from the impacted area may demand that local citizens get involved in the response (Wenger & Parr, 1969; Roth, 1970; Forrest, 1974, 1978). They get involved because they have resources and manpower available (Roth,

1970; Forrest 1974, pp. 54-58, 1978; Mileti, 1999, p. 222). Proximity to the impact area is, therefore, a condition spurring emergence.

d) Pre-existing social networks are the other primary condition that assists the formation of emergent groups in a locally affected area (Form & Nosow, 1958; Barton & Merton, 1963; Dynes, 1970, 1978, 2005; Taylor, Zurcher & Key, 1970; Forrest, 1974; Quarantelli, 1983; Drabek, 1968, 1986; Wenger, Quarantelli & Dynes, 1989; Aguirre et al., 1995; Neal & Phillips, 1995; Mileti, 1999). Prior contact, liaisons, and familiarity with one another in the neighborhood may foster emergence. Communities that are dominated by personalized relationships tend to cope with disasters with their pre-existing structures (Dynes, 1970, p. 103; Forrest, 1974, p. 84; Tierney, 2001, pp. 113-114, 174-177). In disaster situations, individuals tend to seek out those that they are familiar with to determine a course of action. These individuals in turn seek out others to join the collective effort (Forrest, 1974, p. 98, 1978). Social networks that have inherent leadership within the community continue with the same leadership during disaster times (Forrest, 1974, p. 27, 1978). Thus, pre-existing networks spur emergent behavior.

Characteristics of Emergence

In this section I will discuss characteristics of emergence within and outside the U.S. that agree or disagree with the Indian tsunami situation. I will highlight characteristics based on emergent tasks, structures, composition, and duration of emergent groups in Nagapattinam.

Compare and Contrast

Emergent Tasks and Structures

According to the literature, emergent groups form within and outside the U.S. to deal with disaster-generated tasks (Form & Nosow, 1958, Taylor, Zurcher & Key, 1970; Prince, 1920; Kennedy, 1971; Drabek, 1981; Quarantelli, 1984; Dynes, Quarantelli & Wenger, 1988, Aguirre et al., 1995). In the Indian situation, emergent groups formed at the State level to handle disaster-generated tasks. Similarly, at the Local level volunteer teams handled body recovery and disposal.

According to the literature, emergent tasks and emergent structures seem to appear in close conjunction with one another. To handle emergent tasks, responding agencies resort to emergent structural changes (Form & Nosow, 1958; Barton & Merton, 1963; Barton, 1969; Taylor, Zurcher & Key, 1970; Forrest, 1974; Wenger, 1978; Ireland, 1984, Neal, 1985; Quarantelli, 1983, 1994; Aguirre et al., 1995; Wenger, Quarantelli & Dynes, 1989). Priority tasks after the tsunami appeared to be body recovery, disposal, and debris clearance. The State, District, Municipal, Local and NGO personnel handled all emergent priority tasks. In addition, NGO coordination appeared to be an important task for the State level authorities, while mass burials appeared to be the most important task for municipal officials. In order to handle emergent tasks, the State created IAS teams that constituted members from the District and Municipal levels as well. At the Local level, teams formed and handled emergent tasks based on culturally defined structures, i.e. seniors and village elders led the teams. Therefore, emergent tasks did appear with emergent structures after the tsunami.

The literature suggests that divisions of labor are based on leadership positions and authority (Forrest, 1974; Wenger, 1978; Neal & Phillips, 1995). In India, the State named an IAS officer the Incident Commander due to rank and seniority in the services. Likewise, IAS officers acted as Team Leaders due to their leadership capabilities and their authority. Similarly, the District Collector led the District and Municipal response due to leadership potential. At the Local level, village elders used their seniority and leadership position from normal times, in the emergency time period, to lead the response. The entire response at the State level and the formation of the IAS teams reflected a new structure with emergent divisions of labor (see figure 2, p. 86).

According to the literature, organizations that respond to an emergency have interactions with the community from the pre-impact phase (Wenger, 1978). Also, leaders of emergent groups are chosen due to their skills and relevant knowledge of the social system in question. Leaders possess knowledge of the social system because of prior involvement or previous socialization in the area (Forrest, 1974). The Indian IAS emergent groups testify to this fact. IAS Team Leaders had, in the past, been District Collectors in the area. Therefore, because they possessed knowledge of the local area and the people, the State government made them Team Leaders.

Also according to the literature, emergent groups have relatively little hierarchy, roles are not specialized, and there is no formal element of organization (Stallings & Quarantelli, 1985). In the Indian situation, although no formal organization existed in the Local level response, yet hierarchy appeared based on respect for seniority. Emergent groups of local citizens performed disaster-relevant tasks based on the advice of their local Panchayat leaders and village elders.

The literature suggests that tasks and structures of police departments may change. Officers may exercise personal discretion in the field, but for the most part they find themselves taking directives from local emergency managers (Wenger, Quarantelli & Dynes, 1989). In the Indian situation, police officials constituted emergent IAS teams and reported to their Superintendents or Team leaders in the field. Therefore, police officials experienced new tasks and new structures in the field.

The literature also suggests that communication lines change after a disaster (Ireland, 1984; Neal, 1985; Quarantelli, 1983, 1994). The channel of communication did appear emergent in Nagapattinam as well. Emergent relationships that developed between officers of the State, District, Municipality and NGOs led to emergent communication networks (see figure 3, p. 92).

Composition

According to the literature, local citizens are the first to respond (Form & Nosow, 1958; Taylor, Zurcher & Key, 1970). Prince (1920) described how volunteers from the local area initiated the response effort after the explosion in Halifax, Canada. In India too, volunteers at the Local level appeared to be local citizens and survivors. In addition, emergent groups may also consist of public officials (Mileti, Drabek & Haas, 1975). Public officials (IAS officers) did constitute emergent groups created by the State to handle the entire response effort. The literature also suggests that visitors to the area may form emergent groups as well (Prince, 1920; Taylor, Zurcher & Key, 1970; McLuckie, 1977; Quarantelli, 1984). Visitors did not appear to form emergent groups in the Indian context. This may be attributed to the fact that boats weighing 10 -15 tons blocked all access to some villages.

The literature suggests that emergent groups are short-lived and dissolve when the emergency period is over (Dynes, 1970, p. 46; Taylor, Zurcher & Key, 1970; Forrest, 1974; Mileti, Drabek & Haas, 1975, p. 75; Stallings & Quarantelli, 1985; Tierney, 2001). In India, local citizens, that formed emergent groups, handled body recovery and disposal tasks and then dissolved. Similarly, the IAS teams created at the State level dissolved after handling emergent tasks. Therefore, in terms of duration of emergent groups, the Indian situation concurs with the literature.

Indian Emergence

At this stage I would like to offer a new model of emergence that may serve to understand the Indian context of emergence better. Emergence is based on what I have observed in India with the body handling and response effort. An explanation of the diagram follows Figure 14.

Figure 14: Indian Emergence
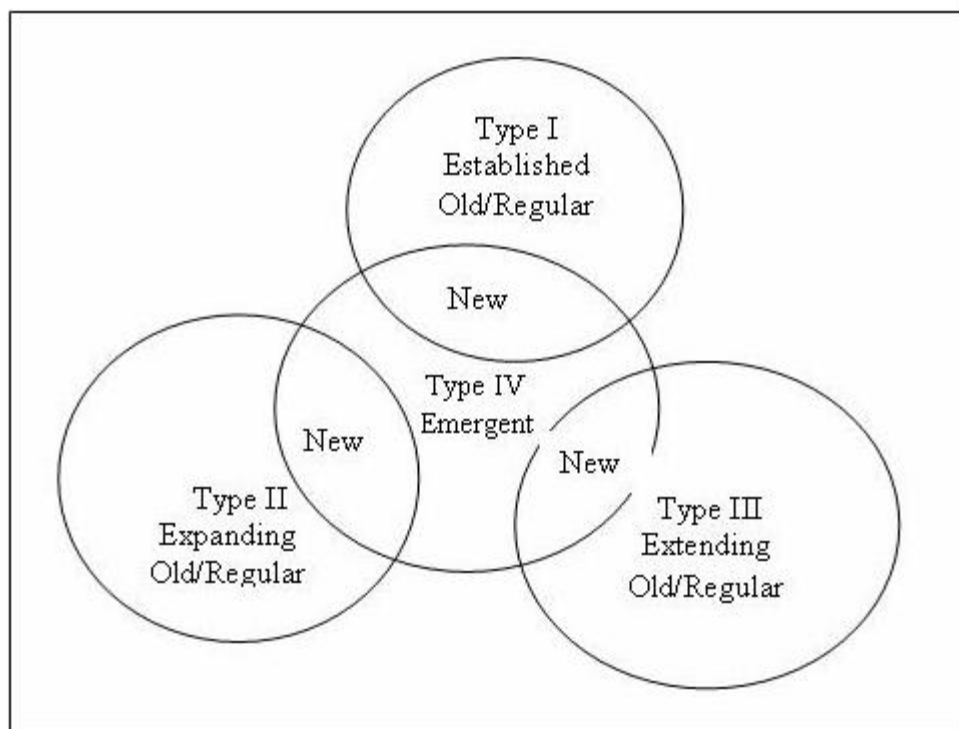
The literature suggests that established organizations (Type I) are not likely to change their structure or their tasks. The literature also suggests that in the event established organizations perform new tasks, they will revert to their traditional tasks as soon as possible (Dynes, 1970). In India, the Indian Administrative Services is the right arm of the executive government and can be compared to an established organization. It is a highly structured and delineated organization with clear lines of authority. This organization of bureaucratic officers experienced changes in its tasks and structure in the aftermath of the tsunami. IAS officers generally make independent decisions about policy issues. However, in the field they made decisions pertaining to body handling and disposal and reported to the Incident Commander. Therefore, even established organizations, like the IAS, engaged in task and structural changes. Even established organizations like the police department experienced a new structure and new tasks. Police officials reported to their IAS Team Leaders in the field and performed emergent body recovery tasks. Therefore, it is suggested that established organizations experienced a phase of emergence in their tasks and structures. The new structure of the IAS dissolved soon after the crisis period ended.

According to the literature, expanding organizations (Type II) witness a new structure, but perform regular tasks (Dynes, 1970). In this case, NGOs are considered expanding organizations. NGOs experienced a new structure when they expanded their ranks and brought in volunteers. But NGOs also assisted locals with dead body recovery and disposal, a task unknown to them. NGOs in India are usually concerned with development and education issues. Therefore, this example of an expanding organization

testifies to a new structure and non-regular tasks. It is also suggested here that expanding organizations engage in non-regular tasks for a brief period, in disaster times.

According to the literature, extending organizations (Type III) perform new tasks, but their structure remains the same (Dynes, 1970). In India, extending organizations reported to the IAS Team Leaders instead of their company managers. Therefore, an emergent relationship is observed. Type III organizations, experienced new structures and performed new tasks as well. For example, cement companies brought earth movers into the field for debris clearance and body removal.

According to the literature, emergent organizations (Type IV) are based on entirely new structures and tasks (Dynes, 1970). In this instance, on the advice of village elders, locals performed emergent tasks of body handling and recovery. Their pre-disaster loose structure strengthened after the tsunami, as elderly advice formed the leadership authority structure. Therefore, emergent tasks and structures are apparent. Hence, Type IV remains an emergent group with elements of new tasks and new structures embodied within it. The Venn diagram (see figure 14, p. 135) serves to illustrate emergence, in terms of new tasks and structures that appeared in India in Established, Expanding, Extending, and Emergent Organizations.

Conditions of Emergence

I will now examine each condition of emergence from the literature review and relate them to the tsunami context. This contrast and comparison will help to establish similarities or differences that arose from the data.

Compare and Contrast

a) Unmet Needs

The literature suggests unmet needs spur emergence (Form & Nosow, 1958; Barton & Merton, 1963; Dynes, 1970; Parr, 1970; Forrest, 1974; Wenger, Quarantelli & Dynes, 1989; Drabek & McEntire, 2002). Unmet needs occur when people are isolated from traditional responding agencies (Dynes, 1970, p. 146; Stallings, 1978; Drabek, 1986, pp. 157-172). In the emergency period of the tsunami disaster, huge boats had lodged on the main roads that connect the villages to the District Administration. This inaccessibility isolated the villagers from traditional responding agencies. Therefore, emergent groups appeared to handle body recovery and disposal tasks.

The literature suggests that a breakdown in organizational capability to respond to the disaster generates unmet needs (Form & Nosow, 1958; Barton & Merton, 1963; Dynes, 1970; Parr, 1970; Forrest, 1974; Wenger, Quarantelli & Dynes, 1989; Drabek & McEntire, 2002). Organizational breakdown occurs due to lack of planning, lack of prior experience, lack of authority, collapse of authority, and challenging tasks (Parr, 1970; Drabek, 1968, 1981, p.17, 1986; Stallings, 1978; Mileti, 1999, p. 222; Drabek & McEntire, 2002). In India, the District Administration's resources fell short of their capability to adequately respond to disaster-generated needs, thus, generating emergence. Also due to lack of prior planning, lack of prior experience, and challenging tasks at the District and Municipal levels, the State government intervened. Therefore, the tsunami context parallels the research findings in the literature.

On the other hand, the presence of authority, leadership capabilities, and the need for quick and independent decision makers also spurred emergence at the State level. As

a result IAS teams formed. The need for quick and independent decisions makers that spurred emergence in Nagapattinam is a condition not parallel to the findings in the U.S. and abroad. In addition, the State government seemed to centralize authority with one Incident Commander, yet decentralized authority to 11 people in the field. Decentralizing authority made the IAS teams answerable to the Incident Commander, and kept the authority structure somewhere in between a command and control and emergent one. The response effort in Nagapattinam appeared centralized and decentralized. Thus, this finding is specific to the Indian Ocean Tsunami context.

An example in the literature describes how emergent groups appeared after the earthquake in Chile in 1965, but their influence was restricted as officials solely handled the earthquake (Kennedy, 1971; Quarantelli, 1984). However, in India, the local people performed most of the body recovery and disposal tasks before any administrative units could access the area. Therefore, it may be suggested that officials did not discount the capabilities of the local citizenry.

b) Magnitude of the Disaster

The literature suggests that when the scope of a disaster is great, emergence is more likely to be observed (Barton & Merton, 1963, pp. 5, 125; Barton, 1969; Dynes, 1970, pp. 81-82; Roth, 1970; Kreps, 1978; Wenger & James, 1994; Tierney & Goltz, 1997; Tierney, 2003). The Indian Ocean Tsunami was an unprecedented set of events to take place in this part of the country. A tsunami was unknown to people in this area. In a matter of a few minutes, waves washed ashore and left thousands dead and many more injured. Locals realized the need to perform body recovery and disposal tasks because

bodies lay on the streets. Thus, emergence occurred at the Local level to handle emergent tasks due to the magnitude of the disaster.

Also because of the magnitude, district resources proved insufficient to handle bodies or clear debris. Thus, resources of the State became imperative. The State government possessed resources that could regain access to the affected areas, in terms of material and personnel. In addition, the State Government received air reconnaissance reports, district reports, and damage assessments by senior IAS officers. Therefore, the State realized that the magnitude of the event warranted State intervention. IAS teams had the power to mobilize far more earth movers and excavators than the district. The magnitude of the event also required quick and independent decision makers in the field to handle disaster-generated tasks. Thus, the magnitude of the event spurred emergence at the State level.

c) Proximity to the Impact Area

The literature suggests that proximity to the impact area generates emergence (Wenger & Parr, 1969; Roth, 1970; Forrest, 1974, 1978; Kreps, 1978). In the Indian situation, local citizens performed the initial tasks of body recovery and disposal until the State regained access to their villages. In this disaster, people either died or survived, relatively few people appeared injured. Therefore, body handling appeared to be the main task for local citizens. Local citizens and NGOs present in the impact area began body recovery and disposal tasks before responding agencies entered the field.

d) Pre-existing social networks

Pre-existing social networks are the backbone of Indian society. These networks serve to empirically ground the theory that pre-existing ties are key conditions that

provoke emergence (Form & Nosow, 1958; Barton & Merton, 1963; Dynes, 1970; Taylor, Zurcher & Key, 1970; Forrest, 1974; Drabek, 1986; Wenger, Quarantelli & Dynes, 1989; Aguirre et al., 1995). At the State level, the officers' familiarity with Nagapattinam provoked emergence at this level of government. IAS officers had previously been District Collectors in the area and knew the local geography and people very well. Also, the prior professional affiliations of IAS officers with one another provided the condition for team selection.

Emergent groups form where kinship and community values dominate life (Roth, 1970). In India, villagers knew one another by name and by the number of family members that existed in each family. They also knew where to search for victims. Prior social networks also existed in Velankanni, where local merchants knew one another from the sea shore (where they sold goods together). Therefore, they banded together to help find family and friends and recover and dispose of dead bodies.

e) Community Altruism

The literature also suggests community altruism as a condition which spurs emergence (Prince, 1920; Barton, 1969; Roth, 1970; Dynes & Quarantelli, 1968; Kennedy, 1971; Aguirre et al., 1995; Tierney & Goltz, 1997). Altruism was certainly visible after the Indian Ocean Tsunami as local people got together and searched for victims and friends. In India, on a daily basis in small time crises, community cohesion and altruism are the key life savers sometimes. The inaccessibility to the affected area, coupled with the cohesive nature of the fishing community, and pre-existing social networks, triggered emergence at the Local level in Nagapattinam.

<u>Discussion of Conditions</u>

The main conditions that triggered emergence in Nagapattinam can be summed up as the magnitude of the event, disaster-generated unmet needs, and pre-existing social networks at all levels of government.

The scale of the disaster encouraged the District Administration to test a new authority structure. In doing so, the District Administration placed the police, fire, health, rescue, and other departments under the command of the District Collector. However, when they finally realized the full scale of the tragedy by December 29, the need for on-the-spot decision makers became apparent. In addition, the resources at the District level in terms of manpower and resources proved insufficient to handle the scope of the disaster. Therefore, the district requested the state for help. This in turn led to the formation of IAS teams under the supervision of a senior IAS officer in the service, the Incident Commander. IAS teams brought in resources and independent decisions makers to handle the response. The magnitude of the event proved far more than what the District Administration could handle alone and spurred emergence at the State level. At the Local level, villagers experienced the magnitude in terms of the number of dead that lay in the streets. The dead included their own family members. As a result, the locals banded together, formed teams, and organized body recovery and disposal.

Resources of the municipality also fell short on account of the magnitude of the disaster. Therefore, under the supervision of the Municipal Commissioner, the Municipality of Nagapattinam requested sanitary workers and earth movers from neighboring districts. At the local General Hospital, the number of bodies reflected the

magnitude of the event. Therefore, the hospital resorted to emergent processes of post mortem, temporary morgue development, and triage systems to handle the bodies.

As stated by Roth (1970), magnitude of impact and available manpower may demand that local citizens get involved in the response. This was apparent in the Indian Ocean Tsunami context. Local villagers initiated body recovery and disposal tasks due to the fact that bodies lay strewn about on streets from the sheer magnitude of the tsunami. The stench from rotting bodies as well as perceived health issues further initiated emergent behavior. In the village of Velankanni, local merchants had the manpower available and, therefore, began search and rescue and body disposal tasks.

The locals also realized that their needs were left unmet due to huge accessibility issues. The fact also remained that the primary roads, that linked the villages to the District Administration, appeared completely blocked. Thus, unmet needs spurred emergence at the Local level.

The literature suggests a lack of coordination during the emergency generally spurs emergence at the local community level (Barton & Merton, 1963; Parr, 1970; Dynes, 1970; Drabek, 1986; Wenger, Quarantelli & Dynes, 1986; Drabek & McEntire, 2002). However, this was not the case in India. Locals organized themselves into groups because their access was cut off from the main roads that lead out of the village, and not due to a lack of coordination at the administrative level. Likewise, emergence at the State level occurred due to the need to make spot decisions in the field, a condition that is dissimilar to prior studies in the U.S. and abroad.

Pre-existing social networks definitely played a part in the organization of all emergent teams at the State, District and Local levels. At the State level, IAS officers'

familiarity with one another (from prior professional affiliations in school, training, and in their jobs) and their interactions with the people of the area prior to impact, triggered their selection as team leaders. At the Municipal level, pre-existing social networks with neighboring municipalities enabled the large inflow of sanitary workers that managed the dead body disposal and sanitation needs generated by the disaster. Even at the General Hospital on account of pre-existing networks, the Nagapattinam General Hospital officials could request help from neighboring districts to send in their doctors. Similarly, emergence at the Local level occurred due to pre-existing social networks between the villagers (prior affiliations are based on friendship networks). Local elders and fishing Panchayats leaders, discussed in the analysis, had predetermined relations with the community. Therefore, formation of groups and division of labor occurred smoothly, even though it was emergent. In Velankanni, the Parish priest had pre-existing social ties with the neighboring diocese and parishes. Therefore, the priest called upon their youth sections to assist with disaster-generated needs. Similarly, in Velankanni the merchant sectors organized themselves based on pre-existing friendships and carried out dead body recovery tasks. In the Taylor, Zurcher and Key (1970) study, pre-existing social networks led to the formation of the first response group among local people. Similarly, in the study by Forrest (1974) pre-existing social networks and former ties in the community led to emergence at the local level, providing ample similarities with the Indian context. Aguirre et al. (1995) in his study in Guadalajara, Mexico, also offered evidence that pre-existing social networks led to emergent behavior among locals when search and rescue parties formed to locate victims.

After the Flint Beecher, Michigan, tornado, Form and Nosow (1958) discuss how the local residents performed search and rescue in the first few hours. Community altruism provides a similarity between the Flint Beecher, Michigan, case study and the Nagapattinam, India, example. The only difference in this instance can be observed in terms of the tasks being performed. While in Flint Beecher, Michigan, residents searched for survivors and victims, in India, locals searched and recovered primarily dead bodies.

Conclusion

A summary of the key points of this study indicate that pre-existing social networks triggered emergence at all levels of government in India. Therefore, the Indian tsunami context concurs with the literature. Emergence appeared to generate from the fact that people knew each other. State level officials had worked in the area, district officials knew the local area, municipal officials had prior contact with neighboring municipalities, and local people knew one another. Thus, prior social contacts generated emergence.

The magnitude of the event, in accordance with the literature, spurred emergence at all levels as well. The tsunami was new to the area that it affected and in a few minutes, the sea that is normally a provider became a 'destroyer' and killed thousands. The magnitude of the event, therefore, led to emergent behavior as locals organized themselves into groups to remove the vast number of bodies lying strewn on local streets.

The division of labor achieved at the State level within and among the IAS teams occurred due to the need to centralize authority with an Incident Commander to avoid duplication of efforts in the field. The division of labor at this level is highly interesting. Even though authority appeared centralized with the Incident Commander, yet IAS Team

Leaders enjoyed a certain level of freedom in the field. They enjoyed this freedom on account of their capability to make independent and intelligent decisions as the need arose. Therefore, the set of conditions that led to this level of emergence and division of labor was the knowledge, managerial skill, independent decision making power, familiarity with the area, and spontaneity of the IAS Team Leaders.

The division of labor at the Local level reflects the Indian cultural context of respect for the advice of elders in all situations, including when disaster strikes. In India, the advice of elders is held in high esteem and tremendous respect is given to them. Their age and wisdom is revered by the young and even middle-aged folk. Given this cultural context, respect for elders, their advice, and wisdom appeared as the key conditions that triggered emergence at the Local level.

The Dynes' typology also discusses emergent groups forming last, after established, expanding, and extending organizations fail to meet the needs of the local community. However, this is not the case in India, as emergent groups formed at the local level primarily due to inaccessibility to the District Administration. Emergent groups also formed because bodies lay strewn across the street and something had to be done.

The Indian culture is one in which, due to the teeming millions, even in a small crisis in a neighborhood like a house fire, hundreds will gather as either onlookers or will pitch in along with the responding police and fire services. Given this context, therefore it is not a mystery that emergent groups formed, met the disaster-generated needs, and dissolved back into the cultural realm after the tsunami, only to reappear again as and when the needs arises.

The State governments' involvement stemmed from the fact that each and every individual has to receive compensation in disasters. Therefore, the government sent in high level teams who could make quick and spontaneous decisions in order to ensure that every family received compensation. The IAS teams helped to centralize authority and decentralize efforts efficiently.

Recommendations for future research

Future research should be geared toward more cross comparative studies on emergence. The literature on emergence is insufficient to enable substantial typologizing across cultural and international borders. Research on disasters in India is extremely sparse and the current available research remains inadequately cataloged. Disasters are becoming an extremely common occurrence across the globe. In developing countries, the loss of lives is the greatest, as the pressure of population of land continues to increase. With this increasing pressure comes a tendency for the less fortunate to settle for land that is at high risk from natural calamities. It is practically impossible to prevent the less fortunate from occupying lands that are at risk from natural hazards. Therefore, we need to educate or train local people on search and rescue, disaster preparedness and response issues. Therefore, research needs to continually document evidence, wherever it may exist, on how communities can help one another in disasters.

Recommendations for Disaster Management Practice

The practice of disaster management needs to focus on the existing research on varying issues pertaining to response and, thereby, increase preparedness levels of communities. The fact that emergence is most likely to take place among local people in countries where kinship has a high value, needs to be accounted for and incorporated into

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disaster management plans of local communities. Emergence at the Local and NGO levels can be harnessed as a useful resource if carefully considered. Manpower and resources are in abundance in countries with a high populace. Therefore, harnessing manpower and resources requires adequate planning to be able to meld it into the response of official organizations. A formal response procedure to meet and manage massive disasters needs is recommended at all levels of government in countries like India. In developing countries, where a great number of people live in highly vulnerable areas, the loss of life is directly proportional to the magnitude of the disaster. Thus, disaster management plans need to be adequately defined. The knowledge of local people and their search and rescue capabilities should not be underestimated, but rather used as a tool by formal response agencies.

Recommendations for Policy

Government investment in warning systems is recommended. Officials should be appointed to act as point-of-contact people in the event that other countries may learn of impending danger. The government should put policy in place to make people more aware of the dangers of natural disasters and the vulnerabilities of the areas that they may live in. Training programs on disaster preparedness and response need to be delivered to the local audience.

A top down approach used in Tamil Nadu at the State level met with bottom-up local efforts and facilitated efforts from NGOs. This appeared to meet and manage the disaster-generated needs in Nagapattinam. This response needs to be formalized for the future.

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APPENDIX I

Interview Questions

Search and Rescue Interview Guide

Name: _____   Date_____

Location: _____   Interview # _____

1. Were you involved in any search and rescue activities as a result of the tsunami?

    If Yes: Go to question 2
    If No: Thank you for your time.

2. Where did you begin your participation in the search and rescue efforts?

3. How were you involved in the search and rescue efforts? *Probe*: individual level of participation, challenges and how they met those challenges.

4. How long did you participate?

5. Why did you become involved? *Probe*: sources of motivation.

6. Did you work with others? *If yes*, please describe how you worked with others. *If no*, describe your own activities. *Probe*: division of labor in relationship to others.

7. What resources did you use/have? *Probe*: location, source, use of resources including tangible, intangible or others as they emerge during the respondent's interview.

8. Did you observe any *other* individuals involved in other search and rescue activities that day? Any other groups? Any governmental officials? Any non-governmental officials?
    - *Probe*: describe what they saw of each unit of analysis including division of labor, activities, time span.

- *Probe*: who were the main people performing Search and Rescue? What were they doing?

9. Have you done Search and Rescue in the past? Please describe your activities. *Probe*: Prior training in first aid, search and rescue, swimming:

10. Anything else you would like me to know about what you did or observed on that day regarding Search and Rescue?

Demographics:

Age:
Religion:
Income:
No. of family members:
No. of children:
Occupation:

Thank you for your time. Please accept this food packet as a token of our appreciation. We thank you for your participation in the study. The results will be used to help improve response in future events.

APPENDIX II

Document List

1. Video clips from hospital: 1) damage to video with final segment short clip of morgue; 2) water at the hospital, outflow; 3) same as first clip it seems; 4) water at the hospital, debris moving equipment. Video provided by high level hospital administrator.
2. NGO report, GIS data on excel file and searchable government "ready reckoner" file of all government orders made to handle the tsunami. Note: the NGO report contains village by village reports of impact including deaths, demographics of bodies recovered and more. Provided by the NGO Coordination Center in Nagapattinam.
3. Report from the Velankanni Rector's office, Our Lady of Health Basilica, on the tsunami and immediate aftermath. Includes information on Catholic Youth engaged in mass burials and some religious events surrounding the burials.
4. Copies of CD-ROM purchased in Velankanni commercial district of the tsunami.
5. Series of documents provided by the Nag Fire Dept.:
   - Report, Post tsunami operations by Fire Service.
   - List of private voluntary organization and staff provided including doctors, para-medical staff, students, volunteers, and vehicles.
   - Action Plan, Disaster Relief Medical Team, Nag District.
   - List, temporary shelters, location and numbers.
   - Map of Nagapattinam District.
   - Set of photographs, fire service and new boat and what appears to be putting out a fire or perhaps at a mass cremation?
   - Tsunami Relief Report, Nagapattinam (spiral bound, lots of data) from DC
   - Fire Chief Assessment Document

APPENDIX III

Visual List

S.NO	NUMBER	TITLE	LOCATION	DESCRIPTION	REMARKS
Thursday May 5th 2005					
1	0050	Research and Rehab Department	Chennai	CRA Office, Revenue Building.	The Buckeye Guy!
2	0051	Disaster Management and Mitigation Department	Chennai	Revenue Building	
3	0052	Offices	Chennai	Offices in the Revenue Building.	
4	0053	Revenue Building	Chennai	Outside view of the Revenue Building	
5	0054	Foundation stone	Chennai	Corporation Of Chennai-Ripon Buildings	
6	0055	Ripon Building	Chennai	Corporation of Chennai building	
7	0056	Ripon Building Lawn	Chennai	Corporation of Chennai building	
8	0057	Intervention Area 2	Chennai	Coordination chart at the Bhoomika Trust Office	

9	0058	Intervention Area 3	Chennai	Permanent Shelter Construction chart at Bhoomika Trust Office.	
10	0059	Notice Board at Bhoomika Trust.	Chennai	District Collectors names and contact information are posted on this board.	
11	0060	IT Department,	Chennai	Outside the office of the Secretary of the IT Department.	
12.	0061	The guys who took us around.	Chennai	The driver and Public Relations Officer outside the IT Department	
			Friday May 6th 2005		
13.	0064	Sleeping on the job.	Chennai	Waiting Room, Director of Fisheries,DMS Complex.	
14.	0065	Chronology of Directors.	Chennai	Interviewee 004 listed on 39 & 42.	
15	0066	Director of Fisheries	Chennai	Outside the office of the Director of Fisheries.	
16	0067	DMS Complex	Chennai	In the hallway of the DMS Complex.	
17.	0068	Fisheries Department	Chennai	A collage at the Fisheries Department.	
18.	0069	Fisheries Department	Chennai	The collage depicts fisherfolk activities.	

19.	0070	Fisheries Department	Chennai	Depiction of technology in the fishing industry.	
20.	0071	Prohibition and Excise Department	Chennai	The office of the Flying Squad.	Dr. Neal liked his name and title!
21.	0072	CRA Office	Chennai	View from the Revenue Building.	
22.	0073	CRA Office	Chennai	View of Marina Beach from the Revenue Building.	
23.	0074	CRA Office	Chennai	Close up of Marina Beach.	
24.	0075	CRA Office	Chennai	View of the road.	
25.	0076	CRA Office	Chennai	Dr Neal in the hallway.	
26.	0077	CRA Office	Chennai	The Buckeye guy!	
27	0078	Control Room	Chennai	Control Room of the State Relief Commissioner in the CRA Office.	
28.	0079	Control Room	Chennai	Shireen outside the Control Room.	
29.	0081	Unicef	Chennai	Dr. Neal outside the Unicef office.	
30	0082	Unicef	Chennai	Shireen outside the Unicef office.	
			Monday 9th May 2005		
31	0093	Chennai Highway	Chennai	View from the highway.	
32.	0094	Chennai Highway	Chennai	View of the sea from the highway.	
33.	0095	Temporary shelters	Chennai	Shelters seen along the Chennai highway.	They were markedly in straight lines.

34	0096	Temporary shelters	Chennai	Same as above from a different angle.	
35	0097	Destroyed huts	Chennai	A destroyed village along the Chennai highway.	
36.	0098	Destroyed huts	Chennai	Closer view of the above.	
37.	0099	Destroyed huts	Chennai	Same as above but from a different angle.	
38.	0100	Damaged boats	Chennai	Damaged boats seen along the Chennai highway.	It seems they were trying to salvage some parts.
39	0101	Temporary Shelters	Chennai	Temporary shelters along the Chennai highway.	Seemed to be made out of tin or steel with plastic roofing.
40	0102	Damaged bridge	Nagapattinam	Bridge constructed by the Indian Army on the 29th of December 2004.	Police were monitoring the flow of vehicles on the bridge.
41	0103	Damaged boats	Nagapattinam	The two boats were brought inland by the waves.	
42	0104	Damaged boat	Nagapattinam	Closer view of the boat that was brought inland.	It was lodged alongside the damaged bridge.
43	0105	Channel	Nagapattinam	Picture take to show the distance the boats were carried.	Construction of a new bridge in progress.
44	0106	Damaged Boats	Nagapattinam-Akkrapettai	Damaged boats in the village of Akkrapettai.	
45	0107	Damaged Boats	Nagapattinam-Akkrapettai	Damaged boats in the village of Akkrapettai.	

46	0108	Destroyed homes	Nagapattinam-Akkrapettai	Damaged housing in Akkrapettai	
47	0109	Destroyed boats.	Nagapattinam-Akkrapettai	Damaged boats brought inland in Akkrapettai.	
48	0110	Destroyed boats.	Nagapattinam-Akkrapettai	Damaged boats brought inland and packed together like sardines	
49	0111	Destroyed boats.	Nagapattinam-Akkrapettai	Same as above-Different angle	
50	0112	New boats	Nagapattinam-Akkrapettai	New boats on the other side of the channel.	Most of the new boats were following the Indian flag color scheme (Saffron, White and Green).
51	0113	Damaged housing	Nagapattinam-Akkrapettai	Destroyed concrete houses and rubble.	
52	0114	Damaged structures	Nagapattinam-Akkrapettai	Damaged structures in the village.	
53	0115	Damaged Houses	Nagapattinam-Akkrapettai	The foundation of the staircase in the background is destroyed.	The staircase is still standing!
54	0116	Akkrapettai village	Nagapattinam-Akkrapettai	Destroyed view of the coastal village.	The trucks in the background were coming to collect fish.
55	0117	Saree	Nagapattinam-Akkrapettai	A mangled saree in the village.	
56	0118	The beach	Nagapattinam-Akkrapettai	Rubble strewn along the beach.	Fishermen selling fish in the background.

57	0119	Destroyed village	Nagapattinam-Akkrapettai	Trucks coming in to collect fish.	
58	0120	Damaged house	Nagapattinam-Akkrapettai	Different angle of the staircase without a foundation	
59	0121	Damaged walls	Nagapattinam-Akkrapettai	Broken walls near the above staircase.	
60	0122	Damaged boats	Nagapattinam-Akkrapettai	A Boat lies in the foreground beyond repair.	
61	0123	Damaged boats	Nagapattinam-Akkrapettai	Another boat brought inland, lies beyond repair.	
62	0124	Village	Nagapattinam-Akkrapettai	Different view of the village	
63	0125	Temporary shelters	Nagapattinam-Akkrapettai	Shelters donated by Global Uplift USA	The shelters are made out of tin or steel
64	0126	Temporary Shelters	Nagapattinam-Akkrapettai	Same as above-Different view	
65	0127	Road Sign	Nagapattinam-Akkrapettai	The Tata Relief Committee Rehab Project	
66	0128	Damaged structures	Nagapattinam-Akkrapettai	A view of the coastal village further down the road.	
67	0129	Coastal view	Nagapattinam-Akkrapettai	A view of the ocean from the village.	
68	0130	Palm trees	Nagapattinam-Akkrapettai	Another view of the village.	
69	0131	The coast	Nagapattinam-Akkrapettai	The coast is not filled with sand anymore.	
70	0132	Petroleum tanks	Nagapattinam-Akkrapettai	Slippers were seen strewn in the village.	
71	0133	Shoreline	Nagapattinam-Akkrapettai	The village shoreline. The pier in the distance was being repaired.	

72	0134	Lighthouse	Nagapattinam-Akkrapettai	A view of the village from the shoreline.	
73	0135	Fishing nets	Nagapattinam-Akkrapettai	Boats and nets lying unattended in the village.	
74	0136	Damaged boat	Nagapattinam-Akkrapettai	A boat brought inland,beyond repair.	
75	0137	Temporary shelter	Nagapattinam-Akkrapettai	Shelters donated by SIR,PSSS & SMSM	Bleaching powder was scattered around the temporary shelters.
76	0138	Temporary shelters	Nagapattinam-Akkrapettai	Shelters donated by CARITAS-India	
77	0139	Temporary shelters	Nagapattinam-Akkrapettai	Another angle of the above.	Note the bleaching powder. People were seen cooking on the outside.
78	0140	District Collectorate	Nagapattinam	Offices inside the collectorate.	
79	0141	NGO Coordination Centre	Nagapattinam	A sign outside the elevator in the collectorate building	
80	0142	Women's Self Employment	Nagapattinam	Victims selling their wares in the collectorate building	
81	0143	Collectorate Building	Nagapattinam	Outside view of the collectorate	
82	0144	Hut	Nagapattinam	NGO Coordination hut on the collectorate grounds.	
83	0145	Collectorate Building	Nagapattinam	A larger view of the collectorate building.	

84	0146	New boats	Nagapattinam	The only boats that were not following the Indian tricolor.	
Tuesday 10th May 2005					
85	0147	The Basilica	Nagapattinam-Velankani	The church of the Virgin Mary.	
86	0148	The Basilica	Nagapattinam-Velankani	Different view of the church.	
87	0149	The Basilica	Nagapattinam-Velankani	The church from a different angle.	
88	0150	The Basilica	Nagapattinam-Velankani	Frontal view of the church.	
89	0151	The Basilica	Nagapattinam-Velankani	View of the church from higher ground.	
90	0152	Shrine Offices	Nagapattinam-Velankani	Shrine Priests Residence and Offices and Souvenir shops.	
91	0153	Coastal Velankani	Nagapattinam-Velankani	Towards the coast from the shrine.	
92	0154	The shrine from a distance	Nagapattinam-Velankani	The shrine can be seen in the distance from the shoreline.	A comparison of this picture can be made with slide 25 on the Tsunami ppt.
93	0155	The beach	Nagapattinam-Velankani	Tourists taking a dip after visiting the shrine.	
94	0156	The beach	Nagapattinam-Velankani	View of the sea.	
95	0157	A local vendor	Nagapattinam-Velankani	A local guy selling sea shells.	He said two of his shops got washed away.
96	0158	Western Shrine	Nagapattinam-Velankani	One of the shrines at Velankani	

97	0159	Shrine	Nagapattinam-Velankani	Another place of worship.	
98	0160	The Basilica	Nagapattinam-Velankani	North facing side of the church.	
99	0161	Eastern shrine.	Nagapattinam-Velankani	The northern end of the church leading to the eastern shrine.	
100	0162	Mass grave	Nagapattinam-Velankani	One of the three mass graves. They appear 30x30 ft in size and 11/2 ft above the ground.	These graves were along a dirt track with a garbage dump behind them. The road was being paved.
101	0163	Mass grave	Nagapattinam-Velankani	The second of the three graves.	Note the garbage dump in the background.
102	0164	Crucifix	Nagapattinam-Velankani	Crucifix on the second grave.	
103	0165	Mass grave	Nagapattinam-Velankani	Fresh earth on the third grave.	
104	0166	Graves	Nagapattinam-Velankani	These appear to be children's graves.	Graves were east facing and had five bricks each at the head.
105	0167	Graves	Nagapattinam-Velankani	Area in and around the graves.	
106	0168	Grave	Nagapattinam-Velankani	Seemed like a grave with flowers hanging over it.	
107	0169	Mass grave	Nagapattinam-Velankani	A mass grave in the distance and the road being paved behind it.	

108	0170	Mass grave	Nagapattinam-Velankani	Different angle of the graves.	
109	0171	Mass grave	Nagapattinam-Velankani	Two of the mass graves.	
110	0172	Burial ground	Nagapattinam-Velankani	Crucifix within a compound near the mass graves.	
111	0173	The crucifix	Nagapattinam-Velankani	The crucifix reads "May the victims of tsunami rest in peace, 26-12-2004".	3500 people are presumed buried here.
112	0174	Dirt road	Nagapattinam-Velankani	The dirt road to the graves, they are being paved.	
113	0175	The mass graves	Nagapattinam-Velankani	The site of the mass graves.	
114	0176	SEVAI	Nagapattinam	A Voluntary organization.	
115	0177	SEVAI	Nagapattinam	Building boats	
116	0178	SEVAI	Nagapattinam	Fishing boats project	Signs of SEVAI were very prominent along the entire Nagapattinam road.
117	0179	Destroyed bridge	Nagapattinam	Bridge from picture 0102 taken from north Nagapattinam	
118	0180	Destroyed bridge	Nagapattinam	The same bridge above.	Note the concrete block floating in the water.

APPENDIX IV

IRB Form

Oklahoma State University Institutional Review Board

Date	Monday, April 25, 2005
IRB Application No	AS0581
Proposal Title:	The Value of "Emergent Citizen Groups" in Disasters: Search and Rescue in Tamil Nadu in India
Reviewed and Processed as:	Expedited (Spec Pop)

Status Recommended by Reviewer(s): Approved   Protocol Expires: 4/24/2006

Principal
Investigator(s

Shireen Hyrapiet	David M. Neal	Aswin Subanthore
410 S. Hester Apt. 2	519 Math Science	225 Scott Hall
Stillwater, OK 74074	Stillwater, OK 74078	Stillwater, OK 74078
Thomas Wikle	Brenda Phillips	
225 Scott Hall	536 Math Science	
Stillwater, OK 74078	Stillwater, OK 74078	

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

✗ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, emct@okstate.edu).

Sincerely,

Sue C. Jacobs, Chair
Institutional Review Board

VITA

Shireen Hyrapiet

Candidate for the Degree of

Master of Science

Thesis: EMERGENT PHENOMENA IN INDIA AFTER THE INDIAN OCEAN
          TSUNAMI

Major Field: Fire and Emergency Management Administration

Biographical:

     Personal Data: Born in Calcutta, India on the 10th of October, 1978

     Education: Graduated with a Bachelor of Science degree from Loreto College,
Calcutta with a First Class degree in Geography Honors from Calcutta
University in June 2000. Attended Millersville University of
Pennsylvania and graduated with a Bachelor of Arts degree in May
2003. Attended Oklahoma State University, Stillwater, Oklahoma,
and completed the requirements for the Masters degree at Oklahoma
State University in May 2006.

     Experience: Worked as a content developer in India for a period of nine months;
employed as a research assistant for professors in Emergency
Management while attending Millersville University, PA. Interned
with the Lancaster County GIS Department and Planning Commission.
Employed as a graduate assistant at Oklahoma State University,
Department of Political Science. Served as a graduate assistant on the
Safety Committee for the College of Arts and Sciences.

     Professional Memberships: Phi Kappa Phi, Gender and Disaster Network

Name: Shireen Hyrapiet   Date of Degree: May, 2006

Institution: Oklahoma State University   Location: Stillwater, Oklahoma

Title of Study: EMERGENT PHENOMENA IN INDIA AFTER THE INDIAN OCEAN
                TSUNAMI

Pages in Study: 171   Candidate for the Degree of Master of Science

Major Field: Fire and Emergency Management Administration

Scope and Method of Study: The purpose of this study was to determine if emergence occurred after the Indian Ocean Tsunami in December 2004. Emergence defined as new tasks and structures after disasters that meet and manage massive disaster needs. For example, after a disaster emergent citizen groups perform disaster-generated tasks. A series of open-ended interviews with document collection and observational and visual data gathering procedures were used in the field. Snow-balling sampling was used to identify potential interviewees.

Findings and Conclusions: Emergence occurred at the State, District, Municipal, Local and Non-Government Organization levels in India after the tsunami. Emergent tasks and structures developed to meet the disaster-generated needs. Emergent groups appeared to be short-lived and were composed of public officials and private citizens. Conditions that generated emergence appeared to be pre-existing social networks, the magnitude of the disaster, unmet needs, and proximity to the impact area. In addition, the need for quick and independent decision makers in the field appeared to trigger emergence at the State level. Emergence appeared in established, expanding, and extending organizations as well.

ADVISER'S APPROVAL: Dr Brenda Phillips