Abstract: This paper uses recent theoretical advances in the field of hazards research to inform the analysis of an empirical study on flood hazard conducted in central Pakistan. The investigation seeks to understand the causes of vulnerability and their development that culminates in disaster, with the basic presumption that empirical events have causal links going back to societal structures which are not measurable but contain the mechanisms that lead to the events and their perceptions. A case study in five villages of central Pakistan was conducted to understand the elements of communities' and social groups' differential vulnerability to flood hazard. The elements of vulnerability are situated within a tripartite conceptual space of vulnerability, composed of entitlement relations, empowerment relations, and political economy. A modified "pressure and release" model was applied to the field survey results to understand the progression of vulnerability from the structural abstract level to the concrete level of physical disasters. I concluded that the study communities' vulnerability was largely a function of their disempowerment.

Key words: vulnerability, differential vulnerability, causation, entitlement relations, empowerment relations, political economy, structural level, concrete level, disaster.

Hazards, by definition, occur only where and when natural extremes and social systems interact (Kates 1971; Kates and Burton 1986; Susman, O'Keefe, and Wisner 1983). Traditionally, hazard-related research and policy has concentrated on the physical events causing disasters. Behavioralist analysis has broadened the discourse on hazards by also addressing individual and organizational perceptions and behavior. In this paper I build upon and go beyond behavioralist analysis to contend that social systems are stressed to the breaking point by extreme physical events because of problematic social structures that systematically discriminate against the socially, culturally, and economically marginalized segments of society. Generally there has been little overlap between theoretical and empirical literature in hazards research. I seek to address that deficiency by drawing upon the theoretical literature in the subfield to inform the analysis of an empirical study. Using a case study conducted in two rural communities in the Indus Basin of Pakistan, I analyze the long-term sociopolitical factors contributing to vulnerability to identify the causal chain of events and processes at varying geographic scales that culminate in a disaster. The presumption underlying the analysis is that empirical events have causal links going back to societal structures which are not measurable, but contain the mechanisms that lead to the events and their perceptions (Sayer 1992). The empirical study is not intended to be statistically representative. As with intensive research...
of an open system, the inferences drawn from it are causal and not statistical, drawing their strength from the strength of analysis and not from the representativeness of the sample (Silverman 1989).

The analysis begins with the premise that the degree of threat experienced by societal groups from physical hazards like floods is a function of four interactive variables: risk, exposure, vulnerability, and response (Kotliyakov et al. 1988). The degree of risk is a function of the physical and human processes that affect the nature and magnitude of hazardous phenomena like floods, hurricanes, and technological hazards. Exposure is a function of the socially determined physical location of the communities at risk, as well as the human decisions and societal structures that imperil the community. Vulnerability is a state of defenselessness which renders a community powerless to withstand the debilitating effects of events commonly perceived as disaster or natural hazards (Anderson and Woodrow 1989; Chambers 1989; Swift 1989). The state of defenselessness and insecurity that may cause a person to suffer shocks and stress if exposed to a hazard is symptomatic of deprivation, and poverty is one of the most important dimensions of that deprivation, along with others, such as physical weakness, isolation, and powerlessness. I focus on identifying and understanding the causal relationships between vulnerability and the social institutions engendered in the state, the Pakistani political economy, and entitlement relations in the rural communities.

**Previous Research and Connections to Theory**

Traditional approaches in hazards research and mitigation have concentrated on the risk variable—for example, the engineering approach to flood mitigation by the Army Corps of Engineers in the United States and the provincial irrigation departments (PIDs) in Pakistan (NESPAK and Harza Engineering 1979; Platt 1986). This technocratic approach toward hazards is capital and technology intensive and places a low priority on the social factors that contribute to the differential vulnerability of population groups. Riverine floods or coastal storms of similar magnitudes may kill thousands in South Asia but only a few dozen, if that many, in North America. The exposure units (population) may be just as dense on the South Florida coast as they are in the Bay of Bengal, but socially influenced degrees of vulnerability result in very different damage figures. Engineering interventions have been effective in the First World in decreasing loss of life and the frequency of disasters. But as observed in the relatively recent Mississippi River floods of 1993, the same engineering measures have tacitly encouraged massive investments in the floodplains, leading to massive property damage by relatively infrequent but more intense flood events (Kusler and Larson 1993). Technocratic approaches may be successful in preventing loss of life, but they are too expensive for poorer countries and communities and do not offer a long-term solution to the problem of vulnerability mitigation and disaster prevention.

The behavioralist/pragmatist analysis of hazards, particularly by geographers Gilbert White, Robert Kates, and Ian Burton, shifted the focus of hazards management from technocratic engineering to questions of individual perception and community and institutional decision making (Burton, Kates, and White 1978, 1993; Kates and Burton 1986; White 1974). Other analysts have sought to move beyond the behavioralists’ theoretical and ideological ambiguity and to explicitly address the social and political sources of causality (and thereby constraint) on individuals and institutional perceptions and behavior (Emel and Peet 1989). Individuals and institutions do not exist in a social vacuum; they are deeply embedded in the social and political matrix of the society of which they are a part. Therefore any analysis of them cannot be successful without a deeper dis-
course on the social determinants of their behaviors and perceptions.

Recent developments in hazards research employ an inclusive approach that recognizes the historical, political, and social causes of vulnerability (e.g., Blaikie et al. 1994; Hewitt 1983; Palm 1990; Susman, O'Keefe, and Wisner 1983; Watts 1983; Watts and Bohle 1993; Wisner 1993). In this paper I take the position that disasters caused by floods are not accidental interruptions of ordinary life, but are characteristic features of the places and societies where they occur. Discrete disaster events are merely symptomatic of systemic failure, and not causes of it. The risks, inconveniences, and damages in disasters are caused by ordinary life, rather than by the rareness and scale of the hazards (Hewitt 1983). Disasters dramatically highlight the dissonance between human societies and their natural environment and are disturbing because they disrupt our ordinary, normal lives. But if vulnerability to disasters is caused by processes deeply embedded in ordinary life, then one must rethink the very notion of ordinary, normal life as inherently hazardous (Hewitt 1983). Therefore hazards research comes to have wider implications than its primary focus on admitted important physical events.

Arguing from extremes is a long and revered tradition in the social sciences. Political scientists and historians, for instance, have long used extreme events like wars and revolutions as subjects of analysis to highlight the underlying political or historical processes. If human-environment interactions can be described as the core concern of geographic inquiry, environmental hazards then become the geographers' analytical equivalent of wars and revolutions for understanding the processes influencing the core concerns of the discipline. Furthermore, hazards analyses that treat everyday processes as the main culprits in causing disasters are also likely to yield results that illuminate our understanding of everyday human existence. Therefore the responses to disasters informed by such analyses are also likely to have wider implications for concerns such as sustainable development, political and social justice, and sustainable resource use (Mileti et al. 1995).

**Formalizing the Elements of Vulnerability: Spaces of Vulnerability**

The above discussion of vulnerability can be formalized through the “social space of vulnerability” suggested by Watts and Bohle (1993). They suggest that the most vulnerable individuals or groups are the ones who are most exposed; have the least capacity to deal with the shock, and have the least potential to recover from the shock. The three essential thematic elements of vulnerability are therefore exposure, capacity, and potentiality. It is from the determinants of these three elements that the triangular “space of vulnerability” is derived. They map the space of vulnerability with respect to its social, political, economic, and structural-historical coordinates and go on to define three causal processes of vulnerability. Entitlements entails a particular distribution of resources—for example, land, water, and productive capital—which determine capacity and potentiality. Enfranchisement/empowerment includes a litany of rights and institutions by which entitlements are defined and fought over. These entitlements include both resources and democratic rights, such as having a say in the organization of one’s natural environment. Political economy is composed of a historically determined configuration of class relations that may lead to a disproportionate concentration of resources in the hands of certain groups and individuals.

The three causal processes can only be grasped relationally, and Watts and Bohle devise a tripartite structure that defines the space of vulnerability through the intersection of the three causal powers of entitlements, empowerment, and political economy. The intersection of these causal powers produces three parallel analytical concepts: economic capability, property
relations, and class power. Economic capability emerges from a certain configuration of entitlements and empowerment, property relations from the intersection of entitlement and political economy, and class power from specific forms of political economy and empowerment relations. Disasters occur every time there is a violent, short-term, external shock to these mechanisms (Watts and Bohle 1993).

Figure 1, adapted from Watts and Bohle (1993), graphically represents the space of vulnerability. Although the original model was developed in the context of famine, the underlying processes and social structures are so similar that it is readily adaptable to the hazard of flooding. Each of the three points of the triangle has important complementarities and areas of overlap with the other two. The tripartite causal structure in the case of floods comprises ownership of land, the main source of livelihood (entitlement); state and civil society relations seen in political and institutional terms (enfranchisement/empowerment); and the structural-historical form of class and gender relations within a specific political economy. The space of vulnerability has an internal structure, and it is therefore possible to locate vulnerable groups and regions within it. The dominant causal process of vulnerability at specific times and places and the relative importance of the other two causal processes determines the location of vulnerable groups and regions within the space of vulnerability. The following case study attempts to place vulnerable communities within this space of vulnerability.

Vulnerability and development are closely related. Development is a process of directed change and therefore its definition must embody both the objectives of the process and the means of achieving those objectives. Sustainable development has many definitions, but the most widely accepted one is that of the World Commission on Environment and Development (WCED 1987, 41): “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” From this simple definition of fundamental objectives—meeting current needs and sustainability requirements—one can derive a whole range of operational objectives that cut across most previous intellectual and political boundaries. Vulnerability-causing processes operating at various scales are inextricably linked with the ordinary everyday lives of people exposed to a hazard. Resilience or vulnerability are the direct outcomes of social, political, and economic forces that shape people’s everyday existence. Therefore vulnerability mitigation would be an inherent operational objective of any sustainable development-oriented effort, as the fundamental objectives of sustainable development are crucial to vulnerability mitigation and resilience building (Mileti et al. 1995).

**Macro-level Context**

Given the macro (national and international) scale of forces that determine or constrain adjustment to the environment by both individuals and communities, it is
important to analyze the forces of vulnerability at that level. In the context of famine in the Indo-Pakistan subcontinent, Hewitt (1983, 198) argues that weather-related famine should not be "interpreted as a raw expression of imbalance between population and natural resources, brought to a head by weather uncertainty." Instead, investment decisions by national governments have made the rural and agricultural sector more vulnerable to meteorological events. The observation is just as true in the case of flood hazard in Pakistan.

Pakistan is not only manifestly poor, with an annual per capita income of less than U.S. $500, it also suffers a human development index of less than 0.4, indicating that its population, education, and health are also severely substandard (UNDP 1994). Agriculture is the most important sector of the country, contributing 25 percent to the gross domestic product and directly or indirectly employing about two-thirds of the population (Table 1). Some of the social indicators, and land distribution information, for rural and urban areas of Pakistan are shown in Table 1. Using literacy rates and access to health care, the rural areas are clearly lagging behind. Also, close to 95 percent of the farms in Pakistan are considered small-production farms. The Pakistani government's expenditure in some of the major sectors is depicted in Figure 2; it is illustrative of the institutional perspective that underlies its operations. The three biggest expenditure categories for the central government in Pakistan are defense and debt servicing and general administration. The total share of education, health, and social welfare for the country's 115.8 million people is a paltry 1.6 percent, 1.0 percent, and 3.4 percent of the federal budget respectively. The government evidently gives low priority to provision of basic needs to the people, and this is one of the major macro-level factors contributing to the lack of resilience/vulnerability of the population of Pakistan.

I reviewed the government of Pakistan's seventh five-year plan (1988–93) to understand the allocation of development funds to rural and urban areas (Table 2). Unfortunately Pakistan's investment statistics for its five-year plans are broken sectorally and not spatially and do not include even a broad urban-rural classification. It is possible only to infer the urban or rural destination of those expenditures based on the spending category; for example, the money for agricultural development is likely to be spent in the rural areas and can be considered an investment in the rural areas. The fact that 72 percent of the coun-

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**Figure 2.** Pakistan federal government budgetary allocations for 1993. Source: World Bank (1993).

**Table 1**

<table>
<thead>
<tr>
<th>Social Indicator</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literacy rate (%) (1981)</td>
<td>47.1</td>
<td>17.3</td>
</tr>
<tr>
<td>Population per hospital bed (1980)</td>
<td>610</td>
<td>7,004</td>
</tr>
<tr>
<td>Population per doctor (1980)</td>
<td>1,801</td>
<td>25,829</td>
</tr>
</tbody>
</table>

Land Distribution (1981 Census)

| Number of farms with size < 10 hectares (%) | 95.1 |
| Area of farms with size < 10 hectares (%)  | 59.4 |

Source: Naqvi and Rashid (1992); Zaidi (1988).
try’s population has claim to less than 19 percent of the development funds reveals a marked urban bias in the development strategy of the federal and provincial governments. The dismally low share of rural health in the development expenditure goes to explain the extremely insufficient levels of access to health facilities in the rural areas. Interestingly, public sector corporations have claim to almost 47 percent of the total development outlay in the seventh five-year plan. Evidently, large state-owned corporations, with their bloated bureaucracies, are a higher priority with the government than public health. The fertilizer subsidy, which benefits predominantly the prosperous landlords in the rural areas, has a higher proportion of the planned expenditure than rural health.

Furthermore, there is a body of literature which has documented the bureaucratic ethos of water-related bureaucracy in Pakistan (e.g., Dove 1994; Gilmartin 1994). It has been noted that the colonial bureaucratic structure of water resources management regime in Pakistan is not receptive to small-farmer needs. This undemocratic bureaucratic structure was created by the British colonial administration to serve its own ends of consolidating and legitimizing its control over a colony. Unfortunately since independence that same structure has been employed by successive Pakistani governments to meet the needs of a privileged elite, all in the name of technocratic efficiency and rational decision making, of which the largely illiterate Pakistani population is ostensibly incapable.

The above brief overview serves to contextualize the micro-scale vulnerability study, conducted in two rural communities of central Punjab, that follows. Also, it highlights the Pakistani state’s systematic neglect of the rural poor. Vulnerability to hazard is caused by lack of resilience against environmental stress, and resilience is a function of access to productive resources, health, education, and political empowerment. By the broadest of indicators, then, the bulk of the population, especially in the rural areas, has limited access to resilience-building resources. It can therefore be surmised that Pakistan’s rural poor are indeed quite vulnerable to environmental stress. The spending patterns of the government of Pakistan are not incidental outcomes of random events and decisions. The Pakistani state, consistent with the reigning neoliberal economic wisdom, has chosen to concentrate on urban-biased development and export-oriented economic growth to compete within the global economy. The consequences of that choice are evident in the geographies of vulnerability that those policies help to create.

### Vulnerability at the Micro Level: The Geographic Context

To understand the factors contributing to exposure and vulnerability at the micro or village household level, I conducted a field study in a low-lying floodplain area in the Kabirwala tehsil (county) of District Khanewal, in the Punjab province of Pakistan (Fig. 3). Politically and economically, Punjab is the most important province of Pakistan. It is considered the breadbasket of Pakistan thanks to the existence of the world’s largest surface irrigation system, initially constructed by the British and significantly expanded by the post-independence governments of Pakistan.
Pakistan. Prior to independence this very same area served as the breadbasket for the entire British India. Although Punjab covers only 26 percent of the land area of Pakistan, it contains 46 percent of the total cropped land and 76 percent of irrigated land. Seventy-two percent of the Punjabi population is directly or indirectly associated with the agricultural sector.

The study area is primarily a semi-arid desert with average annual precipitation of about 180 millimeters, 70 percent of which is concentrated in the monsoon season between the months of June and August. The cropping pattern in the area closely follows the monsoon cycle. The two planting seasons are **rabi** (sown in autumn and harvested in spring) and **kharif** (sown in spring and harvested in autumn). The main **rabi** crop in the area is wheat and main **kharif** crops are cotton and rice. The **rabi** crops are primarily for household consumption by the small farmers, while the **kharif** crops are primarily used for cash income by most farmers, large or small. Since **kharif** coincides with the flood season, it is the cash crops that are most susceptible to damage from flooding.

Five communities within the Kabirwala tehsil of district Khanewal and Shorkot tehsil of district Jhang were chosen for the field study. Of the five, two communities, Pindi Kamlanewala (hereinafter referred to as Pindi) in Sheikhupura Union Council and Qatalpur in Qatalpur Union Council were selected for detailed analysis. The other three were selected to provide geographic variation in the places where the questionnaires were administered, to lend variation to the data sample. These communities were selected for their locations in agriculturally important canal colonies of
central Punjab and for meeting the following criteria: (1) exposure to flood hazard, including the major floods of 1973, 1976, 1978, 1988, and 1992; (2) variation in landholding size and land tenure within and among the communities; (3) the presence of the Pakistan Institute for Environmental and Development Research, the host non-governmental organization (NGO), who facilitated this case study; and (4) a cooperative attitude toward outside research by the residents of the communities.

The field study consisted of both informal interviews and survey questionnaires directed at three strata of household types: large landed farmers (>10 hectares), small landed farmers (<10 hectares), and landless laborers. I could only include about three large farmers (with landholdings of more than 10 hectares) in the survey. Just before the time of the field survey the government of Pakistan had made a decision to tax agricultural income, and the larger farmers, who were the main target of the legislation, were suspicious of anybody inquiring about their assets or income, fearing that the information might end up in the hands of the income tax department. I was able to hold a detailed interview with one of the large landlords, however. A total of 50 questionnaires were administered, 15 each to households in Pindi and Qatalpur and the rest in the communities of Bela Sarbana, Chak 6-D, and Kundal Khokhran. I also conducted detailed personal interviews with community members, government officials, and other individuals with regional influence.

Pindi and Qatalpur: Contrasting Geographies of Vulnerability and Exposure

Pindi comprises about 200 households and lies astride the Sidhnai spillway channel (Fig. 3). The total area of the village is about 690 hectares, much of which is uncultivable because of chronic waterlogging and salinity problems. The landholdings range from 2 to 50 hectares, but the majority of the residents are landless. The village has no electricity, potable water supply, or sewage disposal facility, and only a dirt road connects it to the nearby main highway. About 20 kilometers from Pindi, the village of Qatalpur lies on somewhat higher ground and comprises about 1,000 households according to an estimate by the local residents. Although there are some small farmers the village is dominated by four major landlords, who each own 400 to 600 hectares of generally highly productive, prime agricultural land. The four landlords belong to one of the most politically influential families in the country. Qatalpur is connected by a high-quality metalled road with the main highway, and its residents enjoy a potable water supply and electricity. While I was in Qatalpur plans were being discussed to construct a sewerage system in the village. The two villages, despite their proximity, presented quite a contrast in the level of physical amenities available to them. This contrast also carried over into the relative exposure and subsequent vulnerability of the two communities to flood hazard, especially to floods of high magnitude like the one in 1988.

Both the villages are susceptible to flooding from the Ravi River, and some marginal lands of Qatalpur are also occasionally flooded by the Chenab River (Fig. 3). According to local residents Pindi was flooded much more frequently and more intensely and suffered proportionately greater damage than its more affluent neighbor. In searching for reasons for this contrast one may start with the most obvious physical features. The Sidhnai spillway channel is the main determinant of the relative exposure of the two communities to flood hazard. The spillway presently exhibits a design of questionable motivation and inequitable outcome.

The spillway was originally designed as a flood bypass for water flows exceeding the designed capacity of the old Sidhnai barrage at Kot Islam. According to the local population, the original plan for the spillway, designed before independence,
located the proximal end of the waterway at the confluence of the Haveli Canal and the Ravi River, upstream of the Sidhnai headworks and flowing straight into the Chenab River (Fig. 3), thus carrying flood flows to the headworks safely away toward the Chenab. Completed in 1962, the finished version revealed a very different design; the spillway did not flow toward the Chenab, but was rerouted directly back into the Ravi, 17 kilometers downstream from its beginning and 10 kilometers short of Qatalpur, thus bypassing the landholdings of the most influential Qatalpur family. Consequently when a flood of the magnitude of 1988 occurs, river water enters the spillway from both ends, breaks through the side levees, and wreaks havoc on the surrounding communities that lie astride the Sidhnai spillway, especially Pindi. Similar outcomes were reported for the lower-intensity floods of 1976 and 1978 as well. The following dialogue held between myself and a major landlord of Qatalpur village is revealing about the suspicious change in the original design:

Q. Doesn’t this spillway design actually aggravate the flood problem for the surrounding communities?
A. Indeed it does . . . (he went on to explain how, as described above).

Q. Then would it not have been better if the authorities had stuck to the original design? Would it not have mitigated the flood hazard?
A. Yes, it most certainly would have. But you see if the original design had been followed some very valuable and productive land would have been wasted in the actual construction. Not to mention increased susceptibility of the additional land to flooding. That would have been unacceptable.

Q. Whose lands are those?
A. (laughing) Mine, of course! (looking toward others present). That is the straight truth (implying there is nothing to hide about it).

The certainty and lightness with which the last phrase was said left little room for further inquiry as to the reasons for the change in the original design. Other local residents, primarily in Pindi, confirmed that it was indeed the landlords in Qatalpur who influenced the authorities to change the spillway design to save their lands.

The designed capacity of the new Sidhnai headworks is about 4,200 cubic meters per second, but during the 1988 floods 7,735 cubic meters per second reached the headworks. Of that flow 1,071 cubic meters per second were routed through a breach in the right marginal b Ensemble (levee) at Mai Sapuran and 595 cubic meters per second were routed through the spillway. Still, 6,070 cubic meters per second, exceeding the safe capacity of the headworks by 1,665 cubic meters per second, passed through it. The designed safe capacity of the Sidhnai spillway is about 714 cubic meters per second, which is clearly insufficient to deal with a flood of the magnitude experienced in 1988. The maintenance of the spillway is severely neglected by the provincial irrigation department, and because of sediment accumulation and uncontrolled vegetation the present capacity is much less than the designed capacity, thereby exacerbating the risk. Furthermore, according to the locals, the Ravi River originally broke through the levees on its left bank, but since the building of a Pakistan Army Ordnance depot in Abdul Hakim, the River is not allowed to breach its left bank. When those same residents were pushed to explain why they think the construction of an ordinance depot would necessitate diversion of water toward their community, the somewhat resigned response was, “well, sahib [sir], one cannot let valuable ammunition get flooded out. We are poor people, the landlords in Qatalpur are powerful people, the military is a powerful institution, the floods are only for us poor folks.”

The two communities reported very different experiences with relief efforts. The residents of Pindi reported petitioning many times for relief and even resettlement if the authorities insisted upon using their village as the main inundation zone,
but to little avail. They reported getting virtually no relief from the government in the aftermath of the 1988 flood. Some of the Pindi families had no choice but to live on the nearby road for months while waiting for the water to recede from their houses. The Ravi River is generally confined to its main channel by a system of levees, and consequently its bed has been raised higher than the surrounding floodplain because of continuous deposition during low-intensity floods. Therefore once water has breached the levee it takes a long time to be pumped out, to recede, or to evaporate, thereby also causing a major public health hazard, with mosquitoes and water-borne diseases festering in the static flood water.

Asked about how they are informed about an impending flood and why no relief is provided, the following progression of events was related by one local resident of Pindi:

Well, before every flood the police comes to the village and chases everybody out of their houses to the nearest road on high ground. After the main flood wave has passed the Deputy Commissioner [the provincially appointed chief executive and judicial officer of the district] shows up. He sits on a chair while we all sit on the floor or on charpois [a rope bed] in front of him. He asks questions about our needs and problems and the Assistant Commissioner [the provincially appointed chief executive and judicial officer of the tehsil (county)] or some other officer from his office responds. Nobody from the village dares speak in front of him. He is a very powerful man and nobody in this village has the courage to talk to him. He passes orders to his juniors, promises relief and leaves. Nothing ever happens and why would it for people like us. We are such a bunch of cowards. (Interview, June 1994)

The residents of Qatalpur, on the other hand, reported active relief efforts by the government during the floods of 1988 and 1992. Furthermore, the entire economy of Pindi was being held hostage to irrigation development policies and flood control policies that seemed to be benefiting Qatalpur more than Pindi. Pindi had chronic waterlogging and salinity problems, in addition to periodic flooding, which limited the farmers' choice of kharif crops to less valuable rice, whereas Qatalpur seemed to have much higher quality irrigated land on which to produce significantly more valuable cotton crops.

The Household Level: The Converging Geographies of Vulnerability and Exposure

The exposure and vulnerability to floods was by no means equal within the communities. The spatial pattern of settlement was glaringly skewed in favor of the relatively affluent. The more affluent bhumardars (formal head of the village) and other landowners in Pindi tended to have their homes on relatively higher ground in the middle of the village, while the poorer sharecroppers and landless peasants tended to have their homes on low-lying fringes of the main village. Similarly, in Qatalpur the poorer landless laborers had their homes located in the inundation zone, while the glaringly palatial homes of the large landlords were farther away from the inundation zone in the middle of the village (Fig. 4). One of the landless peasants on one of the Qatalpur landlords' lands explained his reasons for living right in the middle of the inundation zone: "Sir, the landlords are kings, we are mere subjects, wherever they are gracious enough to allow us to live, we have to live there."

To further ascertain intracommunity vulnerability questionnaires were administered, whose findings are summarized in Table 3. Income, as reported by questionnaire respondents, is significantly different among the landless, the small farmers, and the large landowners. Although the total number of large farmers is small (N=3), the annual income and average landholding size is instructive, even though these measures have almost certainly been understated. The large landowners and small farmers reported a significantly greater
percentage loss of income during flood years than the landless. Small farmers and the landless had a proportionately high number of people with nonfarm sources of income, in addition to the farm income. Most of the landless and small farmers reported insurance against total loss of income during a flood as the main motivation for seeking off-farm employment. Interestingly, more than half of the small farmers and one-third of the landless laborers still had not recovered their preflood number of livestock two to five years after the event.

The large landowners suffered the loss of a higher percentage of their income, especially since the floods destroyed the highly valuable cotton crop. But two of the three did not think that it threatened their livelihood, because they had the resources (e.g., savings) to recover from the losses. One large landowner from Pindi said that his recovery was difficult, and that it was largely facilitated by the fact that he could rent out his tractor and also draw upon his earnings from the winter wheat crop. Overall, the larger landowners, depending on their size, seem in the past to have had sufficient savings to recover from flood hazards. On the other hand, the landless laborers did not suffer as much proportional loss of income and were able to recover through finding jobs in local recovery projects, as well as through sale of livestock and help from the community. The size and productivity of the landholdings were big factors in determining the vulnerability of a household.

Almost all the households (landless, small farmer, or large farmer) reported sickness of children and older members of the household in a flood's aftermath. The most commonly reported ailments were cholera, malaria, diarrhea, and skin ailments. (Only one death, that of a child in Pindi, was reported.) Children and the elderly therefore demonstrated greater vulnerability to the hazard than others. Family size apparently had no effect on the incidence of disease or loss of income in

| Table 3 | Intracommunity Vulnerability to Flood Hazard in Pindi and Qatalpur |
|------------------|------------------|------------------|------------------|
| **Indicator** | **Landless (N=21)** | **Small Farmer (N=26)** | **Large Landowner (N=3)** |
| Average income (1994 U.S. $/yr.) | 282 | 2,580 | 23,500 |
| Income loss in flood year (%) | 41 | 67 | 77 |
| Average landholding (hectares) | 0 | 6.9 | 84 |
| Average number of dependents | 2.7 | 3 | 3.3 |
| Average number years of schooling | 4 | 8 | 15 |
| Percentage with nonfarm sources of income | 71 | 77 | 33 |
| Percentage with fewer cattle heads than before the last major flood | 33 | 54 | 0 |
| Primary means of recovery | Sale of livestock; loans from friends and relatives | Nonfarm labor; loans from friends and relatives; sale of livestock | Loans from lending institutions |

*Source: Author's questionnaire.*
the aftermath of a flood hazard. Larger families, however, were better able to recover, because of the availability of a greater number of hands to work for recovery.

**Formalizing the Elements of Vulnerability**

Vulnerability is interpreted as the powerlessness of individuals, groups, and classes to influence decisions that determine their exposure to the hazard. The poorer residents of Pindi and Qatalpur had little say in the design of the spillway, although they suffer the most from it. The government that designed the spillway in this particular case created a hazard, and although theoretically the people have power over the state through their voting power, in practice that power counts for little. The state-run irrigation system of Punjab or the civil works around its banks may be of benefit to the big cotton producers, but the state does not always distribute the risk of flood hazard democratically. Pakistani bureaucrats historically have demonstrated a tendency to favor large landlords at the expense of small farmers and the landless (Dove 1994; Gilmartin 1994). Likewise, the people’s vote cannot stop the state from protecting the ordinance depot in Abdul Hakim at their expense. The preservation of civil structures, ammunition dumps, and cotton fields of the powerful are the priorities of the institutions of the state, not the livelihood of the poor.

The poor residents of Pindi were quite aware of this reality. Indeed, everybody in Pindi and Qatalpur understood their exposure and vulnerability to floods as a function of their powerlessness and poverty. In contrast, the more “educated” engineers and bureaucrats at water-related agencies at the provincial and federal level were unwilling or unable to see the connection. Almost all of them insisted that floods were the work of God and that they were trying to help people with their policies, which were based on nothing more than the strictest technical criteria. Hewitt’s (1983) description of hazards as an “archipelago of isolated misfortunes” in the technocratic mind seems particularly pertinent in this regard.

The case study indicates that the communities’ and social groups’ vulnerability was largely dependent upon the level of political and economic influence that the residents wielded. The decisions about the spillway design and the vigor of recovery efforts illustrate this. Therefore one can conclude, with reference to Watts and Bohle’s (1993) model discussed above, that vulnerability in the case study is largely a function of disempowerment vis-à-vis certain classes and institutions, and therefore the study villages’ vulnerability can be situated in the realm of power and institutional relations rather than in either entitlement relations or political economy (Fig. 1). The lack of medical facilities, schools, and electricity, as well as irrigation, in Pindi are factors contributing to the vulnerability of the community, and the undemocratic fabric of the institutions of state is the main explanation for Pindi’s enhanced exposure and vulnerability to flood hazard.

The gravitational pull of class relations and political economy on the point of vulnerability can also be explained by the congruence between economic and political strength. The largest landlords of Qatalpur translate their financial resources into political power. Their best and most fertile lands are dedicated to the growing of cotton, and those lands are incidentally also the least exposed to flood hazard. The poor living on already marginal lands happen to be the most exposed. In Qatalpur and Pindi Kamlanewala people are living on known hazard-prone areas, because the necessities of the political economy of Pakistan and the entitlement relations force them to eke out cash incomes from marginal lands. This dependence upon marginal lands for cash income by small farmers explains the gravitational effect from the dual forces of entitlement relations and political economy
in the Watts and Bohle (1993) space of vulnerability.

The Causal Progression of Vulnerability

Vulnerability is understood to be connected to long-term factors which affect the ability of a community to respond to natural hazards and that cause it to suffer from their consequences. The "pressure and release" (PAR) model by Blaikie et al. (1994) adequately formalizes the components of long-term factors of vulnerability and what constitutes a disaster. A graphic adaptation of the model to a flood hazard context is presented in Figure 5. Vulnerability is conceptualized at three levels or orders of progression. The distant root causes, which are basically structural in nature, constitute a set of processes in the society operating at the larger national and international scale. Mechanisms are the social forces that translate the social structures into dynamic pressures. Dynamic pressures are articulated in terms of institutional and legal geography and the people's perception of it. This institutional and legal geography manifests itself in terms of empirical unsafe conditions. As per the above discussion, processes for vulnerability analysis have been divided into three structural issue areas: entitlement, empowerment, and political economy (Watts and Bohle 1993).

Mechanisms for Root Causes

In the PAR model in Figure 5, the transformation of structures to "actual" dynamic pressures is mediated by the mechanisms of exchange relations in the economy, demographic growth, poverty, lack of political rights, and economic compulsions to grow cash crops. Demographic pressures are evident from the fact that households in the study villages averaged 9 members, with a maximum household size of 20. An average household had 41 percent of its members under the age of 18. Poverty was a real mechanism in the field study, with landless peasants reporting an average annual income of U.S. $282. Only one woman in the 50 surveyed households had more than five years of education.

The limits to political participation by the residents of Pindi and poorer sections of Qatalpur is illustrated by their relatively greater exposure to flood hazard. The residents have little influence in the management of their own resources, such as irrigation water, and even less on the decisions of the state institutions that decide about the exposure of their lives and property to flood hazard. The Sidhnai spillway design serves the interests of a powerful few, thereby transferring a disproportionate level of risk onto the weak.

Skewed distribution of productive resources in the field study is evident from the range of the landholdings, from none to an estimated 600 hectares. The production of cash crops like cotton and accumulation of profits from them into the hands of the mighty few accentuates the social and political inequalities and has a positive feedback effect on the other mechanisms. Cotton is an expensive crop to cultivate and therefore out of reach of most small farmers. The large farmers, on the other hand, have access to official lending institutions as well as their own capital reserves to finance the buying of the expensive chemical fertilizers, insecticides, and herbicides essential for a good cotton crop. The same large farmers are also in a better position to absorb the shock of losing the relatively fragile crop. The crop therefore leads to progressive concentration of wealth in the hands of a few large farmers, whereas the small farmers are progressively marginalized in an increasing cash economy, where the goods and services that they traditionally produced themselves have to be bought on the market for cash payment. Since the most productive land is dedicated to cash crops, thereby taking it away from essential food crops, some of the small farmers still end up spending parts of their meager cash resources on food.
PROGRESSION OF VULNERABILITY

Root Causation

Structural Pressures

Unsafe Conditions

State Necessity

Productivity

Waterlogging & Salinity Problems

Levees on Spillways

End run by maintaining

Allowing people to live in a known hazard

Biological

Loss of livelihood during floods leading to indebtedness and reduction in assets

Small farms dependent on income from land particularly when in disastrous

Health

Existing poor health conditions raise risk of infection

Existing facilities with a distance

Reduced Flood Hazard

Figure 5. Structural and conjunctural pressures that result in disasters.
Dynamic pressures translate the structural causes of vulnerability into concrete and observable unsafe conditions, as discussed above. These dynamic pressures or explanations of vulnerability have further dimensions of class, gender, age, political impotency, and state action. People in the study villages were observed to have varying levels of vulnerability on account of these dimensions. The poorer households even in a place like Pindi Kamlanewala were located on the low-lying fringes of the community, whereas the house of the lumberdar (the revenue officer for the village) was at the highest point, in the middle of the community. A similar pattern was found in Qatalpur. At a community level the poorer Kamlana Rajputs of Pindi were more in harm’s way and more defenseless than the Syed Pirs (religious leaders) of Qatalpur.

Children and the elderly were more likely to fall sick from cholera, malaria, and other waterborne diseases in the aftermath of a flood than the adults. Political impotency is an important dimension because the spatial distribution of the hazard is influenced by political decisions made at the government departmental level. Also, after the 1988 flood the Pindi residents spent months on the road, waiting for the flood waters to recede, whereas the Qatalpur residents were well taken care of by influential local people with national-level standing. The major criteria for relief appears to be related to political influence: Pindi did not have any major political figures as residents, and Qatalpur had some of the most influential people in the country as its residents. The attention paid by government agencies to each of the communities seems to reflect that reality.

The dimension of political impotency also ties in with the dimension of state policies. The urban-oriented development strategy of the Pakistani state discussed above leaves the majority of the rural population at the economic and political periphery of the country. The lack of access to basic facilities, like health, education, and safety from periodic flooding, contributes to the vulnerability of the population. The politically marginalized sections of society have no way of influencing state actions, which serve to accentuate their vulnerability and exposure to a range of hazards, not the least of which is floods.

For the dimensions of class, political impotency, age, and state we have direct evidence from the study villages, but I could not investigate the gender dimension comprehensively because of culturally determined limitations. Other researchers working in similar areas, however, have identified gender as an important dimension of differential vulnerability (e.g., Pattan 1993).

The story does not end at a disaster. The flood disaster takes its toll in terms of assets, basis of livelihood, and physical strength of the members of a community. But in its aftermath in the study villages, the community had to recover through sale of livestock, or through the procurement of monetary loans and/or material assistance or favors from friends, relatives, community members, and often powerful local people. Through these mechanisms of recovery the poor mined their existing stock of assets (e.g., an overwhelming majority of the 50 respondents to the questionnaire sold a farm animal to aid in their recovery from floods) and went deeper into debt monetarily and, at times, morally (i.e., they owed a favor to the powerful). Suffice
it to say that over time the increase in dynamic pressures through demographic growth, aggravation of poverty, and maldistribution of resources in Pakistan could continue to increase people’s vulnerability to hazards. How and over what time frame social groups’ state of vulnerability will evolve would be an interesting future research question.

Conclusion

In this paper I have attempted to convey the thematic and spatial interconnections and complexities of disasters. Vulnerability was defined as a function of individuals’ and communities’ state of defenselessness to hazards and their inability to recover from the effects of those hazards. It has been demonstrated that the Pakistan government’s national-level policies are heavily urban biased and make for an uneven level of development between urban and rural areas. At the local level, there are stark contrasts between the level of vulnerability of two communities studied. But the geographies of vulnerability at the intra-community household level are remarkably similar in the two villages of Pindi and Qatalpur. A modified pressure and release model has been used to understand the structural causes of vulnerability to flood hazard in the study area.

Power, and the institutional relations that lead to its concentration in a few hands, is the major structural contributor to vulnerability of all the vulnerable groups to flood hazard, according to the case study. Entitlement relations that skew access to productive land and agricultural inputs, as well as the political economy that makes the farmers subservient to the needs of the broader cash-driven national and international economic system, are the other two structural causes of vulnerability. Although entitlement relations were less important in determining vulnerability of landless laborers, they were very important for small farmers. In short, the same factors that contribute to inequitable and unsustainable development at the national scale also contribute to vulnerability of communities and individuals to flood hazard at the local level.

Analyses of flood hazard and response to them should not limit themselves to controlling the physical risk or analysis of organizational and individual perceptions and behavior. Human and social psychology may have important insights to offer, but the neglect of the accumulative social structures across various scales would render any hazards analysis incomplete at best. A development strategy that understands the above three structures as problematic and then lends itself to effective operationalization to undermine these structures would be most appropriate in the Pakistani context. It is also through addressing the social structures in vulnerability analysis that the full potential of the hazards subfield in geography in addressing issues of development and everyday social life can be realized. The project ahead of us for hazards mitigation is not just building stronger levees or more powerful weather satellites, but equity and justice in resource management.

References


