

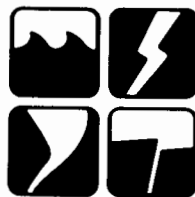
# **Natural Hazard Research**

**NATURAL DISASTER MANAGEMENT IN KOREA:  
AN ANALYTIC STUDY WITH POLICY IMPLICATIONS**

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## PREFACE

This paper is one of a series on research in progress in the field of human adjustments to natural hazards. The Natural Hazards Working Paper Series is intended to aid the rapid distribution of research findings and information. Publication in the series is open to all hazards researchers and does not preclude more formal publication. Indeed, reader response to a publication in this series can be used to improve papers for submission to journal or book publishers.

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## SUMMARY

The purpose the study presented here was to analyze the management of storm-flood disasters, a major type of natural disaster in Korea. The findings have political implications for the ways in which natural disasters are managed. The method adopted in the study involved an integrative framework; the study itself included survey interviews and field observation. The framework adopted examines the environmental circumstances of South Korea; the relevance of sociocultural values and the national political economy; the effects of the government's organizational structure and policies; and individual responses to natural disasters and to the government's role in disaster management.

All of these factors are necessarily linked to particular disaster problems. To analyze individual responses, a total of 273 individuals participated in the survey interview, which consisted of a structured questionnaire. The study sites for the interview included three regions in South Korea that, in recent years, were statistically proven to be disaster-prone.

The case studies resulted in some major discoveries: 1) Storm-flood disasters in Korea are closely related to human mismanagement, although they are primarily due to the nation's geographical situation, which makes it vulnerable to annual natural events of heavy rainfall and typhoons. 2) These disasters are of two different types—the inner-city flood and the riverine flood. Inner-city floods often occur in densely populated and newly developed urban areas that lack flood-control facilities. Riverine floods frequently occur in rural agricultural areas along waterways in major river basins, where there are unprotected embankments and soil erosion due to construction undertaken for industrial and other regional development. 3) Disaster management by both the government and the public, including the residents of disaster-prone regions, is often “temporary” management that focuses on emergency relief and recovery when a natural disaster occurs, rather than preparatory management aimed at future disasters. 4) The government's organization for disaster prevention is centered in the national government, and decisions are sent out through communications and management networks to local government organs when emergencies arise. 5) Disaster policies that emphasize emergency relief and recovery have rarely focused on long-term plans for recovery or preparation for future natural disasters. The funds for disaster management are unstable and limited to the handling of emergencies. The process of planning and implement-

ing disaster policies is a hierarchical procedure involving bureaucratic authority but with little review and evaluation or civic participation. 6) Responses by individuals to government disaster management reveal a high degree of dissatisfaction with the quality of management. Individuals want disaster policies to be “realistic,” to be concerned with real-world disaster situations, and to put much greater emphasis on preparation for future disasters.

This study’s recommendations for the government include the establishment of an independent organization involving a high degree of professionalism, the development of disaster policies stressing preparation from a long-term perspective, and the creation of an efficient management structure that will pursue support through laws and through positive interaction with the public and other professionals in the specific fields relevant to disaster problems. In addition, better preparation should include both effective policies and education.

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## INTRODUCTION

Natural events have affected human life throughout history. Those natural events that have caused great loss of human life and property are described as “natural disasters.” Natural disasters chiefly include floods, drought, hurricanes or typhoons, tsunamis, earthquakes, volcanic eruptions, tornadoes, and wildfire. These types of natural disasters have claimed great losses in human and property resources—in recent years, the loss of almost 250,000 lives and some \$40 billion in property worldwide per year (Bruce, 1991). One source suggests that the increase in worldwide natural disasters represents on average a fivefold increase in frequency and about a threefold increase in total economic losses over four decades (Berz, 1990).

In response to such enormous disaster losses in societies where these disasters have frequently occurred, there have been efforts to reduce the loss potential at the individual, group, community, and governmental levels. Yet, despite all these efforts, natural disasters continue to be costly in terms of their economic burden as well as the social stress they cause in the societies where they occur.

One such effort was an international conference—the First Year Conference of the International Decade for Natural Disaster Reduction (IDNDR) in Japan in 1990. The basic idea of the IDNDR is to prevent, or at least reduce, potential damage due to natural disasters on an international scale, while taking into account the human role in these disasters (Advisory Committee on the International Decade for Natural Hazards Reduction, 1987, 1989). At this conference of about 1,300 participants, including professionals from forty-three nations and sixteen international organizations, the participants discussed their experiences with natural disasters. They examined the causes of disasters and the problems encountered by existing institutions and organizations established to deal with disaster prevention. Through this discussion, the participants determined that disasters are exacerbated—if not more likely to occur—as a consequence of regional development and urbanization. The participants recognized, therefore, that disaster-related problems should be resolved through efforts to pay more attention to the promotion of prevention and reduction of risk.

The international conference created among the participants a recognition that natural disasters constitute a worldwide problem that must be resolved through international cooperation, particularly through interdisciplinary scientific research on natural disasters on



an international scale.

Regarding participation in international cooperation, the present study, within the integrative framework of human geography, is intended to provide useful scientific information regarding Korea's experiences with natural disasters. Up to the present, resource losses in Korea due to natural disasters have been increasing annually, thereby putting great stress on the Korean economy and society. However, little documentation of natural disasters has been produced by the Korean government, and the research on natural disasters, especially storm-flood disasters in Korea has been minimal. This study is therefore intended to help inform the Korean society, the research community, and other research communities in the world regarding natural disasters in Korea.

### NATURAL DISASTERS IN KOREA

Korea has suffered from natural disasters throughout its history. These disasters have included floods, typhoons, rainstorms, snowfalls, tidal waves, thunderstorms, and lightening strikes. Among these, floods, storms, and typhoons have had a higher frequency of occurrence than other types of natural events, and they have caused the greatest losses in human life and property. According to government statistics, the frequency of occurrence is as follows: floods, 28% (396 recorded events); storms, 27% (380 events); typhoons, 19% (265 events); snowfall, 11% (153 events); and other disasters, 14% (199 events), out of a total of 1,393 recorded events during the period 1904-1990 (NDPCH, 1991, p. 447).

The natural disasters of floods, storms, and typhoons are known among the Korean people as *p'oongsuhae* (storm-flood disaster). Storm-flood disasters occur throughout the summer season every year. Geographically, this is because the Korean peninsula is located between the world's largest landmass, the Asian continent, and the largest body of water, the Pacific Ocean. Meteorologically, storm events occur particularly because the peninsula is situated in an atmospheric region where air masses of low pressure originating in the Yangtze Valley in southeastern China meet with high-pressure air masses originating in the western North Pacific Ocean.

Beyond these physical causes, storm-flood disasters, in particular, are the result of human mismanagement and unwise development activities that have occurred in the context of

economic as well as industrial development pressures, including regional development and urbanization.

Storm-flood-prone regions in Korea (Figure 1) are areas along the coastline and those lowland regions that lie along the stream channels of the major rivers of Korea: the Han'gang, Nakdonggang, and Kumgang rivers. Coastal regions are affected mostly by typhoons and tsunamis, while river basins are affected mostly by storm-floods and an occasional typhoon. Storm-flood disasters in the river-basin regions have been associated with increased population density and regional as well as industrial development over the last several decades.

Figure 2 indicates an overall increase in losses year by year, except for the highest damage-loss year in 1987, when there were two typhoons and one heavy rainfall within a two-month period during the summer. The total losses due to storm-flood disasters in Korea during the ten-year period 1981-1990 amounted to 2,828 deaths and property damage valued at about 3,307 billion Won (equivalent to about \$4,267 million).

As shown in Figure 3, among various sectors of society, the largest proportion of damage happened to public facilities (as a percentage of total loss during the same ten-year period); the reconstruction of these facilities typically requires high expenditures due to the large scale of the structures involved, such as roads, stream channels and riverbanks, schools, and other public-use buildings. Damage recovery for public facilities, therefore, requires government assistance. Some damages are in fact recovered by the Korean government.

### **Statement of the Problem**

Again, Korea is prone to natural disasters annually, particularly to storm-flood disasters. Therefore, great resource losses, plus the high cost of damage recovery and disaster prevention, have become a heavy social and economic burden on both the government and the general public. This burden has increased and will continue to increase year by year, since Korea is located in a geographic region of highly unstable atmospheric conditions where frequent heavy rainfall and strong windstorms constantly occur.

At the same time, recent Korean government policy has given priority to economic growth, although there are increasing environmental problems, including problems related to natural disasters.

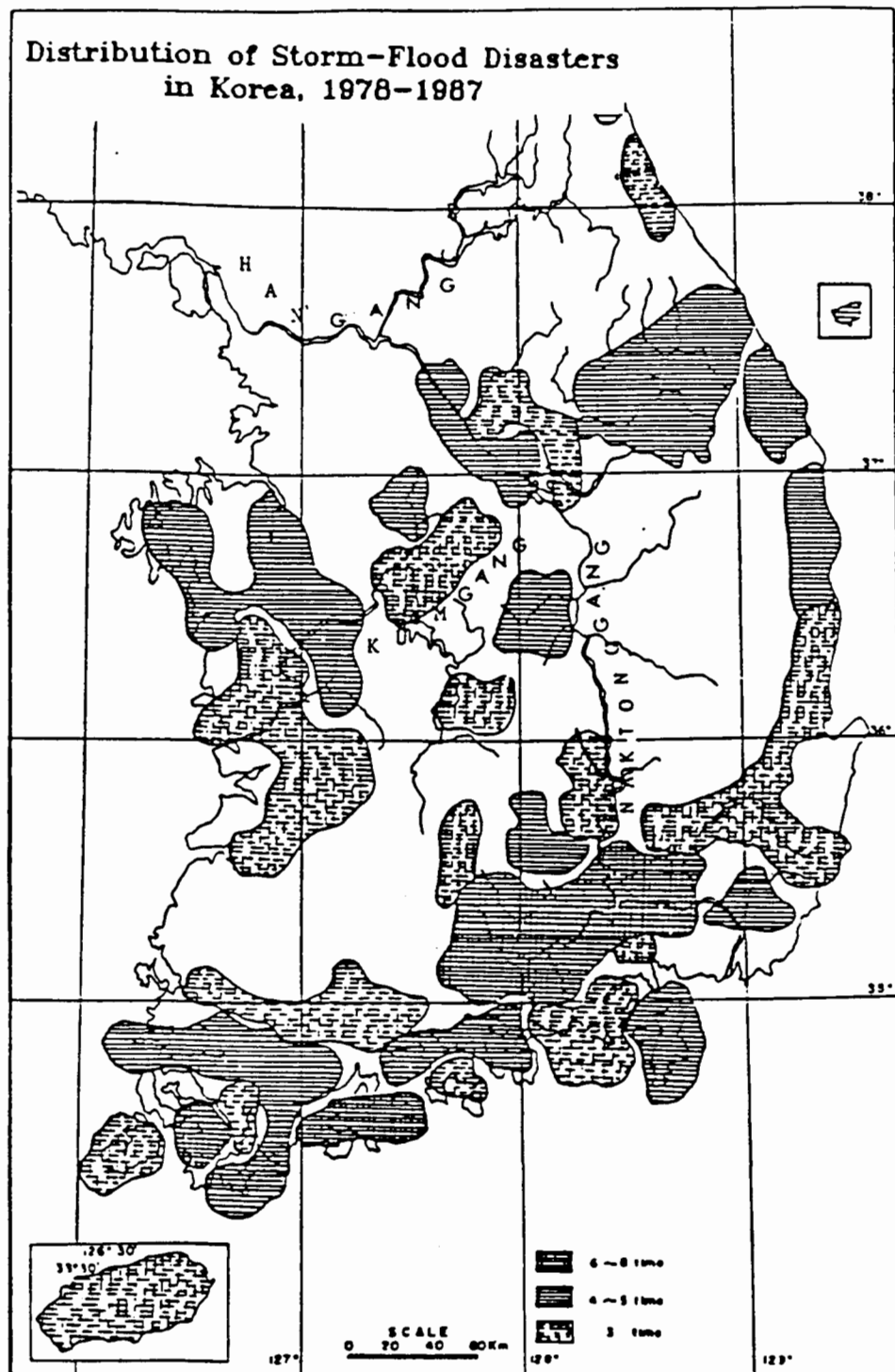


Figure 1  
Distribution of Storm-Flood Disasters in Korea, 1978-1987

Source: Redrawn from MOC, 1988, p. 308

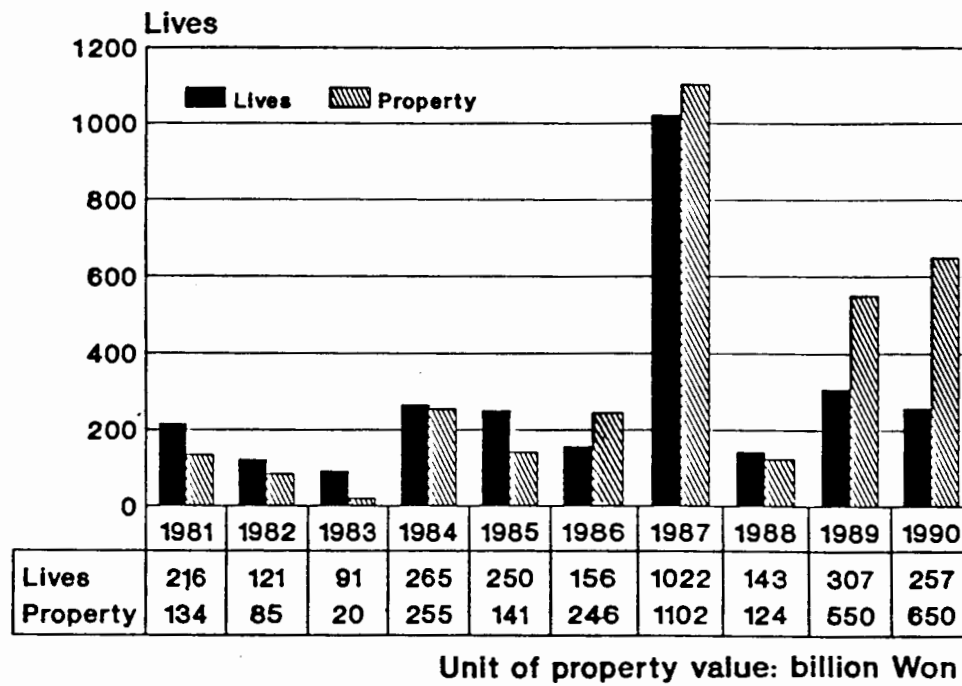


Figure 2  
Loss of Life and Property Due to Storm-Flood Disasters in Korea, 1981-1990

Source: Derived from NDPCH, 1991, p. 447

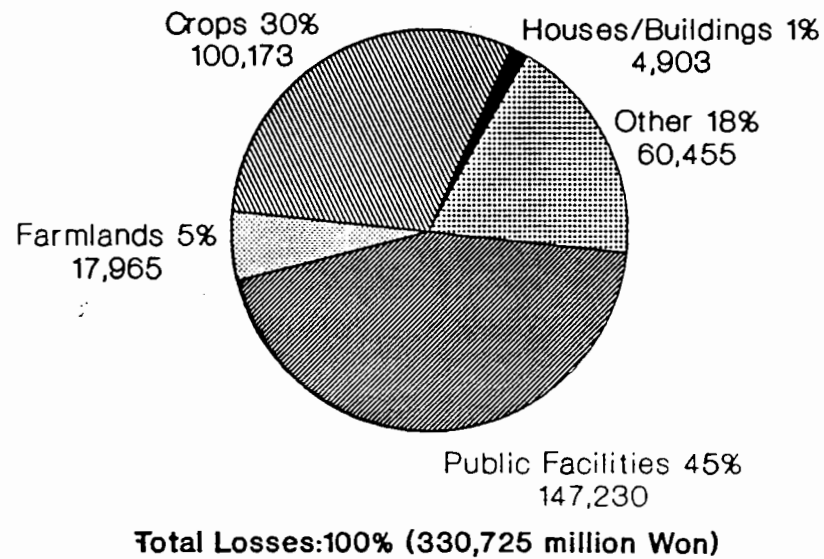


Figure 3  
Storm-Flood Damage Loss by Sector, 1981-1990

Source: Derived from NDPCH 1991, p. 447

To date, the management of natural disasters in Korea has depended on government intervention that consists mostly of emergency relief and recovery aid, although government disaster countermeasures include provisions for prevention as well. Government funds for disaster management come from fixed, reserve, and supplementary budgets, as well as from public donations. The expenditure of these government funds, however, is limited to a small proportion of the fixed revenue of the Ministry of Home Affairs, where the National Disaster Prevention and Countermeasures Headquarters plays the central role in disaster management. Most of these funds are supplemented by funds from other ministries and by public donations when necessary.

These supplementary funds constitute a large proportion of the total funds available for disaster management. This means that natural disaster management by the Korean government depends upon unstable funds that cannot be relied upon to cover long-term management plans.

From this review of natural disasters in Korea and the government's role in disaster management thus far, there are certain questions that arise:

1) What are the major factors causing the increase in damage to property and loss of life from natural disasters in Korea? What are the relevant social, economic, and cultural factors involved?

The societal level:

- A. What are the environmental conditions of Korean society as they relate to the experience of natural disasters?
- B. What are the dominant beliefs of Korean society affecting hazard perception?
- C. What are the leading relevant cultural traits in the society affecting responses and adjustments to hazards?
- D. What is the political-economic structure of the society and the consequences for disaster management and/or reduction?
- E. How seriously does the society regard natural disasters?

- F. How are all of these elements related to the overall increase in damage to property, injury, and loss of life from natural disasters?

2) What are the strategies for natural disaster management at the individual level, and what are their relationships to government and society generally?

The individual level:

- A. How do the people in natural disaster-prone regions cope with natural disasters?
- B. How seriously do these people regard natural disasters?
- C. Why do people occupy disaster-prone regions?
- D. How do the people evaluate their government's role in natural disaster management?
- E. What do the people desire from their government in natural disaster management?
- F. How are all of these elements related to the overall increase in damage to property, injury, and loss of life from natural disasters?

3) How does the government manage natural disaster preparation and relief?

The government level:

- A. What is the institutional structure within the Korean government for natural disaster prevention?
- B. What are the major policies of the government regarding natural disaster prevention?
- C. What is the process for planning and implementing policies regarding natural disasters? How is this process evaluated?
- D. What are the sources of funds for government disaster management? How are these funds allocated? Is there any evaluation process concerning this allocation?
- E. How seriously do the professionals engaged in natural disaster management regard natural disasters?
- F. How do these professionals evaluate disaster-related policies and policy implementation?

- G. How are all of these elements related to the increase in damage to property, injury, and loss of life due to natural disasters in Korea?

### **Research Objectives**

The basic objective of the present study is to analyze natural disaster management through an examination of management efforts by individuals, the government, and society as a whole, in specific regions in Korea. An additional objective is to examine an integrative analysis method, applying it to the case of Korea.

The specific objectives are:

- 1) To understand the real-world situation involving the management of natural disasters, particularly storm-flood disasters, in Korea.
- 2) To identify, from socioeconomic and cultural perspectives, major factors causing increases in resource losses from natural disasters in Korea and to discover links among those perspectives in relation to storm-flood disaster problems.
- 3) To provide recommendations to those who plan and implement disaster policy in the government to improve disaster management with the objective of reducing the damage potential of natural disasters.

## NATURAL DISASTER RESEARCH

Fundamental ideas that characterize human geography and distinguish it from other social sciences include its emphasis on a spatial perspective, place and region, and the human-environment relationship. The study of the human-environment relationship refers to the analysis of both how humans impact the natural environment and how the environment influences people (Macgill, 1986, p. 358-361). The present research is just such a study.

In the study of the human-environment relationship, natural disaster research has evolved following diverse philosophical and academic perspectives. These perspectives are not rigidly limited by the traditional approaches associated with determinism, possibilism, positivism, structuralism, or sociology generally. Rather, the research more often reflects modified or synthesized forms and approaches.

For an example, in the application of environmental determinism to the study of natural disasters, geographers in general do not entirely accept the determinist position that elements of the physical environment are major influences on human behavior. Instead, they extend the concept to include other environmental factors as deterministic variables in order to effect a broader understanding of the human-environment relationship (Palm, 1990, p.58). Although environmental determinism has strongly influenced disaster studies, studies strictly grounded in environmental determinism have had limitations. For example, geographers who have adopted the approach may give little regard to the impact of natural events on human settlement because of their focus on environmental constraints on economic activities in a specific region.

Similarly, the positivist position has also been a major influence on natural disaster research, but this approach has not been strictly limited by the original concept of positivism. Rather, it attempts to derive general principles for individual responses to the environment by means of an empirical deductive study. A study using this approach might focus on individual decision making in order to discover the ways in which individuals decide among various alternative actions in their environment (Johnston, 1991, p. 136-187).

Within positivism in the context of natural disaster research, there are two major approaches—the humanistic, which tries to recognize the humanity and quality in people, and the behavioral, which is connected with the positivist and spatial tradition in science. The



behavioral approach is widely adopted by geographers who pay particular attention to the role of perception in the human-environment interaction. Such research is commonly referred to as an environmental perception study dealing with hazards, particularly natural hazards. Some important pioneering studies addressed hazard perception and choice in floodplain management (Burton, 1962; Kates, 1962; and White, 1964). Thereafter, in the United States and other (especially developing) countries, natural disaster perception studies further evolved with the development of behavioral models and the adoption of interdisciplinary research frameworks from other fields in the social sciences (White 1974). Most natural hazard perception studies have been conducted within a common framework that includes: the examination of human occupancy in hazard-prone regions; the identification of possible adjustments to hazards; the analysis of human perception and prediction of hazards; the illustration of processes of adjustment to hazards; and the examination of an optimal set adjustments and their social consequences (Mitchell, 1974, p. 312-313). Although natural hazard perception studies have contributed to geographical research concerning human-environment relations, the studies have received much criticism, including questions regarding methodology. Such questions include: How, using such a method, is it possible to discover an individual's actual thoughts? and, How can it be proved that there is a strong link between environmental images and actual behavior? (Bunting and Guelke, 1979). Criticism has also been extended to the questions, regarding behavioral differences, of how to determine if there has been an inaccurate perception of a particular hazard by a responder (Saarinen, 1982), and whether a study gives sufficient attention to the complexity of responses to and definitions of hazard events (Whyte, 1986).

In opposing the positivist explanation of human behavior based on a microscopic analysis of individual responses to a particular event in the environment, structuralist geographers in natural disaster research stress an approach explaining human behavior based on macro-level structural conditions that affect behavior. However this structuralist approach has also received criticism, including the assertions that structuralist studies rarely address underlying processes in human-environment interaction (Duncan and Ley, 1982, p. 37) and that the structuralist approach cannot predict specific outcomes that can be verified (Collins, 1981, p. 94). A more through discussion of the problems of micro- and macro-analysis follows.

### **The Micro-Macro Problem**

In most natural hazard studies, micro-analysis has dominated, and has focused on the relationship between individuals and their hazard-prone environment. Regarding such micro-analysis, scholars have offered criticisms together with suggestions for alternative approaches. One critique has pointed out that the type of analysis used in hazard studies pays insufficient attention to the complexity of the interactions among individuals, groups, sociocultural systems, political economies, and other aspects of the society. Moreover, these studies do not provide explanations of the links among all of the levels that are involved in the analysis. Critics therefore suggest that there is a need to specify the links among the levels of analysis in order to understand how social structure is involved in the transforming of a hazard into a disaster (Drabek, 1986). Another criticism is that disaster studies in most cases have not treated the whole problem of disaster. Critics taking this tact have suggested alternative ways of looking at the problem: 1) natural hazards are characteristic of places and societies where disasters occur and are thereby integrated into ordinary life; 2) the awareness of and response to natural hazards are dependent not only on the prevailing structure and values of society, but also on the prevailing social order and the larger historical circumstances in which the human-environment relations are developed (Hewitt, 1983, p. 24-25). One radical criticism raised by a Marxist geographer against the apparently naive determinism and behavioralism in natural hazard studies rejects the simple distinction between natural versus human-made hazards in hazard studies and goes on to recommend an analysis of the social aspects of natural disasters, including a consideration of the existing political and economic structure (Waddell, 1983, p. 38-42).

One recent criticism (Palm, 1990) is that, since the geographical tradition emphasizes the human-environment relationship, a geographical study dealing with natural disasters should be able to explain that relationship. This critique recognizes that large numbers of empirical studies of natural disasters focus either on individual decision making in uncertainty (micro-level) or on societal structures supporting or delaying response and recovery (macro-level). The criticism asserts that such micro or macro points of view alone fail to provide sufficient perspective to explain integrated response at both the individual and the societal levels.

### **An Integrated Micro-Macro Framework**

Palm (1990) therefore advocates the integration of micro- and macro-levels in analysis for a better understanding of the human-environment relationship. Her proposed framework is based on perspectives derived from realist philosophy and empirical work based on structuralist sociology. The present study attempts to evaluate this integrative framework through its examination of storm-flood disasters in Korea.

The integrative micro-macro framework consists of three levels of micro-, meso-, and macro-analysis. At the micro-level, an individual's response to natural disasters is constrained not only by the political and economic system in which the individual lives but also by the individual's attitude toward the environment, based on the experience of the culture in which the individual exists. Therefore, a research inquiry involving micro-level analysis begins by examining how the individual or household (the decision-making unit) responds to natural disasters that occur in the local environment. Next, the inquiry examines how one can take the variety of individual responses and translate them into scientific knowledge about environmental risk, knowledge that can in turn be used to bring about individual action. This type of inquiry is complex, but it can be accomplished—for instance, by a researcher examining the possible impact of natural hazards on individual awareness. The kinds of impact include personal experiences with hazards, and personal experience can refer to the length of residence in a hazard-prone region and/or the degree of previous experience with damages or losses due to natural hazards. A researcher would then attempt to determine whether awareness can be strengthened by outside agencies such as public information, either through individual contact or through government programs, or simply by the frequency and regularity of natural hazard occurrences. More importantly, the researcher would seek to identify factors that account for the variation in individual responses in order to translate more efficiently scientific knowledge into action (Palm, 1990, pp. 88-90). In the case of Korea, the micro-level analysis first examines the level of awareness of individuals inhabiting storm-flood disaster regions and of professionals who are involved in the resolution of disaster problems. The analysis is then extended to these individuals' responses to natural disasters. Awareness includes the level of capability to respond to disasters (for example, through the intervention of both private agencies and public information systems); the degree

to which people believe they can control their own destiny (the level of motivation) and recover from the effects of disaster; and the degree of importance that people attach to storm-flood disaster problems. The responses to natural disasters by both local inhabitants and professionals involve the degrees of risk perception of and adjustment to disasters, as well as the perception of the government's role in disaster management.

In a macro-level analysis, the objective is to examine the factors within the social structure that compel an individual response to hazards. A research inquiry using macro-level analysis might investigate the nature of the existing political and economic conditions and how they are related to individual behaviors in an environmental setting. The inquiry then tries to determine the nature of the culture that shapes the relationship between the political economy and the environment. In such an analysis, a researcher would identify the major structural constraints of the political economy that affect the relationship between the individual and the environment—that is, the predominant economic activities of the society and the relationship of these activities to the national or international economic system and the structure of authority. The researcher would then examine how these economic activities link various characteristics of the environment to responses of the individual and link the society to the varying conditions of the environment. The examination would also include an investigation of the kind and structure of authority that influences land use. The researcher would further investigate the effect of shared cultural values, including: the nature and safety of the environment; the purpose of human interaction with the physical environment; the degree to which human activity has an influence on the environment; individual versus collective responsibility for the general well-being of the population; and the interactions among the people and their use of the environment (Palm, 1990, pp. 80-88). In the case of Korea, the macro-level analysis is presented from the perspectives of the general socio-cultural background of Korea and of the political economy of the nation in its historical and environmental contexts. The purpose of this analysis is to examine whether these factors are possibly connected to a physical environment involving storm-flood disaster problems and the activities of people in Korea that are associated with disaster problems.

The meso-level is situated between the micro- (individual) and macro- (societal) levels, and activities at this level may modify the relationships among individuals, the society, and

the environment. The meso-level includes societal role-playing individuals, including planners, emergency managers, civil servants and government agents, and other members of the bureaucracy, all of whom influence the behavior of individuals. Located in the intermediate level also are the impersonal structures of programs or policies that people attempt to manage on a routine basis. In an analysis at this meso-level, a researcher would examine the social role of influential individuals who administer the laws of society and exercise their influence on other individuals who reside in the local area. That is, a researcher would examine how these persons constrain and enable individual behavior as they carry out their administrative duties. The researcher would, in turn, examine how the social role of these individuals affects the societal rules through their management of the rules (Palm, 1990, p. 91). In the case of Korea, the meso-level analysis involves an examination of the structural function of the national and local governments and other relevant government agencies in Korea with an emphasis on their activities related to the management of storm-flood disasters. The analysis examines the structural and functional elements of governmental activity in storm-flood-prone regions; the legislative acts and policies that have dealt with storm-flood disasters; the processes involved in planning and implementing these disaster policies; and the allocation of funds. It attempts to show how all of these are relevant to disaster management. The analysis also examines the development of human settlement in disaster-prone regions.

The links between the levels in general can be depicted as a series of mutual constraints connecting the micro-level of individual responses to the macro-level of the society, which consists of the political economy. Such analysis begins with the micro-level to determine whether or not an individual is aware of hazards. If the individual is aware of them, then the response will be affected by the individual's own estimate of the impact of the hazard, by the prominence of particular events in everyday life, and by individual motivations influenced by beliefs regarding control of destiny. The researcher would then see how these individual determinations are related both to cultural values, including the appropriateness of environmental management, and to the political economy. The researcher would also include an examination of the mediate links, which could be managers or policies evolved into a routine procedure. In the Korean case, all of the significant information elicited from the analysis at

the three different levels—micro-, meso-, and macro- —is examined in terms of the relationship between these levels.

## METHODS

The methods used in this study include administration of a questionnaire, personal interviews, field observations, and a review of the relevant maps and government documents.

The previously mentioned integrative framework is employed to overcome some limitations in natural hazard studies that are based on a single micro- or macro-analysis; thus a better picture is provided of natural disasters in the context of the human-environment relationship. The personal interview approach is designed to facilitate the systematic collection of data and to elicit sensitive and insightful information from and about human responses. Finally, field observations were made to obtain information that the respondents did not or could not state when they were interviewed.

### Sampling and Procedure

From October 1989 to July 1990, 273 participants participated in face-to-face interviews in the three study sites of Kwangmyong, Puyo, and Miryang. Of these, 253 were decision makers in household units in three storm-flood disaster-prone regions that were selected based on government statistical data. The household members who had actual experiences of storm-flood disasters were randomly selected from a list obtained from the township or county—62 household members for the Kwangmyong region, 124 for the Puyo region, and 67 for the Miryang region. Also selected were 12 government officials from the national government in Seoul and provincial and local government in Seoul, six officials from the provincial and local governments in the study regions, and eight officers of institutions cosponsored by the government and private organizations in Seoul. Both the government and institutional officers had directly participated in the resolution of storm-flood disasters or else indirectly participated through research work relevant to disaster problems.

The household members were interviewed, using a structured questionnaire, by well-trained graduate students majoring in geography at local universities and supervised by the author. The government officials and institutional officers were interviewed by the author using both structured and additional “open” questions.

The design of the questionnaire was a modification of the *Natural Hazards Research Questionnaire* that has often been used by researchers in natural hazard perception studies

and incorporates some portions of the questionnaire used by Rossi, Wright, and Weber-Burdin (1982). The questionnaire was translated into Korean and modified to be more understandable by Korean participants. The Korean version was discussed with Korean researchers and translated back into English by a Korean doctoral candidate in a social science field. The questionnaire was tested in a pilot study in a suburban area near Seoul.

The questionnaire covers four major areas: 1) awareness of natural disasters, especially storm-flood disasters; 2) perception of and adjustment to the disasters; 3) assessment of disaster-prevention policies and the role of the government; and 4) general background information. The structured questionnaire came in three different versions according to the participants—residents, government officials, and institutional officers. Open questions prepared in advance were asked of both the government officials and the institutional officers as subsidiary questions necessary for obtaining insightful information that the respondents did not or could not express on the questionnaire. A request for cooperation in the interview-survey was conveyed by computer communication from the National Disaster Prevention and Countermeasures Headquarters in Seoul to each of the counties in the study area prior to the departure of the author and his research assistants to those areas. After arriving in a study area, the team visited the county offices to obtain information on the people in the disaster-prone regions to be sampled. Each of the interviews was recorded on the questionnaire and checked after the interview was completed. While the interviews were conducted, field observations were made by the author in order to examine the physical environment of the region as well as the activities of everyday life. The interviews with the officials of the provincial and local governments in the disaster-prone regions were conducted by the author himself, who prepared the structured questionnaire in addition to open questions that might be necessary to clarify the questions in the questionnaire or to obtain additional information. Before and after the interviews, the author observed activities performed in the local government offices. All the data obtained were analyzed using a computer statistical program and compared with data acquired from observations by participants in the field.



### Locale of Study Sites

The Korean peninsula lies between 33° and 43° north latitude, and between 124° and 130° east longitude. The peninsula has an area of 220,847 square kilometers, with a length of approximately 1,000 kilometers and an 18,200 kilometer coastline.

The peninsula is located on the northeastern edge of the Eurasian continent, connected to the Chinese mainland by mountains and rivers which at the same time form a natural barrier (Figure 4). The entire terrain constitutes both a geologic and a climatic frontier between the Asian landmass to the north and the Pacific rim to the south. This position has long been reflected in the natural environment of the peninsula as well as in its historical role as a point of transition between the Asian continent and the islands of the Pacific. The natural environment also reflects the vulnerability of the peninsula to natural disasters including heavy rainfall, storms, and typhoons during the summer monsoon season.

The political division of the Korean peninsula since 1945 has given North Korea control of about 55% of the terrain and South Korea about 45%. The Republic of Korea (South Korea) alone incorporates a land area of 98,477 square kilometers—about one-fourth the size of Japan, its neighbor to the southeast. Its population reached 42.38 million people in 1990 (EPB, 1991).

The peninsula has geographical features making it vulnerable to frequent storm-flood disasters. About 70% of the land area is mountainous including the two major mountain ranges of T'aebaek and Sobaek. As presented in Figure 4, the T'aebaek runs along the eastern coast, making the east considerably higher than the west and south coasts. Because these mountains lie close to the Eastern Sea (Donghae) or the Sea of Japan, most mountain streams flow down from the north and east; they then join the rivers, which run all the way down to the west and south coasts. Most of Korea's plains lie along the major rivers and are close to the lower west and south coasts. Storm-flood disasters often occur in these coastal plain areas.

As seen in the same figure, the Sobaek runs diagonally through the center of the country, forming a natural boundary among the provinces of Ch'ungch'ong, Cholla, and Kyongsang. The middle of the Sobaek range is a region important to the nation's overland traffic, connecting the major urban centers, including the national capital, Seoul, and the provincial

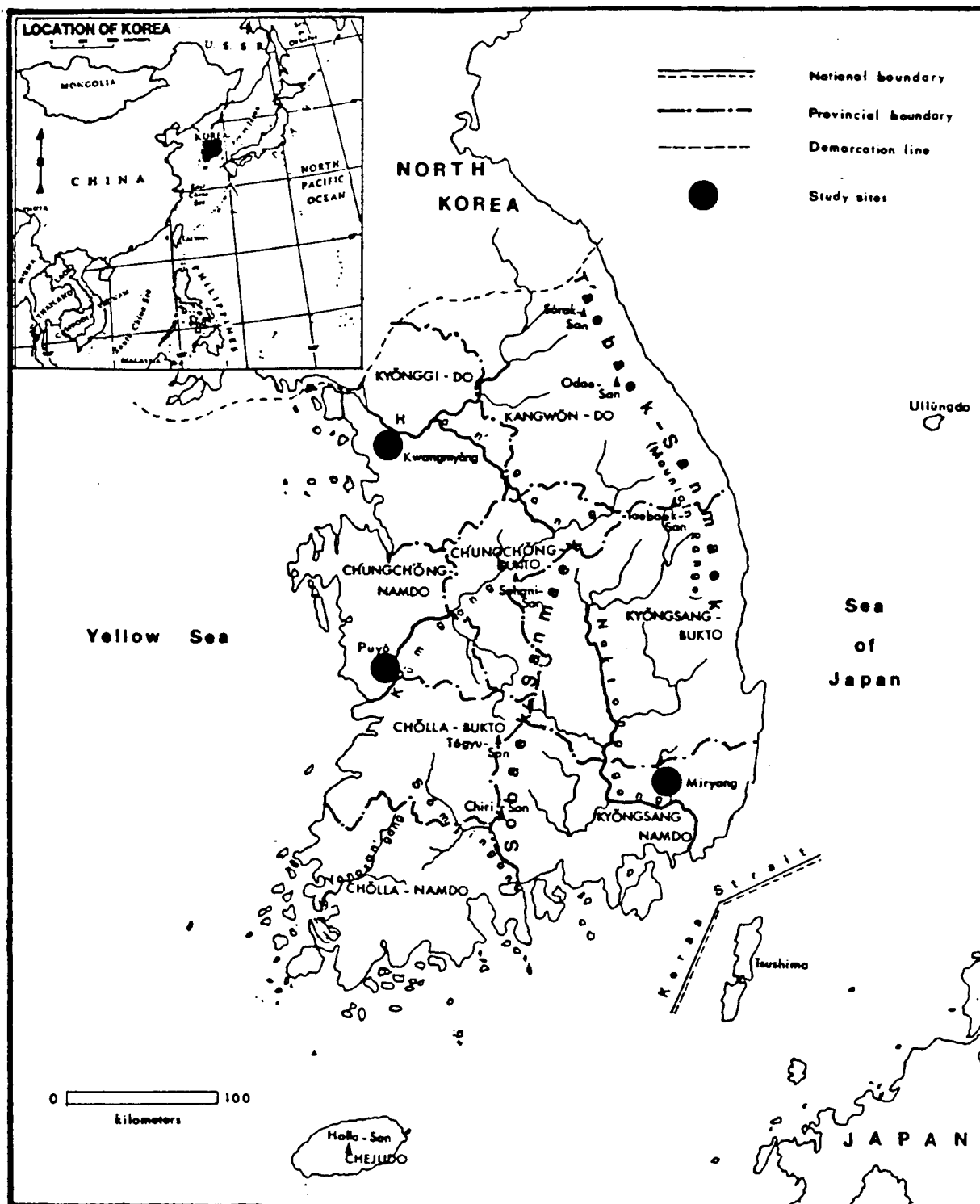


Figure 4  
Study Sites and Physical Features of Korea

capital cities. The regions near the major urban centers have experienced concentrated regional development since the late 1970s. In the process of regional development, areas near major construction sites have often been exposed to soil erosion, which has led to extensive sedimentation in the rivers. The increased sedimentation has caused the rivers to become increasingly shallow, and this in turn has led to frequent overflowing during heavy rains.

Connecting the two mountain ranges are the major rivers, the Han'gang, Kumgang, Nakdonggang, Somjin'gang, and Yongsan'gang, which have supported human settlements throughout the history of the peninsula—particularly during the recent period of development in South Korea. The Han'gang (with a drainage area of 26,219 square kilometers and a length of 470 kilometers), Nakdonggang (23,860; 525), and Kumgang (9,886; 401) have considerably larger drainage areas and annual discharge and are longer than the other two rivers, the Somjin'gang and Yongsan'gang (Kuklip Jiriwon, 1986). The three study sites selected for the present study lie in each of the three major river basins: the Han'gang (the study site of Kwangmyong), Nakdonggang (Miryang), and Kumgang (Puyo).

Each of the drainage areas of these three rivers involve a significant slope. For example, the Han'gang has over 10% slope in 86.3% of its drainage area, 83.6% for the Nakdonggang (Kuklip Jiriwon 1986, p. 330). Due to this relatively steep slope, when heavy rains pour into the rivers, the rivers run fast and quickly reach the point where they flow over their banks. The three rivers also become more vulnerable to flooding when sea water backs up from the mouths of the rivers.

In addition, the upper reaches of the three rivers have undergone intensive construction and structural modification, including the construction of six multipurpose dams during the past three decades: Soyang and Ch'ungju Dams on the Han'gang; Andong, Namgang, and Hapch'on Dams on the Nakdonggang; and Daech'ong Dam on the Kumgang (KWRC, 1990, p. 166). This construction has contributed to the nation's economic and regional development, but it has also resulted in considerable ecological change in and around the rivers.

The Han'gang receives numerous tributaries from the T'aebaek range to the north and west. Its middle and lower courses are wide with a depth of up to three meters. The river connects South Korea's inland areas with the sea, running through the center of Seoul, the capital city, along the way. Around the capital city in earlier times there was a wide area

devoted to agriculture, which is now one of the most densely populated areas in the country and represents the economic and cultural heart of the nation. Because of the rapid increase in population and industrialization, over the past three decades the area has undergone intensive, rapid urban industrial expansion. Related to this expansion, there have been frequent floods in urban areas during the summer season in recent years. One region where such floods have occurred is Kwangmyong, one of the study sites, situated in the Han'gang river basin.

The Nakdonggang, the longest river in southern Korea, flows down along the southwestern slope of the T'aebaek range, then passes through the deep valley between the eastern branches of the range until it empties into the Korea Strait. In earlier times, this river basin contained agricultural and historic sites, but it now accommodates new industrial development since the government accelerated the expansion of industrialization in the region in the 1970s. The basin, flowing into the eastern and southern coastlines, has frequently been vulnerable to typhoons passing through the Korea Strait. Part of the region, including agricultural and industrial areas, has also often been inundated during the summer rainy season. Miryang, another study site, is located in the vicinity of the Nakdonggang basin.

The Kumgang, running down from the Sobaek range into the Yellow Sea, passes through agricultural plains and by historic sites as well as some recently developed industrial areas. Around the river basin, there has been regional development, but to a lesser extent than in the basins of the Nakdonggang and Han'gang. The agricultural areas of the Kumgang basin, situated close to the west coast, have frequently been exposed to storms and floods. The study site of Puyo lies in this river basin.

Although the Korean peninsula is surrounded by the sea on three sides, the climate is, to a large extent, continental, with four distinct seasons. Like the rest of East Asia, Korea has a monsoon climate characterized by cold, dry winters and hot, humid summers. The monsoon climate is the result of two directly opposed air currents: one in the north blowing down from the area of the Siberian anti-cyclone toward the Pacific Ocean (called the winter monsoon) and one in the south blowing up from the tropics in a northwest direction towards Mongolia (the summer monsoon). These two air currents regularly alternate, thereby causing great and sharp changes in the peninsula's weather.

In relation to storm-flood disasters, it is the summer winds that bring heavy rainfall,

storms, and typhoons. In Korean, this summer rainy season is referred to as *Jangma Ch'ol*. The natural events that occur in summer have the potential to cause floods, including the possibility of storm-flood disasters during the rainy season from June to September. The frequency of heavy rainfall is highest from June to August or September. Typhoons are most common from July to September (CMO, 1990b). Storms, also major natural disasters in Korea, occur most frequently during the winter and spring, but less during the summer. Therefore, floods and typhoons are the events most closely related to storm-flood disasters during the summer; every year they result in great loss of human life and property. In summer, typhoons bring rainstorms with heavy precipitation when they approach the Korean peninsula. Typhoons include tropical cyclones that originate in the western North Pacific within the zone between 32° and 40° north latitude and 120° and 138° east longitude.

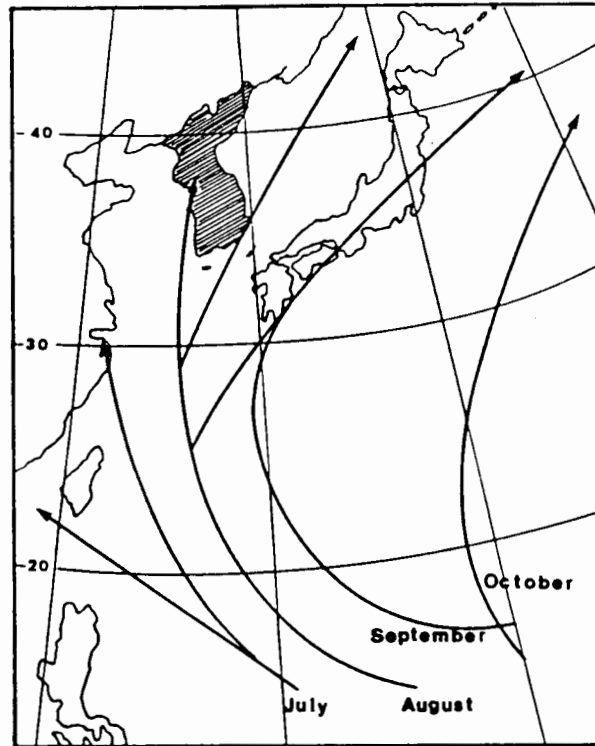
A tropical low-pressure cyclone that occurs in the western North Pacific typically moves toward the west along the equatorial air stream, then upward to the north, simultaneously developing powerful winds until it finally changes direction and moves steadily toward the northeast as it enters the mid-latitude westerly zone (KIST, 1986; Chen, 1965). The typical monthly track of typhoons shown in Figure 5 is closely associated with the summer season, from June to September.

From 1961 to 1990 typhoons occurred about three times less than heavy rainfall, with the frequency of typhoons relatively stable (CMO, 1990b).

Summer typhoons have resulted in storm-flood disasters in the regions along the southern and eastern coasts of the Korean peninsula, as illustrated in Figure 6. Of the study sites, Miryang, near the east coast, is in one of the most disaster-prone regions, having frequently experienced typhoons.

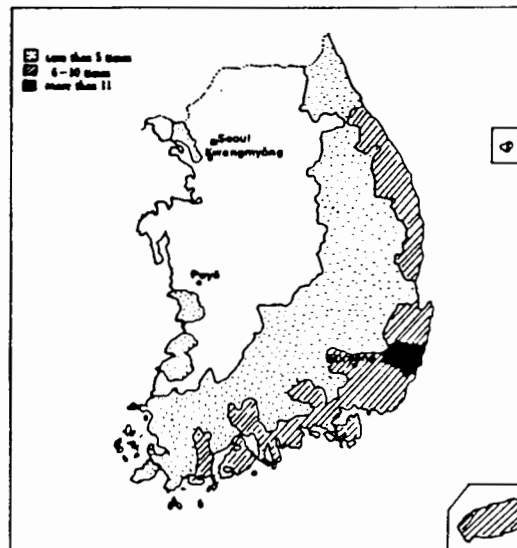
The annual average rainfall in southern Korea is approximately 1,265 millimeters, ranging from about 970 to about 1,770 millimeters, based on a meteorological analysis of rainfall from 1961 to 1990 (CMO, 1990b). Storm-flood disasters are primarily due to heavy rains that fall in June, July, and August. These three months account for more than half the total annual rainfall.

From 1961 to 1990 the frequency of heavy rainfall in disaster-prone regions during the summer season was about five times the annual average (CMO, 1990b). The frequency in-



**Figure 5**  
Average Monthly Track of Typhoons in Korea

Source: Reproduced from CMO, 1990b.



**Figure 6**  
Disaster-Prone Regions Due to Typhoons

Source: Reproduced from CMO, 1990b.

cludes a gradual increase, particularly in the 1980s. The disaster-prone regions experiencing heavy rains are shown in Figure 7. In the figure, these regions are spread out, as compared to the regions prone to typhoons. Regions of heavy-rainfall are predominantly in the west and south rather than the east, and they are close to river basins. The disaster-prone regions include all of the three study sites. The average annual rainfall in those sites reached 1,304 millimeters during the period 1961 to 1990 (KMA, 1991), compared to an average annual rainfall of 1,265 millimeters for the entire country during the same period.

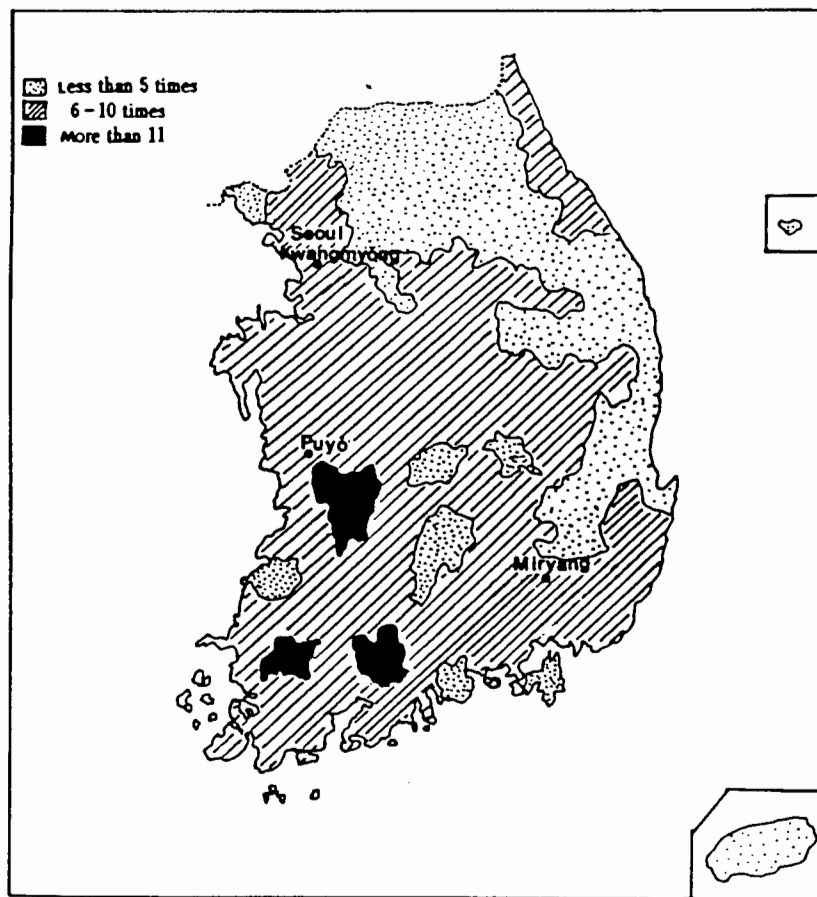


Figure 7  
Disaster-Prone Regions Due to Heavy Rains

Source: Reproduced from CMO, 1990b.

### The Three Study Sites

The city of Kwangmyong in the Han River (Han'gang) basin is located to the immediate southwest of Seoul; 15 kilometers to the west is the large port city of Inch'on. Kwangmyong is bordered on the south by Anyang and on the north by Puch'on; two streams, the Kaehwach'on and the Anyangch'on, form natural boundaries on the west and east, respectively. Along the Kaehwach'on, there are many residential and some agricultural areas, while along the Anyangch'on, there are a few mixed agricultural and residential areas. In the center of the region, from north to south, lie wooded hills.

As detailed in Figure 8, the city is situated close to a confluence of the two streams, the Anyangch'on coming from the southeast and the Kaehwach'on from the west. These streams meet in the northern part of the city and then run into a delta at the Han River. Close to the delta is the center of the city, with residential areas that contain several crowded apartment complexes. The most flood-prone regions in the city are the residential areas near the delta in the north and the agricultural areas along the Kaehwach'on in the west.

The city of Kwangmyong, with a total area of 38.86 square kilometers, became one of the newly developed satellite cities of Seoul as part of the government's policy to transfer some of the population of the densely populated capital city into new cities of medium size. Because of its proximity to Seoul and its lower land values and housing-rental costs, Kwangmyong has increased in population by about six times since 1970. The city now holds 328,803 persons (City Office of Kwangmyong, 1991).

The residents of Kwangmyong, typical of the residents of many new cities, are originally from various rural areas. A majority of them are employed or involved in economic activities in Seoul, while others are employed in commerce and agricultural production elsewhere in the region.

The city has been extensively developed. For example, according to local government planning documents, the region was involved in a development project that included a total area of 38.6 square kilometers in 1989, with approximately 81.4% of the land being used for conservation, including forests and greenbelt; 17% for residential areas; and 1.6% for commercial areas (Kyonggido, 1990). A considerable portion of the development was in the residential area of the city, and there is the prospect of further residential development



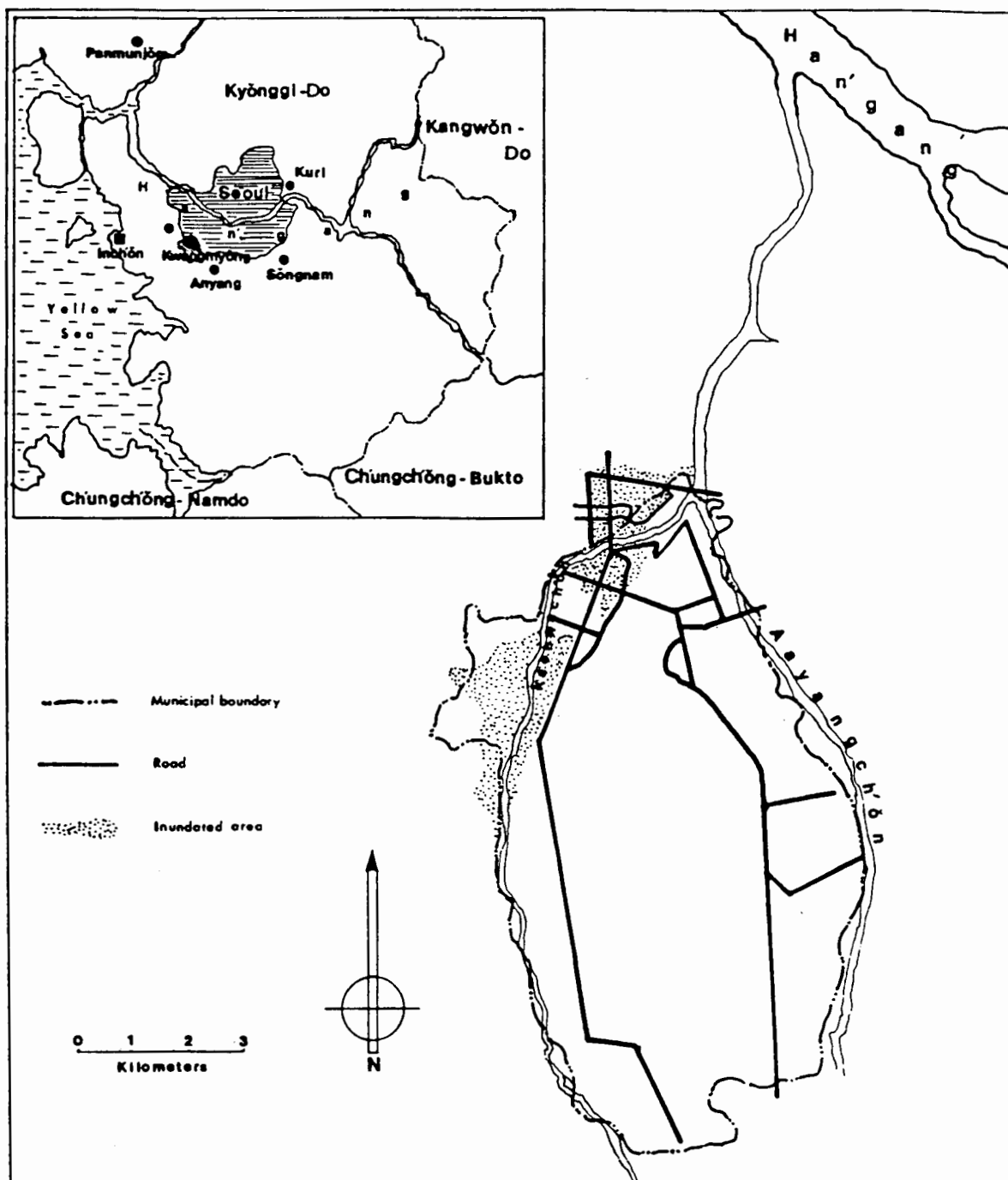


Figure 8  
The Study Site of Kwangmyong

due to the great increase in the city's population.

The county of Puyo (see Figure 9), located in the Kum River (Kumgang) basin, covers a total area of 64.97 square kilometers. It is part of the Nonsan P'yongya, the great plain which extends to the west and south coasts. The county is also approximately 20 kilometers from the mouth of the Kumgang on the west coast. The eastern part of the county includes mountainous areas that are connected to the Sobaek range. The region is bordered by the Kumgang along its entire length from north to south. Along the Kumgang there are many agricultural areas, with residential areas mixed in here and there. In the agricultural areas there are a considerable number of paddy fields, dry fields, and greenhouses along the riverbanks. There are also dry fields and greenhouses situated between wooded hillsides. The most flood-prone areas in the region are the low-lying agricultural fields where there are sections, below the level of the embankment, used for the cultivation of cash fruits and vegetables.

Puyo county, which includes an ancient city with many historic sites, is less developed than most other rural regions that have undergone regional development as a result of government policies over the past several decades. Recently, however, the region has seen a gradual increase in development. For example, according to the local government's plan for urban development, the 1990 urbanization project was to involve a total area of 39.7 square kilometers divided as follows: 74.8% for conservation, including forests and greenbelt; 17.6% for agriculture; 5.7% for residential areas; 1.2% for commercial activity; and 0.7% for industrial use (Office of Puyo County, 1991). A considerable portion of the region that had been devoted to agriculture was scheduled for development, and an increasing amount of this development was taking place in the agricultural areas along the banks of the rivers. The population of Puyo county has gradually declined in recent years, and in 1990 it stood at 30,875 persons (Office of Puyo County, 1991). As in other rural regions, a majority of the residents here are native-born, with others coming from other rural areas. While many are engaged in agricultural production, some are involved in commercial activities.

The city of Miryang (Figure 10) is located in the Nakdong River (Naktonggang) basin, within 20 kilometers of the river mouth on the south coast. The eastern part of the city consists of a mountainous area reaching up into the T'aebaek range. The Miryanggang

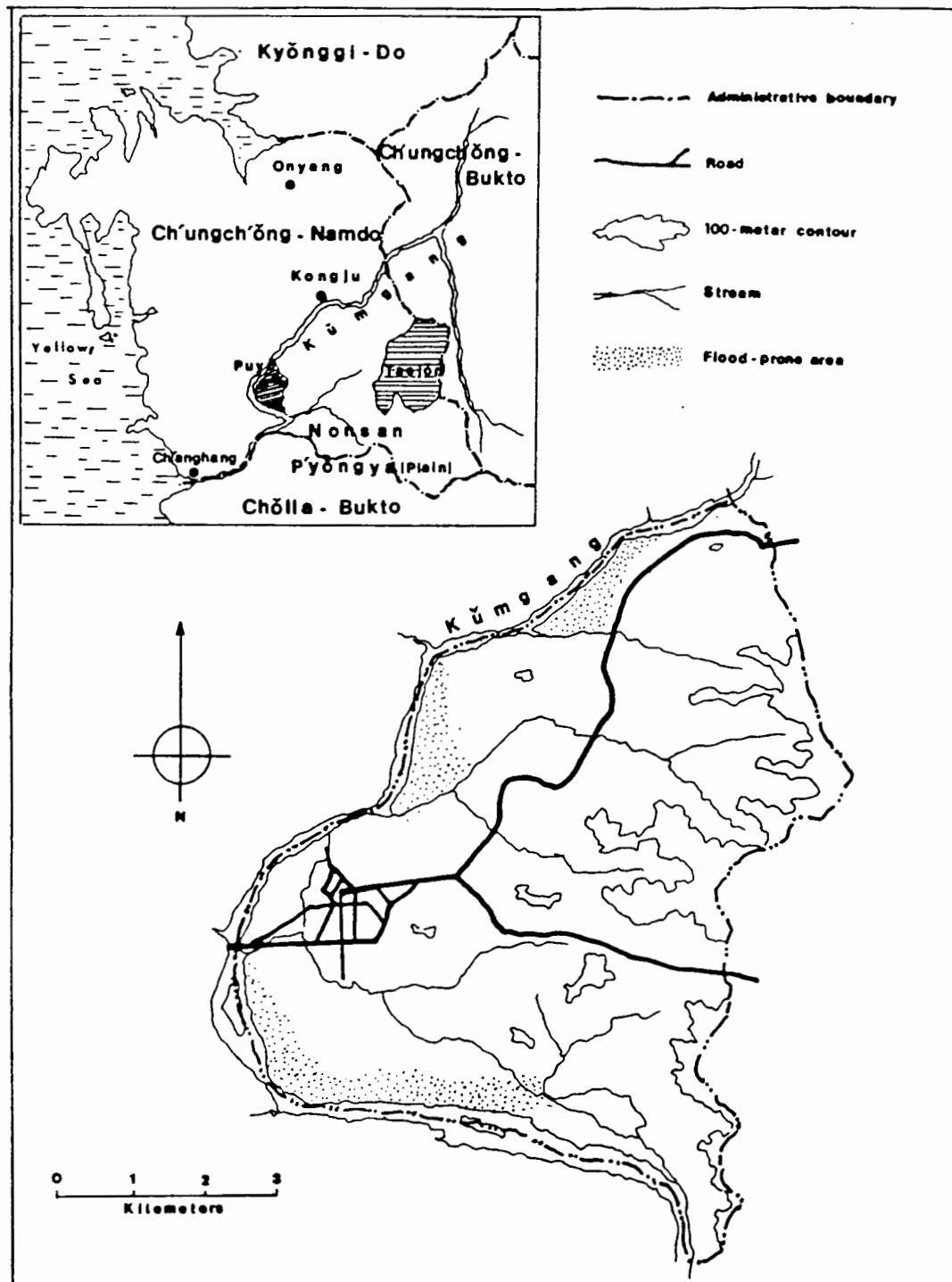


Figure 9  
The Study Site of Puyo

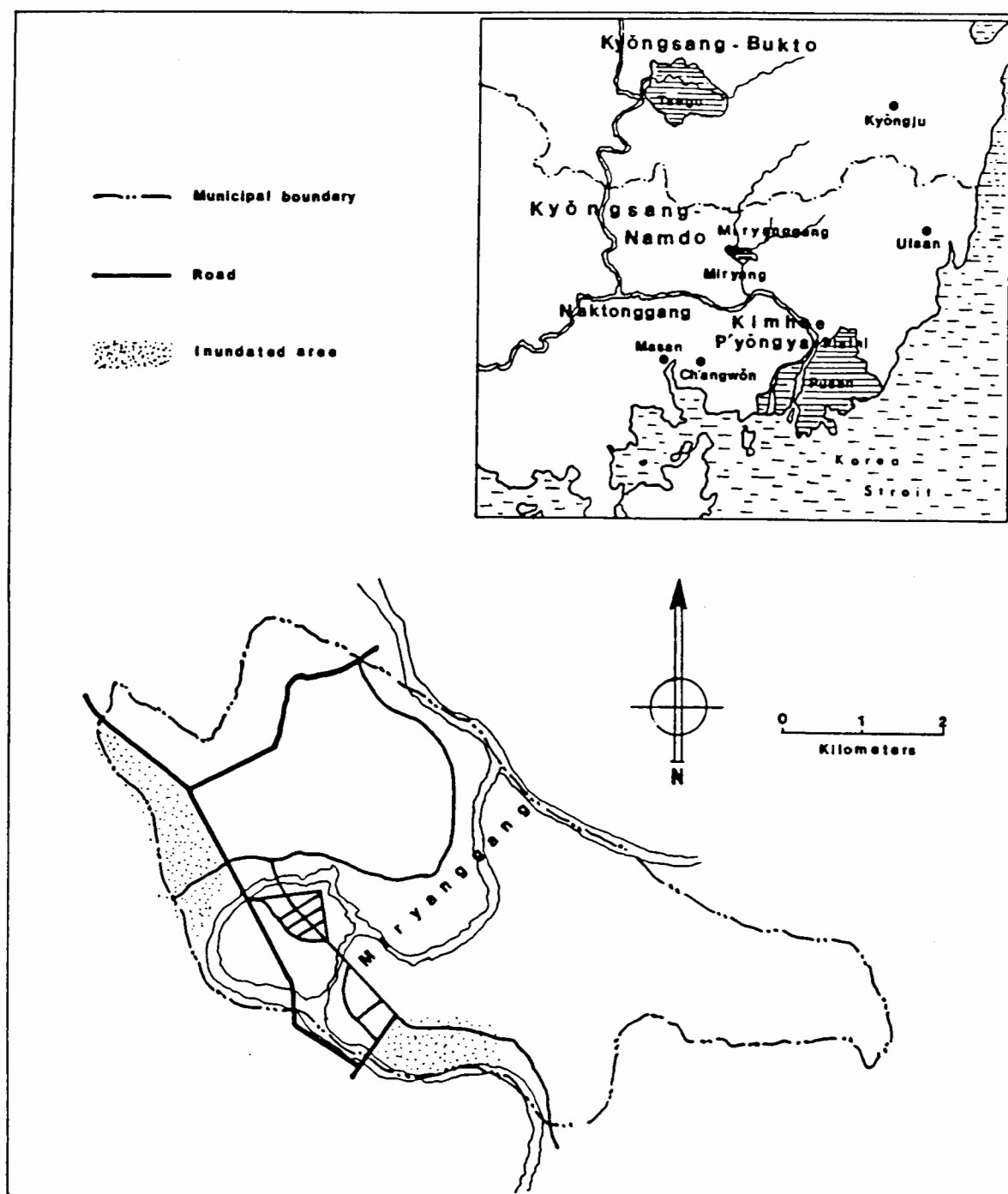


Figure 10  
The Study Site of Miryang

originates in the northeastern mountains, passes through the city's center, and then runs down into the Nakdonggang. Along the Miryanggang, there are mixed agricultural and residential areas that lie at the head of the great plain of Kimhae P'yongya extending to the south. The low-lying agricultural areas along the banks of the Miryanggang are exposed to floods and typhoons. The city of Miryang, with a total area of 28.84 square kilometers, was recently promoted in status from a county to a city. The region has long been important to inland traffic, connecting as it does other larger cities including Taegu and Pusan. Despite the city's geographic importance, it has experienced less development than the new industrial regions of Ch'angwon and Ulsan, located not far from Miryang.

Similar to the people of Puyo, a majority of the native-born residents of Miryang are employed in agricultural production, while others are involved in commerce. Although the region has undergone gradual development, there has also been a gradual annual decline in the population in recent years, with 55,470 persons in 1989 (Kyongsang Namdo, 1990). The city undertook an urbanization project in 1989 involving a total area of 22.8 square kilometers, allocating land as follows: 56.5% for conservation, including forests and greenbelt; 24.6% for agriculture; 15.4% for residential areas; 2.2% for commercial activity; and 1.3% for industrial use (Kyongsang Namdo, 1990). Thus, the region was involved more in agricultural and residential development than in industrial development.

The pattern of land use in the three study sites is quite varied, as shown in Table 1. The table shows that there is a relatively large proportion of the land devoted to agricultural use, if one combines dry fields and rice paddies in each of the study sites. With regard to the large proportion of land devoted to agriculture in Kwangmyong (about 35% of the city's total area), although the city is located on the immediate outskirts of Seoul, it is still in transition to urbanization. The table shows that the city has a relatively large proportion of land allocated to residential dwellings (4.7 square kilometers, about 12% of the total area). The residential section of Kwangmyong, which includes the city's center, is located in one large area near the delta.

As illustrated in Table 1, the large proportion of the total area taken up by the river in Puyo (about 16% of the county's entire area) indicates that there is some potential for river flooding in the agricultural sections along the shore of the Kumgang. The table also shows

that all three study sites have only a small proportion of their land devoted to river and stream banks—less than 1% of the total area of the three sites (0.5% in Kwangmyong and Puyo, and 1.1% in Miryang). This suggests that, in comparison to the larger area occupied by the actual river, there are insufficient embankments to protect developed sections from flooding. In fact, in agricultural areas, there are few embankments.

Table 1  
Land-Use Patterns in the Three Study Sites

Unit: Square kilometer

Region:	Kwangmyong	Puyo	Miryang
<u>Land use:</u>			
Dry field	4.86	7.54	4.01
Paddy field	8.64	14.32	3.89
Forest	15.51	24.98	13.45
Road	1.58	2.03	0.71
River	1.10	10.16	3.17
Embankment*	0.21	0.35	0.32
Drainage	0.59	2.31	0.27
Dwelling	4.71	2.14	1.82
Factory	0.12	0.13	0.14
School	0.38	0.22	0.25
Public facility	0.20	NA. **	0.40
Historic site	0.15	0.20	0.01
Graveyard	0.28	0.26	0.25
Other	0.53	0.33	0.15
Total	38.86	64.97	28.84

Notes: \*: A natural or an artificial riverbank.

\*\*: NA indicates data not available.

Source: Derived from data provided by local government offices of Kwangmyong, Puyo, and Miryang in 1990.

There were places of cultural significance in all three areas surveyed, including a considerable number of historic sites and graveyards, many of which were situated in the surrounding hills and even in the middle of agricultural land.

The three study sites were located in environments where there was a high potential for storm-flood disasters. Again, these environments are determined primarily by the geographical circumstances of the Korean peninsula described earlier, including: 1) an annual occur-

rence of typhoons and heavy rains during the summer season; importantly, the summer rains are often characterized by a heavy downpour that occurs within a short period of time; 2) rivers that run from east to west and from north to south, because the mountainous or hilly regions are generally in the north and east and the lower-lying plains in the west and south; 3) rivers that are relatively short compared to those in other countries, with riverbeds that have steep gradients; the rivers run swiftly and are quick to become swollen and overflow in heavy rains, particularly when the water from the sea backs up through the river mouths; 4) riverbeds that are shallow because of sedimentation due to normal erosion, erosion due to human actions and development, and the release of waters (and accompanying sediment) from behind dams.

Because of these physical conditions, the three study sites have become storm-flood disaster-prone regions in recent years. The types of disasters that have occurred in the three regions include inner-city floods in Kwangmyong and river flooding in both Puyo and Miryang.

Again, the two regions of Kwangmyong and Puyo are more likely to be affected only by heavy summer rains, while the Miryang region is affected by both heavy summer rains and typhoons. For example, Kwangmyong experienced inner-city flooding five times over an eighteen-year period: in August 1972, July 1977, September 1984, July 1987, and September 1990. Except for the 1984 flood, which occurred in the agricultural area in the west, all of the floods occurred in the low-lying residential areas near the delta on the north of the city. Besides heavy rains, the causes of these floods have been attributed to a lack of reservoirs and flood-control facilities in the city (City Office of Seoul, 1992).

Puyo experienced floods due to the overflowing of riverbanks following heavy rains in four consecutive years: July 1986; July 1987; June, July, and August 1989; and July 1990. The areas suffering the most damage from these floods were low-lying agricultural areas along the Kumgang. The causes of the flood disasters in Puyo were identified as the failure of embankments to contain the flow of the rivers, as well as the lack of embankments, channels, and other relevant flood-control facilities in the region (Office of Puyo County, 1988; CMO, 1990b).

Miryang also had annual storm-flood disasters in June, July, and September 1985; June

1986; June 1987; August 1988; July 1989; and July 1990 (CMO, 1990b). These natural disasters resulted in a great deal of damage to property in the low-lying agricultural areas along the Miryanggang. These disasters were due primarily to heavy rains and typhoons. Other official causes were similar to those in Puyo.

Comparing the three regions, the places most damaged by heavy rains or typhoons have been agricultural and residential areas. Kwangmyong incurred more damage in residential areas, while Puyo and Miryang sustained more damage to agricultural lands. In all three regions, many portions of the agricultural areas, particularly the agricultural land along the rivers, are rented by farmers from the local government. In fact, this kind of land-use practice might have increased the potential for storm-flood disasters in these areas. A local government officer [personal communication] indicated that there was a high level of failure of embankments in regions where these structures had previously collapsed. Thus, the failure of embankments is likely to be related to mismanaged recovery from earlier disasters.



## RESULTS AND DISCUSSION

### The Korean People and Their Environment

#### *The Sociocultural Perspective*

Based on linguistic, archaeological, and ethnographic evidence, the Korean people are believed to be descendants of the same family that includes the Turkish, Mongolian, and Tungus people, whose ancestors originally inhabited the Altaic Mountains in Central Asia. Some of these people eventually migrated eastward to what are now Manchuria and Siberia, and from there the original Koreans moved down into the Korean peninsula and settled five thousand years ago or more (KOIS, 1990, p. 57). Over their long history, these people have shared one common language and one culture, and they have developed a unique society. A Korean identity has been maintained, and the Korean cultural and social system is noted for its homogeneity and uniformity. However, during the course of their historical development, the Koreans have experienced military, political, and cultural assaults from external forces, first from China and Mongolia, then from Japan and Russia, and thereafter from the nations of the West. Most recently, since 1945, the Korean people have been divided by the political and military competition between North Korea and South Korea.

Because of their long and turbulent history, and particularly because of their recent experience with the North, the people of South Korea probably share feelings of insecurity concerning their overall environment. This insecurity may, in part, explain the tendency of Koreans not to take a long-term view of their role in the environment. This lack of a long-term perspective shows up in many aspects of the society, and at least one example is relevant to storm-flood disaster problems. Korean society as a whole has given considerable attention to and support for recovery after storm-flood disasters. Specifically, when storm-flood disasters strike certain areas (mostly in disaster-prone regions), the people in these areas actively participate in the subsequent recovery efforts. Some of these participants give indirect support to the affected residents by making donations during mass-media campaigns or by visiting the residents and bringing them needed goods. Some direct help to local residents comes in the form of group-sponsored recovery activities by the military, the police, the civil defense, and other private organizations. But all of these dynamic activities come to a halt soon after the effects of the disaster have abated. All of the people involved

are likely to become preoccupied with other social problems and to lose interest in storm-flood disaster problems. To cite another example, traditionally, the government, mass-media, academicians, and other professionals vigorously report on particular storm-flood disaster situations and even issue calls for intensive, nationwide support for victims living in places affected by such a disaster. However, after the disaster has gone, there is seldom any discussion of long-term resolution of these storm-flood disaster problems that the society faces at least twice a year—on both a national and a local level. This scenario is repeated every summer and leaves the concerned observer wondering whether something could be done to prevent future storm-flood disasters.

Sociocultural practices in Korean society are deeply influenced by Confucian beliefs, adopted from China and accepted as part of Korean culture. One of these practices relates to the importance of human relationships, especially of the family, as fundamental to the entire social structure. Human relationships are seen in the context of a hierarchical order between unequal but loyal pairs. There are five such relationships including: ruler and subject, father and son, husband and wife, elder and younger brother, and friend and friend (not equal but based on the superiority of one to the other). Hierarchical relationships extend to collective relations in which individuals perceive themselves as part of a group. The group, for example, involves family members as well as those persons who share the same values, goals, or even surnames.

The idea of hierarchical relationships affects various other aspects of Korean society. Such relationships may help to nurture the society on the one hand, but they may serve to weaken some of its evaluation systems on the other. Specifically, it is a dominant belief among Koreans that younger members of the society should not criticize or evaluate the older members. This belief can be extended to the managerial system in the society, in which people at the lower levels in government offices or private business firms are not in a position to criticize or evaluate the work of people in higher positions. Consequently, people of younger age and lower position have little opportunity to experience and learn any proper way of evaluating the existing systems in the society. The situation is similar in other Asian societies influenced by Confucian ethics. In the case of Korea, hierarchical relationships have been strictly observed in the managerial systems of the society and have been strictly

practiced in government administration. For example, in the four republics led by military governments during the past three decades in South Korea, the most significant characteristics of management included a top-down decision-making process and a heavy-handed and expeditious management style in which interference by opponents was not tolerated. In other words, the president decided on and formulated major policies and courses of action, and his subordinates assisted in the implementation. In the decision-making process, the influence of politicians, political parties, and the public is negligible. This kind of managerial strategy has probably made it possible for the government to achieve rapid economic development, but the strategy may in turn have caused problems because there has been a suppression of democratic processes, including the development of evaluation systems, and there has been corruption and an imbalance in the power structure of the society.

This consequence of cultural heritage can be seen in disaster management by the government, including the management of storm-flood disasters. There has been very little participation and evaluation by politicians, political parties, and the public in the design and implementation of plans for dealing with natural disasters. This problem is discussed more fully in the section below on the government and disaster management.

Another aspect of society and culture influenced by Confucianism is *Kwanzon Minbi*—“respect for officials and disrespect for the people.” This tradition originated in the Confucian belief that the people should show respect and honor to scholar-officials who have received higher education. It has long been practiced in Korean society, particularly in the government managerial system. Thus, it is common to encounter people who feel that they have been treated unfairly by officials at the windows and counters of local government offices. In addition, visits by the public to government offices are generally limited to those who have permission. This is not only for security, but also because of the tradition *Kwanzon Minbi*. There is little opportunity for the public to know what is going on inside government offices. In fact, for the current study, it was not easy to visit government offices or get information on storm-flood disasters without first receiving a recommendation or permission from an official at a higher level. Under such circumstances, it can be very difficult for the public to participate in the evaluation of government management including the management of storm-flood disasters.

*Josang sungbae*, or ancestor worship, is another aspect of Korean culture derived from Confucian tradition. The term refers to respect for deceased older members of a family. Ancestor worship has been practiced in various forms in Korea throughout its history. It is predominantly a family observance, particularly in rural communities. For example, when a family faces the memorial day for its older deceased members, all of the immediate family members and their relatives come together to observe the day in the ancestral home. Attendance at the event is almost mandatory. Those who cannot be present must visit the grave of the ancestor shortly afterward. Each family has its own memorial day, and ceremonies are virtually ongoing in cemeteries in the suburbs and at tombs in the fields, on hillsides, and in the mountains in the rural regions. In fact, in the study sites of Miryang and Puyo graves were numerous on the hillsides and even in dry fields and the back yards of private homes.

Ancestor worship is closely related to residency preference in disaster-prone areas, as proven in a typhoon disaster study conducted by the author. The study revealed that the residents of typhoon disaster-prone areas in Cheju preferred remaining in these areas and were willing to risk annual typhoon disasters (Kim, 1988).

Finally, another important tradition in Korean society is the people's belief in the value of education for their children—the Confucian ethic that stresses the importance of education in the early years for one's future life and well-being. Most Korean parents willingly sacrifice themselves for their children's education, since they believe that one can improve or succeed in life by following the path of education. These high educational aspirations have probably resulted in the increase in the number of educated people in the population, especially in large urban areas. In turn, this increase has probably contributed to the recent economic achievements of Korean society.

On the other hand, it has also resulted in certain educational and environmental problems in the larger urban areas. One education-related problem is the stress caused by the college-entrance examination, which has become a great burden to students and parents alike during the exam preparation period every year. Widespread education is also related to the rapid increase in population in the large cities, including Seoul and Pusan, where educational and industrial facilities are concentrated; people from less populated regions are increasingly

moving to the cities, seeking educational and economic opportunities there. Seoul increased in population from 1966 to 1990 faster than any other area in the nation. This city accounted for 23.7% of the country's total population of 29,192,000 in 1966 compared to 42.7% of the total of 43,520,000 in 1990 (Song, 1991). This rapid population increase in the capital city is not unrelated to storm-flood disaster problems there and elsewhere. For example, the government, concerned with the rapid increase in the capital's population, developed several "satellite" cities on the outskirts of Seoul during the 1980s in order to relocate some of the population. Since the new cities were hastily developed, they did not include adequate flood-control facilities. Thus there have been frequent inner-city floods during the summer rainy season. Moreover, population problems in the large cities have ultimately led to environmental and social problems including pollution, traffic congestion, housing shortages, inflation due to high land values, labor disputes in factories, and crime. Crimes such as robbery and hostage-taking in particular have recently been on the increase, often becoming a threat to public safety. These problems have so affected daily life that they tend to take priority over the serious problem of storm-flood disasters.

These social and environmental problems are phenomena familiar to all developing societies. In Korea, these problems have become serious byproducts of the rush toward industrialization and urbanization in the process of economic development. In this context, the problem of storm-flood disasters is as related to the government's management of economic development as to geographical and/or meteorological factors.

### *Political Economy*

The political culture of the Republic of Korea is an integration of aspects of traditional Korean, Chinese, and Western cultures. The most important feature of Korean culture in this regard is its heritage of aristocratic and bureaucratic authority. The Chinese component includes the Confucian concepts of hierarchy and social harmony. The Western element includes an emphasis on individual independence and the drive for power and position. This composite political culture has influenced the social system and is particularly reflected in the attitudes of government officials.

In this political culture, the government is perceived as both authoritarian and bureau-

cratic—that is, the government assigns a strong position to itself and expects to define national goals and priorities. At the national level, the government plays a central role in initiating, regulating, and developing various activities encompassing the social, political, economic, and cultural domains. (In the cultural domain, for example, there is even a government policy to restrain the costly extravagance of wedding ceremonies among wealthy families.)

In contrast, the duty and right of civic participation in political activity has only been imperfectly realized in limited areas, such as voting in the national elections, initiating lawsuits, and attending community meetings. Recently, however, the level of civic participation has risen, since President Rho Tae Woo promoted democratization in 1987, in step with the growing worldwide trend. National civic participation is still limited to the activities of political opposition parties in the National Assembly, labor disputes in factories and other institutions, street demonstrations by college students, and smaller community meetings in towns and villages. Public passivity and the limitation on opportunities for the public to participate in the political system may have allowed the government to consolidate its power, but it may also have contributed to the weakening of the system through which the government evaluates its own management. Under these circumstances, the government could smoothly accelerate national development as it planned, thereby achieving enormous national progress during the last three decades. Some of the significant activities by the government relate to its Five-Year Economic Plans and Ten-Year National Land Development Plans. These policies are necessarily linked to storm-flood disaster problems, however, as described below.

Economic conditions in South Korea in the early 1950s were poor because the nation's social and political conditions were unstable just after the Korean war and because the nation's economy relied heavily on agriculture, which was unmechanized, unprofitable, and vulnerable to natural disasters such as floods, typhoons, and drought. Accordingly, the government, led by President Syngman Rhee of the First and Second Republics, found it necessary to attempt to rehabilitate the nation's economy. Although the government made some efforts, the nation's per capita income in the 1950s remained below U.S. \$100.

After Park Chung Hee's successful coup in 1961, the military government of the Third

Republic began to consider long-term national development to promote the nation's economy. The government then drafted the First Five-Year Economic Plan, which focused solely on economic growth. Thereafter, five consecutive economic plans were completed and the sixth is currently in progress.

The five economic plans have been well detailed in a comprehensive analysis of the Korean economy by one Korean economist, Byung-Nak Song (1990). The following is a summary of what he found.

The first economic plan (1962-1966), initiated by the Park government, was an attempt to lift the nation out of poverty and establish a foundation of economic self-reliance. The second plan (1967-1971) attempted to modernize the infrastructure of the economy, thereby promoting the efficient allocation of resources throughout the nation. As a result, self-reliance and rapid growth were achieved, but, at the same time, the government began to realize that there was an increasing disparity in income in a number of areas: between export and domestic-goods industries, among business firms of different sizes, and between urban and rural areas. To remedy these disparities, the government drafted a third plan (1972-1976) to promote equity in income. At the same time, the government initiated a comprehensive national development plan, which included a Ten-Year Land Development Plan. To promote more equal distribution of income, the government continued with a fourth plan (1977-1981), reflecting the transformation of the nation's agricultural economy to an industry-oriented economy that was becoming increasingly complex in terms of both changing demands and inflation. The government then drafted a fifth plan (1982-1986) to achieve economic stability. Up until the "oil shock" of 1973, the government had not, in fact, paid much attention to economic stability. From its experience with the fourth economic plan, it realized that economic stability could not be achieved through an economic emphasis alone. The government then shifted its focus from quantitative economics to social development in its sixth plan (1987-1991). As a result of these six Five-Year Economic Plans, the nation has come close to achieving a per capita income of about U.S. \$6,000 in 1991, and hopes to achieve a per capita income on the same level as the more advanced countries by the 2000s.

On the other hand, because of narrowly focused national policies that have given priority to economic development, the nation now must deal with severe income disparity between

social classes, between the rich and the poor. The country also faces various problems that have accumulated in the process of instituting rapid, heavy-handed economic development over the past three decades.

Indeed, major problems related to storm-flood disasters can be closely tied to the two Ten-Year National Land Development Plans. These two plans covered 1972 to 1981, and 1982 to 1991. The plans were intended primarily to cover the development and management of land, but they were eventually directed toward enhancing the economic plans. The objectives of the first plan were to establish a foundation for industrial development, involving the development of new industrial regions. The second plan detailed specific objectives: to control the growing concentration of the nation's population in the capital, Seoul; to balance development among the various regions; and to improve environmental conditions. In the first plan, the government was involved in intensive construction activity, while in the second plan, it addressed both population and environmental problems. A considerable amount of construction was planned and carried out under these plans, including constructing: a total industrial area of 317 square kilometers; multipurpose dams with a holding capacity of 115 billion cubic meters; 1,551 kilometers of highways; urban subway systems totaling 524.5 kilometers; approximately 7.4 million units of housing; and port facilities to accommodate 224 million tons.

However, with regard to storm-flood disasters, this structural expansion is closely related to the increase in the flood hazard. During summer rainy seasons, many rural regions along the major rivers underwent a considerable amount of construction with consequent soil erosion around the construction sites, leading to the failure of the natural and artificial riverbanks. In the larger cities, streets, channels, and drainage systems were (and are) often flooded, and terraces in residential areas sometimes collapsed.

Beyond this, with regard to the potential causes of storm-flood disasters as a result of overall structural and economic expansion, recent public criticism suggests mismanagement by the government of this expansion. Such criticism was issued in 1987, when the nation was struck by three consecutive storm-flood disasters—the most severe in recent decades (with property losses totaling 1,102 billion Won and a loss of 1,022 lives). One criticism made by the mass media suggested that the increase in storm-flood disasters was most likely related to



an overall shortage of flood-control facilities as well as mismanagement of the existing ones. The criticism also stated that most construction projects in the cities were undertaken by contractors who had given little consideration to flood prevention and whose projects had not been properly inspected by the government. The result was an increase in the collapse of terraces in residential buildings during heavy rainstorms. It was also suggested that the increase of inner-city floods was closely related to human management practices, particularly by the government (KBS, 1985).

Another criticism raised by an academic research group also concerned government mismanagement. This group discovered that storm-flood disasters were related to intensive structural expansion in the process of economic development by the government. From a technical point of view the group pointed out that the government had shown little consideration for flood-control in the process of constructing the nation's numerous dams, particularly multipurpose dams built chiefly for economic purposes. The group then proposed an increase in flood-control facilities, particularly in the major river basins. The group asserted the importance of management; there should be sufficient funds for unified disaster management with professional expertise at the governmental level (Lee and Kim, 1987).

There have been other recent discoveries, as a result of empirical studies on flood disasters, that urbanization and industrialization influence the incidence of floods. One study concerned with flood hazards in metropolitan Tokyo revealed that urbanization in a region results in structural and functional as well as hydrological changes—for example, in the extension through an impassable area of a high-density drainage-system network, or through the improvement or construction of river channels and embankments. The study suggested that it is important in any management strategy to consider the consequence of such changes and to understand both a region's physical characteristics and the socioeconomic adjustments that will have to be made (Nakano and Matsuda, 1987, p. 271-285). Another study on problems related to flood disaster prevention in developing countries pointed out that flood disasters are in part a consequence of urbanization, which brings with it structural changes, new land-use patterns, and mismanagement due to a lack of knowledge about the effects of the structural changes, proper financing, and maintenance. The study then asserted that flood disasters are more likely to be caused by "human failure" than by natural events (Watanabe,

1989, p. 86).

Korea is no exception to these criticisms in the case of flood disaster problems. As has already been mentioned, with little opposition from the public, the government has used its authority to accelerate the process of urbanization and industrialization during the past several decades. Further, the government has primarily been in charge of the construction and maintenance of flood-control projects and related public facilities. Therefore, it is necessary to examine the government's structure and function with regard to the management of storm-flood disasters, the most serious type of natural disaster in Korea, in order to understand the nature of the disasters themselves.

### **The Government and Disaster Management**

Management of natural disasters in Korea involves the activities of four major groups: 1) people who inhabit disaster-prone regions, 2) professionals who work for the government and relevant institutions, 3) the public in other regions who support these two groups, and 4) national and local governments. Activities related to disaster management have become group activities of the society as a whole. The actual institutional management of natural disasters, however, has been conducted chiefly by the national and local governments. Accordingly, to understand disaster management, one must examine the institutional structure and function of the government relevant to disaster management.

#### *Structure and Function*

The national organization dealing with disasters in Korea (Figure 11) consists primarily of the National Council of Civil Defense (*Jung'ang Minbang'wi Hyop'uihoe*), through which the entire government system participates in activities related to the nation's security. This organization has suborganizations: the National Disaster Prevention and Countermeasures Headquarters (*Jung'ang Jaehae Daech'aek Bonbu*); the Local Headquarters for Disaster Prevention and Countermeasures (*Jibang Jaehae Daech'aek Bonbu*); and the Flood-Control Group (*Subangdan*). In the Manual of Disaster Prevention and Countermeasures (*Jaehae Daech'aek P'yollam*), which contains the official governmental guidelines for disaster

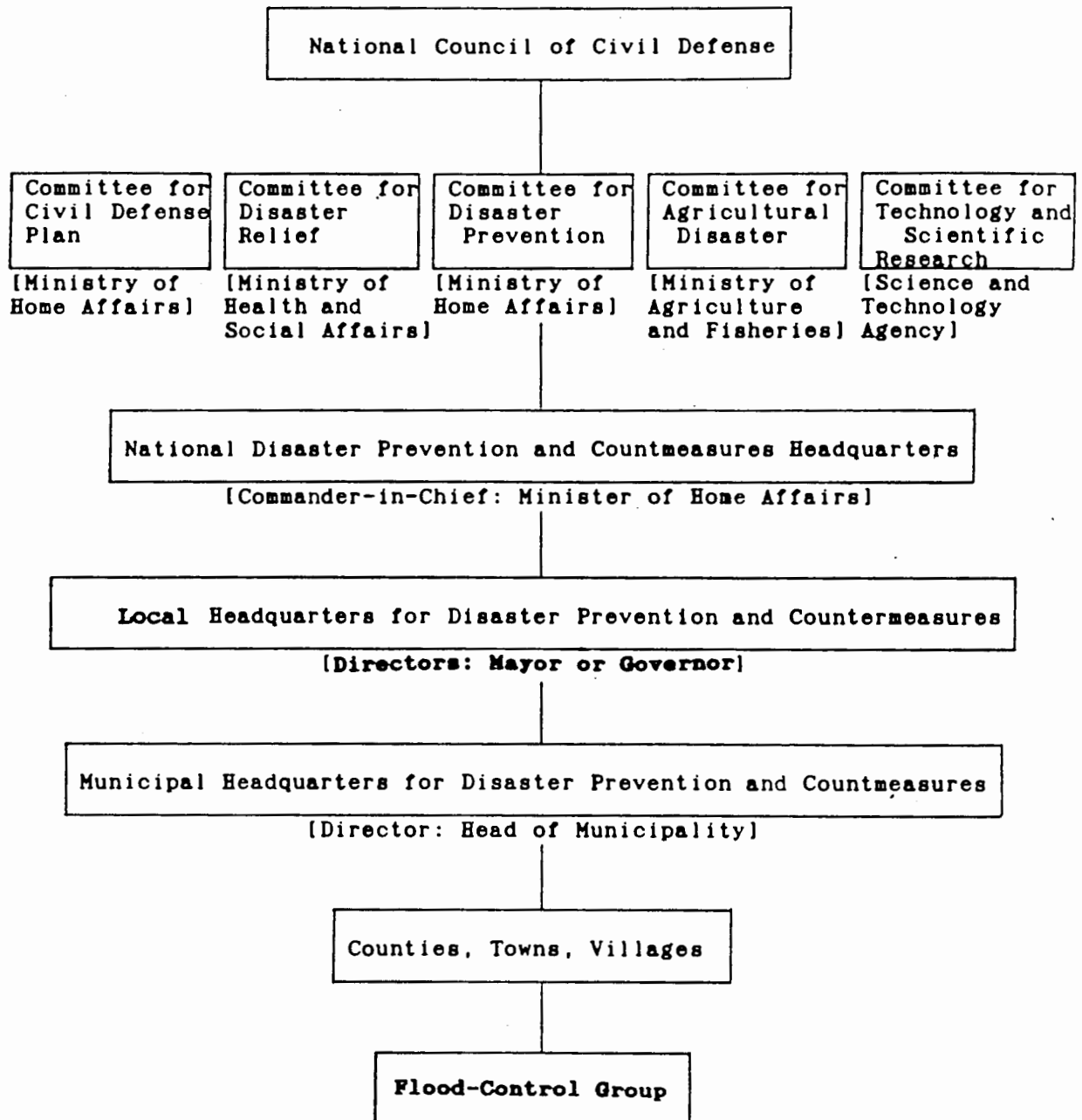


Figure 11  
National Organization for Disaster Prevention

management, the National Council of Civil Defense has outlined its major objectives: the establishment of an official organization, the enhancement of methods of disaster prevention, prompt action to effect disaster recovery, and the development of technology and scientific research related to disasters. The basic mission of the national organization is to examine and revise the basic plans for disaster prevention, to assign a mission to each of the committees, and to discuss the specific reports related to disaster prevention that have been submitted by the chairpersons of each committee. However, in reality, the activities that go along with the mission are limited to emergency management, while other objectives such as scientific and technological research are rarely realized.

The active governmental organizations dealing with disaster management are the National Disaster Prevention and Countermeasures Headquarters (NDPCH) and the Local Disaster Prevention and Countermeasures Headquarters (LDPCH). The NDPCH was recently transferred to the Ministry of Home Affairs from the Ministry of Construction, in accordance with the Disaster Prevention Law proclaimed on December 27, 1990; actual work started in April of the following year. The old NDPCH was established in 1967, after Korea experienced the ravages of Typhoon Sarah, and it was recognized that there was a need for disaster prevention thereafter. The recent behind-the-scenes transfer of the NDPCH may represent recognition by the government of the limitations of heavy reliance by the Ministry of Construction on structural strategies aimed at disaster prevention. It may also demonstrate a recognition by the government of the need for using the broader networks of the Ministry of Home Affairs for disaster management. However, in reality, the new NDPCH has changed little in terms of its structure and functions.

As shown in Figure 12, the NDPCH involves the participation of staffs from 17 government organizations, consisting of five senior officers and their subordinates from the Ministry of Home Affairs, one senior officer from the Ministry of Construction, and 24 senior officers from various ministries. This suggests that the officers are charged with double responsibilities; they have not only their primary work for the ministries to which they belong, but also the additional work that must be done for the NDPCH.

Based on field observation, in reality, the NDPCH mission was managed chiefly by a few officers of the Disaster Prevention Section who had recently been transferred from the

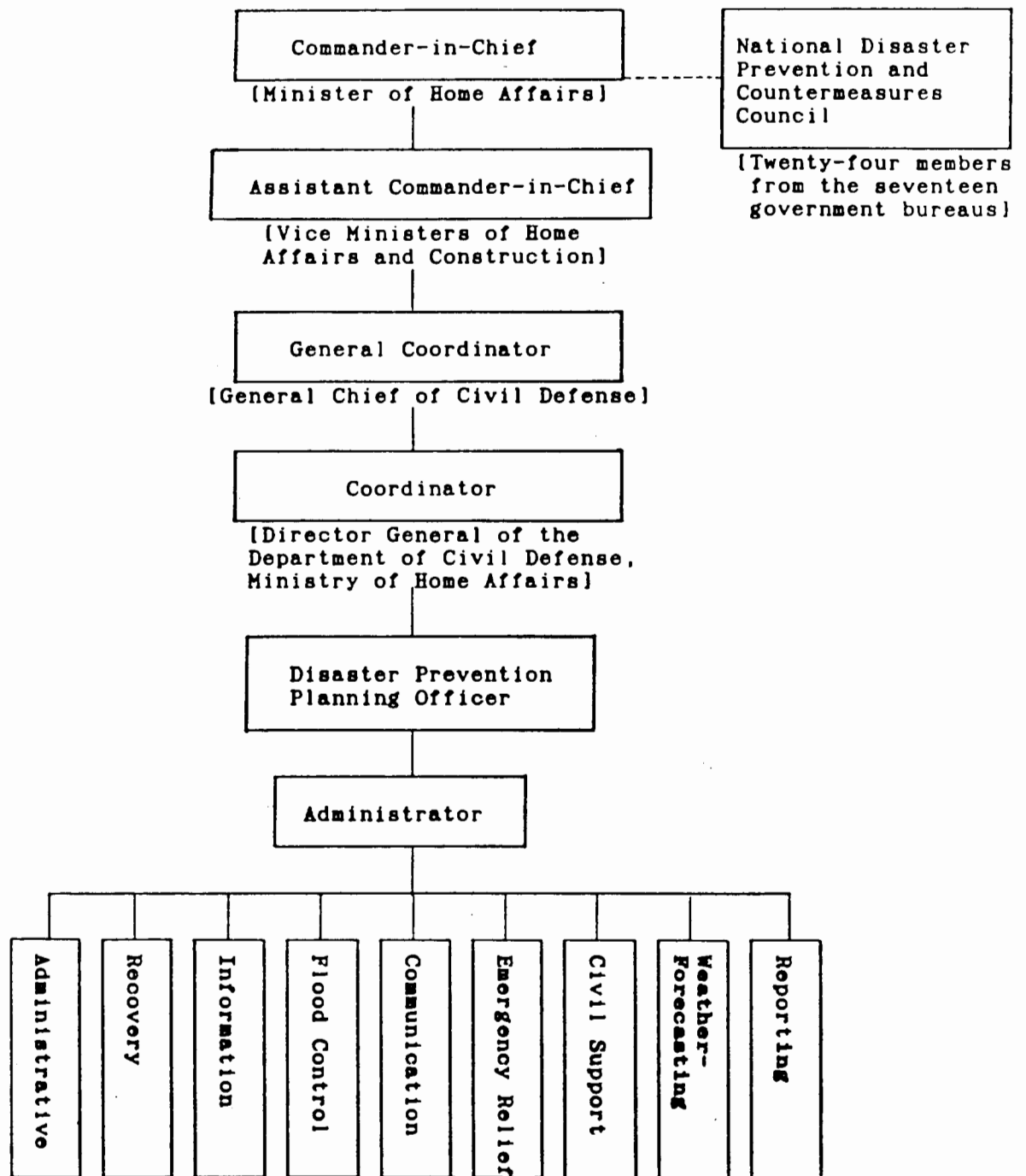


Figure 12

### Organization of National Disaster Prevention and Countermeasures Headquarters

Note: Titles in parentheses indicate the original position in the government organization.

Source: NDPCH, 1991, p. 7

Ministry of Construction to the Ministry of Home Affairs, where they worked under the supervision of the senior officers at the upper levels of their new ministry. The nine sections at the bottom level in the NDPCH are activated at the time of an actual disaster. It is questionable how such a small group of people can properly manage a disaster, considering the amount and complexity of the work involved in a real situation. Even if this small a number can handle the work load, there is still the question of the quality of professionalism. One government officer indicated that he was not sure what he was supposed to do in the planning of disaster management because of his own lack of knowledge of the field.

The NDPCH primarily deals with the Disaster Prevention Law in general, the Storm-Flood Disaster Prevention Law in particular, and the relevant regulations. The basic mission, as broadly stated in the governmental guideline documentation, is to coordinate emergency management throughout the nation and to devise appropriate responses to disasters. Major specific activities of the NDPCH include: the creation of disaster policies and relevant programs and the plans for their implementation; the delivery of instructions to lower-level organizations to begin policy implementation and the actions necessary for disaster prevention; and the allocation of funds required for disaster prevention. However, in practice, the NDPCH's efforts mostly involve the management of emergency relief and recovery at the time of a disaster, rather than advance preparation for future disasters. For example, at the time of this study, the NDPCH, in cooperation with the relevant government agencies and civilian support groups, was actively involved in emergency relief and recovery following a storm-flood disaster. In contrast, NDPCH activities concerning preparation, mitigation, and long-term recovery were negligible. In addition, both the government, including the NDPCH, and the public were likely to become aware of a natural disasters through mass media such as newspapers and television only when a storm-flood disaster was imminent. Otherwise the public was unlikely to be concerned about the subject.

LDPCHs, as described in Item 17 of the Storm-Flood Disaster Prevention Law (*P'oongsu Jaehae Daech'aekbop*), can be established when necessary in provinces, cities, counties, and districts by the authority of the director general of the NDPCH. The law has no provision providing a permanent location for the LDPCHs and thus implies that LDPCHs are temporary offices, the location of which can be determined when a disaster occurs. Such a

temporary arrangement is understandable given that natural events are unpredictable. An LDPCH can be established anywhere an emergency arises. When one does arise, assistance would, of course, be available from various groups, such as the relevant governmental offices, the military, local police forces, fire station offices, the civil defense group, the flood-control group, and other support groups, including the residents of the region where the disaster occurred. However, how disaster management, especially the management of preparation, can be properly undertaken under this temporary structure remains a question. During normally quiet periods, LDPCHs are inactive in all of their disaster-management roles, including preparation and mitigation for future disasters. For example, the present study found that one county office in an area which often experienced storm-flood disasters, an office that used to function as the LDPCH mission, did not have the specific organizational structure or the personnel and did not perform the routine management work in advance necessary to prepare for a storm-flood disaster. Instead, the county office performed inspections of flood-control facilities from time to time and submitted reports to the NDPCH upon request. Once the reports were given to the NDPCH, they were rarely kept beyond a few years for reference. In fact, for the present study, it was difficult to uncover the information in local offices. In addition, similar to the NDPCH officers, the county officers have their primary, routine work, and to these persons disaster management seems to be "extra work."

A basic mission of the LDPCH, as described in Item 9 of the Storm-Flood Disaster Prevention Act, is to conduct programs regarding disaster prevention including: the construction and improvement of flood-control facilities; education and training for disaster prevention; preparation for emergency relief including early warning, rescue, medical care, and evacuation; and the management of funds, equipment, and labor. The present field survey showed that the mission in general was to be able to perform emergency management, including disaster relief and recovery, every time a natural disaster occurred. The mission of education and training relevant to mitigation and preparation, however, was not sufficiently part of routine practice, considering that the region in which the observation was made was disaster-prone. Indeed, there was no specific plan for conducting this mission. Even a document recently issued by the new NDPCH concerning public education for disaster

preparation includes only a half-page-long description of this function and some examples from other countries (NDPCH, 1991).

Planning and implementing basic policies for disaster management is primarily done by NDPCH. From the relevant central administrative organs the NDPCH collects and reviews the data necessary to begin planning. The plan drafted by the NDPCH is then submitted to the prime minister, who must approve the plan after consultation with the Committee for Disaster Countermeasures (*Jaehae Daech'aek Wiwonhoe*) of the Ministry of Home Affairs (NDPCH, 1991, p. 12). After the basic plan has been approved, policies for implementing it are designed by the NDPCH using information obtained from the LDPCHs. The NDPCH commander-in-chief again submits the plan to the Prime Minister for approval. After the plan has been approved, the NDPCH delivers it to the lower governmental agencies in the provinces and cities, and then to the counties, towns, and villages. These basic policies are then modified to meet the specifications of the LDPCHs in order to meet the particular needs and disaster situation in the local regions. During this study, government officials who had experience with disaster management indicated that there was a great deal of conflict among governmental organs concerning emergency management. Some of these officials also stated that there were problems because certain disaster management tasks were simply avoided, when there was no specific indication in the instructions to do a follow-up (NDPCH, 1991, p. 12-15). This kind of problem often emerged among local governments, specifically the individual government organs with disaster-management responsibilities in a region, giving rise to conflicts among them. These conflicts became more serious when they resulted in avoidance of responsibility in regions involving major rivers under the charge of various administrative agencies.

In relation to the organizational structure for emergency management, Lewis has discovered problems with a "mechanistic" organizational structure, characterized by a multilevel hierarchy under a centralized authority charged with managing emergency events. Such a structure, he maintains, cannot perform well, since an environment that is subject to emergencies is an inherently unstable, uncertain, or changing environment in which communications and decision-making systems may break down and standard operating procedures may not apply. Lewis proposes an "organic" structure for dealing with disasters, particular-



ly with problems caused by communications breakdowns when decisions have to be made on-site by lower-level personnel. An organization with this structure tends to have the following characteristics: 1) its division of labor permits different approaches, for example the application of a matrix or task-force approach; 2) its job assignments are flexible, allowing in advance for readjustment to the needs of the emerging situation; 3) it involves network communications that emphasize maximum communications flow; 4) it relies on consultation and coordination rather than instruction and command; 5) it involves self-control and discretion rather than direct system control; and 6) it limits any preoccupation with the chain of command (Lewis, 1988, p. 174-175).

Cahill and Comfort discuss another problem in emergency management involving interorganizational disaster management. Their study underscored the importance of examining the process of determining what can be worked out under specific conditions with particular resources and constraints. Such a process involves information, communication, goals and norms, and reflective feedback on actions taken. The study introduced several factors that tend to increase the level of interorganizational capability: 1) open and continuous flow of information among organizations; 2) interpersonal communication and mutual trust; 3) the consciousness of a kind of professionalism that incorporates values, goals, and a commitment to participation; and 4) a willingness among the participating organizations to evaluate their actions and adjust their performance to meet the changing demands of a disaster situation (Comfort and Cahill, 1988, p. 182-183).

### *Disaster Policies*

As stated in the government guidelines on disaster prevention (*Jaehae Daech'aek P'yollam*), disaster policy in Korea covers all major natural disasters: heavy rainfall, typhoons, windstorms, heavy snowfall, earthquakes, and tsunamis. However, a detailed review of the policy objectives demonstrates that the policy focuses on heavy rainfall and typhoons. The policy contains the following major objectives: 1) to eliminate the potential causes of disaster before the occurrence of a disaster; 2) to effect emergency relief and the prevention of epidemics; 3) to facilitate recovery from an emergency; 4) to save human lives; 5) to implement disaster education and training; 6) to institute a public campaign for disaster

awareness; and 7) to perform other administrative functions related to disaster management. Specifically, to expand on the activities of Item 1 above, the government is expected to concentrate on structural approaches to disaster prevention such as dams, channels, banks, levees, and sewage systems. Items 2 to 4 detail the tasks that are to be performed at the time a disaster occurs. Items 5 and 6 deal with activities related to the preparation for a disaster. The activities of education and training are generally limited to public campaigns, carried out through a small number of government publications, through television and radio announcements, and through civil defense and community meetings. However, these activities are not routine and are significant only when a disaster occurs. The disaster policy specifies certain activities as part of disaster management such as weather forecasting and issuing warnings on approaching extreme natural events, reporting on field conditions in disaster-prone regions or regions that have been struck by disaster, and carrying out emergency relief and recovery during a disaster.

Weather forecasting is charged to the *Kisangch'ong*, the Korea Meteorological Administration (KMA), which bases its evaluations on a computer analysis of the information obtained from both domestic meteorological observations and observations from abroad via telecommunications from Tokyo under the Global Telecommunication System operated by the World Weather Watch program of the World Meteorological Organization. The KMA manages a computer network extending to forty-two weather forecast offices throughout the country. The meteorological information provided by the KMA is reported by the mass media, such as television, radio, newspapers, and "Weather Call" (number 131)—the recorded-message telephone system of the *Jung'ang Kisangdae* (CMO, 1990). During normal weather periods, there are daily (four times a day), weekly (twice a week), and monthly (once at the end of the month) forecasts. Daily forecasts provide information on general weather conditions, including wind speed and direction, temperature, precipitation, and wave height. In addition, local forecasts are the sole responsibility of the local Weather Forecast Offices in each region of the country. The weekly forecast provides weather information for agricultural, commercial, and recreational purposes, whereas the monthly forecast is used for industrial purposes. When an extreme natural event approaches the Korean peninsula, meteorological alerts are provided to the public via the mass media (CMO, 1990).

Despite this high-technology weather-forecasting system in Korea, there has recently been some criticism, by the public—especially by the residents of disaster-prone regions, of weather forecasting. The criticism concerns the occasional inaccuracy of weather forecasting and the delay in issuing meteorological alerts prior to natural disasters. However such criticism has been accompanied by little systematic scientific analysis of these inaccuracies.

Reporting the occurrence of a natural disaster condition in a region is mandatory according to Item 35 of the Storm-Flood Disaster Prevention Law. Such a report must detail the causes of a natural disaster, the date of its occurrence, the places where damage was incurred, and the extent of damage. The actual initial reporting (to district, town, and village government offices) of damage to property, missing persons, and/or loss of human life is done primarily by the persons who claim to have incurred the damages or other residents in the regions involved. The subsequent report, including the claims that have been collected, goes to the upper levels of the local office, then up to the NDPCH, in a hierarchical fashion. The report of the disaster is supposed to be conveyed through a computer system and must be documented, but, in practice, the report is delivered mostly by telephone and facsimile. The report does not include any confirmation of the facts by the residents of the disaster region, and, of course, a report made by means of a telephone call may leave questions concerning the reliability of the information.

The report actually consists of three reports, including: the initial report regarding the discovery of the disaster; the daily report (issued every twelve hours) on general disaster conditions; and the final, consolidated report summarizing the disaster, made two days after the disaster is considered to have ended. A confirmation is then made by a combined field-inspection team, which has taken photographs in the field and documented the major disaster damages, within five days after the final report has been made. The confirmation report then goes to 14 upper-level governmental organs and 20 mass media institutions. All of these reports are based on a form prepared by the government (NDPCH, 1991, p. 50).

A review of the reporting process reveals that these reports focus on emergency relief and recovery during the disaster period. Again, the reports do not seem to involve confirmation or evaluation. Their reliability is, therefore, questionable, and, indeed, the competency of the professionals engaged in the preparation of the reports might also be questioned. The

reports are prepared by local officers, who, again, have other primary work, divorced from disaster management.

Disaster policies and programs have been determined primarily through the Disaster Prevention Law and other relevant laws. Other laws refer to the regulations that are issued by the appropriate government agencies, since, as stated earlier, the basic disaster management plan is designed by the NDPCH and implemented by the LDPCHs, working closely with the relevant government agencies. Specifically, applicable laws include: 1) the Storm-Flood Disaster Prevention Law and Storm-Flood Disaster Prevention Act (*P'oongsuhae Daech'aekbop Sihaengryong*), which specify the regulations for disaster management in general and storm-flood disaster management in particular; 2) the Civil Defense Law (*Minbangwi Kibonbop*), which defines the regulations for national security; 3) the Law for Sea-Disaster Relief (*Su'nan Kuhobop*), which details the regulations for maritime emergency relief, including the rescue of ships and persons involved in marine accidents; 4) the Disaster Relief Law (*Jaehae Kuhobop*), which outlines the details for emergency relief management for specific disasters such as droughts, typhoons, floods, and fires; 5) the Agricultural Disaster Prevention Law (*Nong'up Jaehae Daech'aekbop*), which specifies regulations for disaster prevention in relation to agricultural production; and 6) the regulations for the management of dams, including hydroelectric power stations, and of flood control. Since all of these regulations are administered by different government agencies, there have been conflicts among the agencies in implementing policies proposed by the NDPCH and the LDPCHs. Moreover, the regulations put heavy stress on emergency relief and recovery. For example, the Storm-Flood Disaster Prevention Law consists of seventeen items relating to emergency relief and recovery, but contains only three items on preparation. Some disaster policies that are well known to the public, including the residents of disaster-prone regions, include: greenbelt regulations, emergency relief aid (including goods necessary for daily needs), compensation for damage caused by disasters, disaster loans at special interest rates, tuition waivers for schoolchildren in regions undergoing recovery from disaster, and programs that incorporate activities like civil defense training (*Minbangwi Hullyon*) and community meetings (*Bansanghoe*).

These public policies, however, again put much more emphasis on emergency relief and recovery than on preparation. Emergency relief and recovery involve rescues, evacuation, emergency assistance, and the restoring of public facilities like buildings, roads, channels, and stream and riverbanks. Emergency relief and recovery activities are performed by local residents, LDPCH officials, the relevant government agents, the flood-control group in the disaster region, and by the military forces, the civil defense Group, and other supportive groups from outside the region.

Although the NDPCH initiates action on emergency relief and recovery, the principal responsibility for emergency relief and recovery is charged mainly to the *Jung'ang Jaehae Kuho Hwaldong Bonbu*, the Central Office for Disaster Relief Action (CODRA), which is part of the Ministry of Health and Social Affairs. The process by which emergency relief is carried out involves a multihierarchical delivery system; it is also heavily reliant on the cooperation of other organizations. When a disaster occurs, the NDPCH first requests cooperation regarding action for emergency relief from CODRA and other government and civilian agencies such as the Red Cross and the National Disaster Prevention and Countermeasures Council (*Jonkuk Jaehae Daech'aek Hyop'uihoe*), and the military and police forces stationed in Seoul. CODRA delivers its instructions concerning emergency relief to the local agents charged with emergency relief activities in the cities and provinces involved in a disaster. At the same time, CODRA requests the provision of goods for emergency relief from the Central Warehouse (*Jung'ang Bich'uk Mulja Bogwan Ch'anggo*); requests are then conveyed on to the regional and local warehouses in the disaster regions. At the same time, CODRA local agents deliver instructions from the headquarters to the lower-level agencies for action while they request cooperation from the Red Cross, the military and police forces, and civilian groups. This process, according to the NDPCH manual (1991), is designed to secure emergency relief in a speedy and efficient manner. However, one can question just how reliable and effective this process is.

Emergency recovery is complicated, since recovery typically requires a large amount of funds that come from diverse government organizations. Emergency/recovery contributions by the government are limited to 1.2 billion Won for districts in Seoul; 8 million Won for five major cities (Pusan, Inch'on, Taegu, Kwangju, and Taejon); and 5 million Won for

cities and counties with a population of more than 300,000 persons. The sources of such funds are the national government, local governments, lending agencies, and individual properties (private funds) (NDPCH, 1991, p. 74-79).

The damage compensation program is a subject of great interest among the residents of disaster-prone regions, who have severely criticized it, especially in regard to the disaster policies of the government. Their criticisms are discussed in the section on individual responses to natural disasters.

The process of emergency recovery (Figure 13) is carried out primarily in the field, where disasters have occurred. Residents take their claims of property damage or reports of injury or loss of family members during a natural disaster to the local offices in the district, town, or village in the region where their damage or loss occurred. After receiving these claims from the residents, the officers charged with handling the matter go into the field to inspect the claims. They calculate damages, basing their estimates on the Tabular Statement for Disaster Damage Calculation (*Sanjong P'yo*) and submit their report to their senior officers for approval (NDPCH, 1991, p. 71-72). In the process of calculation, there is hardly any consultation between the officers and the claimants. This lack of consultation gives rise to a substantial number of complaints between residents and officers; at the same time in effect it helps to prevent conflicts between these groups. Next, the commander-in-chief of the local headquarters in the disaster region submits the report of damages to the LDPCH in the local city, district, or county, combined with another report of damages made by the relevant agencies in the region. After he receives the damages reports from all the local offices under the LDPCH, the LDPCH chief submits the report with the combined statistical data on damages to the next higher LDPCH headquarters in the local city and provincial offices. This report becomes the first statistical account of damages. The LDPCH at this higher level reports the general disaster conditions in the region to the NDPCH, while taking initial but limited action for emergency relief and recovery. The NDPCH analyzes the reports from the LDPCHs and the field survey report from the cooperative inspection team and then creates a recovery plan and submits it for approval to the Committee for Disaster Countermeasures, including 24 committee members from 17 government offices.

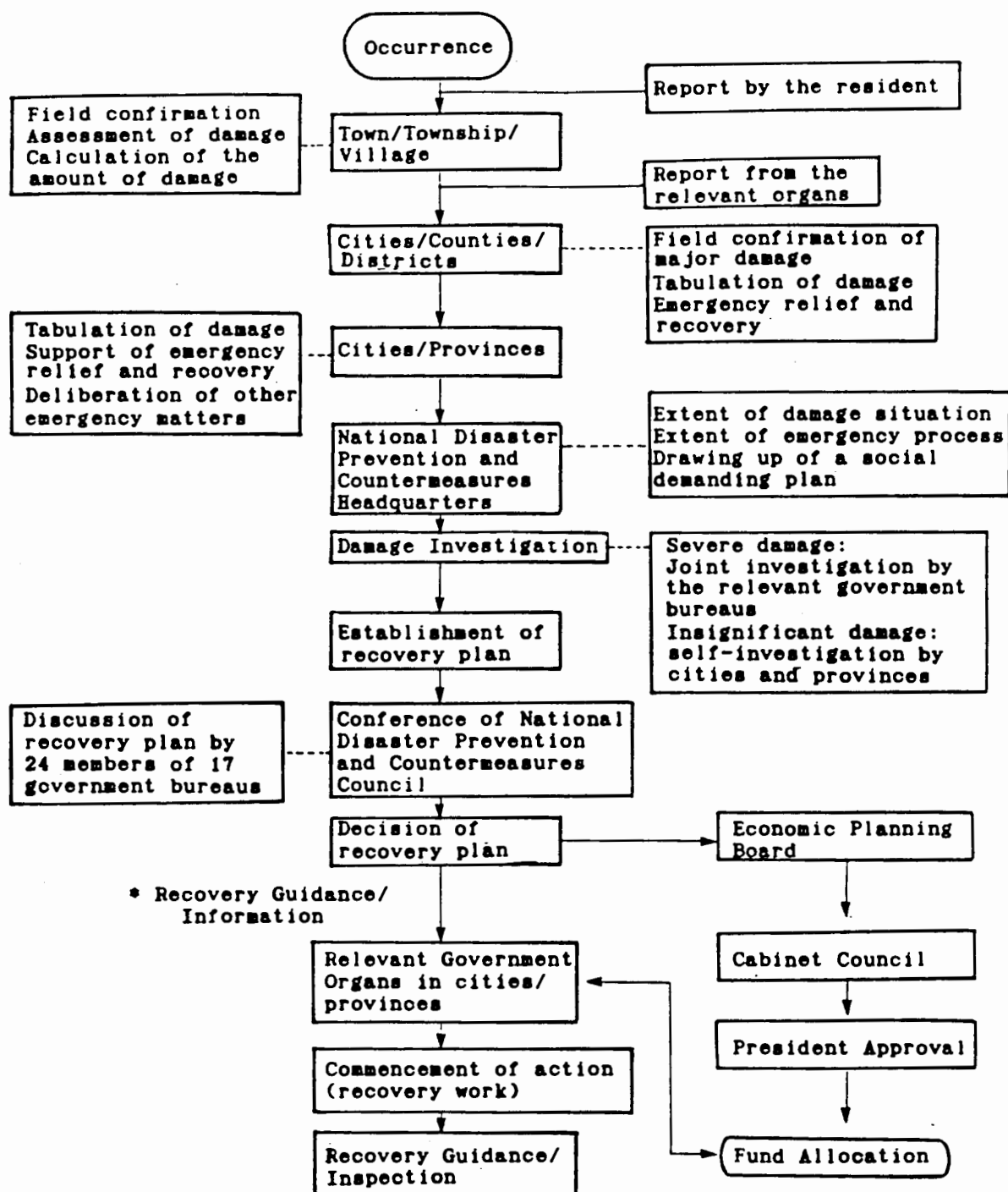


Figure 13  
Mechanism for Disaster Recovery

Source: NDPCH, 1991, p. 73-74.

After the plan is approved, the NDPCH delivers it with instructions to the LDPCHs and then to the lower local offices, while requesting funds for executing the recovery plan from the Economic Planning Board (*Kyongje Kihoek'won*), where it is determined how the disaster recovery funds are to be obtained. Subsequently, the proposal is sent out for approval—first to the Cabinet Council (*Kukmu Hoe'ui Sim'ui*) and finally to the president. The appropriated funds then go to the LDPCHs in the region where the recovery plan is to be implemented.

The sources of funds for natural disaster management in Korea include individual properties, government revenues, loans, and public donations. Individual properties refers to private funds appropriated by individuals who recover disaster damages at their own expense. These funds are supplemented by loans provided at special low-interest rates—for example, financial assistance from credit or agricultural unions. Individual loans are given to people in disaster areas to be used both for recovery and for disaster prevention in a program of self-reliant disaster management. Public donations include money and goods for emergency relief and recovery. Donations are made by the public (both individuals and groups), by business firms, by private and governmental institutions throughout the country, and by Korean residents abroad. Public donations are collected annually through advertisements or street campaigns via media such as newspapers, television, radio, theaters; public agencies such as the Red Cross, the YMCA, and the YWCA; and the sale of postage stamps. The collected donations go to the Council for National Disaster Countermeasures (CNDC), established in 1961. This organization is run by professionals from various segments of Korean society. The organization is closely connected to government agencies like the NDPCH and the ministries of Public Health and Social Affairs and of Home Affairs. A review of the list of members and the amounts of the donations shows that these members in fact participate in fundraising activities through their original institutions. For example, the members are primarily presidents of mass media institutions and large business firms, representatives of financial institutions and religious groups, and chiefs of staff of such organizations as the YMCA, YWCA, Red Cross, and other important groups. Since the members have other primary work, they are likely to be “drop by” executives, who only review important matters related to the undertaking; a small number of staff persons do the actual work for the organization (You, 1982).



The primary objective of the CNDC is to raise, distribute, and manage funds obtained from the public for the national social welfare. Its specific objectives are to collect donations from the public at various levels, to assist in disaster management—including disaster relief and recovery—and to undertake other socially beneficial activities such as the development of underground water delivery systems. The organization even provides assistance to foreign countries suffering disasters. The annual donations collected by the CNDC go into disaster management primarily via the government.

### *Disaster Funds*

Sources of disaster funds by and large come from the budget of the national and local governments, the loans of financial institutions, and individual properties. Government resources represent about 58% of the total disaster funds. About 14% comes from individual properties invested by residents in disaster-affected regions (NDPCH, 1991, p. 449). Thus, disaster management has been chiefly the charge of government; however, residents in disaster-prone regions have had to assume a considerable personal burden.

Sources of government funds include the reserve budget, the fixed budget, the supplementary budget, and public donations. More specifically, the reserve budget contains funds that can be allocated to specific areas to cover deficiencies or to handle emergencies. The reserve budget, in other words, can be used for the management of natural disaster emergencies. The supplementary budget is a temporary budget, required by the national government, which also makes up for deficits brought on by such contingencies as natural disasters. The fixed budget is an amount allocated specifically for natural disaster management, and this budget represents the only stable funds that can be counted on for that purpose. The fixed budget is limited to damage recovery, and it receives the smallest proportion, about 9%, of the total government funds allocated for that budget, as compared to the reserve and supplementary budgets. Overall, this suggests that government funds for natural disaster management are more likely to come from other sources than the fixed budget. Moreover, provision for government funds for emergency relief and prevention of natural disasters is not clearly stated in the Storm-Flood Disaster Prevention Law. Again, this indicates a lack of certainty about the availability of government funds for natural disaster management.

## Individual Responses to Natural Disasters

### *Perception*

The responses to the first question in the questionnaire that formed the basis for this study concerned the opinions of the participants regarding the most serious problems in the region in which they live. The question was aimed at measuring how seriously they perceive storm-flood disasters, in order to assess their motivation and commitment to disaster management. About 80% of the respondents, who were residents of disaster-prone regions, regarded natural disasters as the most serious problem in their respective regions. Such awareness was more prevalent among Puyo residents than in either Kwangmyong and Miryang. To a question concerning priorities for the resolution of regional problems, about 30% of the 235 respondents answered that the first priority should be the problem of natural disasters. This high awareness of natural disaster problems may indicate a motivation to pursue disaster management. Concerning the first question, government officials and institutional professionals did not view natural disasters as serious. Only three respondents regarded disasters as serious, ranking this category third in importance. Despite their work as disaster management professionals, these respondents (including government officials) did not see natural disasters as a serious problem. However, these people do have a good knowledge of the natural disasters that have occurred over the past few years—as discovered through additional questions. An explanation for their position may be that they are preoccupied primarily with other problems—housing, traffic congestion, labor disputes (during the survey period, there were several such disputes), and other social problems. These findings are similar to those of other recent research that investigated the degree of seriousness with which natural disasters were held by the people who had experienced disasters and who had engaged in their management. The research revealed that most of the respondents showed great interest in a natural disaster during the actual event but showed a low degree of interest, or even forgot the matter entirely, when disaster was absent (Rossi, Wright, and Weber-Burdin, 1982, pp. 39-67).

Although almost all of them perceived natural disasters as very harmful, about half of the residents in storm-flood disaster regions did not view disasters as unavoidable, as shown in Table 2. In the expression of these views there are regional differences: more Puyo and

Table 2  
Perceptions of Natural Disasters

Is a Natural Disaster:	Unit: Number of respondents (%)			
	Kwangmyong	Puyo	Miryang	Total
<u>Harmful?</u>				
Yes	59 (23.4)	119 (47.2)	65 (25.8)	243 (96.4)
No	3 (1.5)	5 (2.0)	1 (0.4)	9 (3.6)
<u>Unavoidable?</u>				
True	24 (9.5)	62 (24.6)	37 (14.7)	123 (48.8)
Not true	35 (13.9)	61 (24.2)	28 (11.1)	124 (49.2)
Don't know	3 (1.2)	1 (0.4)	1 (0.4)	5 (2.0)

Miryang residents responded with concern, compared to Kwangmyong residents.

In addition, residents were well aware of the most severe natural disasters that have occurred during the last ten years in Korea. About 96% of 252 respondents selected floods as the most severe natural disasters and typhoons as the next most severe.

The section of the survey dealing with the experiences of natural disasters by residents during the past ten years included questions concerning what types of natural events had caused the most severe damage and when it was that these events occurred. Residents stated that the most severe natural disasters were the storm-flood disasters of 1959 and 1987. About 45% of 208 respondents remembered quite well that the most severe storm-floods occurred in those years. Meteorological statistics support these responses, indicating that the disasters in those years were the most severe in the nation's modern history (CMO, 1990).

Residents also remembered the types of damage that resulted from storm-flood disasters. The greatest damage involved houses, agricultural products, and agricultural properties, in that order. More houses were damaged in Puyo and Miryang than in Kwangmyong. Regarding house structure, about 50% of 253 residents responded that they lived in houses built of cement blocks, and a considerable percentage lived in houses made of wood. Overall, the houses in Puyo and Miryang were poorly built, making them vulnerable to natural events such as storms and heavy rains.

In addition, only 16 out of 241 residents said they participated in the housing insurance program. Moreover, residents added that general damages due to the most recent event and damage to houses in particular were in fact the latest in an accumulation of damages that had occurred in recent years—damages from which they had not yet completely recovered. Some respondents further added that damages could not be fully recovered because of the financial difficulties resulting from an almost annual loss of property. Property losses reached from 500 to 1,000 thousand Won, and these became a heavy financial burden when added to debts incurred due to previous disaster recovery.

Calculations of disaster damages were done by both the residents themselves and the local government. About 68% of 227 respondents stated that the calculation had been done by themselves; 20% said it had been done by the government. Interestingly, only a few people in the latter group knew that there was a table of calculations standardized by the government, even though the government guidelines mandate the use of the calculation table by local government officials when a calculation of damages is undertaken with local residents.

Prediction of coming natural disasters by the residents was relatively accurate; the percentages are shown in Table 3. Among those who responded “yes” to the likelihood of another storm-flood disaster in the near future, there were regional differences: the Puyo residents gave more “yes” answers than the residents of Kwangmyong and Miryang. However, the Puyo residents also included a considerable proportion who responded “don’t know” (about 31% of 124 respondents).

In answer to an extended question about when a natural disaster would recur, about 78% of 176 respondents predicted a future disaster would come soon, within a year.

Table 3  
Prediction of Future Disasters

Unit: Number of respondents (%)

Will a storm-flood disaster come again soon?	Kwangmyong	Puyo	Miryang	Total
Yes	47 (18.8)	76 (30.4)	48 (19.2)	171 (68.4)
No	7 (2.8)	9 (3.6)	4 (1.6)	20 (8.0)
Don't know	7 (2.8)	39 (15.6)	13 (5.2)	59 (23.6)

In relation to human occupancy in storm-flood-prone regions, when asked about their preference regarding places to live, about half of the residents stated that they wished to leave the disaster-prone regions. However, more than half of the residents responded that they did not have any other place to live and that they had no choice but to stay where they were because they received their income from the region and because their families and relatives were there. These respondents who preferred to leave the disaster-prone regions but felt they had to stay offered additional reasons for their decision. Kwangmyong residents cited the soaring land values and rental costs in Seoul, where most of them worked. These higher costs prevented them from moving out of flood-prone regions, where land values and rents were lower. Both the Puyo and Miryang residents cited the limitation of their occupational skills to agricultural production, which meant that they could not work in the cities; but more importantly, they spoke of their responsibility to maintain the practice of ancestor worship in the local areas where they had spent their entire lives—a responsibility that made it impossible to leave. These reasons for continued occupancy closely reflect the findings of other natural hazard perception studies, some of which report that the factors affecting human occupancy in natural disaster-prone regions are predominantly related to economic activities in the region (Burton, Kates, and White, 1978), while other researchers have pointed to significant cultural reasons for human occupancy (Islam 1974; Kim 1988; Bryant 1991).

### *Adjustment*

To questions designed to measure adjustment to natural disasters, all of the residents responded that they had experienced more than one storm-flood disaster while living in the region. In response to specific questions about what they had done before, during, and after these extreme natural events, the residents replied as indicated in Table 4. Before the natural disasters, a considerable percentage of the residents stayed at home without doing anything to prepare for the event. However, more than half worked on their houses and agricultural plots. There were regional differences: the Kwangmyong and Miryang residents were more likely to have stayed at home or to have evacuated from the region, while a considerable number of Puyo residents worked on preparation for a potential disaster.

Table 4  
Disaster Help Needed

	Unit: Number of respondents (%) (total respondents = 253)			
	Kwangmyong	Puyo	Miryang	Total
<u>For recovery</u>				
What kind of help?				
Helping hands	19 (7.5)	79 (31.2)	37 (14.6)	135 (53.3)
Monetary compensation	21 (8.3)	32 (12.7)	36 (14.2)	89 (35.2)
Tools and equipment	12 (4.7)	53 (21.0)	22 (8.7)	87 (34.4)
Who helped you?				
Family	6 (2.4)	85 (33.6)	18 (7.1)	109 (43.1)
Neighbors	10 (3.9)	52 (20.6)	17 (6.7)	79 (31.2)
Local government	20 (6.0)	35 (13.8)	13 (5.1)	68 (26.9)
<u>For preparation</u>				
What kind of help?				
Opinion exchange at community meeting—	10 (3.9)	53 (21.0)	13 (5.1)	76 (30.0)
Improvement of disaster facilities—	28 (11.1)	28 (11.1)	12 (4.7)	68 (26.9)
Knowledge of disaster—	6 (2.4)	40 (15.8)	20 (7.9)	66 (26.9)
Who helped you?				
Neighbors	6 (2.4)	42 (16.6)	17 (6.7)	65 (25.7)
Family	6 (2.4)	43 (17.0)	13 (5.1)	62 (24.5)
Local government	13 (5.1)	32 (12.7)	17 (6.7)	62 (24.5)

During the event, many people did evacuate, while many others stayed at home. However, some of the Puyo and Miryang residents still participated in disaster management activities. After the event, almost all of the residents engaged in recovery work.

To an extended question concerning ways of forecasting future natural disasters, only 45 respondents stated: "through mass media such as television and radio." A few claimed knowledge of traditional ways of prediction such as noting the height of waves at high tide and the amount of snowfall in winter the year before the disaster occurred.

With regard to recovery and preparation efforts, residents were asked what kinds of assistance they needed most and who had provided the assistance. As shown in Table 4, the assistance most needed was that of a helping hand, and it was family members and neighbors who provided most of this. In the process of recovery, local government help was also cited.

The residents of Kwangmyong showed more interest in compensation by the government, while the residents of Puyo and Miryang expressed more interest in helping hands and tools and equipment for disaster management. This does not mean that the people of Puyo and Kwangmyong were not interested in government compensation. Rather they expected only such assistance as could meet their need to recover expenses. A more specific discussion is included in the section below on government policy.

For assistance in preparing for disasters, respondents suggested that the most desired types of assistance were an exchange of opinions at community meetings, improvements in and management of flood-control facilities, and advance knowledge of natural disasters. The assistance that was actually provided came, in order, from neighbors, family members, and the local government. There were regional differences as shown in Table 4. A majority of the residents in the three study sites stated a need for assistance in disaster management that consisted of both structural and nonstructural approaches; the structural approach applied to disaster facilities and the nonstructural approach to exchange of opinions and experiences at community meetings.

The residents of Kwangmyong were more interested in a structural approach, whereas in Puyo and Miryang, residents were more inclined toward a nonstructural approach. As for assistance that was actually provided, in Kwangmyong assistance came more from government than from family members and neighbors. The Puyo and Miryang residents, on the

other hand, claimed that actual assistance came equally from family members, neighbors, and the government.

The adjustment attitudes of the residents of storm-flood disaster regions, however, displayed both passivity and dependency regarding the management of storm-flood disasters. In contrast, Cheju farmers in their own typhoon disaster-prone region showed a positive and self-reliant attitude regarding typhoon disaster management, throughout both the preparation and recovery phases of disaster. The adjustment practices of the Cheju people included developing accurate means for predicting natural disasters by relying on both traditional and modern methods, and changing their patterns of agricultural production to so that the harvest period would be in advance of predicted typhoons.

Again, concerning their continued residence in disaster-prone regions, the other participants cited economic reasons for not moving. In contrast, the Cheju people gave a predominantly cultural reason: family ties seem to have motivated them to positively adjust to their circumstances. Indeed, even the Kwangmyong residents, similar to the respondents who lived in the large cities, appeared to live busy, “ant-like” lives, commuting to the capital city early in the morning and home again late at night on a daily basis—and appearing to give little thought to past or future natural disasters. In Puyo and Miryang, the residents were typical agricultural area residents; during good weather, their daily lives were focused on agricultural production throughout the day. On days when the weather was bad, many of the farmers spent their time relaxing or gambling, and they seemed to be unconcerned about the natural disasters that had damaged their crops in the past.

In contrast, every year Cheju farmers worked hard to prepare for typhoons. In addition, these people were very positive in their expectations of what the government could do in the event of a natural disaster.

These contrasting attitudes suggest that the residents of disaster-prone regions can adjust, if the government guides them in a systematic way, using an organized strategy that includes effective disaster policies. Thus, it is useful and appropriate to examine how the residents of storm-flood disaster-prone regions and professionals who were engaged in disaster management perceived the disaster policies of their government.



*Government Policy*

With regard to governmental disaster policies, the survey asked “Do you know about the disaster policies of the government?” Only 19% of 245 respondents (21 respondents from Puyo, 18 from Miryang, and 8 from Kwangmyong) knew about the recovery policy. These people knew about the compensation offered for damages and about the special low-interest loans for recovery of damage to agricultural products. They expressed much interest in receiving compensation but were not satisfied with the amount offered. The respondents felt that the compensation policy was “unrealistic”; the small amount offered could only provide minimal recovery, and incomplete recovery created the potential for further damage in the event of a subsequent natural disaster. (The respondents knew that a natural disaster occurs almost every year, although they generally could not predict accurately when it would strike.)

The respondents also said that the loan policy was unrealistic; the loan added a heavy burden, because if the agricultural harvest for that year was ruined, then there would be no way to repay the loan the following year. The respondents added, “If you have damage to the agricultural products that are your only source of income—for three consecutive years—then what should you do to pay back the loan?”

When the residents were asked “Why don’t you buy insurance to protect your property from loss?” they replied that it would be an added burden. Concerning possible mandatory purchase of disaster insurance from the government, only 36% of 251 respondents agreed with the suggestion.

Approximately 83% of 251 respondents (106 from Puyo, 62 from Miryang, and 40 from Kwangmyong) knew about the policy concerning preparation for future disasters. They knew about civil defense training and the building and improving of facilities such as levees and drainage systems as the heavy rainfall season approached. However, these same respondents desired a more systematic policy that would take a long-term approach.

Concerning emphasis in disaster policies, a majority of the residents preferred an emphasis on preparation rather than recovery, clearly suggesting a recognition of the importance of preparation in reducing the damage potential of disasters. On the other hand, professionals were well aware of disaster policies, including programs and laws, but their

opinion of these policies was that they were “unrealistic,” because the existing compensation program possibly encouraged local residents to become dependent upon government assistance in the resolution of disaster problems.

The professionals felt that government disaster policies should reinforce self-reliance. Moreover, they pointed out that the compensation program could not lead to the achievement of a satisfactory level of recovery, since local governments suffered from a pronounced shortage of funds. The professionals suggested that the national government should provide local governments with the funds necessary for efficient disaster management, combining this with public education programs that would encourage disaster management by the residents themselves. The professionals also felt that existing disaster policies were inefficient because of problems with the underlying laws related to disaster prevention. For example, Item 29 of the Storm-Flood Disaster Prevention Law states that the authority to call the Flood-Control Group in a region into action lies with the local mayor and governor, but the law provides no stipulations for what to do when the local people do not cooperate with the authorities. There is no stated means for resolving this potential conflict between government organs involved in disaster management.

Regarding policy emphasis, most professionals agreed on the importance of disaster preparation. On the question of whether disaster policy should involve a structural or a nonstructural approach, the professionals' first choice was a nonstructural approach; their second choice was an approach that was both structural and non-structural. Structural measures include the construction of such facilities as dams, stream channels, embankments, sewage systems, roads, and buildings, while nonstructural approaches include policies, facilities management, education, land-use planning, weather forecasting and warning, and public communications to lessen disasters' toll. The professionals wanted to emphasize a nonstructural approach because the increase in storm-flood disasters had been linked to the expansion of urban areas, an increase in land use in regions susceptible to floods, and general regional development. In order to reduce these potential contributing factors, it would be necessary for government to reconsider current disaster policy and to enforce existing policies regarding regulations and programs that restrain causes. Even the professionals who recommended an emphasis on a structural approach advocated that a nonstruc-

tural approach be implemented after the structural approach, because a nonstructural approach requires a discussion of the facilities needed to deal with disasters. Interestingly, the neutral respondents who chose both approaches presented a rationale that the two approaches are interrelated in practice.

### *Public Expectations of Government*

Local residents and professionals alike were explicit in discussing their difficulties in the area of disaster management but their ideas and suggestions regarding what the government had failed to do and what it should do were implicit. The question "Who is most responsible for disaster management?" was asked to determine how the public, both local residents and professionals, felt about such responsibility. The participants responded that the greatest responsibility belonged to the national government, almost as much to the local governments, and to the local residents, in that order. Among regions, the Puyo residents stated that the local government should have more responsibility for disaster management, while the respondents in Kwangmyong and Miryang felt that such responsibility should be held by the national government. Overall, these responses imply that local residents see the government as having the major role in disaster management. These findings may also indicate that the residents have become dependent on government or that they tend to avoid responsibility.

The residents' reaction to a question on possible difficulties in implementing government disaster policies suggests that: 1) the residents' opinions concerning disaster policies are seldom reflected in what the government decides; 2) government organs do not cooperate with each other; and 3) the attitude of government officials is passive. It is significant that almost half of the respondents suggested that the difficulties in policy implementation were caused by the government in the process of disaster management. It is also significant that more than half of the respondents wished that their opinions were reflected in government policy. However, there were regional variations in these responses: more of the Puyo and Miryang residents wished that there was a greater reflection of their opinion in government policy than did the respondents in Kwangmyong. Such a desire to see their opinion reflected in the process of government policy implementation is clearly expressed in the responses to the question "What do you think about having your opinion considered in government policy

formulation?" A majority agreed that their participation was important and that their opinion should be taken into consideration before and after policy implementation is undertaken. In contrast, some of the professionals expressed a more negative attitude regarding whether residents' opinions should be reflected in policy formulation and implementation. The professionals suggested that a process for hearing residents' opinions might be useful but added that the inclusion of opinions of residents might complicate the discussion because of the residents' lack of knowledge concerning natural disasters. This position suggests a somewhat authoritarian and bureaucratic attitude toward the public by professionals.

When asked what they desired most from government in the way of disaster management, the residents' priorities were: 1) the improvement of facilities for disaster prevention; 2) the creation and implementation of an efficient disaster policy; and 3) the enhancement of disaster policy through an emphasis on preparation, including education. It can be interpreted that the respondents from the three study sites felt that governmental disaster management ought to emphasize preparation rather than recovery.

The professionals were asked more specific questions relating to disaster policies. They agreed that the present policies are focused much more on emergency relief and recovery than on preparation. They saw current disaster recovery policies divided into three categories: emergency recovery, completed recovery, and improving recovery. Emergency recovery refers to actions directed toward urgent needs such as clearing or repairing damaged roads, bridges, channels, and embankments in order to restore temporary accessibility. Completed recovery refers to the completion of certain tasks. Improving recovery means that facilities are in the process of recovery. All of these recovery activities give priority to public facilities, disaster prevention facilities, agricultural lands, and private houses, in that order. The professionals recalled that in the recovery process there has always been assistance from government agencies and from other nongovernmental organizations like the Red Cross. In addition, the professionals suggested the need for a long-term recovery policy rather than a "temporary" or partial one, as is the present practice.

With regard to preparation, the professionals delineated the relevant activities that should be undertaken by the government. These include: weekly inspection of disaster-prone regions; authorization of shelters for people who have been evacuated from regions vulnera-

ble to natural disasters; improvement of facilities for disaster prevention; inspection of facilities for emergency aid; increased inspection of stream channels connected to major rivers; and appointment of officials to oversee the maintenance and securing of public buildings. The professionals insisted that the policies related to preparation be strengthened. They did not define specific problems with preparation policy; instead they suggested a more effective policy that included additional funds for both policy implementation and a systematic education program to improve public participation in disaster prevention. The professionals stated that they basically believed in the importance of preparation in disaster management at both the government and local levels, since preparation is important in reducing the potential for damage and loss from typhoons and floods. The professionals recognized the existence of problems in communication between government agencies and local residents in disaster-prone regions; their stated reasons for the problems were: the public was passive, ignorant, or uncooperative, and there was lack of knowledge concerning disasters and lack of communication among the government officials engaged in disaster management. The professionals were well aware of residents' expectations of government, such as expectations for an increase in the amount of compensation, a long-term plan for recovery, and the earlier implementation of preparations for future natural events.

On a question concerning difficulties in disaster policy implementation, the professionals cited specific difficulties in both preparation for and completion of implementation. These problems were related mostly to a lack of funds, a lack of some form of evaluation of the work done, and a lack of education for both the general public and government agencies involved in disaster management. Although the professionals stated that there are provisions for evaluation within government organizations and that there are educational programs in the process of implementation, it appeared that evaluation remains minimal both before and after implementation.

The final suggestions made by the professionals for the formulation of a better disaster policy included: 1) revising regulations and policies, including programs, relevant to disaster prevention; 2) establishing an independent organization charged with disaster management, or promoting the existing NDPCH as an independent organization; and 3) developing "permanent" disaster policies from a consistent, long-term perspective.

### *Policy Implications*

The findings of the present study suggest the following recommendations for those developing countries, including Korea, that experience great resource losses due to natural disasters, particularly storm-flood disasters, while they pursue economic development:

- 1) Establish an independent organization for disaster management that can focus on reducing particular natural disasters experienced in that country. Such an organization would have an “organic” structure, fixed funds, and personnel with a high level of professionalism in the field of disaster management.
- 2) Establish a disaster preparedness policy based on a nonstructural approach. Such an approach would help not only to reduce potential for cumulative damage in subsequent years but also to reduce the cost of recovery.
- 3) Develop realistic, flexible, and updated preparedness plans. A “realistic” plan is effective, since its design must be based on information obtained in the real world. A flexible plan provides local officials and communities with the opportunity to be adaptable in decision-making in the constantly changing environment of disasters. An updated plan provides current information to assist local officials and communities in their activities.
- 4) Establish specific recovery plans for local governments and communities. Basic plans for recovery should be drawn up in advance and include specific information about existing conditions in disaster-prone regions and a specific framework resulting from consultation with professionals in the relevant fields. Plans for recovery should include provision for two types of recovery: short-term and long-term.
- 5) Include a review or evaluation of the work done. A proper review and evaluation will clarify what changes are needed.
- 6) Enhance the existing early warning system and develop an early warning education program for the public. An early warning system, including a plan for evacuation and for educating the public concerning this plan, is an important aspect of any comprehensive effort to prepare for approaching natural disasters.
- 7) Develop a systematic education program on preparedness. This educational program should include the training of institutional officials already engaged in disaster management who will then perform the task of educating the public. The institutional officials will then be

able to use the resources they possess in carrying out the suggested program.

8) Revitalize research on natural disasters and overcome the inherent potential conflicts between the research community and the disaster management community. The active mutual involvement of these two communities will lead to a greater level of professionalism in both.

## SUMMARY AND CONCLUSION

### Summary

In the Republic of Korea, natural disasters, especially storm-flood disasters, are related to a variety of environmental conditions, including geographic location and meteorological conditions.

Discussion of these environmental conditions necessarily elicits feelings of insecurity among the Korean people toward their general environment, feelings reinforced by an historical experience of frequent foreign invasions and, recently, by military confrontation with North Korea and the deterioration of the physical environment and other social problems. Because these other, more general environmental problems have been a serious preoccupation of the Korean people, natural disasters alone have not become a major social issue—except at the time of an actual disaster.

More importantly, environmental problems in Korea are closely related to the current strong drive toward economic development that involves both education and political initiative. There has been an acceleration in the nation's progress—but with consequent environmental problems including increased natural disasters.

Increased educational, political, and economic opportunity in Korean society is supported by sociocultural values predominant among the Korean people, values that emphasize the importance of education to one's future life and the observance of a hierarchical social order. The observance of hierarchy has enabled the government to oversee the nation's rapid economic success, but at the same time it has weakened the system of evaluation within the government and prevented full civic participation.

Looking at the more immediate causes of natural disasters, one can see one paramount contributing environmental problem: the population problem in the major urban areas, particularly in the capital city of Seoul. As the government expanded the industrial sector in the urban areas beginning in the late 1960s, there was an influx of rural migrants into the cities seeking better economic and educational opportunities. The consequent rapid increase in population in urban areas resulted in shortages of land and housing, and more importantly, of drainage and sewage systems.

As one way to resolve the urban population problem, the government has accelerated the



expansion of new urban areas on the outskirts of the major cities and moved industry from the cities into the rural areas. As a result, urban congestion has somewhat improved, but it remains a serious problem.

The densely populated, newly developed urban areas often experience floods during the summer rainy season. The major causes of inner-city floods are inadequate flood-control systems—including drainage and sewage, inadequate management of these systems, and a lack of expertise in the planning of new buildings and other structures that includes specific construction methods for flood protection.

In the rural areas, the government has overseen industrial expansion in order to promote regional equity in economic development. However, because of the manner in which regional development has been carried out, newly developed areas in the major river basins have been exposed to landslides where rivers have not been provided with protective embankments, and, during the summer rainy season, to floods. Beyond these causes of disasters related to economic development, there is a dominant perception by the public that the government is responsible for the resolution of disaster problems, because the government has played a central role in disaster management in the past—particularly in the management of disaster relief and recovery. On the other hand, the government has expected from the public an attitude of self-reliance in disaster management.

Responsibility for emergency management following disasters in Korea has been assumed chiefly by the national and local governments. The organizational structure for disaster management is characterized by a multihierarchical delivery system that, again, involves little evaluation. This organizational structure requires great cooperation among intergovernmental organizations; however, the involvement of so many different organs has sometimes led to conflicts among them, thereby weakening the cooperative effort necessary for efficient disaster management. In addition, each organization typically has a communications network among itself and its suborganizations. One can ask whether information flow and management in this context is accurate and consistent.

The National Disaster Prevention and Countermeasures Headquarters (NDPCH), an organization within the national government, occupies the central role in disaster management in Korea. However, in the absence of a natural disaster, the NDPCH is a very limited

organization with a small active staff, and even among this limited staff, the level of professionalism is questionable. Most members work primarily for another ministry, and their work for NDPCH is secondary. Moreover, they usually have no basic professional training or responsibilities in the field of disaster management.

The planning and implementation of disaster policies and programs have been charged to the NDPCH. However, upon the NDPCH's request, actual implementation of emergency relief and recovery has been under the Central Office for Disaster Relief Action and NDPCH's suborganizations in local governments. In other words, plans for disaster management are designed by the NDPCH, but decision-making with regard to ongoing disaster situations can be flexibly assigned to the lower, local government organs. It is questionable whether the NDPCH has considered the implications of this flexibility.

The organizational structure for disaster management, including the provisions for policies, programs, and funds, is basically a temporary system for emergency relief and recovery in the actual presence of a natural disaster, rather than a permanent arrangement involving preparedness, mitigation, and long-term recovery during those intervals when disasters are not occurring. Because disasters are perceived as temporary phenomena, the NDPCH and its suborganizations, together with the relevant governmental organs, are rarely involved in systematic long-term preparation. More importantly, because of the shortage of funds for recovery, the government is usually hard pressed just to complete recovery operations after a natural disaster has occurred. This incomplete recovery itself increases the cumulative damage potential of future natural disasters. Funding for disaster mitigation, including educational programs, is given little consideration.

Disaster laws and policies emphasize emergency relief and recovery and the preparation for them. The laws and policies, however, seldom stress long-term preparation, mitigation, migration, and recovery following the annual disasters.

Disaster management by the government is "unsatisfactory," according to individuals who have experienced storm-flood disasters and according to government and institutional officials involved in disaster management. These people all agree that organizational structure and disaster policies in general should be reformed to create a better, more systematic disaster-management process that puts renewed emphasis on preparation and a long-term

perspective. This process must be based on appropriate disaster laws that are sufficiently flexible to accommodate the various disaster-prone regions in Korea.

Regarding responsibility for disaster management by the government, people tend to be of two different opinions. Residents in storm-flood, disaster-prone regions assign much more responsibility to the government, while officials give responsibility to both the government and the public, including residents of the affected areas. In addition, everyone points to the need for accurate information on impending natural disasters, including forecasting and early warning. They also see a need for an evaluation process involving civic participation; proper guidance or educational programs; and cooperation among the public (including the residents of disaster-prone regions), the government, and intergovernmental organizations.

### Conclusion

The present study provides a comprehensive picture of natural disaster problems in the southern portion of the Korean peninsula.

With this comprehensive picture of the region's storm-flood disasters, some recommendations can be made regarding policy formulation by the government, since the government has long played a central role in disaster management and will continue to do so in the future. In that future, Korean society as whole will continue to pursue the goal of economic progress, and the government will continue with policies that emphasize industrial and regional development. As long as there is such development with no consideration for flood-control, the potential for storm-flood disasters will undoubtedly increase.

Some changes in government policy regarding natural disasters have occurred recently, but these changes are still minimal. Thus, the government still needs to reconsider its organizational structure and policies relating to disaster management, and it needs to focus on preparation, taking a long-term approach. Preparation ought to include educational programs for both the public and governmental officials in cooperation with the academic community. Education will help improve awareness of natural disasters, increase commitment to their resolution, promote a cooperative attitude, and, importantly, increase self-reliance in disaster management. The government must work with both the public and professionals in the field, and it must be an active participant in international organizations and programs such as the

International Decade for Natural Disaster Reduction (IDNDR). Recent Korean participation in this initiative has been minimal and passive.

The current study suggests a possible line of further investigation concerning the links between environmental conditions and the evolution of Korean society that would examine how environmental conditions have been influenced by human activity. However, this study has also revealed some shortcomings in the use of integrative analysis to explain structural change as well as actions and attitudes among individuals engaged in disaster management. Future studies may suggest ways in which an integrative framework, such as the one used in the present study, can be used more effectively, or ways to create a more comprehensive framework.

Still, the results of the present study generally show that this framework is a useful method for explaining what happens in a particular society and environment subject to problems in natural disaster management. It is unlikely that this kind of understanding could be obtained from research involving either macro- or micro-level analysis.

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