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Disaster Preparedness, Vulnerability and Resilience

- Review of Theories and Implementations -

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Abstract

This review paper aims to suggest policy directions to secure the effective implementation of disaster preparedness policy by minimizing vulnerability for disaster and building disaster resilience in the event of large-scale disasters. Disaster preparedness refers to activities undertaken prior to the onset of a disaster to improve the response capacities of individuals, households, organizations, communities, and countries. The roles of these units include assessing their disaster vulnerabilities, anticipating problems that may arise in the event of disasters, and improving the ability to reduce disaster impact and ensure efficient and effective responses. In this context, we reviewed the theoretical framework underlying disaster preparedness, vulnerability, and resilience in disaster situations and then examined some of the problems that hinder proper preparation for a prompt and efficient response to the disaster. Based on the findings of the review, we recommended the government to develop programs to ensure effective implementation of disaster preparedness policies for vulnerability reduction and resilience building.

Key words: disaster preparedness, vulnerability, resilience, policy implementation

Ⅰ. Introduction

Why has disaster response failed despite many years of effort to develop a disaster management system? In order to effectively carry out response activities to protect lives and property from disasters, disaster preparedness actions and measures must be preceded. If policy is not prepared in advance, unexpected problems will arise in the

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implementation process. In particular, in the differentiated organizational structure of the modern society, it is required that various agencies and organizations solve problems together as a cooperative system to deal with a disaster. In reality, however, when a crisis occurs, the vulnerability increases rapidly, which leads people to have doubts about whether a crisis and emergency management system operates properly. Even though there is an organizational system to manage the crisis, an organized disorganization exists, which means that after the crisis, it turns out that the system did not work and thus the crisis was not managed effectively (Han & Jeong, 2011: 39-40). Therefore, for a disaster response to be successful, it is necessary that we prepare thoroughly before a disaster occurs.

Why do we analyze disasters and vulnerabilities? The reason lies in creating a sustainable model for developing the economy, developing society, and improving the environment we live (Baker, 2009: 120). If we do not understand what constitutes disasters and vulnerabilities, resilience of disaster-affected individuals, communities, and institutions is limited. Disasters are extreme situations that show people's dependence on external organizations and the environment, the economic and social structure of the community, the resilience of affected groups of stakeholders, and how to deploy knowledge and material resources to reduce vulnerability and increase resilience (Oliver-Smith, 1999). The solution to disaster preparedness, prevention and recovery in Japan could be the same as the US solution, while the solution to Louisiana could not be the same as the Iowa solution. Context matters. Until disasters are perceived as social problems and vulnerabilities are understood as multidimensional concepts, market and policy responses will exacerbate vulnerabilities for people living in the communities affected by natural disasters (Baker, 2009: 120)

Because of the complex and diverse nature of crisis, multiple organizations must participate in the complex and comprehensive efforts to implement crisis and emergency management policies. Crisis and emergency management policy is implemented in a multi-organizational relationship in which two or more organizations work together to achieve their goals (Lee, 2000: 42-44). Therefore, interdependence between organizations involved in the policy enforcement process and participating activists should be considered. The implementation of crisis and emergency management policies by multi-organizations is also influenced by situational variables such as the type of disaster, the characteristics of the region, and the degree of understanding or awareness of the disaster.

As a rational means of action, multiple organizations participating in the disaster management system will consciously allocate resources, interests, and responsibilities in order to achieve policy objectives. Once established, these organizations demonstrate a clear concept of appropriate public action in emergencies. Organizations should be able to adapt flexibly to sudden damage or change while providing continuity in operational procedures. No single organization has the resources, skills or operational capacity to cope with major disasters (Comfort, 1988: 15). Therefore, today's disasters cannot be managed by one organization on their own, and it is desirable for multiple organizations to prepare for disaster together by creating a cooperative system.

The uniqueness of issues, policy design, and implementation problems continue to hinder disaster preparedness efforts. Disaster response mechanisms are not suitable for most potential risks because of the difficulty in identifying risks, defining risks, and communicating information to policy makers and the public in a clear and powerful manner. Crisis managers should therefore develop a range of policy and program options that can provide a standard of competence for minimal preparedness (Waugh, 1988: 111).

Disaster preparedness can be viewed as being prepared to respond effectively to disasters, hazards or other emergencies (Haddow, *et. al.*, 2014: 181). But preparedness should be treated as a matter of penetrating entire disaster management, rather than simply preparing for response. If all agencies, both the government and private institutions, want to measure the effectiveness of the response as a result of a disaster, it is necessary to be prepared. It is also important to note that preparedness is a source of sustainability for the community after a disaster (Cho, 2019: 189). Under uncertainty in the disaster environment, the vulnerability of technical and social systems cannot be fully predicted. Therefore, securing resilience to mean the ability to respond effectively to accidental events and to gently accommodate sudden changes without lethal damage, is essential as one of disaster preparedness (Kim, *et. al.*, 2011: 69).

In this context, the purpose of this study is to review the theories and implementations of disaster preparedness, vulnerability and resilience to suggest policy directions to secure the effective implementation of disaster preparedness policy by minimizing the vulnerability for disaster and building disaster resilience in the event of large-scale disasters.

II. Disaster Preparedness

Disaster management has been discussed around four phases of preventing, preparing, responding to, and recovering from disaster over time (Lee, *et. al.*, 2006: 68; Coppola, 2015: 12-13; Phillips, *et. al.*, 2017: 35-36). Coppola (2015: 12) described the elements as follows: First, prevention reduces or eliminates the likelihood or consequences of harm, or both. Prevention is “treating” risks to lessen society. Second, preparedness includes the use of tools to help people affected by disasters to increase the chances of survival and to minimize the financial and other losses. Third, the response is to take steps to reduce or eliminate the impact of disasters that have already occurred or are currently occurring, to prevent psychological distress, financial loss, or both. Fourth, recovery returns the survivors to its normal state after being affected by the consequences of the disaster. The recovery phase generally begins immediately after a disaster response and continues for months or years.

In a crisis situation, various government agencies and private organizations will be involved in the response process. By integrating the knowledge and expertise of these various institutions and organizations, the most appropriate measures should be determined, timely established, and implemented. However, multi-organizational decision-making structures facing crisis create organized disorders that are characterized as policy confusion, administrative delays, and avoidance of responsibilities (Han & Jeong, 2011: 40). In order to control these negative phenomena and respond quickly and efficiently, it is important to be prepared before disaster strikes.

Preparedness refers to activities undertaken before a disaster to improve the response capacity of individuals, families, organizations, communities, municipalities, and states. But what does it mean to “improve response capacity?”At the most general level, “enhanced response capacity” refers to accurately assessing risks, anticipating problems that may arise from disaster events, and taking appropriate preventive measures to reduce the impact of damage. On the other hand, it refers to the ability of social units to ensure an efficient and effective response (Phillips, *et. al.*, 2017: 140).

Thus, as a crisis and emergency management function, disaster preparedness is the closest activity to the onset of disaster, minimizing damage and improving disaster response. Functionally, although disaster preparedness includes many other activities to implement and verify

emergency plans and prepare for disaster response, it is somewhat overlapping with disaster mitigation and closely linked to disaster planning. The operational model of Integrated Emergency Management System (IEMS) of the Federal Emergency Management Agency (FEMA) defines disaster preparedness as "activity to develop operational capabilities to respond to a crisis" (Waugh, 1988: 113). For example: (1) crisis management organizations; (2) crisis operational planning; (3) resource management; (4) direction and control; (5) crisis communications; (6) alerts and alarms; (7) crisis public information; (8) government continuity; (9) housing protection; (10) evacuation; (11) protective measures; (12) crisis support services; (13) crisis reporting; (14) training and education; (15) repetitive exercises and drills.

Preparedness policy consists of response development activities to prepare in advance for response in the event of a disaster. For example, activities that proactively secure important resources to use in response, secure informed consent from response agencies, train people in response, and develop response plans (Lee, 2000: 77-78). Park (2010: 16) categorized the activities of preparedness policies into natural and man-made disasters. Activities for natural disaster preparedness policies include the implementation of education and training for each type of disaster, the preparation of stockpiling and equipment operation for emergency recovery, resource transport and control plans, resource emergency support measures, establishment of warning facilities and systems, and residents evacuation and emergency broadcast coordination. Man-made disaster preparedness policy activities include disaster response training, establishment of standard operating procedures, identification of relevant agencies by type of disaster, identification of resource holding agencies, and resource transport and control plans, etc.

In the United States, President Barack Obama announced in March 2011 Presidential Policy Directive-8 (PPD-8) that terrorism, cyber attacks, epidemics, and major disasters threaten national security in the 21st century. National Preparedness was announced to systematically protect the country from such threats. The U.S. national readiness has identified 32 core capacities (CCs) as the means to achieve the National Preparedness Goal (NPG) as the highest goal (Rheem, *et. al.*, 2017: 118).

Preparedness is to minimize the negative consequences of a disaster through effective precautions. Preparedness activities can be divided into government preparedness and public preparedness (Coppola, 2015: 276-307). First, government preparedness activities undertaken by administration, crisis management, public health, and service agencies can be generally classified into five categories: planning, exercise, training, equipment, and statutory authority[1]. Second, public preparedness activities are those in which ordinary citizens are empowered to help themselves, their families, neighbors and strangers. Prepared public must have the skills to conduct special activities such as search and rescue, emergency rescue, and fire fighting. Particular attention should be paid to the preparedness phase, where coordination and co-operation in each sector occurs before a disaster occurs (Lee, *et. al.*, 2006: 70). Medical disaster management, for example, is an area where coordination problems arise between organizations and regions, and coordination and cooperation can only be achieved by overcoming social,

1) The various functions that should be addressed in the plan are as follows (Coppola, 2015: 282): Direction and control, notification and warning, evacuation and/or shelter in place, communication, public works, public information, fire suppression, search and rescue, emergency medical services and mass care, mortuary services, security and ambient security perimeter control, inclusion of military resources, transportation, traffic control, relief, short- and long-term recovery, financial management, international coordination, volunteer management, donations management, vulnerable populations, pet and animal response, catastrophic incident response.

economic and political obstacles that make coordination difficult.

Disaster preparedness is an ongoing process of evaluating threats, finding vulnerabilities, and determining resource needs. This includes both efforts to prevent and mitigate negative consequences and to accumulate resources for response and recovery (Pfefferbaum, 2014: 697). Disaster preparedness phase is an operation preparation stage, such as establishing an operational plan for response activities and maintaining the ability to respond to disasters so that they can respond effectively after disasters occur despite prevention activities (Kim, 2015: 365).

Without open and formal support for preparedness efforts, proper disaster preparedness cannot be achieved. Emphasis on prevention and response programs can have a significant negative impact on preparedness efforts[2] (Waugh, 1988: 117). Land use planning, for example, is one of the most intense political issues in state and local governments. Preparedness efforts, including the design and construction of buildings, will minimize public support for the program to the extent that governmental control over the use and development of the land must be strengthened. Disaster preparedness capacity has some proactive plans and efforts to establish a disaster response system before a disaster occurs (Veenema, 2007; Lee & Lee, 2016: 98).

Disaster preparedness consists of activities aimed at improving response and coping skills. We must plan not only to respond effectively to disasters during and after disasters, but also to successfully lead and resolve problems related to short-term and long-term recovery. The Capability Assessment for Readiness (CAR) lists the 13 Emergency Management Functions (EMFs) that should be addressed in disaster preparedness efforts (Sutton & Tierney, 2006: 3-4). ① Laws and Authorities, ② Hazard Identification and Risk Assessment, ③ Hazard Mitigation, ④ Resource Management, ⑤ Planning, ⑥ Direction, Control, and Coordination, ⑦ Communications and Warning, ⑧ Operations and Procedures, ⑨ Logistics and Facilities, ⑩ Training, ⑪ Exercises, Evaluations, and Corrective Actions, ⑫ Crisis Communications, Public Education, and Information, ⑬ Finance and Administration. The central goal of disaster preparedness is to increase the efficiency, effectiveness, and impact of disaster response. However, despite the fact that many institutions are making large investments, the effects have been mixed and the same mistake has been made over and over again (Chrispoplos, *et. al.*, 2001: 195). And why does disaster management fail whenever a major disaster occurs? This is because disasters cannot be completely prevented, and the level of damage is determined by the efforts of various members of society. Nevertheless, trust and legitimacy of the government can be strengthened if the government draws the cooperation of the members of the society and wisely prepares and responds to the disaster situation (Kim & Moon, 2015: 84).

Activities to successfully implement disaster preparedness can be presented in eight dimensions or states: ① hazard knowledge, ② management, direction, and co-ordination of emergency operations, ③ formal and informal response agreements, ④ resource acquisition aimed at ensuring that

2) Disaster mitigation and preparedness can be addressed together. For example, Christoplos, *et. al.* (2001: 185-198) deal with mitigation and preparedness, using the concept of disaster mitigation and preparedness (DMP). It is said to be partially fused because in part, mitigation and contrast are actually closely related. But in the US National Research Council report, mitigation means implementing disasters before they affect them, and providing 'passive protection' when disaster impacts occur. Preparedness implementations, on the other hand, include the development of plans and procedures, the recruitment and training of personnel, and the provision of facilities, equipment and materials needed to provide 'active protection' during a crisis response. Disaster and emergency management scholars and experts distinguish between mitigation and preparedness (Sutton & Tierney, 2006: 4-5).

Table 1. Preparedness dimensions and activities

Dimensions of Preparedness	Associated Activities
Hazard knowledge	- Conducting hazard, impact, and vulnerability - Using loss estimation software, scenarios, census data - Understanding potential impacts on facilities, structures, infrastructure, populations - Providing hazard information to diverse stakeholders
Management, direction, and coordination	- Assigning responsibilities - Developing a division of labor and a common vision of response-related roles and responsibilities - Forming preparedness committee, networks - Adopting required and recommended management procedures(e.g., National Incident Management System) - Providing training experiences, conducting drills, educating the public
Formal and informal response plans and agreements	- Developing disaster plans, evacuation plans, memoranda of understanding, mutual aid agreements, collaborative partnerships, resource-sharing agreements - Participating in broader and more general planning arrangements(e.g., neighborhood and community preparedness groups, Urban Area Security Initiative regional plans, industry-wide preparedness initiatives)
Supportive resources	- Acquiring equipment and supplies to support response activities - Ensuring coping capacity - Recruiting staff - Identifying previously unrecognized resources - Developing logistics capabilities
Life safety protection	- Preparing family members, employees, others to take immediate action to prevent death and injury, e.g., through evacuating, sheltering in place, using “safe spaces” within structures, taking emergency actions to lessen disaster impacts on health and safety - Containing secondary threats, e.g. fire following earthquakes
Property protection	- Acting expediently to prevent loss or damage of property - Protecting inventories, securing critical records - Ensuring that critical fuctions can be maintained during disaster - Containing secondary threats
Emergency coping and restoration of key functions	- Developing the capacity to improvise and innovate - Developing the ability to be self-sustaining during disasters - Ensuring the capacity to undertake emergency restoration and early recovery measures
Initiation of recovery activities	- Preparing recovering plans - Developing ordinances and other legal measures to be put into place following disasters - Acquiring adequate insurance - Identifying sources of recovery aid

※ Source: Sutton & Tierney(2006: 8).

emergency functions can be carried out smoothly, ⑤ life safety protection, ⑥ property protection, ⑦ emergency coping and restoration of key functions, and ⑧ initiation of recovery activities.

Lee & Lee (2016: 96-109) developed a systematic disaster education and training program based on learner capabilities by focusing on disaster preparedness of health workers and identifying factors that affect disaster preparedness. According to the study, disaster preparedness capacity of health center staff was relatively low, and disaster education needs were high. In addition, disaster preparedness was significantly higher in men, level 6, and in disaster education and basic life support (BLS) education experiences. Factors affecting disaster preparedness were gender, experience of disaster education and training, and experience of BLS education.

Kim & Moon (2015: 83-116) categorized disaster management organizational performances into perceived prevention and preparedness outcomes from a proactive perspective and perceived response and recovery outcomes from a reactive perspective. Disaster preparedness is defined as “activity that improves readiness for various organizations and communities to respond effectively to disasters in the short term, before disasters occur” (Donahue & Joyce, 2001: 730), and disaster management organizations. The effects of public-private cooperation and public sector

cooperation on organizational effectiveness were analyzed. According to the research results, disaster management organizations need to establish and operate an organic linkage system with the private sector as well as the public sector related organizations in the entire disaster management process, and improve communication through securing the business continuity of disaster management officials.

Some important points about disaster preparedness should not be forgotten (Phillips, *et. al.*, 2017: 140-143). First, disaster preparedness can be measured at various levels of analysis. Disaster preparedness is important at the individual, family, organizational and community levels. For example, individuals and families can use protective measures, such as first aid kits, to ensure their safety in the event of a disaster. Organizations can develop plans and train staff about what to do in case of emergencies. Communities can prepare for community-wide disaster exercises and launch public education campaigns to inform people about the dangers in the community. At a high level of analysis, countries around the world can enter into mutual aid agreements to provide disaster relief when disaster strikes poor countries such as Haiti. Ultimately, preparedness is a shared responsibility and the entire community should be involved in successful efforts.

Second, we need to know the varying degrees of preparedness. Disaster readiness is not a simple alternative to indicating that a household, organization, and community is either prepared or not prepared. Preparedness ranges from low to high, with some social units doing little or no countermeasures and others taking as many preventive measures as possible. Of course, most households, organizations, and communities fall somewhere between the two extremes and unfortunately, many lean toward the lower end of the continuum. Levels of preparedness vary over time and across locations.

Third, we do not have a standardized measure of disaster preparedness at the level of community, municipality, national and international analyses. At the family level and organizational analysis level, researchers need to be aware of the various factors in order to use checklists to measure disaster preparedness. Moreover, at higher levels of analysis, such as communities and countries, disaster preparedness is much more difficult to measure because issues such as political systems or intergovernmental relations, priorities of crisis and emergency management functions, and social and financial capital must be considered.

Fourth, we must consider disaster preparedness in a cultural context. Culture is a central feature of all societies that strongly influences individual behavior. When talking about culture, sociologists and anthropologists distinguish between material and nonmaterial elements. Material culture includes clothing, homes, tools, stories, monuments, and physical objects. Nonmaterial cultures are shared values, moral beliefs about what is right or wrong, norms and rules, traditions, and sense of unity. Of course, the two elements of culture are very closely related. For example, in the United States, individualism, competition, and material achievements are reflected in the kind of cars people drive, homes and places.

Ⅲ. Disaster Vulnerability

In the early 1970s, researchers found that the number of natural disasters was roughly the same, increasing human and material losses in disasters. They also found that disasters of the same magnitude could produce dramatically different results. If costs and losses increase even though the number of natural disasters is the same, it is inferred that the cause of such a consequence is the social system. They realized that most vulnerable people are more likely to suffer from disasters. The living conditions of the poorest,

most ill, most dependent and most marginalized inhabitants increase their direct and indirect exposure to the social, economic, political and psychological consequences of disaster events as well as physical hazards (Gillespie, 2010: 8). So, the concept of vulnerability began in the early 1980s as a way to reduce losses from disasters[3].

Wisner (2004) categorized approaches to vulnerability analysis from disaster into four categories: demographic approach, taxonomic approach, situational approach, contextual and initiative approach (Baker, 2009: 116-117). Each of these approaches has implications for policy. First, the demographic approach suggests that vulnerability is a condition and that everyone in a particular social category, such as women, African Americans and the elderly, is vulnerable (e.g.: Commuri & Ekici, 2008). Demographic approaches help to identify those who need help, but the premise of identifying vulnerabilities for demographic groups is fundamentally flawed (Baker, *et. al.*, 2005; Bankoff, 2001; Cardona, 2004; Escobar, 1995; Fordham, 2004; Wisner, 2004). Demographic approaches in vulnerability analysis reduce people to "a homogeneous, culturally undifferentiated human population that is diversely combined in terms of helplessness, passivity, ignorance, hunger, illiteracy, desire, oppression and inertia" (Bankoff, 2001: 23). This is a narrow definition of one person and identification of one's identity, which limits human potential and makes individuals trivial in these groups (Sen, 1999: 8).

Second, the taxonomic approach is the second major method of vulnerability analysis. Classification systems based on commonly recognized causal tasks are used to describe different types of vulnerabilities; physical (e.g., living in disaster-prone areas), economic (e.g., need for ongoing assistance), social (e.g., tourist accidents at hazardous area, proportion of female heads), and provision of information (e.g. crisis response training), environmental (such as deforestation), or personal (such as tourists or renters). Wisner (2004) considers the taxonomic approach to be more advanced than the demographic approach, but still considers vulnerabilities as one-dimensional constructs, and again there seems to be confusion between risk and vulnerability constructs.

Third, the situational approach treats vulnerability as a multidimensional concept and as a dynamic process rather than as a static state as in demographic and taxonomic approaches. In this approach, vulnerability is not a characteristic of any group but a consequence of economic, social and environmental conditions. For example, "it is not the gender of women that characterizes vulnerabilities, but the gender under certain circumstances" (Anderson-Berry, 2003: 16). The situational perspective also considers vulnerabilities as temporary factors by recognizing that vulnerabilities may be temporary. In other words, vulnerabilities are seen as being fluid and socially constructed rather than fixed and objective. The main criticism of the situational approach is that findings from one disaster situation cannot be generalized to another. While the outcomes of one disaster cannot be identified with another, it can generalize the framework for analysis and provide useful guidance for marketers and public policy makers.

Fourth, the fourth approach to vulnerability analysis in disaster research is the "contextual and proactive" approach. In this approach, community members know their strengths and weaknesses, but outsiders do not. Community members also decide what risks to live with and what risks need to be managed. The philosophy and methods of participatory

3) The concept of vulnerability was first introduced from vulnerability research by Kenneth Hewitt (1983), Cuny (1983), Wijkman & Timberlake (1984). Some researchers have criticized the vulnerability perspective for dismissing individual responsibility and oversimplifying the vulnerability. For example, vulnerabilities are simply measured in proximity to hazard zones, such as living in flooded areas (Gillespie, 2010: 5).

behavior research (Ozanne & Saatcioglu, 2008) and deliberative democracy (Ozanne, *et. al.*, 2009) are consistent with this approach to vulnerability analysis. This approach takes into account the voices of underrepresented groups. The biggest drawback, however, is that many people are constrained by short-term time orientation and daily activities, making it difficult to participate in self-protection or capacity building opportunities (Viswanathan, *et. al.*, 2009; Wisner, 2004).

Recently, disaster researchers seem to move from demographic and taxonomic analysis to the situational approach (Wisner, 2004). As disaster researchers expose more social inequalities, it is likely that community-based participatory approaches will be mixed with situational approaches. For example, when Hurricane Katrina struck New Orleans in 2005, 30% of the population lived in poverty, and one in three people did not own a car, relying on external factors for protection (Bolin, 2007). Therefore, the daily situation of the New Orleans population prior to the hurricane formed the response and safety awareness of New Orleans citizens. Lessons learned from Katrina and other disasters will affect the development of the concept of vulnerabilities and the development of groups that have the right to define vulnerabilities and their solutions (Baker, 2009: 117).

Based on these discussions, it is necessary to use the perspective of vulnerabilities in disaster preparedness. First, what we can do about natural risks is limited, but by reducing vulnerability, overall disaster damage is reduced. Second, vulnerabilities are associated with all risks, not just the type of disaster. Third, because vulnerabilities change constantly, they need to be reevaluated periodically. Fourth, there are parts that can eliminate or reduce vulnerabilities in each disaster cycle, and the removal or reduction of these vulnerabilities can lead to the reduction of human injury and material damage. Disasters are post hoc and uncertain, so they cannot be completely prevented. Therefore, in order to minimize the impact of disasters and to ensure effective and timely recovery afterwards, it is a direct means to reduce or eliminate vulnerabilities of people and communities before disasters occur (Kim & Hong, 2017; Yang, 2016; Gillespie, 2010; Kim & Hong, 2018: 27). If a risk factor exists inside an organization, vulnerability analysis can be understood as a process of identifying the cause of the risk factor that can develop into a real risk. In this case, vulnerability analysis can be defined as investigating, identifying, evaluating and classifying vulnerabilities such as personnel, equipment, facilities, information, business operation procedures and administration, etc. (Seo, *et. al.*, 2015: 358).

Ⅳ. Disaster Resilience

In disaster-prone communities, the entire community suffers from both direct and indirect damage. Disasters impact across many sectors of society and affect them for a long time.

Disaster impacts not only result in material-based destruction and loss of life, but also range from people's mental shocks, to disrupting family and community trust, to political fluctuations, the collapse of local economies, and changes in social consciousness. Hence disaster should be understood as a multi-dimensional impact on society beyond mere physical phenomena (Choi, 2017; Sung & Choi, 2018: 89).

The concept of resilience is increasingly important as a way to comprehensively protect individuals, families, communities, or society from potential hazards, regardless of the type of disasters, natural or man-made (Bragdon, 2014: 712). At the same time, resilience in the field of disasters is defined at various levels, such as the physical, ecological and social sectors, as well as in cities,

communities and individuals. This definition emphasizes the ability to adapt successfully in the face of confusion, stress, and adversity (Kim, *et. al.*, 2011: 66). The community's resilience to disasters can be seen as setting steps for reconstruction and recovery, while limiting negative consequences by adopting and implementing measures to prevent, mitigate, prepare and respond to disasters (Pfefferbaum, 2014: 697). Also, resilience in the field of disasters is defined at various levels, including the physical, ecological and social sectors, as well as in cities, communities and individuals. This definition emphasizes the ability to adapt successfully in the face of confusion, stress and adversity (Kim, *et. al.*, 2011: 66).

The initial concept of resilience focused on how well a system returned or reorganized to restore stability after stress or disturbances in the ecosystem, processed materials, or personal psychology. For example, in the field of nature and ecology, resilience is defined as the ability to self-clean when pollution or small changes occur in the natural environment and ecosystem (An, *et. al.*, 2017: 17). In recent years, social scientists have adopted this concept and applied it more widely to the human community in relation to disasters. Since the magnitude of natural disaster impacts is a function of both natural and man-made factors, resilience to disasters often takes into account input from both domain factors. In Bakkensen, *et. al.*(2017: 983), disaster resilience emerges from a number of policy actors, including individuals, governments and private markets and from various sub-disciplinary or sub-community systems of economic networks, social networks, infrastructure networks, and institutional networks. Resilience means that a system can continue and function more successfully during a disaster, compared to a relatively less resilient counterpart. These main elements are highlighted in two definitions (refer to Bakkensen, *et. al.*, 2017: 983). First, the National Academy of Science defines disaster resilience as "the ability to prepare for, plan, absorb, recover, and adapt more successfully to disasters." Secondly, the Intergovernmental Panel on Climate Change (IPCC) defines disaster resilience as "guaranteeing the preservation, restoration and improvement of the basic structure and function of the system" and "the ability of systems and their sub-components to effectively predict, absorb, control, and recover from disaster impacts."

In fact, what we worry about is how society can have stronger resilience from the threat of disaster. However, the concept of reinforcement can be discussed on the premise of maintenance. As resilience reinforcement is possible based on the maintenance of the resilience system, it is necessary to consider the reinforcement strategy. It is also necessary to discuss "what is the minimum to avoid the collapse of the regime?" (Kang, 2017: 24).

It is important to build communities with disaster resilience to effectively respond to unpredictable and frequent disaster situations. Its components include social, economic, human, institutional (Cho, 2019: 190-191), and operating capital. First, social capital acts to buffer the impact or negative effects of the external environment based on trust and norms. In social relationships that are cared for and readily available when needed, individual voluntary interactions enhance disaster resilience through disaster response and recovery planning processes.

Second, economic capital enhances resilience through regional economic stability and diversity and equitable distribution of resources. Regions with high economic stability are relatively easy to access to a variety of resources, including financial resources, and are less likely to be exposed to risks than regions with low economic stability.

Third, human capital is either innate or acquired, and the more productive populations in the community, the better is the capacity to build resilience. Residents'

Table 2. Components of disaster resilience

Components	Main contents
Social Capital	- Social capital buffers the shock and negative effects of the external environment based on trust and networks - In social relationships that are cared for and readily available when needed, individual voluntary interactions enhance disaster resilience through disaster response and recovery planning processes
Economic Capital	- Economic capital improves resilience through regional economic stability, diversity and equitable distribution of resources - Regions with high economic stability are relatively easy to access to a variety of resources, including financial resources, and are less likely to be exposed to risks than regions with low economic stability
Human Capital	- Human capital is either innate or acquired, and the more productive populations in the community, the better is the capacity to build resilience - Residents' education levels, their knowledge, skills, diverse experiences and health improve their skills associated with disaster response, adaptation and recovery - The lower the elderly, disabled, and migrant population, the higher the resilience
Institutional Capital	- Institutional capital has many problems such as livelihood or loss of residents when disasters occur, and the system for disaster response and management of residents becomes a major concern - It is important that communities anticipate impacts they have not experienced in the past and implement proactive disaster management
Operational Capital	- Operating capital means having the necessary equipment, systems, and manpower necessary to efficiently respond to and recover from a disaster when a disaster occurs - The more equipment, systems, and manpower, the higher the disaster resilience

※ Note: Cho(2019: 190-191) describes social capital, economic capital, human capital, and institutional capital as a measure of disaster resilience. In this paper, operational capital is added as a measure.

education levels, their knowledge, skills, diverse experiences and health improve their skills associated with disaster response, adaptation and recovery. The lower the elderly, disabled, and migrant population, the higher the resilience.

Fourth, institutional capital has many problems such as livelihood or loss of residents when disasters occur, and the system for disaster response and management of residents becomes a major concern. It is important that communities anticipate impacts they have not experienced in the past and implement proactive disaster management.

Fifth, we need operational capital along with these four components to build a community with disaster resilience. Operating capital means having the necessary equipment, systems, and manpower necessary to efficiently respond to and recover from a disaster when a disaster occurs. The more equipment, systems, and manpower, the higher the disaster resilience.

In addition, because of the various purposes and methods of introducing resilience, different resilience components have been considered for each field using resilience. However, there are functional objectives of resilience that are common in all areas: robustness, redundancy, rapidity, resourcefulness, and regional competence (Kim, *et. al.*, 2011: 67-68; An, *et. al.*, 2017: 18). First, robustness refers to the durability of the system to withstand external shocks. The fundamental element of the system is the ability to withstand damage from external shocks. Second, redundancy means that there are functionally similar and replaceable resources. Third, rapidity refers to the ability to quickly recover a system by setting recovery priorities and targets in order to shorten the damage period after the damage occurs. Fourth, resourcefulness refers to the ability to diagnose and prioritize problems and to place various recovery resources in place. Fifth, regional competence refers to the ability to adapt to environmental changes, including understanding of risks, collective action, decision making, and problem solving. Thease can be gained through training and on the basis of unity and risk perception and disaster experiences created by community trust, autonomy, cooperation, participation, and communication.

How do we improve disaster resilience while disaster types have become more complex and uncertain. It is

Table 3. The functional objectives of resilience

Functional objectives	Factors of function
Robust	- Natural environment safe from disaster - Durability of infrastructure and buildings - Robust economic structure
Redundancy	- Replaceable infrastructure - Surplus resources and finance - Diversity (economy, communication means, etc.)
Rapidity	- System (plan, management) - Information (rapid and accurate delivery and sharing) - Resource transport
Resourcefulness	- Securing resources (disaster relief supplies and equipment, information, technology, finance, personnel) - Resource management (leadership, planning, prioritization, assessment, equity) - Resource management (resource monitoring and deployment)
Regional competence	- Unity (trust, autonomy, cooperation, participation, communication) - Adaptation (risk awareness, disaster experience) - Education and training

※ Source: Kim, *et. al.*(2011: 68).

necessary to find resilience determinants and suggest ways to improve them. Resilience determinants can be divided into physical, social, economic, administrative and institutional, and human capacity (Lee & Kwon, 2017: 482-483).

First, physical capacity refers to a basic disaster response infrastructure that can respond to and recover from disasters. Second, social capacity is the invisible capital of the community, which means social capital. Third, economic capacity refers to the system's ability to continue production and maintain its original function in the event of a disaster. Fourth, administrative and institutional capacities refer to the workforce, budget, and system that local governments will use for disaster management. Fifth, human capacity refers to the people and resources that can be mobilized to restore disasters. In addition, it is necessary to consider a cooperative network because local governments are limited in responding to and recovering from disasters due to recent disaster uncertainty and difficulty in forecasting.

Kang (2019: 218) suggested that disaster response is not a social institution or a technical dimension, but a continuous and repetitive problem solving process by building an integrated system of humans and technology through a convergent and complex approach such as humanities, society, environment, technology, and education. It was argued that it should be prevented. In this context, he emphasized the need for strong leadership and coordination to strengthen resilience, clarification of responsibility for disaster risk management, and stakeholder engagement. He also insisted on strengthening the capacity of institutions related to resilience, strengthening social connections and helping each other through community disaster safety training and multi-media channels.

Lee & Kwon (2017: 475-509) asked the question, "How do we measure resilience?" They suggested that it is necessary to reduce resilience costs. The dependent variable of the study, "resilience cost," had a meaning that if the damage from disasters has been centered, it should include the amount of recovery in the future. In other words, the cost of resilience should be viewed as the sum of total damage (Systemic Impact) and Total Recovery Effort (RC = SI + α × TRE). The independent variables were used local government's administrative and policy capacities, physical and human capacities, and social and economic capacities. The main implications of this study are as

follows. First, the higher the level of cooperative networks in the disaster sector that local governments are building up, the more positively they will have in improving resilience. Second, local governments making manuals assuming a variety of disaster situations contribute to the improvement of resilience, from simple precautions to post response and recovery. Third, interaction among local people is an important factor in improving resilience.

Cho (2019: 195-196) found that disaster preparedness activities and disaster resilience directly influenced the effectiveness of disaster management. In particular, community disaster resilience is effective in enhancing the effectiveness of preparedness activities. Therefore, a comprehensive community approach that considers the disaster resilience of the local community in disaster preparedness activities will contribute to securing the effectiveness of disaster management.

V. Directions for Effective Implementation of Disaster Preparedness Policy

1. Trust Relationship and Community Network Building

Disaster damage can be more serious in underdeveloped countries, which lack resources to prepare for disasters and lack infrastructure to mobilize resources. However, disasters can not only negatively affect the community, but also allow for further development. This is because disaster-affected societies can exercise their own coping skills and strengthen community unity (Park, 2009; Sung & Choi, 2018: 89-90). Therefore, social unity and community involvement were recognized as the main factors for successful disaster management. Training programs have been found to help strengthen preparedness capabilities. This requires social unity and promotes social integration, gender equality and community involvement (Kang, 2019: 218). Building a trust network will affect strengthening resilience to ensure safety from the crisis. Kwon & Kim (2016: 181) found that the higher the national corruption index and the lower the economic independence, the weaker the national crisis. In addition, countries with transparency and honesty and high economic independence have secured safety from the crisis[4]. In particular, from a resilience perspective, social capital, such as trust, communication and unity among local people, plays a more important role in the post-disaster recovery process. Because disaster prevention and preparedness mainly revolve around activities such as government analysis, forecasting, and training, the recovery process is limited only by government resources (Lee & Kwon, 2017: 505).

2. Economic Support

In disaster management, it is necessary to recognize disaster preparedness policy as one of the main policy processes and to develop an environment to strengthen local governments' capacity to prepare for disasters. To this end, it is desirable to encourage local governments to increase their capacity to cope with natural and human disasters and to engage the civil society sector in their communities in their efforts to prepare for disasters. To this end, it is necessary for the central government to provide subsidies, an economic support for disaster preparedness, to prepare for preparedness activities. In the United States, for example, FEMA has a Grant Program Directorate. The division is responsible for the strategic and effective implementation and management of federal assistance, FEMA grants, aimed at improving capacity and reducing risk for natural and man-made disasters[5] (We,

4) Kwon & Kim(2016: 167-184) has cross-checked the national corruption index, GDP index, and World Risk index by organizing top 20 and bottom 20 countries to determine the ranking for each country.

et. al., 2012: 41). The areas of application of disaster preparedness grants to strengthen disaster preparedness capabilities are as follows: diagnosis and evaluation of disaster preparedness, establishment of disaster response plan, establishment and operation of disaster preparedness organization system, establishment of plan for purchase and utilization of disaster response and recovery equipment, disaster management training and practice, disaster prevention and mitigation plan, disaster risk diagnosis and evaluation projects.

3. Expert Training and Support

In order to respond effectively to large-scale disasters, it is usually necessary to train experts in disaster preparedness in the community. In the unlikely event of a major disaster, we realize that there is a shortage of disaster response organizations with experts. For example, after the Great East Japan Earthquake occurred in 2011, Japan again recognized the importance of community-based disaster management systems for large-scale disaster response. In Japan, the standing fire-fighting administration is relatively systematic and has played an important role in disaster response. But in the event of a major disaster, we knew there was an absolute lack and limitation of standing fire-fighting. In such a situation, it was concluded that the volunteer fire-fighting group was in close contact with the community and would contribute greatly to the effective response to disasters (Choi & Choi, 2018: 90).

4. Enhancement of Legal and Organizational Structure

In order to effectively implement disaster preparedness policy and ensure the effectiveness of disaster preparedness policy, it is necessary to establish a systematic organizational structure and establish procedures to clearly perform disaster preparedness work (Kang, 2019: 217-218). To improve the organizational structure, leadership, job separation, mechanisms of communication, effective communication between stakeholders, well-defined disaster mitigation strategies, laws, regulations and policies, and so on. For establishing a systematic organizational structure, it is necessary to accurately identify the specific functions and roles that a disaster preparedness policy should implement.

5. Demand-Driven Policy Design

Coordination and support between government ministries involved in disaster management should consider the expertise required to meet the diverse needs of policy makers. For this reason, for example, from a gender point of view, the Ministry of Gender Equality and Family, which can provide professional assistance to disaster victims and affected families, should be included in coordination and support. The development of various plans related to disaster management, and the details of specific disaster management policies and laws related to disaster relief should also be supplemented and improved in accordance with the needs of policy consumers (Song, 2015: 167-168). But even in the statistics of disaster victims, there has been little interest in who they are under the name of disaster victims, including death and missing persons, disaster victims, and injured people. Even victims who have experienced the same disaster have no knowledge of how they cope and act on them, and how they recover from their daily lives. Thus, policies that do not take into account the differences in disaster management demand may result in unsatisfactory or unintended discriminatory consequences

5) The types of disaster-related grants managed by the Grant Program Directorate of the US FEMA are as follows; Homeland Security Grant Program, Assistance to Firefighters, Emergency Management Performance Program, Intercity Passenger Rail Security Grant Program, Non-profit Security Grant Program, Port Security Grant Program, Transit Security Grant Program, Tribal Homeland Security Program (We, *et. al.*, 2012: 41).

(Hwang, 2015: 194). It is necessary to establish and enforce future disaster preparedness and response systems and support policies.

Ⅳ. Conclusion

Sustainable models of disaster reduction and recovery policies will recognize that networks of actors in the market, consisting of businesses, NGOs, governments, and consumers, share a risk and vulnerability experience (Baker, 2009: 120). Understanding the community's resilience and vulnerability to disasters ranks high in policy priorities worldwide. Corporations, governments, and not-for-profit organizations are investing time and resources in many areas to measure and improve resilience (Bakkensen, *et. al.*, 2017: 999). Therefore, for effective disaster preparedness, various efforts should be made to assess resilience and vulnerability, while developing resilience and vulnerability indicators. In disaster preparedness policy, the development of indicators can be used to address social, economic, physical, and human disaster resilience as well as prevention, preparedness, response, and recovery phases along the disaster cycle in order to protect communities from disasters and respond quickly and efficiently. In this context, this study reviewed the previous literatures on disaster preparedness, vulnerability and resilience to suggest policy directions to secure the effective implementation of disaster preparedness policy by minimizing the vulnerability from disaster and ensuring disaster resilience in the event of large-scale disasters. The main findings are as follows.

First, disaster preparedness policy is a response development activity to prepare for the response in the event of a disaster and to minimize the negative consequences of the disaster. Disaster preparedness policy encompasses both efforts to accumulate resources to prevent and mitigate negative consequences, while efficiently implementing response and recovery.

Second, it is necessary to use the vulnerability perspective for disaster preparedness. Through vulnerability analysis, it is necessary to identify the causes of human injury and material damage, while also investigating, identifying, evaluating and classifying vulnerabilities in personnel, equipment, facilities, information, business operations and administration.

Third, resilience means a positive force to overcome trials and hardships, and it is also the ability to adapt against the changing circumstances and use them in a favorable way. In order for a community to have resilience from disaster, it is necessary to have social capital, economic capital, human capital, institutional capital, and operational capital.

Fourth, we need to identify the functions and activities of disaster preparedness and improve specific contents for successful disaster preparedness: ① hazard knowledge, ② management, direction, and co-ordination of emergency operations, ③ formal and informal response agreements, ④ resource acquisition aimed at ensuring that emergency functions can be carried out smoothly, ⑤ life safety protection, ⑥ property protection, ⑦ emergency coping and restoration of key functions, and ⑧ initiation of recovery activities.

In reviewing the existing studies, we have identified the need for community disaster resilience to affect the effectiveness of disaster preparedness activities. Also strengthening resilience requires leadership, coordination, and disaster management responsibilities. In order to improve disaster preparedness, communities need to implement disaster education, ensure organic links with the private sector as well as the public sector, and improve communication among disaster management officials.

Based on the findings from the literature review, we suggested the following directions for the effective

implementation of disaster preparedness policy. First, based on community trust and network building, community unity and participation, social integration and gender equality contribute to disaster preparedness. Building a trust network will affect strengthening resilience to ensure safety from the crisis. From a resilience perspective, social capital, such as trust, communication, and unity among local people, plays a more important role in the recovery process after a disaster.

Second, it is necessary to restructure the environment in order to strengthen disaster preparedness. To this end, it is desirable for the central government to provide economic support to promote disaster preparedness. The disaster preparedness applications to strengthen disaster preparedness capabilities are as follows: ① diagnosis and evaluation of disaster preparedness, ② establishment of disaster response plan, ③ establishment and operation of disaster preparedness organization system, ④ establishment of plan for purchase and utilization of disaster response and recovery equipment, ⑤ disaster management training and practice, ⑥ disaster prevention and mitigation plan, ⑦ disaster risk diagnosis and evaluation projects.

Third, developing disaster preparedness experts is critical to the emergence of disaster preparedness capabilities. In order to respond effectively to large-scale disasters, it is usually necessary to train experts in disaster preparedness in the community. In the unlikely event of a major disaster, we realize that there is a shortage of disaster response organizations with experts.

Fourth, we need to develop a legal system and organizational framework to implement disaster preparedness policies to strengthen disaster preparedness. Without a legal system and organization, it becomes impossible to enforce a disaster preparedness policy. For establishing and improving the legal and organizational system, it is needed to get leadership, job separation, mechanisms of communication, effective communication between stakeholders, well-defined disaster mitigation strategies, laws, regulations and policies, and so on.

Fifth, disaster preparedness policies should be established to reflect the diverse needs of the people. Policies that do not reflect public demand for disasters or that do not account for differences in demand will not effectively respond to disasters or experience policy failures.

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