

Analyzing the Influencing Factor for Enhancing Effectiveness of Disaster Management System*

- Local Government Officials' Perception -

재난관리체계의 효과성 제고를 위한 영향요인 분석

- 지방자치단체 공무원의 인식을 중심으로 -

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Abstract

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The purpose of this study is to conduct empirical analysis on the public servant's perception on disaster management of local government, examine the effectiveness of disaster management system and influencing relationship between the main variables, and suggest the improvements methods. To accomplish the purpose, this study selected variable in fields such as law, system, work processing, and cooperation which are closely related to disaster management system. This study conducted regression analysis by setting effectiveness of disaster management system as a dependent variable and the analysis result showed that the independent variable of each field had positive (+) influence. Based on above analysis results, this study suggested the following measures for improving the effectiveness of disaster management system in the local government. First, to improve the effectiveness of disaster management system in terms of legal system, the local government-centered ordinance infrastructure should be secured. Second, in terms of work processing, practical manual considering the regional characteristic is required. Third, in terms of cooperation, the system for supporting cooperation between local government and private organization should be established and horizontal decision-making and cooperation system should be established between the central government and the local government.

Keywords: local government, disaster management system, effectiveness, influencing factor

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I. Introduction

Urbanization, industrialization, and complicatedness of environment and advancement are regarded as the biggest characteristics in modern era. This means that malfunction of advanced facilities or safety management system in one specific area might cause collapse of the systems in entire society. This is proved by the cases of Sewol Ferry in 2014, MERS in 2015, fires at Jecheon sport center in 2017, and fire at Sejong hospital at Milyang in 2018. Huge scale disasters that cause many casualties and property damages continue to occur along with increasing intensity. Such disaster damages indicate the insufficient disaster safety management system in Korea. Therefore, there has been a demand to solve such issues. Of course, starting from the accident of Sewol Ferry, many of the safety issues that were not found with growth and development along with improved recognition of citizens on the safety in our society have emerged. However, there are still many of the disasters including the accident of children commute bus, paralysis in public transportation system, fire at nursing homes for the seniors, and sink hole due to ground subsidence. It is not possible to deal with such diverse disasters only with the ability of central government (Jaeun Lee, 2015a; 2-3). Hereupon, it is required for all the members in local government and community as well as central government to make an effort to establish safe society.

In such a reality, general natural disasters and social disasters except for the specific and traditional security risk such as war occur in the local areas. Therefore, the role of local community is important. Disaster management system in the past was able to predict the severity of disaster damage and was based on the order and control from central government that was appropriate with a small scale type of single disaster (Soyun Won, 2013; 16). However, disasters occurring in modern era are difficult to effectively cope with due to the large scale, complicatedness, and impossibility of prediction. Especially, first response is important to minimize the disaster damage when it occurs. Therefore, role of local government has been emphasized to perform the first actions and prepare for the disasters in the field (Hoonrae Lee, 2015; 128). Now, central government shall focus on the role of an adjustor of disaster management policies with concentration on the support - connection - collaboration for overall disaster management in the nation instead of direct disaster management service supplier. In addition, local government shall focus on internalizing the disaster safety management system in society (Jaeun Lee, 2015b, 113).

Disaster safety management system in local government is influenced by the legal regulations, organizations, and environment. Therefore, legal and institutional foundation is required for efficient disaster safety management system. In addition, disaster safety management system is a system that performs activities in interaction with environment according to the systematic structure based on the work procedures. When such disaster safety management system is performed seamlessly, it is possible to protect citizens from disasters and secure the foundation to improve the quality of lives.

Hereupon, the purpose of this study is to empirically analyze the recognition of public servants in the field of disaster management in local autonomous communities, identify the influential relationship of major variables and effectiveness of disaster safety management system, and derive solutions for the improvement. Hereupon, this study has chosen variables in the areas of law/policies, work process, and cooperation that were closely related to disaster safety management system.

II. Review of previous studies about disaster safety management system

1. Significance of Disaster Management

The common attitude of the group leader is “I cannot see a crisis, so it does not exist”. Such attitude is similar to Smokers’ Syndrome. In Smokers’ Syndrome, smokers never feel that they would get a cancer although there are general evidences of higher cancer rate in smokers. Similarly, most organizations still don’t pay attention to development of contingency plan although there are evidences of surrounding crisis. Some organizations even reduce the efforts on training the workers of crisis management measures. All high-rank managers in public sectors and private sectors believe that the workers can respond to the disaster without any prior training (Booth, 1991: 117). It is important to have systematic efforts on disaster management even on the regular days without disaster. However, disaster management is more complicated and comprehensive than the conventional thoughts on disaster management. The government’s most important role is to protect the life and property. Such role includes not only crisis-reactive response but also finding the measures for preventing the problem and getting well-prepared for

disaster. The comprehensive approach for disaster management can be described in 4-stage cyclical process. The 4-stage cyclical process is composed of pre-disaster mitigation/prevention, pre-disaster preparedness, disaster response, and post-disaster response or recovery (Cigler, 1988: 39).

The disaster management system of Korea is composed of 4 stages including prevention stage, preparation stage, response stage, and recovery stage for comprehensive management of disaster¹⁾. The prevention stage and preparation stage place before disaster. The prevention stage is composed with activities of evaluating the risk toward disaster and reducing the risk factors. On the other hand, preparation stage is composed with activities of developing operation ability for responding to the disaster. The response stage take place after the disaster and it involves direct activities of disaster management institutes for minimizing the disaster damages. The recovery stage is the long-term continuous activities where measures necessary for recovering to pre-disaster conditions are taken(Jae Eun Lee, 2018:239-242; Sun Hee Yun. et al., 2015: 382-383; Chan Suk Choi, 2014: 574-575; Gi Geun Yang, 2010: 123; Hee Cheon Choi, 2010: 210-214).

The disaster management system in Korea has been improving based on the process of solving the problems which occurred during the disaster response. The early disaster management system focused on natural disaster. Then, the initial disaster management system was revised after the increase of man-made hazards in 1990s. After the Daegu Subway Fire Accident in 2003, the problems of disaster management system were reviewed and the system was revised to integrated disaster management system (Cha Min Yeo, 2014: 441). Also, Sewol Ferry Accident revealed the inadequate early response of the government and problems in fragmented disaster management system. In response, the government reformed the government organizations, established Ministry of Public Safety and Security, and integrated functions to strengthen the function as control power (Sang Min Shin·Hee Kyung Park, 2015: 12; Jae Hyun Bae·Young Won Park, 2014: 321; Cha Min Yeo, 2014: 442). To strengthen national disaster response capacity and establish organic and systematic system between the central government and local government, the government

1) Godschalk(1991: 156) defined the four phases of comprehensive emergency management: ① mitigation: actions taken to eliminate or reduce the degree of long-term risk to human life and property from natural and technological hazards; ② preparedness: actions taken in advance of an emergency to develop operational capabilities and facilitate an effective response in the event that an emergency occurs; ③ response: actions taken immediately before, during, or directly after an emergency occurs, to save lives, minimize damage to property, and enhance the effectiveness of recovery; ④ recovery: activity to return vital life support systems to minimum operating standards and long-term activity designed to return life to normal or improved levels.

integrated Ministry of Public Safety and Security and Ministry of Government Administration and Home Affairs to establish Ministry of Interior and Safety and established Disaster and Safety Management Headquarters in the Ministry of Interior and Safety.

The disaster management system has the characteristic of integrity, learnability, cooperation, and redundancy. The integrity refers to comprehensive disaster management through active information exchange between the government organizations in charge of disaster management. Learnability implies that it is difficult to make prediction on disaster environment and that disaster management organization should have a structure of learning organization for adapting to and controlling the environment. Cooperation implies that disaster management involves diversity and complexity between or within organizations and that cooperative network should be established for effective disaster response. Redundancy is the significant characteristic for response to uncertainty of disaster environment. In case of malfunctioning of certain disaster management organization, the extra organization replaces or supports the function of disaster management organization (Kyung Suk Chae, 2004: 134-135; Chang Won Lee et al., 2003: 13-20; Tae Yun Kim, 2004: 12-16; Jun Chan Kim·Tae Yun Kim, 2002: 13-16).

2. Disaster safety management system by local government

Although a nation holds the ultimate responsibility for policy related to disaster management, protection of the citizen's life, body, and property is not a exclusive duty of a nation. In accordance with Article 2 of Fundamental Act on Disaster and Safety Management, the disaster management policy is specified as the primary responsibility of the local government. Thus, the disaster management activities in the local regions are unique and independent duty of the local government based on authority and responsibility (Bong Chul Kim, 2014: 133-134). Therefore, both central government and local government holds distinct duty toward the disaster and play important role in disaster management. Especially, in the early stage of disaster, the local government is the official institute in charge of disaster management which stands on the first line to perform disaster management. Also, the central government supports the local government in such situation (McLoughlin, 1985: 165).

Hereupon, citizens in local areas are expecting for local autonomous communities to perform the activities and measures needed for disaster management in each stage. In

addition, they are wishing that disaster safety management system is to be operated in the direction for minimizing the disaster damage from organic cooperative system with related organizations and local autonomous communities with actions required in each stage (Donggyun Park, 2012: 134). Therefore, the local government should play the key role in disaster management system by evaluating the factors which may threaten the public security, identifying the vulnerable factors, and securing the necessary resources for effective response and quick recovery (Henstra, 2010: 236). UNISDR define resilience as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”. The resilience of a community in respect to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need (Platt, et. al., 2016: 448).

Local government is serving a role of primarily coping with all the courses in disaster management including the stages of prevention, preparation, coping, and restoration and proceeding direct actions in the field. Local government is performing their duties by constituting disaster management organization in a similar form with central government. However, capacity of local government for disaster management is insufficient compared to central government executing passive disaster management policies for performing instructions from the management and control of central government (Gyungho Kim, et al., 2012, 132).

In the disaster management system, it is necessary to convert passive role of the local government into active role. Due to characteristics of modern society such as urbanization, modernization, complexification, and densification, the central government has limits in managing all disasters. To overcome such limitation, the disaster management system should be internalized in society at large and the role of local government is significant for such internalization (Jae Eun Lee, 2018: 319). Recently, multiple hazard management method has been suggested for disaster management and the method refers to integrated or coordinative approach which covers all range of disasters that are vulnerable to be one-sided (Cigler, 1988: 42). Also, the conceptual direction of disaster management should be modified to make the local government to play active and independent role in disaster management system. For active and independent role of the

local government, the disaster management strategy should change into following direction : Reactive to disaster to proactive measure, hazards to vulnerability, government-led single agency to partnership with private and public fields, responsive disaster management to general disaster management, science-driven approach to multidisciplinary approach, planning for communities to planning with communities, and one-sided communication to communities to communicating with communities (Pearce, 2003: 213). Also, the study of Haddow, et. al. (2014: 373) discussed about future disaster management direction and claimed that it is necessary to enhance the people's awareness on the risks in the local government level. The study also suggested that public demand should be created to make all people participate in establishing resilient community. The annual climate change, increase of seismic activity, constant development in hazardous area and various other factors are making the citizens, companies, and communities vulnerable to disaster. Thus, now is the time to reduce such vulnerability and establish resilient nation.

3. Paradigm of Disaster Management System and Capacity of Local Government

Disaster safety management system of local government is focusing on the stage 4 of disaster management and requiring complex and cooperative system. This means that disaster safety management system shall be appropriately developed with changes in disaster management paradigm (Nemoto Masazku, 2015: 52). According to the paradigm of disaster management in international society, disaster management paradigms have changed including Yokohama Strategies in 1994, Hyogo Code of Conduct in 2005, and Sendai Disaster Risk Reducing Order in 2015. According to Yokohama Strategies in, prevention and reduction of disaster were the main paradigms in the 1990s. In the 2000s when Hyogo Code of Conduct was released, weakness management became the disaster management paradigm. In addition, resilience became the main paradigm of disaster management after 2015 when Sendai disaster risk reduction order was released (Yoohyun Lee, Gihun Kwon, 2017: 275-276). Resilience is closely related to sustainability. In the short term, the concept of community resilience has become a framework for improving preparedness, response, and recovery of disaster in the community level. In the long term, the concept of community residence has become a framework for adaptation to climate change (Cutter, 2014: 65; Rodriguez-Nikl, 2015: 157). The resilience concept includes the

post-event consequence and pre-event preparedness and strategic planning (Zobel & Khansa, 2014: 83).

According to the changes in disaster management paradigm in the perspective of administrative value, they can be classified into order and control in administrative theory, overall risk control in terms of new public management theory, and cooperative governance. Order and control paradigm sets up economic value, proficiency, and efficiency of the disaster management as the top administrative value intending to achieve them through the organization with hierarchical authority relationship and professionalism. Overall risk control is to apply company management on the disaster management administration in terms of new public managerial theory setting the maximization of policy effect from cost as the important value. With reliability as important value, cooperative governance is to provide effective disaster management service by forming the network with non-hierarchical structure by organizations that participate in the disaster management (Eunsung Kim, et al., 2009: 12-32).

The first line of defense against disasters is local. Emergency management begins with city, county, or parish employees working with state, regional, and national counterparts as needed. Because disasters are usually experienced locally, the local emergency management agency (LEMA; Lindell, 1994) takes responsibility for organizing preparedness, response, recovery, and mitigation activities. LEMAs can vary widely from a small office in the basement of city hall, staffed mostly by volunteers, to major urban areas with personnel employed in specialized areas (Phillips, et. al., 2017: 40).

The local government's capacities which influence on the effective disaster management system of the local governments are institutional factor, human factor, policy implementation factor, financial factor, and technical factor. First, in terms of institutional factor, clear structure, role and responsibility, and relationship should be established between the government organizations such as the central office group, regional local government, and basic local government. Secondly, in terms of human factor, sufficient personal, adequate work, and work force should be distributed and leadership and personal capability are necessary for quick and appropriate decision-making when necessary. In policy implementation field, policy, rule, and regulation for decision making are necessary and the public and private organizations related to disaster management should participate and volunteer. For financial and technical fields, sufficient financial resources should be secured to support activities in

whole disaster management processes and effective response management system, technical intelligence system should be arranged. Also, there should be communication network between disaster management organization, local community, press, and mass media (Kasumasari, et. al., 2010: 441-442). When a natural disaster occurred, city and county officials were expected to help those in need. The actions of local governments were often supplemented by the efforts of private relief agencies, such as religious organizations and the Red Cross, etc. By and large, however, there was no expectation that higher levels of government would become directly involved in disaster situations (Schneider, 2011: 18).

Furthermore, after 9.11 Attacks and Hurricane Katrina, there was a movement on returning to disaster management system led by the central government. However, for the current trend on sharing of responsibility and authority and for effective response and management for natural disaster and man-made hazards, resources of local community or help of volunteers are necessary (Waugh & Streib, 2006: 131-132). Although natural disaster is a national issue, the local government provides the best response to natural disaster and takes measures for reducing the damages (Birkland, 2006: 129). Thus, the local government should strengthen the capacity to promote cooperation of local community necessary for disaster management.

4. Review of previous studies

Major previous studies in regard of disaster safety management system in local government are as follows.

Seungpil Choi (2012) has compared and analyzed the disaster management system in Korea and Germany for the legal and institutional review on structure and authority of disaster management system. In this study, it was pointed out how there was a necessity to materialize circumstances of disasters in the law in each disaster management area according to issues from decentralized disaster management laws in Korea and simplifying them and improving the clarity of regulations. In addition, he insisted to reinforce integrated management system among local autonomous communities, flexible cooperation among disaster management organizations, and collaboration from private sectors.

Hyunjong Yoo (2015) has utilized the guardian control model to clarify national responsibility for disaster management. In order to secure the responsibility of government

bureau, he insisted that it was required to reinforce democratic control such as clear distribution of authority and setup for the goals and to exert the responsibility of entrustment as a member of citizens along with functional responsibility as an expert.

Bongchul Kim (2014) has analyzed the official work of local government as a leading disaster management administration suggesting to expand the possibility of cooperation with local council, reinforce of support from central government, guarantee autonomy of local safety management system, establish the cooperative system with private sectors such as citizens, and reinforce the cooperation with local autonomous communities.

Changho Lim (2017) has classified the influencing factors of comprehensive disaster management system into the police activities including the stages of prevention, preparation, and coping, domestic or foreign activities in cooperation, specialty in disaster management, education/training of police officers in regard of disaster, and laws related to disaster management and conducted empirical analysis. According to the results of analysis, he suggested the establishment of domestic and foreign cooperative system, reinforcement of disaster prevention and coping activities, improvement of field guiding ability, and materialization of education/training in regard of disaster to enhance the effect of disaster management system.

Jin Chae (2008) has conducted the empirical analysis by setting up the concern and support of manager with final decision making authority, education/training, communication, budget, and legal institutions as variables to analyze the influencing factors of disaster management efficacy in fire-fighting organizations. According to the results of analysis, he suggested organization of legal policies, education based on the field and practice, training for disasters with related organizations and private organizations, and swift communication as a method to enhance the efficiency of disaster management. In addition, Jin Chae (2012) has analyzed the cooperative system of disaster management of multiple organizations through the cases of foot-and-mouth disease preventing activities. He emphasized that establishment of network among organizations, preparation for measures in specific adjustment on cooperation of disaster management, and leadership of top manager to establish cooperative system of disaster management.

Juhyun Park and et al. (2013) have searched for the efficient disaster management measures along with the issues of disasters coping measures from the case of accident in Bulsan, Gumi, Korea. As for issues derived in this study, there were insufficient actions for coping with disaster, poor management and policies for toxic substances, immorality

and irrationality of government bodies, and insufficient safety management system and government supervision. In addition, they have suggested the establishment of cognition for safety management, materialization of laws in disaster management, integration of overall functions of disaster management, creation of cooperative system with disaster management organizations, reinforcement of work based on the disaster management focusing on the prevention, field and function-oriented disaster management, improvement of ability for coping with disaster management, and realization of manpower and budget as measures for efficiency of disaster management.

Jaeun Lee and Gyunmhoon Kim (2005) have analyzed the status in the utilization of NDMS and recognition of public servants for sharing information in regard of disaster management. They suggested that swift decision making and administrative work performance were important in disaster and also how it was required to establish and utilize information sharing system.

Gyungho Kim et al. (2012) have conducted the influencing factor analysis on the operation of disaster management system with flexible integration, proactive learning, and joint cooperation as independent variables for establishing the efficient disaster management system from the diversification and large scale of disasters. In addition, they suggested the clarification of functions and roles of organizations and groups, establishment of joint management system, adoption of network system among organizations, establishment of practical disaster coping plans, analysis and management of circumstantial control and disaster information, and familiarity with disaster coping methods from advertisement to the citizens in the nation.

Gunjoo Kwon (2005) has analyzed the status of disaster management organization in the integrative, learning, cooperative, and flexible perspective in local government deriving the plans for improvement of efficient disaster management organizations in local autonomous communities. Measures for improvement of disaster management organization in this study include the direct control of groups in disaster management, integrated organization in each disaster function, operation of practical and integrated disaster situation room, and field-based team operation.

Youngju Kim and Myungjae Moon (2015) have conducted the survey of recognition of public servants from local government and local autonomous communities for how cooperation level in private/public sectors in disaster management and collaboration in public areas influence on the organization efficiency.

Jaehyun Bae and Myungsuk Lee (2010) have analyzed the role of government in the course of coping with disasters based on the case of hurricane in America, Katrina. With this case, they pointed out the importance of coping with disasters from network with voluntary participation of various participants and emphasized how governance shall be established to efficiently cope with large scale disasters.

When classifying previous studies based on themes and targets in the analysis, they can be classified into legal and institutional aspects(Choi, 2012; Kim, 2014; Im, 2017), work process aspects(Kim, 2014; Park, et al., 2013; Chae, 2008), and cooperative aspects(Kim·Moon, 2015; Kim, et al., 2012; Bae·Lee, 2010). When deriving the major factors in each area for research and analysis, there are the division of roles in local autonomous communities in wide range of areas and fundamental local communities and existence and materialization of manual regulations in laws and manuals related to disasters in the field of laws and policies. In the work process, swift process, clarity of authority and responsibility of work, and distribution of work were derived as major factors. Lastly, cooperative support between local autonomous communities, disaster management organizations and departments, and private sectors were derived as main factors.

〈Table 1〉 Influencing Factor for Disaster Management System

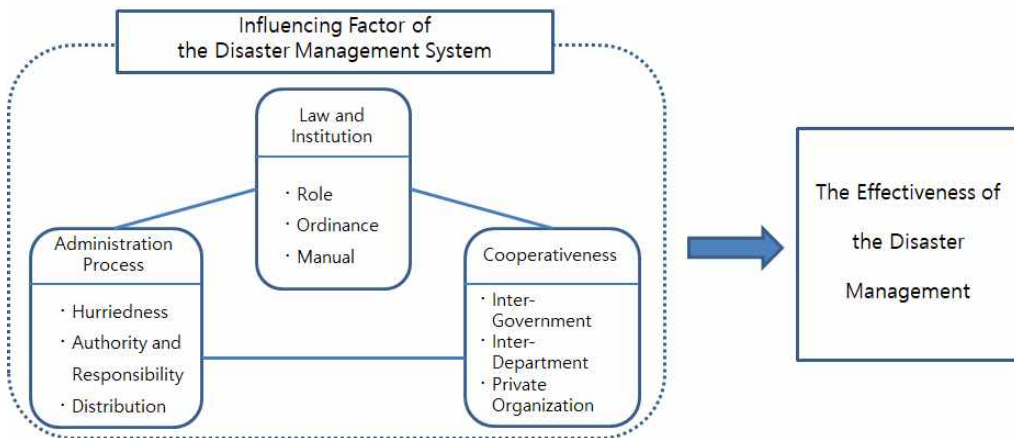
Classification	Main Contents	Main Analysis Subjects
Seung Phil Choi (2012)	<ul style="list-style-type: none"> ◦ Comparative analysis on disaster management system of Germany ◦ Strengthening of integrated disaster management system, organic cooperation, and private-public cooperation 	Legal system of disaster management, legal structure, authority and function of disaster management organization
Hyun Jong Yu (2015)	<ul style="list-style-type: none"> ◦ Emphasis on government duty for national disaster management ◦ Discussion on democratic control for setting goal and clear authority distribution. Suggestion of integrated responsibility model such as the public official's functional responsibility as expert and the citizen's responsibility as social member 	Types of responsibility through 4 guardian control model (Rational tool model, creative leadership model, interest mediation model, postmodern administrative ethics model)
Bong Chul Kim (2014)	<ul style="list-style-type: none"> ◦ Analysis on the local government's affair in disaster management ◦ Strengthening of cooperation between local government and local assembly, between local governments & establishment of cooperation system between private and public sectors 	Installation and operation of disaster management organization, establishment of safety management plan, disaster management activities
Chang Ho Im (2017)	<ul style="list-style-type: none"> ◦ Analysis on influencing factors for police's disaster management system ◦ Establishment of domestic and foreign cooperation system, strengthening of 	Police activities for each disaster management step, expertise of disaster management,

	prevention and preparation activities for disaster, enhancement of on-site instruction ability, practicality of disaster-related training and education	disaster-related training and education for police, legislations related to disaster management
Jin Chae (2008)	<ul style="list-style-type: none"> Analysis on management factors for enhancing effectiveness of disaster management Rearrangement of legal system, on-site practical education, participation of citizen and related organization in training, emphasis on quick and democratic communication 	Attention and support of chief administrator, education training, communication, budget, and legal system
Ju Hyun Park et al., (2013)	<ul style="list-style-type: none"> Analysis on hydrofluoric accident in Gumi Strengthening of citizen's sense of safety, improvement of legal system, strengthening of organization capacity and assignment of proper budget, prevention of damage spread and quick compensation 	On-site disaster response measures focusing on governmental response system, toxic substance management system, safety management system, immorality of government organizations
Jae Eun Lee, Kyum Hun Kim (2005)	<ul style="list-style-type: none"> Disaster management-related public servant's awareness on information sharing. Analysis on actual utilization of NDMS Emphasis on sharing of information between institutes, improvement of public servant's awareness on information sharing, establishment and operation of information management department, development of manual for information sharing 	Work cooperation system between related organizations, work process and degree of carrying out measures, organization and operation, organizational and cultural characteristics
Kyung Ho Kim et al., (2012)	<ul style="list-style-type: none"> Clarification of function and role of organization and group, establishment of common management system, establishment of practical disaster response plan, enhancement of promotion for citizens 	Organic integrity, preemptive learning, connective cooperation
Gwon Ju Kwon (2005)	<ul style="list-style-type: none"> Analysis on status of disaster management organizations in terms of structure Control of disaster management organization leader, integrated organizations for each function, operation of on-site mobile response team 	Integrated structure, learning structure, cooperative structure, organic structure
Young Ju Kim, Myeong Jae Moon (2015)	<ul style="list-style-type: none"> Analysis on private-public cooperation in disaster management organization and degree of cooperation in public sector Arrangement of organic linkage between public sector and private sector, securing of disaster management-related public servant's work, improvement of communication 	Private-public cooperation, cooperation between related organizations (horizontal cooperation), cooperation between central-local governments (vertical cooperation)
Jae Hyun Bae, Myeong Suk Lee (2010)	<ul style="list-style-type: none"> Analysis on Hurricane Katrina in US Establishment of disaster response system and disaster prevention activities for large-scale disaster management, establishment of cooperative network and strengthening of the government's coordination power 	Cooperative network (emphasis on public value, utilization of various resources, work coordination, securing responsibility)

III. Research Model and Investigation Research

1. Research model

This study has classified factors that influenced on the efficiency of disaster safety management system in local autonomous communities as three factors through the review of previous studies. First of all, it is about the legal and institutional area as a basis for the existence and role of disaster safety management organization. As for variables, role regulations, law regulations, and manual regulations were derived. Then, it is about the field of work process related to the performance of disaster safety management. Swift work process, clarity of authority and responsibility, and work distribution were setup as main variables. Lastly, it is about the cooperative area for securing resources needed for disaster safety management. Support for cooperation between local autonomous communities, between departments in the organization, and also between private sectors have been suggested as independent variables. Research model is suggested as follows based on them in the <Fig. 1>.



〈Figure 1〉 Research Model

2. Analysis of reliability of variables

Reliability analysis of questionnaires is made to determine whether responses and concept are consistently and accurately performed. Coefficient of reliability is calculated by using Cronbach' Alpha. In general, if Cronbach's Alpha is 0.7 or higher, it is judged

that reliability is obtained. Therefore, reliability analysis was conducted to verify the reliability of questionnaires.

〈Table 2〉 Reliability analysis of questionnaires

Classification	Criteria average deleted with items	Criteria diffusion deleted with items	Modified items – entire correlation coefficient	Cronbach-a if deleted with items
Establish disaster safety system	43.1906	88.522	.783	.953
Legal institutions	43.1591	90.267	.777	.954
Work process	43.1853	88.523	.799	.953
Cooperation with departments	43.4983	87.764	.767	.954
Role regulations	43.5787	89.344	.732	.955
Law regulations	43.3811	89.700	.781	.953
Manual regulations	43.3392	89.972	.744	.954
Swift work process	43.1224	88.910	.800	.953
Work distribution	43.4406	87.525	.777	.954
Clarity in authority and responsibility	43.4738	87.868	.805	.953
Support for wide range local government	43.5105	89.151	.782	.953
Support cooperation between departments	43.5000	88.496	.788	.953
Support of collaboration of private sectors	43.3689	89.389	.762	.954

As shown in the 〈Table 2〉 above, Cronbach's Alpha value in the questionnaires was 0.7 or higher that consistency and accuracy was obtained.

According to the results of factor analysis in the disaster safety management system in local autonomous communities, following three factors were derived as shown in 〈Table 3〉. Derived factors were legal policies, work process, and cooperation between departments or between organizations.

〈Table 3〉 Factor analysis of disaster safety management system

Classification	Factors		
	1	2	3
Manual regulations	.816	.310	.236
Law regulations	.814	.331	.281
Role regulations	.780	.226	.355
Work distribution	.308	.831	.297
Clear authority and responsibility	.368	.746	.365
Swift work process	.285	.725	.436
Cooperative support in organization	.311	.344	.802
Cooperative support for private groups	.272	.384	.776
Cooperative support for wide range autonomous communities	.444	.338	.676

3. Analysis of general matters in the disaster safety management system in local government

〈Table 4〉 Frequency analysis of general information of disaster safety management system Frequency analysis

Classification	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Entire (Effective percentage)
Establish disaster management system	12 (2.1)	38 (6.5)	168 (28.9)	207 (35.6)	156 (26.9)	581 (100.0)
Legal institutions	7 (1.2)	19 (3.3)	184 (31.7)	232 (39.9)	139 (23.9)	581 (100.0)
Work process	12 (2.1)	37 (6.4)	164 (28.2)	219 (37.7)	149 (25.6)	581 (100.0)
Cooperative work	23 (4.0)	70 (12.0)	208 (35.8)	171 (29.4)	109 (18.8)	581 (100.0)
Role regulations	15 (2.6)	81 (14.0)	226 (39.2)	169 (29.3)	86 (14.9)	577 (100.0)
Law regulations	11 (1.9)	39 (6.7)	218 (37.7)	215 (37.1)	96 (16.6)	579 (100.0)
Manual regulations	10 (1.7)	42 (7.2)	206 (35.5)	212 (36.6)	110 (19.0)	580 (100.0)
Swift work process	14 (2.4)	26 (4.5)	141 (24.5)	247 (42.8)	149 (25.8)	577 (100.0)
Work distribution	28 (4.8)	55 (9.5)	182 (31.5)	205 (35.5)	108 (18.7)	578 (100.0)
Authority or	18	58	221	179	102	578

responsibility	(3.1)	(10.0)	(38.2)	(31.0)	(17.6)	(100.0)
Support wide range government cooperation	12 (2.1)	61 (10.5)	246 (42.5)	171 (29.5)	89 (15.4)	579 (100.0)
Cooperation and support in the organization	16 (2.8)	59 (10.2)	234 (40.5)	174 (30.1)	95 (16.4)	578 (100.0)
Cooperation and support of private organizations	13 (2.2)	43 (7.5)	211 (36.4)	205 (35.4)	107 (18.5)	579 (100.0)

As for the degree of establishment of disaster safety management system, there were 207 (35.6%) respondents with 'agree' followed by 156 (26.9%) respondents with 'strongly agree.' 62% of the total responses turned out to be positive. As for negative responses, there were 50 (8.6%) respondents among 581 that most of the respondents ended up recognizing how disaster safety management system in local government was well established. As for the degree of legal policies, there were 232 (39.9%) respondents with 'agree' as the highest proportion followed by 139 (23.9%) respondents with 'strongly agree.' 63% of total responses turned out to be positive. On the other hand, as for negative responses, there were 7 (1.2%) respondents with 'not agree at all' followed by 19 (3.3%) respondents with 'disagree.' Among 581 respondents, there were only 26 respondents (4.5%) with negative responses. Therefore, most of the respondents ended up recognizing how legal policies of local government was well organized.

As for the degree of work process, there were 219 (37.7%) respondents with 'agree' followed by 149 (25.6%) respondents with 'strongly agree' that 63% of total responses turned out to be positive. On the other hand, as for negative responses, there were 12 (2.1%) respondents with 'not agree at all' followed by 37 (6.4%) respondents with 'disagree.' Therefore, it is a small portion that respondents turned out to recognize how work process of disaster management was well performed. As for the degree of cooperation between departments or organizations, there were 171 (29.4%) respondents with 'agree' followed by 109 (18.8%) respondents with 'strongly agree.' Therefore, 42.8% of the total responses turned out to be positive. As for negative responses, there were 23 (4.0%) respondents with 'not agree at all' followed by 70 (12.0%) respondents with 'disagree.' Total number of positive responses was higher than the one of negative responses. Therefore, respondents recognized how cooperative work between departments or organizations turned out to be well-performed.

As for the degree of roles between governments including the central government, wide range autonomous communities, and fundamental autonomous communities, there were 169 (29.3%) respondents with 'agree' followed by 86 (14.9%) with 'strongly agree,' 15 (2.6%) respondents with 'not agree at all,' and 81 (14.0%) respondents with 'disagree.' Therefore, the number of negative responses was higher than the ones of positive responses. This tells that respondents recognized how roles between governments were well regulated. As for the degree of regulations in laws related to disaster safety management, there were 215 (37.1%) respondents with 'agree' followed by 96 (16.6%) respondents with 'strongly agree' that 53% of the total respondents turned out to have positive responses. On the other hand, as for negative responses, there were 11 (1.9%) respondents with 'not agree at all' followed by 39 (6.7%) respondents with 'disagree.' Therefore, there was only a small proportion of negative responses that laws related to disaster safety management were recognized to be well regulated. As for the degree of manual regulations in manuals related to disaster safety management, there were 212 (36.6%) respondents with 'agree' followed by 110 (19.0%) respondents with 'strongly agree' that 55% of the total responses turned out to be positive. As for negative responses, there were 42 (7.2%) respondents with 'disagree' followed by 10 (1.7%) respondents with 'not agree at all.' As it is a small portion, respondents ended up recognizing how manuals related to disaster safety management were well regulated.

As for the positive response in the swiftness of work process in disaster safety management organization, there were 247 (42.8%) of respondents with 'agree' followed by 149 (25.8%) respondents with 'very agree.' As for negative responses, there were 26 (4.5%) respondents with 'disagree' followed by 14 (2.4%) respondents with 'strongly disagree.' Therefore, there were many positive responses than negative responses making it reasonable to say that disaster safety organization turned out to swiftly process the work. As for positive responses in the degree of work distribution from position or status in disaster safety management organization, there were 205 (35.5%) respondents with 'agree' followed by 108 (18.7%) respondents with 'strongly agree.' As for negative responses, there were 55 respondents (9.5%) with 'disagree' followed by 28 (4.8%) respondents with 'strongly disagree.' Therefore, there were more positive responses over negative ones that disaster safety organization turned out to be recognized to distribute work according to the status and position. As for the positive response on the clarity of responsibility and authority on the work process in disaster safety management organization, there were 179 (31.0%)

respondents with 'agree' followed by 102 (17.6%) respondents with 'strongly agree.' As for negative responses, there were 58 (10.0%) respondents with 'disagree,' followed by 18 (3.1%) respondents with 'strongly disagree.' As the number of positive responses is much higher than the one with negative responses, disaster safety organization turned out to recognize clear authority and responsibility on the work process.

As for the positive responses on the degree of cooperation and support on wide range autonomous communities, there were 171 (29.5%) respondents with 'agree' followed by 89 (15.4%) respondents with 'strongly agree.' As for negative responses, there were 61 (10.5%) respondents with 'disagree' followed by 12 (2.1%) respondents with 'strongly disagree.' As the number of positive responses is much higher than the one of negative responses, it turned out that disaster safety organization turned out to proceed seamless cooperation and support the wide range autonomous communities. As for the positive responses on the degree of cooperation and support in related departments in the local autonomous group, there were 174 (30.1%) respondents with 'agree' followed by 95 (16.4%) respondents with 'strongly agree.' As for negative responses, there were 59 (10.2%) respondents with 'disagree' followed by 16 (2.8%) respondents with 'strongly disagree.' The number of positive responses was higher than the one of negative responses. Overall, disaster safety organization was recognized to well cooperate and support with departments in the disaster safety organization.

As for the positive responses on the degree of cooperation and support in private groups, there were 205 (35.4%) respondents with 'agree' followed by 107 (18.5%) respondents with 'strongly agree.' As for negative responses, there were 43 (7.4%) respondents with 'disagree' followed by 13 (2.2%) respondents with 'strongly disagree.' The number of positive responses was much higher than the one of negative responses. Therefore, disaster safety organization was recognized to well cooperate and support with departments in the disaster safety organization.

IV. Regression analysis for disaster safety management system in local government

1. Correlation Analysis

First of all, correlation analysis was conducted to measure the degree and direction of correlation of factors that influence on the effect of disaster management system in local government.

〈Table 5〉 Correlation of variables

Classification	Role regulations	Law regulations	Manual regulations	Swift work process	Work distribution	Clear authority and responsibility	Support of wide range local autonomous community	Cooperation and support of departments in the organization	Cooperation and support in private group	Effectiveness of disaster management system
Role regulation	1									
Law regulation	.735**	1								
Manual regulations	.669**	.769**	1							
Swift work process	.539**	.614**	.570**	1						
Work distribution	.570**	.593**	.560**	.736**	1					
Clear authority and responsibility	.589**	.631**	.609**	.711**	.770**	1				
Support for wide range local government	.639**	.629**	.607**	.639**	.632**	.674**	1			
Cooperation and support in the organization	.578**	.599**	.574**	.671**	.625**	.665**	.729**	1		
Cooperation and support of private organizations	.572**	.586**	.542**	.678**	.620**	.661**	.669**	.753**	1	
Effectiveness of disaster management	.560**	.622**	.609**	.650**	.599**	.629**	.599**	.585**	.582**	1

** : $p < 0.01$

Results of the correlation analysis of role regulations, law regulations, manual regulations, swift work process, work distribution, clear authority and responsibility, cooperation and support of wide range local government, cooperation and support among departments in the organization, and cooperation and support of private groups as independent variables are shown in the 〈Table 5〉. All the independent variables represent positive correlation (+) with effectiveness of disaster management system. Variables such as clear authority and responsibility and law regulations turned out to be correlated with the effectiveness of disaster management system the most. In addition, correlation coefficient was 0.560 to 0.629 that there was no much of an issue on the multicollinearity.

2. regression analysis

In order to analyze the influential relation with law regulations and effectiveness of disaster safety management system, multi-regression analysis was conducted, and results were shown in <Table 6>. Role regulations, law regulations, and manual regulations were analyzed to positively influence on the effectiveness of disaster safety management system. In addition, law regulations ($\beta=0.295$) turned out to influence on the effectiveness of disaster safety management system the most followed by manual regulations ($\beta=0.274$) and role regulations ($\beta=0.159$) .

<Table 6> Influential relationship between law regulations and effectiveness of disaster safety management system

Classification	Non-standard coefficient		Standardization coefficient	t	Significant probability	Collinearity statistics	
	B	Standard error	β			Tolerance	VIF
(Constant)	1.051	.133		7.887	.000		
Role regulations	.159	.047	.159	3.346	.001	.433	2.307
Law regulations	.319	.060	.295	5.323	.000	.319	3.136
Manual regulations	.289	.054	.274	5.407	.000	.383	2.614
adj-R2	.436(F=149.374)						
Durbin-Watson	1.816						

Dependent variable : Effectiveness of disaster safety management system / *p<0.05, **p<0.01, ***p<0.001

Considering such result, it is required to expand the infrastructure of the cases based on the local government to improve the legal policies. According to the cases related to the prevention, preparation, coping, and restoration for the disaster safety management system, they are all comprised of similar legal systems without reflecting on the unique features of the areas. For example, according to the 'Framework Act on the Management of Disasters and Safety,' it is regulated that nation and government are able to support for the life settlement of residents and restore facilities from damages of disasters. However, it was identified that there was only one case of accident with fire at Jecheon supported by Chungbuk local government that ordinance was enacted for the support of

disaster area without being notified as a special disaster area by the government. In addition, Chungbuk, after experiencing heavy rain from July 15 to 16, 2017, was promulgated to be a special disaster area by the government on the 27th. However, there was no ordinance enacted for the restoration and support for social disaster area before that (Newsis, January 17, 2018). In addition, there is a need to improve them due to insufficient contents related to life safety of citizens such as education, manual, safe industry, and life safety.

In order to analyze the influential relationship between work process and disaster safety management system, multi-regression analysis was made, and results are shown <Table 7>. Swift work process, work distribution, authority, and responsibility turned out to positively influence on the disaster safety management system in local government. In addition, swift work process ($\beta=0.369$) turned out to influence on the effectiveness of disaster safety management system followed by clear authority and responsibility ($\beta=0.282$), and work distribution ($\beta=0.111$)

<Table 7> Influential relationship between work process factor and effectiveness of disaster safety management system

Classification	Non-standard coefficient		Standard coefficient	t	Significant probability	Colinearity statistics	
	B	Standard error	β			Tolerance	VIF
(Constant)	.965	.127		7.608	.000		
Swift work process	.385	.049	.369	7.839	.000	.408	2.452
Work distribution	.103	.048	.111	2.136	.033	.336	2.980
Clear authority and responsibility	.278	.049	.282	5.642	.000	.362	2.764
adj-R ²	.481(F=178.613)						
Durbin-Watson	1.749						

Dependent variable : Effectiveness of disaster safety management system / *p<0.05, **p<0.01, ***p<0.001

Therefore, there is a need to configure manual for the clarity of authority and responsibility for swift work process. According to the results of field investigation that geographical characteristics are not considered on the manual for disaster management in each local government, or they are in a too wide range making it difficult to apply in the actual circumstances, there is a need to revise and supplement the manual in each

local government to use it in the disaster. In addition, it is required to reinforce authority in decision making on public servants or guide to proceed swift corresponding activities in local autonomous communities.

Lastly, results of multi-regression analysis conducted to analyze influential relationship between cooperative factor and effectiveness of disaster safety management system are shown in <Table 8>. Cooperation and support of wide range autonomous communities, organization, and private group turned out to positively influence on the effectiveness of disaster safety management system in local autonomous communities. Cooperation and support of wide range autonomous communities turned out to influence on the effectiveness of disaster safety management ($\beta=0.307$) followed by cooperation and support of private groups ($\beta=0.244$) and in the organization ($\beta=0.177$).

<Table 8> Influential relationship between cooperative factor and disaster safety management system

Classification	Non-standard coefficient		Standard coefficient	t	Significant probability	Collinearity statistics	
	B	Standard error	β			Tolerance	VIF
(Constant)	1.152	.131		8.801	.000		
Cooperation and support of wide range government	.318	.050	.307	6.424	.000	.436	2.296
Cooperation and support in the organization	.178	.054	.177	3.282	.001	.341	2.932
Cooperation and support of private groups	.253	.052	.244	4.909	.000	.402	2.490
adj-R ²	.427(F=144.196)						
Durbin-Watson	1.797						

Dependent variable : Effectiveness of disaster safety management system / *p<0.05, **p<0.01, ***p<0.001

This means that it is required to establish the cooperative support system between local communities and private groups to reinforce capacity of local autonomous communities and secure human and physical resources. Local government shall take a role as a leading organization to actively cope with disaster management beyond the simple role division or right transfer. However, there is a difficulty to swiftly, efficiently, and comprehensively

cope with disasters due to limit in resources. Therefore, it is required to actively proceed MOU for dealing with disasters with local autonomous communities and private organizations near the areas to reinforce capacity of disaster management in local government. In disaster management system, the relationship between governments including central government, regional local government, and basic local government is changing from the vertical command and control relationship to horizontal cooperative relationship (McGuire & Silvia, 2010: 280). However, in the Korean disaster management system, the key upper decision-makings are focused on the central government and the role of local government is limited to figuring out and reporting the disaster situation and performing the decision makings and orders from the central government. Such structure impedes precise judgement and quick decision-making on site. Thus, institutional supplement should be arranged to promote local government to participate in decision-making process.

V. Conclusion

This study has been conducted on public servants implementing empirical analysis on the factors that influenced on the effectiveness of disaster safety management system. For empirical analysis, influencing factors of law policies, work process, and cooperative work were derived as independent variables.

According to the results of multiple regression analysis with the effectiveness of disaster safety management system as a dependent variable, role regulations, law regulations, and manual regulations turned out to positively influence on it. Among them, law regulations turned out to influence on it the most. Factors that were set as independent variables including the swift work process, work distribution, and clear authority and responsibility turned out to influence on effectiveness of disaster safety management system in this study. In the work process area, swift work process turned out to influence on the effectiveness the most. Lastly, all the independent variables in the cooperation turned out to influence on the disaster safety management system, and cooperation and support of wide range government turned out to influence on the dependent variable the most. Based on such analysis result, this study suggested measures for improving effectiveness of disaster management in the local government as follows. First, in terms of legal system,

ordinance infrastructure focusing on local government should be established. Second, in work processing, practical manual considering the regional characteristic should be arranged. Third, in terms of cooperation, cooperative support system should be established between the local government and private organization while horizontal decision-making and cooperation system should be established between the central government and local government.

Disaster management is significant as it protects the life and property of the citizens while influencing on the persistence and development of a nation. In the past, the central government led the disaster management. Then, in 1995, after the start of local government times, the role of the local government has been emphasized until now. However, the disaster management of the local government has limits in responding to expectations of local residents and establishing effective disaster management system. To overcome such limits, previously suggested measures should be implemented while strengthening the disaster management capacity of the local government. The local government's disaster management capacity can be examined by classifying into individual, organization, and local community. In the individual level, the expertise, morale, and motivation should be promoted. In the organization level, leadership, communication, decision-making, and support system within organization should be arranged. Also, in the local community level, disaster management-related promotion, education, and training should be provided for local community and the resources in the private sector should be utilized and expanded. This study has limits in such points and the follow-up studies should focus on influencing factors for disaster management and strengthening capacity.

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기타자료

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〈국문초록〉

**재난관리체계의 효과성 제고를 위한 영향요인 분석:
지방자치단체 공무원의 인식을 중심으로**

이 연구는 지방정부 재난관리 관련 공무원의 인식을 실증적으로 분석하여 재난관리체계의 효과성과 주요 변수들의 영향관계를 살펴보고, 이에 대한 개선방안을 도출하는 것에 목적이 있다. 이를 위해 이 연구는 재난관리체계와 밀접한 관련이 있는 법·제도, 업무처리, 협력 등의 영역에서 변수를 선정하였다. 재난관리체계 효과성을 종속변수로 한 회귀분석결과, 각 영역별 독립변수가 모두 정(+)의 영향을 미치는 것으로 나타났다. 이러한 분석결과를 토대로 지방정부 재난관리체계의 효과성 개선을 위한 방안을 제시하면 다음과 같다. 첫째, 지방정부 재난관리체계의 효과성 개선을 위하여, 법제도 측면의 지방정부 중심의 조례 인프라 확충이 필요하다. 둘째, 업무처리 측면의 지역 특성을 고려한 실제적 매뉴얼 구성이 요구된다. 셋째, 협력 측면의 지방정부와 민간단체간의 협력지원체계 구축 및 중앙정부와 지방정부간 수평적 의사결정 및 협력체계 구축 등이 필요하다.

주제어: 지방정부, 재난관리체계, 효과성, 영향요인