

A Study on the Factors Affecting the Effectiveness of Disaster Management Resources System¹

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A B S T R A C T

The purpose of this study is to derive factors affecting the effectiveness of the disaster management resources system through empirical analysis. In order to achieve this research purpose, this study surveyed the perception of disaster management resources between local government disaster management servants and fire fighters, and regression analysis was conducted through the SPSS program to analyze the relationship between effectiveness and influencing factors. As a result of the study, the factors affecting the effectiveness of the disaster management resource system are laws & regulations, organization, cooperation, and continuity of operation plan. Therefore, it is deemed necessary to consider the enactment and revision of laws and regulations, strengthening the cooperation system, and establishing a continuity of operation plan for disaster management resources system in the future.

Key words: disaster management Resources, effectiveness of disaster management resources, factors, empirical analysis

1. Introduction

Due to the changes and complexity of social structures such as urbanization, industrialization, information services and globalization, if any part of the overall national social operation system breaks down due to problems, there will be successive risks (Lee, et. al., 2005: 56). In addition, according to changes of climate and social environment, recent disasters have gradually become more complex, huge, novel and globalized (National Disaster Management Research Institute, 2017: 3). When disasters occur, the scale of disaster losses depends on the response capacity, and disaster management resources play an indispensable role in the disaster response, which is also an important means of rapid response. The Korean government recognizes the importance of disaster management resources and manages the designation, classification, storage, maintenance, mobilization and support of disaster management resources by a systemic process including laws and regulations, organizations, information systems and so on. However, there are problems such as lack of disaster management resources, cooperation between agencies, real-time

data, and dedicated organizations and personnel(Lee, 2019: 3; Kim, et. al., 2020: 160-162; Ministry of health and welfare, 2016: 171-179).

In order to prevent the recurrence of such a lack or shortage of disaster management resources, it is necessary to research on the factors affecting the effectiveness of the disaster management resource system.

2. Literature Review

2.1 Disaster Management Resource System

According to the Article 34 of Framework Act on the Management of Disasters and Safety, disaster management resources mean the equipment, commodities, materials and facilities prescribed by Presidential Decree which are necessary for disaster management activities.

Disaster management resources exist as an essential part of the disaster response process. When approaching from this opinion, it is necessary to analyze the system of disaster management resources according to the composition of the disaster management system.

As a result of reviewing previous studies on the disaster management system, most of the studies

¹ This study is a partial revision and supplementation of the researcher's doctoral dissertation.

conduct by integrating parts such as disaster management laws, organizations, cooperation, and information systems into components of the disaster management system (Park, 1997; Kwon, 2003; Choi, 2005; Kim, 2005; Moe & Pathranarakul, 2006; Lee, 2007; Kang, 2007; Lee, et. al., 2009; Lim, 2015; Lee & Shim, 2015; Byun, 2018).

Therefore, in this study, the disaster management resource system is defined as one component of the disaster management system, and the composition of the disaster management resource system is divided into four elements: law & regulation, organization, information system, and support process.

Systematic laws and regulations are needed to manage disasters and reduce disaster damage. Laws and regulations play an important role on the in the designation, classification, storage, maintenance, mobilization, and support of disaster management resources. The responsibility for disaster management activities should be clarified to the operating institution and the transfer of responsibility between departments and the avoidance of responsibility should be prevented through laws and regulations (Lu, 2007: 52; Deng, 2012: 31). In the case of disaster management resource organization, it means an organization that performs tasks such as designation, classification, storage, maintenance, mobilization, and support of disaster management resources. In Korea, the organizations divide into three parts Ministry of Interior and Safety (MOIS), Disaster and Safety Countermeasure Headquarters (DSCH), and support agencies. MOIS shall oversee and coordinate the operation and management of disaster management resources necessary for the prevention, preparation, response, and recovery of disasters at the government level. In the event of a large-scale disaster, the DSCH, as a crisis management organization, shall perform its duties and roles as a coordinating agency between disaster management agencies to efficiently cope with disasters. And support agencies refer to disaster management agencies or private institutions or organizations that store disaster management resources, such as Ministry of Science and ICT, Ministry of National Defense, National Police Agency, Korean Red Cross, and Korea Disaster Relief Association. The disaster management resource information system means the system includes functions such as resource procurement, stockpiling and placement management, dispatch and transportation management, and real-time situation management (Ji, 2013: 21), and the disaster management resource information system shall be reliable and easy to use (Seoul Institute of Technology, 2022: 113). T disaster management resource support process can be seen as a process of allowing disaster management resources held by each institution to be injected into the disaster site, and the disaster man-

agement resource support process aims to implement efficient disaster management relief and recovery activities (Gu, 2009: 58-59).

2.2 Factors Affecting the Effectiveness of Disaster Management Resource System

Disaster management resources have a support function for activities in the disaster management response and recovery stage. From this opinion, the goal of disaster management resources is to contribute to activities such as economic and human casualties mitigation, relief of victims, and stabilization of life in disaster areas through rapid and systematic resource support activities. In other words, it can be seen that the effectiveness of disaster management resources ultimately lies in rapid and systematic support activities. Therefore, the disaster management resource system can be seen as a supporting system in terms of laws & regulations, organizations, information systems, and support process so that disaster management resources can be carried out quickly and systematically. If the support of disaster management resources for disaster response and recovery activities is quickly and systematically provided, it can be seen that the disaster management resource system is well supported. In other words, it can be seen that the disaster management resource system is effective. According to this opinion, the effectiveness of the disaster management resource system is considered to be in four areas: sufficient support, rapid support, systematic support, and needful support.

2.3 Sources of Variables

There are previous studies on the effectiveness of the disaster management system, but there were not many prior studies on the effectiveness of the disaster management resource system, and it was judged that it was necessary to systematically organize these factors and conduct research. Therefore, in this study, the effectiveness analysis of the disaster management resource system was conducted by using the influencing factors of previous studies on the effectiveness of the disaster management system as variables (<Table 1>).

<Table 1> Sources of Variables and Metrics

Variables	Metrics	Sources
Laws & regulations	<ul style="list-style-type: none"> ● Systematicity ● Articles related to response support ● Articles related to recovery support 	Park, 1997; Lim, 2015; Jang, 2008
Organization	<ul style="list-style-type: none"> ● Number of personnel ● Leadership competence of the general manager 	Bae, et. al., 2014; Kim, et. al., 2020; Lee & Shim, 2015; Choi, 2005; Park, 1997; Song,

	<ul style="list-style-type: none"> ● Task execution degree of command tower ● Professionalism ● Interest ● Satisfaction ● Judgment ● Responsibility 	2009; Lee, et. al., 2019; Kim & Yoon, 2019
Cooperation	<ul style="list-style-type: none"> ● Coordination mechanism capability ● Communication ● Communication system ● Resource exchange 	Jennings, 1994; Cho, 2010
Continuity of operation plan	<ul style="list-style-type: none"> ● Formation and operation of specialized teams ● Selection of key functions ● Completion of plan ● Education and training ● Improvements of plan 	Shin, et. al., 2015; Choi, et. al., 2016; Koo, 2019
Effectiveness	<ul style="list-style-type: none"> ● Sufficient ● Rapid ● Systematic ● needful 	

3. Empirical Analysis

3.1 Research Hypothesis and Methods

This study aims to derive factors affecting the effectiveness of the disaster management resource operation system. Therefore, the hypothesis was established as follows.

H1: Laws and regulations factors will affect the effectiveness of disaster management resource system.

H2: Organization factors will affect the effectiveness of disaster management resource system.

H3: Cooperation factors will affect the effectiveness of disaster management resource system.

H4: Continuity of operation plan factors will affect the effectiveness of disaster management resource system.

In order to verify the hypothesis, this study conducted a disaster management resource survey by questionnaire, and a regression analysis was conducted using the statistical program IBM SPSS 27. All variables were measured using a 5-point Likert scale ranging from 1 (absolutely not) to 5 (very much) with higher scores indicating more positive responses.

3.2 Survey Targets and Descriptive Statistics

The targets of this survey were local government disaster management servants and fire fighters, and the survey was conducted through online and visits. A total of 309 questionnaires were used as analysis data.

In terms of gender, 255 (82.5%) were male respondents, and 54 (17.5%) were female respondents, accounting for about 4.5 times more male respondents. In the case of disaster response experience, 254 respondents (82.2%) had experience in disaster response, and 54 respondents (17.8%) had no experience in disaster response, accounting for about 4.5 times more respondents. In the case of the ultimately education, 194 (62.8%) chose university, 67 (21.7%) chose college. About Length of public office, 98(31.7%) chose More than 15years, and next is 3years below, 67(21.7%) chose it. About Length of disaster office, 117(37.9%) chose More than 5years, and next is 1years~2years below, 60(19.4%) chose it. Finally, there were 121 local government disaster management servants and 188 fire fighters involved in this survey.

And the descriptive statistics of survey participants are shown in <Table 2>.

<Table 2> Descriptive Statistics of Survey Participants

(N = 309)

Characteristics		N(%)
Sex	Male	255(82.5)
	Female	54(17.5)
	Total	309(100)
Disaster response experience	Yes	254(82.2)
	No	55(17.8)
	Total	309(100)
Ultimately education	High school gradu-	36(11.7)
	College	67(21.7)
	University	194(62.8)
	Graduate school	12(3.9)
	Total	309(100)
Length of public office	3years below	67(21.7)
	4years~5years below	36(11.7)
	5years~7years below	22(7.1)
	7years~10years be-	27(8.7)
	10years~15years be-	59(19.1)
	More than 15years	98(31.7)
	Total	309(100)
Length of disaster	1year below	59(19.1)
	1year~2years below	60(19.4)

office	2years~3years below	43(13.9)
	3years~4years below	11(3.6)
	4years~5years below	19(6.1)
	More than 5years	117(37.9)
	Total	309(100)
Job	Local government	121(39.2)
	Fire fighters	188(60.8)
	Total	309(100)

3.3 Results of Regression Analysis

In order to analyze the factors influencing the effectiveness of the disaster management resources, a regression analysis was conducted on a total of 309 samples. And the results are shown in <Table 3>.

<Table 3> Results of Regression Analysis

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error				Beta	Tolerance
(Constant)	.158	.158		3.458	.000		
Laws & regulations	.044	.044	.116	2.578	.010	.726	1.378
Organization	.075	.075	.098	1.491	.137	.339	2.949
Cooperation	.068	.068	.256	3.704	.000	.308	3.245
Continuity of operation plan	.062	.062	.378	5.912	.000	.360	2.775
R ² (Adjusted R ²)				0.552(0.546)			
F				93.763(p<0.001)			
Durbin-Watson				2.016			

a. Dependent Variable: Effectiveness

As a result of the analysis, the adjusted value of R² representing the ratio explained by the independent variable to the effectiveness of the dependent variable, disaster management resource, is 0.546. These results mean that the four independent variables can explain 54.6% of the total variance for the dependent variable. In addition, the F value representing the statistical significance of the multiple regression

model is 93.763 (p<0.001), and the multiple regression model used in this study is statistically significant. In order to detect the presence of serious multicollinearity between independent variables, the values of tolerance limits and variance expansion coefficients were presented, and as a result of the analysis, it was found that there was no serious multicollinearity problem between the independent variables of this study.

In view of the standardization coefficient representing the relative influence of the independent variable on the dependent variable, the factor that has the greatest influence on the effectiveness of the dependent variable, the disaster management resource system, is the factors Continuity of Operation Plan(Beta=0.378). Next, it was found that the factors of Cooperation (Beta=0.256) and Laws & Regulations (Beta=0.116) affect the effectiveness of the disaster management resource operation system. In other words, it can be concluded that factors of laws & regulations, cooperation, and continuity of operation plan affect the effectiveness of the disaster management resource operation system rather than factors of organization.

3.4 Hypothesis Verification

A regression analysis was conducted on the factors influencing the effectiveness of the disaster management resource system, and the results of the hypothesis verification according to the analysis results are shown in <Table 4>.

<Table 4> Hypothesis Verification

Hypothesis	Results
H1: Laws and regulations factors will affect the effectiveness of disaster management resource system.	Adoption
H2: Organization factors will affect the effectiveness of disaster management resource system.	Rejected
H3: Cooperation factors will affect the effectiveness of disaster management resource system.	Adoption
H4: Continuity of operation plan factors will affect the effectiveness of disaster management resource system.	Adoption

4. Conclusion

The purpose of this study is to derive factors that affect the effectiveness of the disaster management resource system.

In order to achieve this research purpose, this study surveyed the perception of disaster management resources between local government disaster management servants and fire fighters, and statistical results show that factors of laws & regulation, cooperation, and continuity of operation plan are affecting the effectiveness of disaster management resources system.

The following improvement measures are needed to improve the effectiveness of disaster management resources in the future.

First, it is necessary to enact and revise detailed regulations on activities such as designation, classification, storage, and management of disaster management resources, establish provisions on securing dedicated organizations and personnel, and specify detailed cooperation contents for mobilization and support process.

Second, it is necessary to further subdivide the contents of cooperation among the Ministry of Interior and Safety, Disaster Safety Countermeasures Headquarters, and support organizations, including central related agencies and private organizations.

Third, it is necessary to contribute to effective support activities by establishing a continuity of operation plan to utilize disaster management resources in the event of a disaster.

References

- Bae, Young Son, Won Hoi Koo, Ho Joon Shin, and Min Ho Baek. A Study on the Consciousness of Fire-fighting Officers for the Establishment and Revitalization of Integrated Disaster Management System. *Journal of the Korea Society of Disaster Information*. 10(1): 151-158.
- Byun, Woo Taek. 2018. A Study on the Determinants of the Effectiveness of Disaster Prevention: Focused on Perception of Residents for Earthquake. Ph.D. Dissertation. Graduate School of Konkuk University.
- Cho, Jong Mook. 2010. Analysing the Cooperative Relationship among the Agencies for Disaster Management, Ph.D. Dissertation, Chungbuk National University.
- Choi, Deok Jae, Seung Weon Yang, Gi Won Kim, Dae Jin Kim, Hyun Min Jang, Dong Heon Kim, and Min Gyun Eun. 2016. A Study on the Introduction of Business Continuity Management System for Ensuring Uninterrupted Service of Public Institution Based on a Bottom-up Method. *Journal of Korean Society of Disaster & Security*. 9(2): 87-91.
- Choi, Yong Ho. 2005. A Study on the Factors Affecting on the Effectiveness of Pre Disaster Management System of Local Governments. Ph.D. Dissertation, Chosun University.
- Deng, Cong. 2012. Reflections on the Legal Construction of China's Disaster Prevention and Mitigation. *Journal of Huaihua University*. 31(9): 30-33.
- Gu, Yong. 2009. Research on Storage and Dispatch of Regional Emergency Resources for the Significant Emergent Events. Ph.D. Dissertation of Wuhan University of Science and Technology.
- Jang, See Sung. 2008. A Study on the Construction Direction of Disaster Management System in Korea: The Cognition of Disaster Management Public Servant. Ph.D. Dissertation. Graduate School of Myongji University.
- Jennings, Edward T., Jr. 1994. Building Bridges in the Intergovernmental Arena: Coordinating Employment and Training Programs in the American States. *Public Administration Review*. 54(1): 52-60.
- Ji, Xiaofeng. 2013. Information Management of Disaster Relief Supplies Reserve Dispatch. *Disaster Reduction in China*. 2013(19): 20-21.
- Kang, Young Suk. 2007. An Analysis Of Affecting Factors on Disaster Administration of Local Government. Ph.D. Dissertation. Graduate School of Dong Eui University.
- Kim, Chul Woo and Kun Yoon. 2019. An Empirical Study of the Relationship Between Public Expertise and Performance in Government: Focusing on Public Officials in Emergency Management Both in Central and Local Government. *Journal of the Korean Regional Development Association*. 31(4): 281-306.
- Kim, Hyong Yeul. 2005. Approaches to the Study of Emergency Management in terms of Cognitive Relativism With Reference to the Systems and Situational Approaches. *Crisisonomy*. 1(1): 1-19.
- Kim, Joon Ha, Tae Heon Kim, and Jae Wook Jung. 2020. A Study on the Management Improvement of Disaster Recovery Resources of Municipality with Field Survey. *Journal of the Society of Disaster Information*. 16(1): 155-162.
- Koo, Won Hoi. 2019. A Study on the Preparation of Standards to Ensure the Response Task Continuity of a Local Government in the Event of an Earthquake. Ph.D. Dissertation. Professional Graduate School of Disaster Prevention of Kangwon National University.
- Kwon, Kuen Joo. 2003. A Study on the Improvement of the Disaster Management Administration System of Local Government in Korea. Ph.D. Dissertation. Graduate School of Kangwon National University.
- Lee, Dae Woong, Da Sol Lee, and Ju Hyun Lee. 2019. The Effect of the Expertise of Disaster Management Officials on Collaborative Disaster Management: Focusing on Collaboration Capacity and Performance. *Journal of Korea Society of Hazard and Mitigation*. 19(2): 91-103.
- Lee, Jae Eun, Gi Guen Yang, Sung Soo Byun, and Dae Woo Park. 2009. Improving the Investigation System of Natural Disaster Damage. *Crisisonomy*. 5(1): 73-84.
- Lee, Jae Eun, Gyum Hun Kim, and Sang Il Ryu. 2005. The Development Strategy for the Disaster Man-

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- agement System in the Future: Critical Infrastructure Crisis in the Turbulent Environment. *Modern Society and Administration*. 5(3): 53-83.
- Lee, Jae Eun. 2007. Efficient Disaster Management and the Establishment of the Cooperative System among the Civil Society, Government, and the Military : Using the Jennings' Model. *Crisisonomy*. 3(1): 62-74.
- Lee, Sun Beom and Jae Hyun Shim. 2015. Recognition of Public Officials for Disaster Management System. *Crisisonomy*. 11(4): 27-49.
- Lee, Un. 2019. A Legal Study on the Improvement of Management System of Disaster Resources. Ph.D. Dissertation. Graduate School of Donga University
- Lim, Chang Ho. 2015. A Study on the Effectiveness Perception of National Disaster Management System. *Journal of Korean Society of Private Security*. 14(5): 227-254.
- Lu, Qifeng. 2007. *Views and Roles of Disaster Science Research*. Beijing: Beijing Economic Press.
- Ministry of Health and Welfare. 2016. 2015 MERS White Paper. Research Report.
- Moe, T. L. and P. Pathranarakul. 2006. An Integrated Approach to Natural Disaster Management: Public Project Management and its Critical Success Factors. *Disaster Prevention and Management*. 15(3): 396-413.
- National Disaster Management Research Institute. 2017. Pattern Analysis on Unstructured Disaster-related Big Data. Research Report.
- Park, Kwang Kook. 1997. A Study on the Effectiveness Evaluation of Disaster Management System. *Korean Public Administration Quarterly*. 9(3): 581-602.
- Seoul Institute of Technology. 2022. A Study on the Effective Managerial Schemes of Disaster Management Resources in Seoul. Research Report.
- Shin, Ho Joon, Won Hoi Koo, and Min Ho Baek. 2015. A Basic Study for Securing the Business Continuity of Local Governments in the Event of Earthquake and Tsunami. *Journal of the Korea Society of Disaster Information*. 11(2): 227-234.
- Song, Yun Suk. 2009. The Comparison Analysis of Recognition about Disaster Management Organization of Seoul between Fire Fighters and Regular Officers. *Journal of Korean Institute of Fire Science*. 23(4): 154-164.
- Whybark, D. C. 2007. Issues in Managing Disaster Relief Inventories. *International Journal of Production Economics*. 108(1-2): 228-235.

Profile

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