Research of Regional Disaster Prevention Evaluation

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Until now, Korea carried out disaster management under the perception that the central government or the local government bodies are totally responsible. However the capacity of the public disaster management did not live up to the expectations as the size of disasters become larger. Also, due to the increase in society size, diversity and increase in demand for disaster management service "society" is being perceived as the consumer and provider of the service. As the emphasis moves from and to [national security -> personal safety -> social safety], there is a need to measure the disaster prevention capacity of each region to find out whether the region is able to confront disasters, and come up with improvement plans to compensate for any insufficiencies or shortcomings. To analyze this issue, this research conducted interviews on disaster response readiness by [individual resident-residents cooperation-public/ private collaboration] according to each prevention-reaction-restoration stage, as resident representatives(Head of Ri, Head of Tong) as subjects. Based on the interviews, surveys were conducted to deduct the necessary factors needed for the general residents to exhibit disaster prevention capabilities. The surveys consist of 6 factors-risk perception, evacuation inductively, individual evacuation response, disaster prevention system, lookout & precaution, information communication.

Key Words: regional disaster prevention, social safety, disaster prevention culture

Ⅰ. Introduction

Among the 5 national goals[1] announced by the new government in February 2008, "active welfare" includes a strategic goal, "making a safe society, safe from social dangers" which indicates that "disaster and disaster prevention sector" is one of the major issues of the country. This shows that preception has changed, where in the past disaster management problems were looked as issues of technology engineering or tools, but now the local society and its residents are recognized as the major subject of disaster management activities.

So, it is an urgent issue measuring the disaster prevention capacity of each region to find out whether the region is able to confront disasters, and come up with improvement plans to compensate for any insufficiencies or shortcomings. To reinforce the social safety net pursued by the government, not only does

1) A government serving the people, a lively market economy, active welfare, a country rich in talent, a global Korea.

the disaster prevention facilities need to be enhanced but also the individual disaster prevention capacity, cooperative disaster prevention capacity and public & private collaborative disaster prevention capacity of the general people need to be improved.

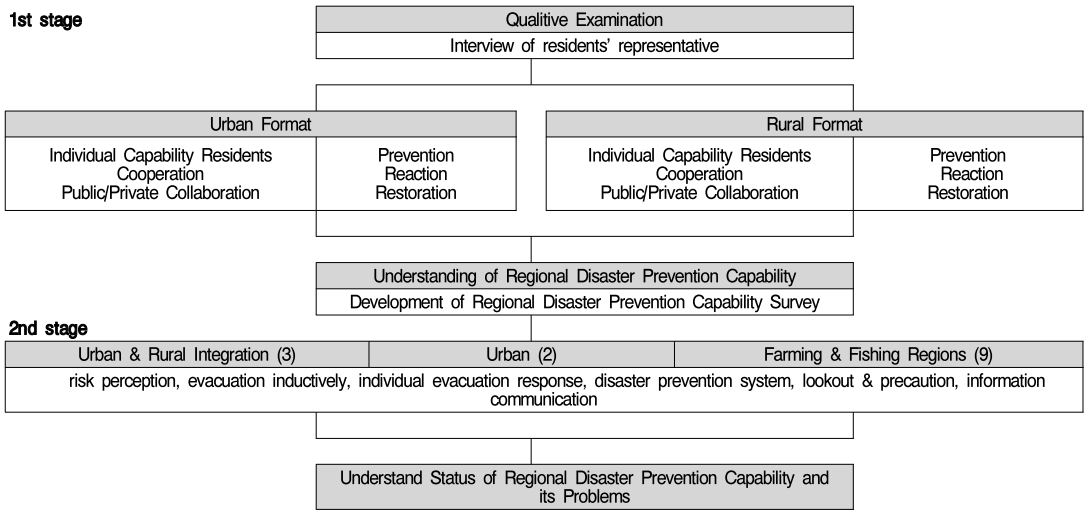


Figure 1. Analysis Framework

In order to strengthen the disaster prevention capabilities of small size regional society, this research will state an evaluation table that will help the review of current regional disaster prevention capability status[2] and evaluate the regional disaster prevention capacity of the research subject regions.

II. Research Details and Methods

1. Research details and methods

Under the assumption that the definition of regional disaster prevention capability is the ability of the regional residents and self generated organizations, in order to evaluate regional disaster prevention capability, there was a need to find out what kind of activities are included in each prevention-reaction-restoration stage. Interviews were conducted with regional representatives (Heads of Ri and Tong) from 3 regions.[3] The Interview was based on disaster response readiness in each stage of [prevention - reaction-restoration] according to [individual resident-residents cooperation- public/private collaboration]. Through the interviews, necessary factors needed for the general residents to exhibit disaster prevention capabilities were deducted and a survey was developed. As seen in below <Figure 1> he survey consist of 6 factors - risk perception, evacuation inductively, individual evacuation response, disaster prevention system, lookout & precaution, information communication.

2) "Disaster prevention capability" is an academic term, and its definition and details differ by each researcher so it is difficult give a simple and clear definition. Disaster prevention capability cannot be realized if the definition of space size and details of disaster prevention are omitted. The definition of disaster prevention capability in this research is "capability of local residents and local disaster prevention organizations to perform in disastrous situations"

3) During 15 June~30 June, 2008, interview with 28 heads of ri and tong in Inje-gun, Garisan-ri, Wondae-ri and Chuncheon city was conducted.

2. Survey and Interview Subject

The survey period was from July 1 to July 30, 2008. The sample group was 273 subjects, that is 10% of the 2,720 members in regional disaster prevention groups from 11 cities and gun within Gangwon-do, 273 copies of the survey was distributed and 87%, that is 238 copies, was collected

Table 1. Sample group and number of subjects in Gangwon-do according to gun/si

	Goseong -gun	Donghae -si	Samcheok -si	Yangyang -gun	Inje-gun	Jeongseon -gun	Cheorwon-gun	Chuncheon -si	Hongcheon -gun	Whacheon -gun	Hoengseong -gun	Total
Total	12	28	11	15	18	20	15	28	37	16	38	238
Male	11	15	11	13	15	17	8	17	33	13	30	183
Female	1	7	0	1	3	3	5	8	2	3	4	37
N/A	0	6	0	1	0	0	2	3	2	0	4	18

III. Theoretical Background of Regional Disaster Prevention Capability

1. Definition of regional disaster prevention capability

The definition of regional disaster prevention capability is diverse. Sometimes it includes physical resources such as preventive facilities, material, provisions, first aid products and intangible resources such as professionals, organization, perception of individuals, technology, action and physical strength. In some instances the definition is restricted to humans and organizations.

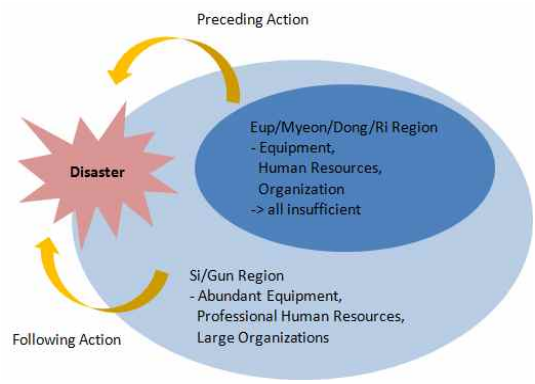


Figure 2. Concept of regional disaster prevention capability according to space size

If the size of space is limited to "small region" and the subject of disaster prevention capability is the residents of the region the concept can be illustrated as in <Figure 2>.

So, definition of disaster prevention capability in this research is "capability of local residents and local disaster prevention organizations, individuals and organizations participating in regional disaster prevention activities based on self motivation and cooperation, to perform in disastrous situations". The regional disaster prevention capability of the region is closely related to the natural environment and culture of the region. For example, areas where there are frequent fires accompanied by strong wind have houses that are located in a cluster in order to ease evacuation.

We call this phenomenon disaster prevention culture[4], and when the culture is firmly established in the

4) 佐藤忠信. 2006. 防災文化について. Natural Disaster Science JSNDS 25-2). p131-132; (source: http://www.drs.dpri.kyoto-u.ac.jp/jsnds/ download.cgi? ssk_25_2_131.pdf#search='防災文化') Disaster prevention culture is a silent agreement between the residents and it can be defined "Fostering of knowledge, technology and social structure to prevent and reduce disasters at the same time an education system to transmit the information" Also, some domestic researchers (Gihwan Seong and others, "In order to obtain the continuity of the safety culture activities") use "safety culture" rather than distinguish disaster prevention culture-disaster culture. However, as the term "safety" is so broad there are confusion and duplication between organizations such as provincial offices, police agency and fire department and even between

form of products or objects it is sometimes distinguished as "disaster culture". As seen in <Figure 3>, this disaster prevention culture is the basis of the formation of regional disaster prevention capability. However due to the development of social structure and technology, disaster culture can not be easily found.

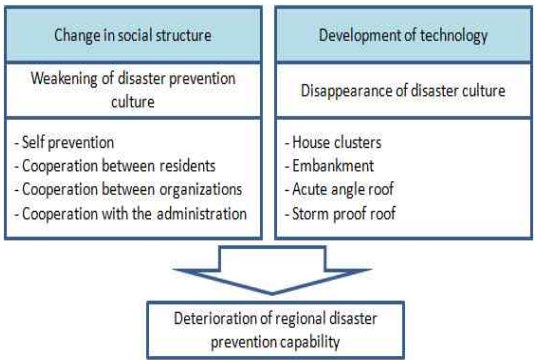


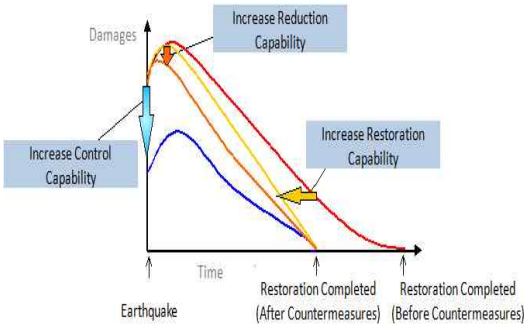
Figure 3. Deterioration of regional disaster prevention capability due to change in disaster prevention culture

2. Form of regional disaster prevention capability exhibition

Generally disaster management process is explained through preparation-prevention -reaction-restoration stages and it is possible to distinguish the concepts and methods in actual disasters. "山本 正典" distinguished the regional disaster prevention capability in 4 forms of exhibition, as seen below.

① Reduce or terminate the external factor that causes disasters = suppress generation
② Reduce or terminate the disaster damages in the local society = increase control capability
③ Prevent secondary damages or expansion of damages = increase reduction capability
④ Speedy restoration of the damaged local society = increase restoration capability

departments. As disaster prevention culture - disaster culture is more concrete and clear, this research will follow the said definition.



Source: 山本 正典. 地震防災における協働

Figure 4. Factors and Effects of Regional Disaster Prevention Capability

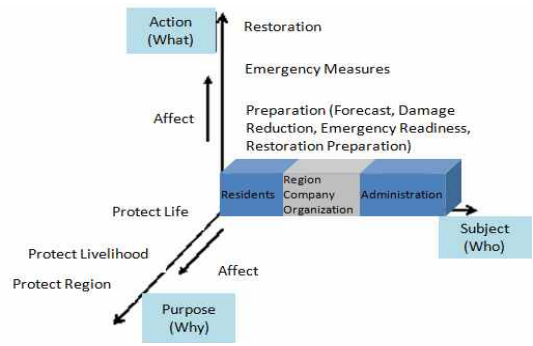
Method ① can be seen as a countermeasure for artificial disaster, however it is impossible to apply to large disasters such as earthquakes or typhoons. Natural disaster can be applied to ②-④ methods. As seen in <Figure 4>, based on time frame, regional disaster prevention capability can be seen as the overall collection of control capability, reduction capability and restoration capability.

Looking into the details of each capability, control capability can be divided into two aspects. One is large public investments such as local infrastructure that need the agreement of the residents in order to conduct any construction and the other is personal economic capability such as repair and reinforcement of individual homes. Reduction capability means crises management capability that tries to reduce the expansion of further damages by efficiently conducting "rescue, first aid treatment, fire extinction or evacuation. Restoration capability is usually controlled by control capability and reduction capability so before disasters it can only be evaluated through the "will" of the residents.

3. Formation factors of regional disaster prevention capability and its characteristics

As a public factor, regional disaster prevention

capability can be illustrated with the concept of it subject, purpose and action. As seen in <Figure 5>, “鍵屋一” can classify subject of regional disaster prevention capability as residents, residents' organization(group) and administration.



Source: 鍵屋一, 地域防災力强化宣言 -進化する自治体の震災對策-

Figure 5. 3 Axis of Regional Disaster Prevention Capability

In case of major disaster it may result in high number of casualty, and it may be difficult to protect life. So the purpose axis, can be distinguished largely into 3 factors, starting from protection of life to protection of livelihood and region.

The subject axis shows that it is impossible to counteract the disaster with only the efforts of the administration. So if the space size is limited to "district" or "ri" the main subject of regional disaster prevention capability will be its residents.

Based on the disaster management process, the action axis shows preparation, prevention, reaction and restoration. Such factors related to emergency readiness and restoration cannot be confirmed in normal circumstances so it must be assessed based on the information regarding preparation readiness. As in <Table 2> disaster prevention activities of each subject can be defined as self help, cooperaton and collaboration which are similar to the Saemaeul Movement ("New Community Movement").[5]

5) The basic spirits that guide the actions of Saemaeul Movement were diligence, self help and cooperation (Homepage of Saemaeul Movement Association)

Table 2. Subjects of Disaster Prevention in Korea

	Definition
Self help	Efforts of individual and family
Cooperation	Helping others close to individual and family (people or organization)
Collaboration	Support from the administration (central government, local government)

Self help is the efforts of the individual or family, and cooperation is within the neighborhood, friends, local community, self organized disaster prevention organization and colleagues which can include support from companies, social services and NPO. Collaboration is support from the central or local government.

Until now the administration was the center of disaster prevention. However after the disasters, "Typhoon Rusa (2002)", "Typhoon Maemi(2003)" and "Torrential Rainfall(2006)"[6] the limits were clear and currently the disaster prevention methods including self help and cooperation is being actively promoted.

Especially according the survey[7] conducted after the flood disaster at Garisan-ri, Inje-gun, Gangwon-do in 2006, as seen in <Figure 6> and <Figure 7>, due to time and space limitations the capability of public disaster prevention was useless in the relief of flood disaster victims.

6) Due to the torrential rain in 2006, in case of Garisan-ri, Inje-eup, Inje-gun not only was the electricity and communication cut off making it impossible to send out disaster information and broadcasting but also transportation was cut off prolonging the isolation of the area. The gun office, cooperated with the military troops located in the area and the residents and managed to free the area from isolation within 3 days.

7) Development plan of flood relief model for farm and mountain area in Karisan-ri. 2006. Gyeongnam Kim. Kangwon development researcher report.

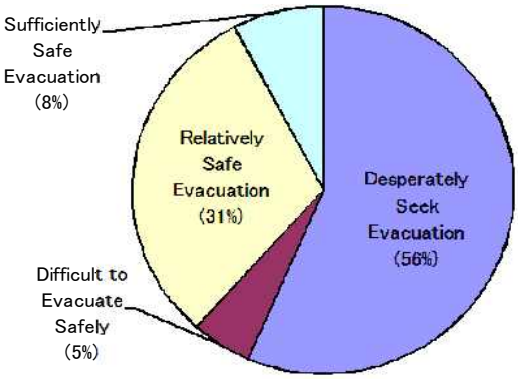


Figure 6. Evacuation Behavior of the Residents of Garisan-ri

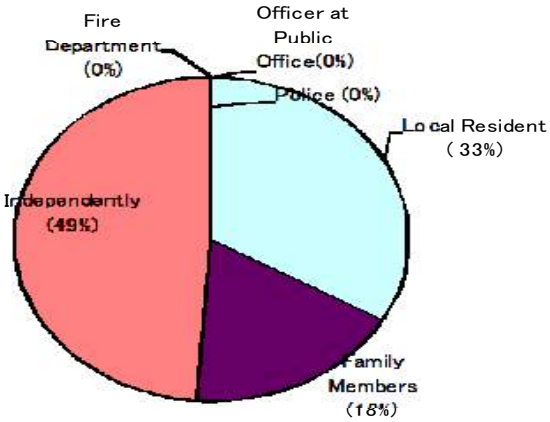


Figure 7. Circumstances Behind Evacuation

IV. Analysis of Regional Disaster Prevention Capacity Status

1. In the view of the residents' representatives

Based on the interview results of the residents' representative of Wondae-ri and Garisan-ri in Inje-gun, Gangwon-do, who experienced great damages due to the Torrential Rainfall in 2006, as seen in <Table 3> there were much effort of the residents such as establishing emergency contact system and obtaining emergency provision to prepare for disasters however preventive actions regarding housing reinforcement and disaster insurance were insufficient.

Especially in case of storm & flood insurance even though the level of government support was very high the percentage of the policy holders were very low, as even the low premium was a burden to the farmers who live in economic difficulty. In order to increase the number of insurance policy holders, there is a need for the local government's active promotion.

Table 3. Interview Results of Residents' Representatives on Residents' Disaster Prevention Capability

	Subject	Prevention	Reaction	Restoration
Farming Mountain Regions	Individual	Housing Reinforcement(x)	Family Action Plan(○), Emergency Provisions(△)	Insurance(x)
	Cooperation	Residents' Organization(○)	Role Assignment(○)	Residents' Cooperation(○)
	Public/Private	Disaster Prevention Activity Experience(○)	Communication Method(△)	Public/Private Collaboration(○)
Urban Regions	Individual	Housing Reinforcement(x)	Family Action Plan(△), Emergency Provisions(x)	Insurance(x)
	Cooperation	Residents' Organization(x)	Role Assignment(x)	Residents' Cooperation(○)
	Public/Private	Disaster Prevention Activity Experience(x)	Communication Method(△)	Public/Private Collaboration(○)

In case of 28-tong, urban areas, in Chuncheon-si, Gangwon-do, although difficult to measure, they gave positive answers regarding the residents' cooperation and public/private sector collaboration. This is due to the news media broadcasting the wretched state of the natural disasters that occurred in the Gangwon-do region in the past causing an indirect experience effect. However seeing the negative answers in other categories, it can be speculated that the "social dilemma" that usually occurs in urban areas seem to have prevailed.

2. Regional Disaster Prevention Capabilityof Residents

With 11 si(city) and gun in Gangwon-do as sample groups, a survey regarding the disaster risk perception was conducted. As seen in <Table 4> survey 1,"Level

of recognition regarding the safety of the village" showed relatively low results with 49.1% answering "Very safe" and "safe". Survey 2,"Acknowledgement of vulnerable areas in the region" showed high score of 82.3% due to many the natural disasters that occurred in the Gangwon-do region in the past causing an indirect experience effect. Survey 3, "Intention to participate in the disaster prevention activities" resulted in 63.4% which show a gap between perception and action. The total level of "Disaster risk recognition" was 64.9%.

Table 4. Level of Disaster Risk Recognition in Gangwon-do

1. Do you think your region(village) is safe from natural disasters? ① very safe ② safe ③ so so ④ uneasy ⑤ very uneasy 2. How much do you know about the vulnerable areas in your region? ① very well ② well ③ so so ④ not so much ⑤ nothing 3. How much do you participate in the disaster prevention activities? ① very much ② some ③ so so ④ not so much ⑤ none at all				
	survey 1	survey 2	survey 3	total
①	31	75	76	182
②	86	121	75	282
③	41	24	64	129
④	62	18	18	98
⑤	18	0	5	23
N/A	0	0	0	0
total(S)	238	238	238	714
(①+②)/S	49.1%	82.3%	63.4%	64.9%

Survey of evacuation inducement capability results are as <Table 5>.

Table 5. Evacuation Inducement Capability in Gangwon-do

4. What will the response be when you as the residents to evacuate? ① almost everyone will evacuate ② more than half will evacuate ③ about half will evacuate ④ more than half will not evacuate ⑤ almost no one will evacuate 5. If you need to evacuate with the residents, how much do you know about the evacuation facilities, the evacuation route, and evacuation methods? ① know very well ② now well ③ so so ④ don't know so much ⑤ know nothing 6. If any residents need the help of the disaster prevention unit, how prepared are you? ① very well prepared ② relatively well prepared ③ so so ④ relatively not prepared ⑤ not at all prepared				
	survey 4	survey 5	survey 6	total
①	75	40	36	151
②	80	119	82	281
③	56	49	85	190
④	15	27	29	71
⑤	11	3	6	20
N/A	1	0	0	1
total(S)	238	238	238	714
(①+②)/S	65.1%	66.8%	49.5%	60.4%

The survey is in 3 areas of recognition-acknowledgement-intention. Survey 4, "Recognition of personal response when requested evacuation" showed 65.1%, survey 5, "Acknowledgement of evaluation facilities" showed 66.8%, and survey 6, "Intention to help" showed 49.5%. Overall level of evacuation inducement capability is 60.4%.

Table 6. Individual Evacuation Response Capability in Gangwon-do

7. Ordinarily are you concerned about the evacuation preparation of those residents living in vulnerable region? ① very much ② some ③ so so ④ not so much ⑤ not at all 8. Do you have sufficient provisions for disaster evacuations? ① very much ② some ③ so so ④ not so much ⑤ not at all			
	survey 7	survey 8	total
①	49	19	68
②	102	51	153
③	52	88	140
④	27	49	76
⑤	6	28	34
N/A	2	3	5
total(S)	243	243	471
(①+②)/S	63.4%	29.4%	46.4%

As seen in <Table 6> of the individual evaluation

response capability survey, survey 7, "perception regarding evacuation preparation" and survey 8, "preparation of emergency provisions" showed respectively 63.4% and 29.4%, resulting in overall score of 46.4%. This indicates that regardless of the indirect effect of water disaster evacuation the residents lack the will to take action. Especially regarding the emergency provisions sector, where expense is needed the will to take action was significantly low. This implies that there is a need for the local government bodies to take aggressive response.

As in <Table 7>, the over all level of disaster prevention system capability is 75.8%. With survey 9,"Active disaster prevention participant recognition", survey 10,"Duty acknowledgement", and survey 11, "Response activity Intentions regarding response activity" showing results of 86.9%(survey 9), 63.0%(survey 10) and 77.7%(survey 11).

Table 7. Disaster Prevention System Capability in Gangwon-do

9. If there are any persons who are active participants of disaster prevention activities in your region please choose 3 answers.
① head of tong/ri ② local disaster prevention group ③ member of night guard ④ member of young men's association ⑤ member of fire brigade ⑥ Saemaeul leader ⑦ Others (_____) ⑧ There are no active people
10. Do you thing your fellow disaster prevention group members acknowledge their duties?
① very much ② some ③ so so ④ not so much ⑤ not at all
11. What do you do when the level of disaster risk is getting higher? Please choose according to priority.(__,__,__,__,__,__,__,__)
① pay attention to the weather forecast ② maintain close contact with si/gun office ③ send notice to fire brigade and night guard to pay attention ④ patrol vulnerable area in danger of flooding ⑤ shout words of caution to those in dangerous places ⑥ collect information on the amount or rain, level of river and change in weather conditions ⑦ dispatch patrol in potentially dangerous places ⑧ don't do any of the above

survey 9		survey 10		survey 11		average(%)
①	127	①	39	①	143	(survey 10 + survey 9 + survey 11)/3
②	59	②	111	②	42	
③	21	③	64	③	11	
others	1	④	20	④	16	
	19	⑤	3	⑤	5	
N/A	1	N/A	1	others	21	
total(S)	238	total(S)	238	total(S)	238	
(①+②+③)/S	86.9 %	(①+②)/S	63.0 %	(①+②)/S	77.7 %	75.8%

Based on the results, disaster prevention system of Korea is relatively good. Especially in the questions asking roles of the individual the results showed consistent answers of "attention to weather forecast", "maintain close contact with si/gun office" and "vulnerable district patrol".

In case of lookout and precaution capability, as seen in <Table 8>, survey 12,"lookout and precaution recognition" and survey 13, "intention to participate in lookout and precaution activity" showed results of 72.6% and 71.8%. With overall capacity of 72.2%.

As a reaction evaluation index the lookout and precaution capability showed a relatively high, positive result.

Table 8. Lookout and Precaution Capability in Gangwon-do

12. Ordinarily do you thing the disaster prevention group members are sufficiently concerned about the lookout and precaution?
① very much ② some ③ so so ④ not so much ⑤ not at all
13. When typhoon or seasonal rain is approaching what activities would you participate in? Please choose according to priority.(__,__,__,__,__,__,__,__)
① patrol vulnerable area in danger of flooding ② maintain close contact with si/gun office ③ send notice to fire brigade and night guard to pay attention ④ If perceived as dangerous, conduct emergency disaster preventive action ⑤ collect information about the amount of rain and water level of the major rivers in the si/gun ⑥ move important items in the vulnerable area to a higher region ⑦ confirm the safety of the residents in the vulnerable area and send notice of precaution ⑧ pile soil or conduct maintenance work on vulnerable areas ⑨ In situations, ask children and seniors to evacuate ⑩ pay attention to the weather forecast ⑪ don't do any of the above

survey 12		survey 13		average(%)
①	43	①	82	(survey 12 +survey 13)/2
②	130	②	54	
③	45	③	12	
④	14	⑩	35	
⑤	4	⑪	2	
N/A	2	others		
total(S)	238	total(S)	238	
(①+②))/S	72.6%	(①+②+⑩)/S	71.8%	72.2%

Overall level of information communication readiness capability is 84.6%, showing the highest level of capability. Survey 14, "Situational communication recognition" and survey 15, "Situational communication acknowledgement"

showed results of 94.5% and 74.7%.

Especially in the "Situational communication acknowledgement" the reliance level of the "village amplifier" was very high. However, this can be effective in densely populated area but in places where houses are scattered such as farming areas or mountain regions the usage is limited.

Also, in urban areas the village amplifier can be used even when the wire/wireless communications are cut off, however in farming or mountain areas when wire/wireless communications are cut off communication between si/fun offices and villages, and even within the village is difficult to maintain. So there is a need to obtain emergency communication methods such as two-way radios or satellite phones.

Table 9. Information Communication Readiness in Gangwon-do

14. When you realize there is a possibility of a disaster where do you sent the information? Please choose according to priority. ① si/gun office and eup/myeon/dong office ② local disaster prevention group, night brigade, fire brigade ③ hospitals and welfare facilities within the area ④ fire department, police department ⑤ neighboring residents ⑥ none of the above 15. What kind of method do you use to sent notice of the disaster conditions to a lot of people? Please select all corresponding answers. ① emergency siren at the area ② village amplifier ③ TV, Radio ④ wire/wireless SMS ⑤ direct visit ⑥ telephone contact network ⑦ visits from public officers ⑧ promotional vehicles ⑨ others				
survey 14		survey 15		average(%)
①	169	①	53	(survey 12 +survey 13)/2
②	30	②	115	
③	0	⑥	10	
④	9	others	33	
⑤	26		4	
N/A	3	N/A	5	
total(S)	238	total(S)	238	
(①+②+⑤)/S	94.5%	(①+②+⑥)/S	74.7%	84.6%

V. Conclusion

The efforts[8] of National Emergency Management Agency, to reinforce disaster prevention on lower regional level with the slogan "active disaster prevention, self disaster prevention", focused on the leaders of the self disaster prevention groups.

However analyzing the capabilities of each si/gun residents, the results showed that the level of general residents' self-independent disaster prevention capabilities and action taking was very low. In order to overcome the exposed limites of leader education there is a need of changed in perception by the administrative offices.

Also, according the case studies of ri/tong residents and survey of recognition-acknowledgement-intention sector, regarding the efforts of self disaster prevention the gap between regions is growing. That is, the gap between urban and rural areas is due to the difference in direct disaster experience and indirect experience effect.

So in areas with little direct experience, efforts to increase the level of self disaster prevention motivation is required along with stronger administrative intention and improved education/training material and methods for disaster prevention groups.

8) In case of National Disaster Management Institute in Cheonan, the program has been implemented 4 times by September 2008 and its target was mostly local people who played a key role in the management coup. Therefore a scheme for local people and evaluation groups should be devised to improve management skill in the municipal government level.

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權建周: 2003년 강원대학교에서 행정학 박사학위를 취득하고(논문: 한국 지방정부 재난관리행정체제의 개선방안에 관한 연구), 현재 강원도 삼척시청에 근무하면서 강원대학교 삼척캠퍼스 방재기술전문대학원 겸임교수로 재직 중이다. 주요관심분야는 지방정부의 재난관리, 정보체계론, 지방자치 등이다. 주요 논문으로는 "지방정부의 재난관리체제 개선방안(2003)" 등이 있다(ibada@hanmir.com).

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