IMPLICATIONS ON SOCIAL INCLUSIVENESS IN CLIMATE RESILIENCE: CASE STUDY OF URBAN FLOOD IN SEOUL

By

Hyeon-Sook Shim

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF PUBLIC POLICY

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DEVELOPMENT POLICY Committee in

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ABSTRACT

IMPLICATIONS ON SOCIAL INCLUSIVENESS IN CLIMATE RESILIENCE: CASE STUDY OF URBAN FLOOD IN SEOUL

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Due to climate change combined with urban concentration of population, the frequency and intensity of urban flooding and its risks have been increased. The social impacts of flood disasters vary by different people as some people have limited access to the means of preparedness, response, and recovery. As confirmed in the case of Seoul, those who have vulnerability factors suffer more from flooding disasters. To protect and support the vulnerable populations countries and cities have developed their own policy measures, manuals and guidelines. Through the comparison of policy measures in representative cities including Tokyo, London, and New York this study finds more room for further policy improvements for vulnerable populations in Seoul. The central and local government, relevant agencies and communities need to cooperate in addressing adaptation to disasters with target-specific welfare for the vulnerable people, which will enhance social inclusiveness in climate resilience.

Key words: social inclusiveness, disaster resilience, vulnerability to urban flood, climate change adaptation, extreme weather

Dedicated to Mrs. Jungwon Lee

ACKNOWLEDGEMENTS

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I. Introduction

Many countries and large populations in the globe have been suffered from natural disasters including earthquakes, hurricanes, typhoons, floods, droughts, and tsunamis. Global warming and climate changes made the situation worse in frequency and intensity in the past century and probably the centuries to come. Growing populations and rapid urbanization since industrialization have intensified more the risks and impacts of these disasters. In most cases, such disasters pose impediments to sustainable economic and human development.

Because of heavy precipitation caused by climate change exceeding the current capacity of infrastructure as well as the concentration of population by urbanization, the damages of urban floods on humans and property losses have become more serious among natural disasters. In urban flooding cases, some people are more vulnerable than others, both in preparedness and recovery from such disasters. Who are the more vulnerable in urban flooding disasters and why?

Experiencing extreme flooding events in recent years, the City of Seoul put forth much effort into tackling the flood damages, including preparing disaster risk maps, improved infrastructure such as capacity-enhanced sewages, rainwater pumping facilities, rainwater storage tanks and permeable pavements. Despite these efforts to improve infrastructures there have been vulnerable populations who are easily exposed to the climate risks and easily become the victims of floods, and sometimes become more likely to go into vicious cycles of vulnerability both socio-economically and in terms of disaster resilience.

This study aims to identify who are most vulnerable to such disasters and examine if they are also socially underprivileged. By looking into the historic disaster data and flood hazard maps for cases of heavy flooding events in recent years in Seoul, and comparing them with

the demographic data by social categories, this report tries to focus on the disaster resilience of the vulnerable classes.

Finally and more importantly, this report discusses on how to further improve the resilience for those who are identified to be more vulnerable. It is important to understand various efforts by cities and countries that have developed their own policies and measures to adequately tackle the disasters from past experiences of flooding disasters. Through research on policy measures in those cities and countries, it also suggests policies to enhance social inclusiveness and welfare for targeted people in water disasters.

1.1 Development of Research Questions

Due to climate changes, frequency, intensity, spatial extent, and duration in rainfall have been changed in the past decades, which resulted in unprecedented extreme weather events (IPCC 2012, 5). On top of such changes in precipitation patterns of flash floods, growing population density and increased impermeable pavement layer in large cities have led to higher risk of urban flooding disasters mostly involved with huge impacts on human and property losses.

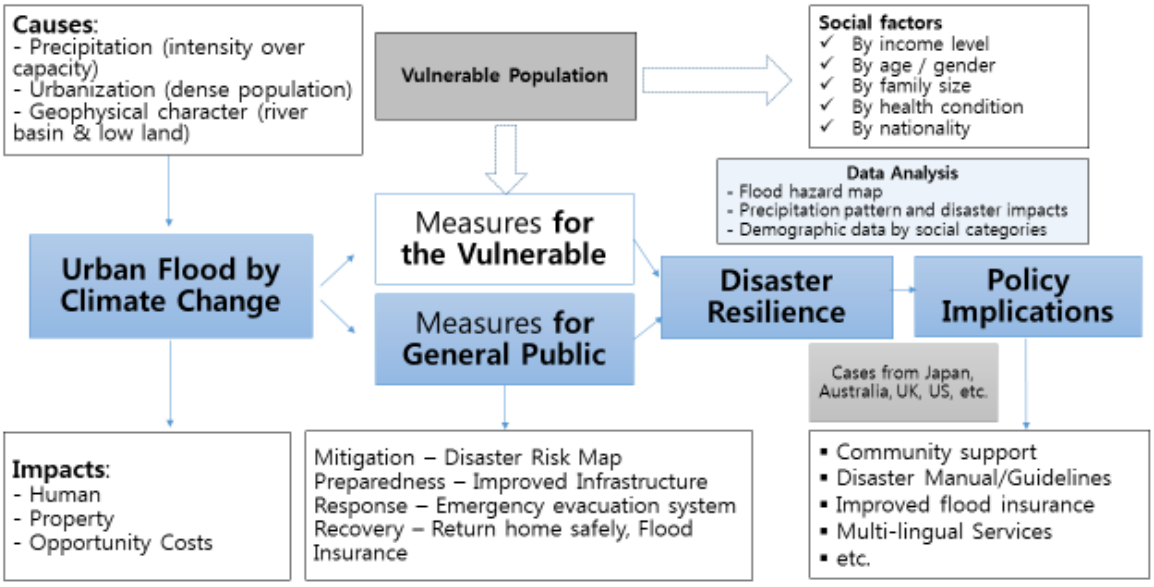
According to the IPCC Report (2012), the vulnerability varies across individuals and communities depending on inequality in socio-economic, geographic, cultural, institutional, and environmental factors. By analyzing several socio-economic factors represented in demographic data combined with disaster factors, this study examines the exposure and vulnerability to flooding disasters of socially under-privileged populations, specifically in the case of Seoul.

Korean government and the local government of Seoul have made a lot of efforts to address vulnerability in flooding disasters, including some measures for those most

vulnerable populations, but there are still room and challenges for enhancing disaster resilience for those people. A comparative analysis on measures that have been introduced and implemented in cases of other cities can be good references and suggestions for Seoul and other cities that have experienced extreme flooding disasters or may be involved in the future.

To build up these research questions, a diagram of mind-map flowchart has been drawn as attached below for better self-understanding on how and where to go for this study.

Figure 1. Diagram of Mapping Flowchart for Research Questions Development



1.2 Methodology

To identify the vulnerable populations in flooding disasters, this study looked into several extreme flooding events in Seoul in the past decade. Considering the time limitation and research capacity, analysis was conducted with the case of flooding events in 2010 which resulted in almost 20,000 inundated houses and huge economic damages.

Using geographic information system (GIS) tools, this study tries to find the vulnerability

in disasters by overlapping several layers of various factors such as i) natural topography displaying with fluvial areas and land use map; ii) disaster maps represented by flood victim population, inundated houses, and flood hazard map; iii) social factor characteristics drawn by demographic data; and iii) taking into account the precipitation characteristic of the year which is also a critical factor in interpretation and analysis. With socio-demographic data from Seoul City government statistics database, several vulnerability factors identified in previous studies were analyzed for the whole city of Seoul by Gu administrative district, for comparison between larger areas that have all different factors indicated above.

For study on policy measures, a comparative approach has been adopted. Through a broad research on measures, manuals and guidelines to address flood disasters in some representative cities including Tokyo, London, and New York, as compared to Seoul, several key categories for policy measures to mitigate social vulnerability and to enhance resilience for the vulnerable populations have been extracted and comparatively analyzed in a master table showing similarities and differences. The categories include measures from generic to specific, from central to local governmental level, from legislative to community-driven or voluntary participation guidance, as well as covering all steps including preparation, response, and recovery. By doing this comprehensive and comparative analysis using vertical and horizontal ways, this study aims to investigate which policy measures have more room for further improvement and to suggest recommendations for climate resilience and social inclusiveness for vulnerable populations.

II. Basic Concepts of Flood Disaster Risk

2.1 Disaster Risk Reduction

There are several definitions on disaster risk. According to the IPCC report, it refers to "the likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery" (IPCC 2012, 3). The UNISDR's definition focuses more on people, by stating it as "exposure of vulnerable population and assets to hazards and probability of harmful consequences or losses". Compared to crisis management that focuses on hazards and disaster events, disaster risk reduction focuses more on risk and vulnerability. Disaster risk reduction (DRR) is defined as "the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development" (UNISDR 2004, 17). Key elements of DRR include vulnerability assessment and early warning systems as well as sharing information through awareness raising and knowledge development (Ibid, 14).

2.2 Disaster Resilience

The concept of resilience has emerged across various fields, involving with resistance, bounce-back, adaptation, and the process from recovery to a transformation. According to the UNISDR, resilience is "the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure" (Ibid, 16-17).

In relation to risk, resilience is a key factor that determines the damage consequence in the hazard events along with vulnerability, where the risk is proportional to likelihood and consequence (Paton and Johnston 2006).

As a more related concept to this research, Whittle et al. argues that resilience is the way on how to respond to and recover from floods and how this process is managed (Whittle et al. 2010, 12). Since this study aims to draw policy measures for improving resilience, especially for vulnerable populations, a dynamic concept of resilience as a strategy shifting would be more relevant and appropriate over recovery process.

2.3 Disaster Vulnerability

According to the IPCC in its 2012 report, vulnerability refers to 'the tendency or propensity to be affected adversely' (IPCC 2012, 3). Disaster vulnerability is defined as 'the degree to which a person or place is susceptible to or unable to cope with adverse effects of climate change' (McCarthy et al. 2001, 1032). The disaster vulnerability is dependent on three dimensions. First, physical vulnerability is related to critical infrastructure such as technical construction of buildings, road pavements, sewerage system and water storage tanks and etc. Second, flood characteristics including the speed and depth of inundation caused by heavy precipitation exceeding infrastructure capacity also matters. Especially, due to climate changes, increasing cases of flash floods and heavy rainfall within short time periods have aggravated these characteristics in recent decades. These two factors have been widely studied and discussed earlier as those factors are relatively easy to measure and to be displayed by flood modeling and flood risk maps for risk assessments. Third, social vulnerability refers to some personal characteristics that restrict people's ability to cope with the disasters, which can explain the different level of social impacts within the flood victims (Coninx and Bachus 2007, 3). Due to its nature, social vulnerability has limitations to be quantified and estimated. However, as this factor is more related to people than other factors, we need to see the exposure of people with certain characteristics to disasters.

In the past studies, social vulnerability factors of flood disasters have been identified in

several ways. A recent report stated that socio-economic factors should include income, age, ethnicity, and poor health and family structure combined with low flood awareness, lack of physical capacity, lack of resources to protect and insure property and weak social networks (Whittle et al. 2010, 10). Similar to this approach, Coninx and Bachus (2007, 6) argued to include age, income, health status, family composition, nationality and property type, in vulnerability. In Korea, a 2010 report by the National Institute for Disaster Prevention (NIDP) classified the vulnerable populations in disasters into three categories, i.e. economically, physically, and environmentally vulnerable people. Economically vulnerable people include individuals who are in severe poverty or recipients of the National basic livelihood security system as they have no money to protect themselves in or before disaster situations. Handicapped, elderly, infants and children are categorized as physically vulnerable people. Foreigners who reside or travel in Korea are defined as environmentally vulnerable class as they are in more difficult situations than local people in disasters due to linguistic, cultural and environmental differences (NIDP 2010, 10-15). Other researches also include people who live in frequent flooding areas, outworkers and elderly lone family as the vulnerable to all disasters (Shin et al. 2013).

As this study is focusing on flood disasters in the case of Seoul, the following categories of vulnerability are considered as a starting point:

1) Low income: Low income people are more likely to suffer from post-disaster impacts because it takes them longer time to recover as well as from pre-disaster preparedness because they do not have money to purchase flood protection insurance or materials.
2) Aged: With limited mobility and other physical constraints, elderly people are prone to flood disasters. Korea is estimated to have rapidly growing population aged 65 or above which will double the population aged 0-14, in 2030 (NIDP 2010, 14). As such, policy

measures to address the vulnerability of aged population are needed urgently.

3) Handicapped: Handicapped or disabled people are more likely to have difficulties in evacuation and recovery. The families with a disabled person may have longer recovery processes (Coninx and Bachus 2007, 8).
4) Family structure: Single-family elderly people are weaker in disaster preparedness and recovery as they lack physical support in disaster situations.
5) Foreigners: With language difficulties foreign residents and visitors are more vulnerable to disasters. Most foreign workers in Korea are living with relatively low income, which possibly increase the vulnerability.

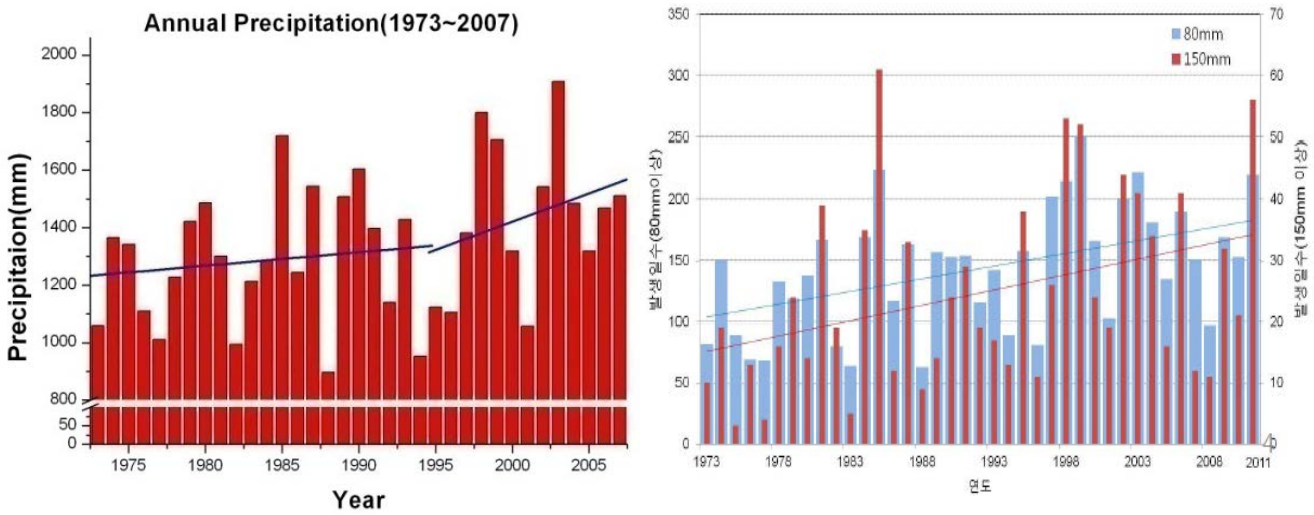
III. Addressing Vulnerability – Case of Seoul

3.1 Precipitation Patterns and Geophysical, Demographic Characteristics

3.1.1 Recent Trends of Precipitation Patterns

Due to global warming, increasing water vapor in the air by higher average temperature has brought extreme weather events of high intensity and frequency, including heavy rainfalls and droughts. Korea is facing more threats of flooding disasters. The annual precipitation shows clear trends of increase after mid-1990' compared to 30 years ago, with more frequency of heavy rain events.[1]

Figure 2. Trends of Annual Precipitation and Heavy Rainfall (over 80 mm) in Korea



Sources: National Institute of Meteorological Research, Korea Meteorological Administration

Table 1. Recent Trends of Summer Heavy Rainfalls in Korea (Shin 2011)

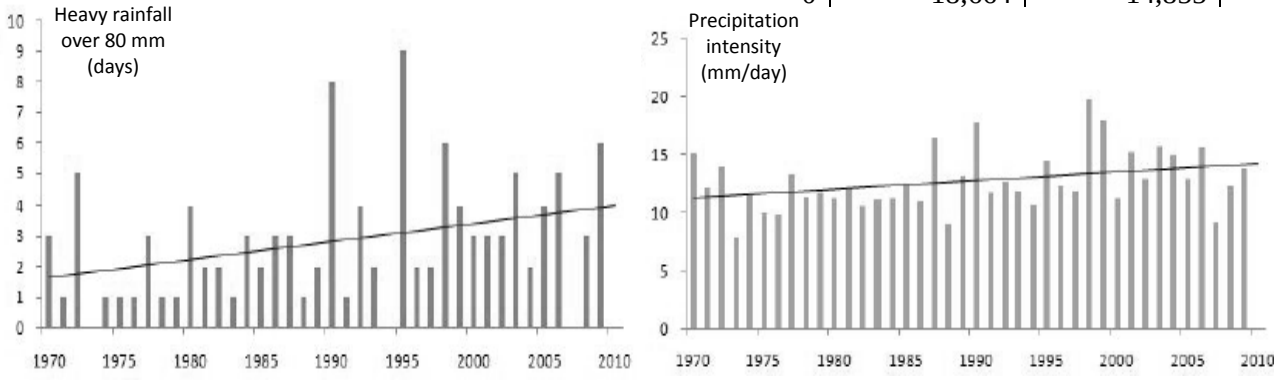
	Average Summer Precipitation (mm)	Average Days of Summer Rainfall (days)
2011	1048.1	48
2000's	768.7	40
1990's	713.7	36
1980's	694.5	36

In the case of Seoul, we can find similar trends. The frequency and intensity of heavy rainfall events have increased in the last 40 years (see Figure 3). In 2000s, the average number of days with heavy rainfall over 80 mm was 3.7 days, more than double as compared to 1.8 days in 1970s. The intensity of precipitation has also increased. In July 2011, Seoul had heavy rainfalls of 1,131.0 mm for one month. In 2010, annual precipitation in Seoul was recorded as 2,043.5 mm, much higher than the average annual precipitation for the previous three decades, which was 1,450.5 mm (Korea Meteorological Administration 2011, 101).

Category	1998	2001	2010	2011

# of casualties (death /missing)	19	42	4	24
# of flood sufferers	2,287	338	-	-
# of inundated houses	0	0	18,664	14,855

Figure 3. Recent Trends of Heavy Rainfalls in Seoul (Lee et al. 2011, 37)



Seoul has experienced several extreme flooding events in the past decades which resulted in huge damages in human and property losses. Statistics prove that the recent flooding events caused a lot of casualties, inundated houses, and economic damages. Table 2 shows the casualties and economic damages caused by the major four flooding events between 1998 and 2011. Compared to the past, the damages from flooding have shown decreasing trends thanks to continuous efforts in improving infrastructure, however, in the cases of extreme urban flooding events, human and economic damages are increasing due to rising intensity of urban heavy rainfall in target areas (Son, Han, Bae 2013; Moon and Yoon 2010). Among these events, the flood in 2010 recorded 19,000 inundated houses, which implies a lot of people affected. For this reason, this study looked into the 2010 case to

Table 2. Damages from Major Flooding Events in Seoul, 1998-2011

Sources: Seoul Metropolitan City Statistics

analyze its social aspects.

3.1.2 Flooding disaster in 2010

On 21 September 2010, a day before the biggest national holiday for thanksgiving in Korea, there was a torrential heavy rainfall in Seoul caused by a belt of rain clouds across the South part of the city which was the most exceptional rainfall ever recorded in September. The daily accumulated rainfall exceeded 250 mm in 17 out of 27 meteorological stations in Seoul. More noticeable characteristics were the spatial difference and time intensity of the rainfall within Seoul. As shown in the Table 3 of precipitation records in Automatic Weather System (AWS) [2], the average daily accumulated rainfall was higher than 230 mm in all regions except the Northeast area (Moon and Yoon 2010). The Southwest Gangseo district hit 293 mm for the day while Northeast Nowon district had only 56 mm. As

Table 3. Precipitation on 21 September 2010

(AWS, per hour)

	Time / Location	Day Total	4 hour peak rainfall
South-West Region	Kangseo	293.0	253.5
	Yangcheon	269.0	238.0
	Youngdeunpo	257.5	228.5
	Dongjak	257.5	231.5
	Guro	219.5	198.0
	Kwanak	159.5	139.5
	Keumcheon	194.0	171.5
North-West Region	Eunpyung	180.5	137.5
	Seodaemun	275.5	237.5
	Mapo	280.5	247.5
	Jongno	259.5	224.5
	Junggu	264.0	230.5
	Yongsan	263.0	216.0
North-East Region	Dobong	95.5	59.0
	Kangbuk	130.5	90.5
	Seongbuk	170.0	133.0
	Dongdaemun	229.5	195.0
	Jungnang	227.5	197.0
	Seongdong	259.5	222.5
	Kwangjin	263.5	221.0
South-East Region	Kangnam	293.0	233.0
	Seocho	261.0	197.0
	Songpa	275.5	214.0
	Kangdong	274.5	232.5
Average		**235.6**	**197.9**

Sources: Seoul Metropolitan City Statistics

[2] More detailed precipitation records of the heavy rainfall on 21 September 2010 measured by AWS are shown in Appendix 1. For reference, the rainfall in 2011 is also in Appendix 2.

for time intensity, for example, maximum rainfalls in Gangseo were 98.5 mm in an hour, 171.5 mm for two hours, and 232.5 mm for three hours, showing a 50 year frequency, 200 year frequency, and 500 year frequency, respectively (City of Seoul 2011).

According to Seoul Metropolitan Statistics, Gangseo, Yangcheon, and Gwanak recorded over 2,300 inundated houses, followed by 1,768 in Guro, while no inundated house was reported in Dobong and Nowon. Total economic damages were calculated to KRW 21.6 billion, about half of which were damages for public facilities. The populations affected by the flooding were also high in those districts, recording more than 2,300 people in Gangseo and Yangcheon, followed by Guro and Gwanak of about 2,000 victims. Considering the

Table 4. Damages from Flood in 2010 (in human and properties)

(Unit: KRW1,000)

Admin. District	Inundated Houses	Victims Affected	Victims (per population 10,000)	Total economic damages	Economic Damages in publc facilities
Jongno-gu	28	28	1.6	53,170	37,570
Jung-gu	25	29	2.1	15,000	-
Yongsan-gu	153	278	10.8	825,822	738,822
Seongdong-gu	126	85	2.7	175,106	124,706
Gwangjin-gu	1507	1671	43.0	1,146,148	240,748
Dongdaemun-gu	59	113	3.0	35,400	-
Jungnang-gu	273	330	7.6	163,800	-
Seongbuk-gu	55	55	1.1	33,000	-
Gangbuk-gu	223	165	4.7	46,800	-
Dobong-gu	0	0	0.0	-	-
Nowon-gu	0	0	0.0	-	-
Eunpyeong-gu	413	402	8.2	52,800	-
Seodaemun-gu	178	228	6.8	1,604,640	1,535,040
Mapo-gu	563	584	14.6	337,800	-
Yangcheon-gu	2336	2343	46.4	4,422,160	3,016,360
Gangseo-gu	2408	2416	41.6	1,756,843	179,624
Guro-gu	1768	2096	46.3	1,045,200	-
Geumcheon-gu	628	698	26.4	377,400	-
Yeongdeungpo-gu	1249	1253	28.1	751,800	-
Dongjak-gu	1365	1362	32.9	816,600	-
Gwanak-gu	2310	1906	34.7	3,047,506	1,667,506
Seocho-gu	740	1046	23.8	3,027,781	2,490,888
Gangnam-gu	523	523	9.1	321,384	-
Songpa-gu	346	616	8.9	430,630	283,630
Gangdong-gu	1388	1198	24.1	1,082,868	39,335
Total	**18664**	**19425**	**Ave. 17.1**	**21,569,658**	**10,354,229**

Sources: Seoul Metropolitan City Statistics

population size, Guro and Gwanak had far more victims as compared to Gangnam or Seocho which recorded much higher precipitation (Table 4).

3.2 Data Analysis on Resilience of the Vulnerable Class

In order to analyze the vulnerability to flooding disasters, the geographic information system (GIS) tool has been used by overlapping several layers of some key characteristic categories:

1) Natural and urbanization factors including:
   - DEM map with river and streams showing low lands and river basins in natural topography
   - Land use map that serves as reference for impermeable areas in urbanization level;[3]
2) Disaster factors including:
   - Flood hazard map
   - Population affected by flood
   - Inundated houses that may also be involved with low lands or basement residences;[4]
3) Socio-demographic factors including:
   - Economic factor

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[3] According to recent studies, on top of change in precipitation patterns due to climate change, rapid urbanization and expanded impermeable pavement areas has also contributed as one of the key reasons to the flooding.

[4] The data is almost the same as the population affected in 2010 flood case (Appendix 9, 10). So the population affected data is only used in the map overlapping analysis in this study.

- Physical factor
- Family structure factor
- Cultural or linguistic characteristics.

The data by district was converted into number per-population to eliminate population size variable disparity.

At first, an overview research has been conducted for the whole area of Seoul on the above mentioned factors and characteristics. Considering the precipitation patters of the 2010 heavy rainfall case, the northeastern part of Seoul that had very little rainfall has been taken out from the analysis. The overlapped GIS maps of the key characteristics show that the most affected districts with human or economic damages have more populations of vulnerable indicators as summarized in the Table 5, followed by individual overlapping tables and maps.

Table 5. GIS Map Layers and Analysis

No.	GIS Maps	Legend	Characteristics	Analysis	Analyzed by
1	**Digital Elevation Model (DEM) + River & Stream**	n/a	**Natural topography**	Natural topography that shows bare earth shapes including elevation. In this map layer, low land and river streams are also included.	District / Dong
2	Land Use Map	n/a	Urbanization	Reference for permeable areas vs. impermeable area such as residential/industrial/commercial areas, and etc.	District / Dong
3	**Flood Hazard Map**	**Flooded**	**Disaster**	Map of the area which shows location, level, and duration of the inundation by typhoon, storm and heavy rainfall, through surveys and measurements of inundation trace	Default layer on all
4	**Victims Affected by Flood**	**Damaged**	**Disaster**	(Data that shows direct damages to people) **# of Affected per population: Yangcheon, Guro, Gangseo, Gwangjin, Gwanak** (ranked in order) *Number of damaged: Gangseo, Yangcheon, Guro, Gwanak, Gwangjin*	District / Dong
5	Inundated Houses	n/a	Disaster	(Low land, basement residences are more involved) # of Inundated houses per population: **Yangcheon, Gwanak, Gangseo, Guro**, Gwangjin *# of Inundated houses: Gangseo, Yangcheon, Guro, Gwanak, Gwangjin*	District / Dong
6	**Recipeint of Basic Livelihood**	**Basic_L**	economic	Nowon, Gangseo, Gangbuk, Geumcheon are the four highest. Except the northern part of Seoul that had much less rainfall, Gangseo, Geumcheon and Gwanak showed much higher level, compared to Seocho and Songpa. Gangseo is 4.7 times higher than Seocho.	District / Dong
7	**Aged 65+ Population**	**Aged_65+**	physical	Aged 65+ shows little variance by district. More aged populations live in northern part of Seoul. Among the southern area, Dongjak, Youngdeungpo, Gwanak, Gangseo, Geumcheon, and Guro showed slightly higher level, compared to Gangnam, Songpa and Yangcheon.	District / Dong
8	**Elderly Single Family Household**	**ESF**	Physical + family structure	Elderly single family household populations are relatively higher in northern part of Seoul. Among the southern area, Youngdeungpo, Dongjak, Gwanak, Gangseo, and Guro showed slightly higher level, compared to Seocho, Gangnam, and Songpa.	District / Dong
9	**Low Income Elderly Single Family Household**	**ESF_LI**	Physical + economic + family structure	(Basic livelihood recipient + Low income) Elderly Single Family Household Yongsan, Gwanak, Sungbuk, and Dobong show far much higher level. Gwanak is 6.5 times higher than Songpa, 2.6 times higher than Gangnam.	District / Dong
10	Aged 80+ Elderly Single Family Household	**ESF_80+**	Physical + family structure	*Analyzed in Dong level for four representative districts*	Dong
11	**Handicapped**	**Handicapped**	Physical	Relatively not much difference by district. Gangbuk, Gangseo, and Jungnang show slightly higher level. In southern area, Gangseo, Geumcheon, Guro, and Gwanak have more handicapped people. Gangseo is 1.9 times higher than Seocho.	District / Dong
12	**Foreigners**	**Foreigner**	Cultural (linguistic)	The variation on the number of foreigners is big. Youngdeungpo, Geumcheon, Guro, followed by Jung, Yongsan, and Jongno, have much more foreign popolations. Youngdeungpo, Geumcheon, and Guro have 6 times more foreigners than Seocho, Gangnam, and Songpa.	District
13	*Housing Prices*	*n/a*	*economic*	*Additional research for later consideration*	

	Natural and Urbanization factors
	Disaster factors
	Socio-demographic factors

Figure 4. Study Area – Four Representative Districts

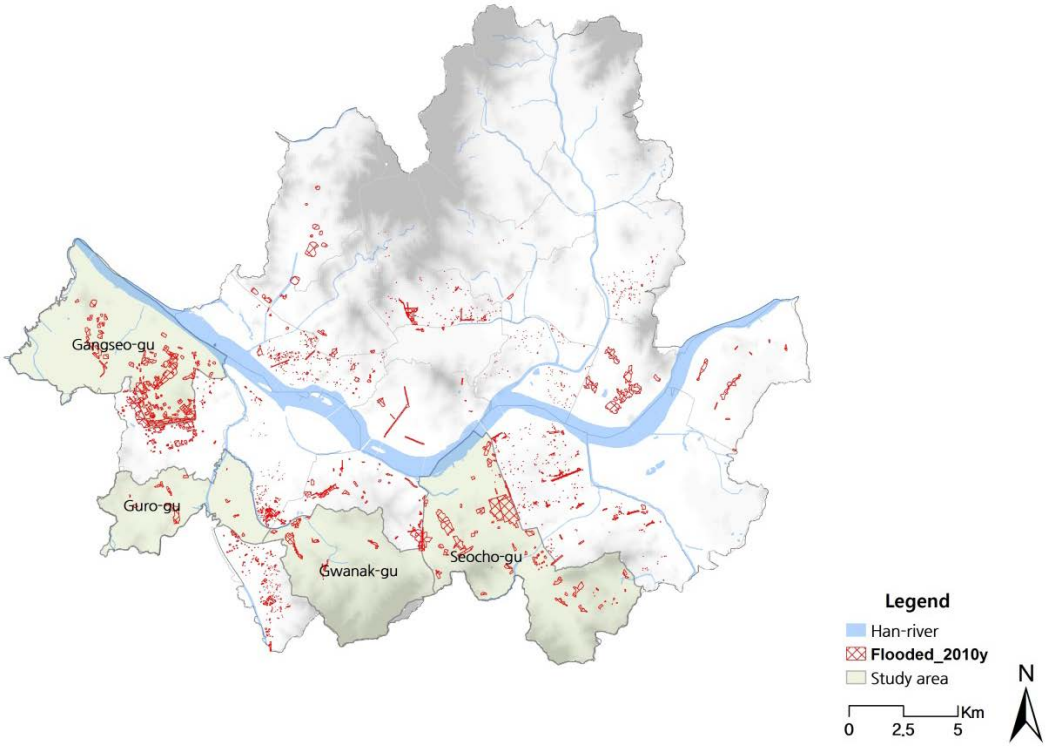


Figure 5. Land Use Map

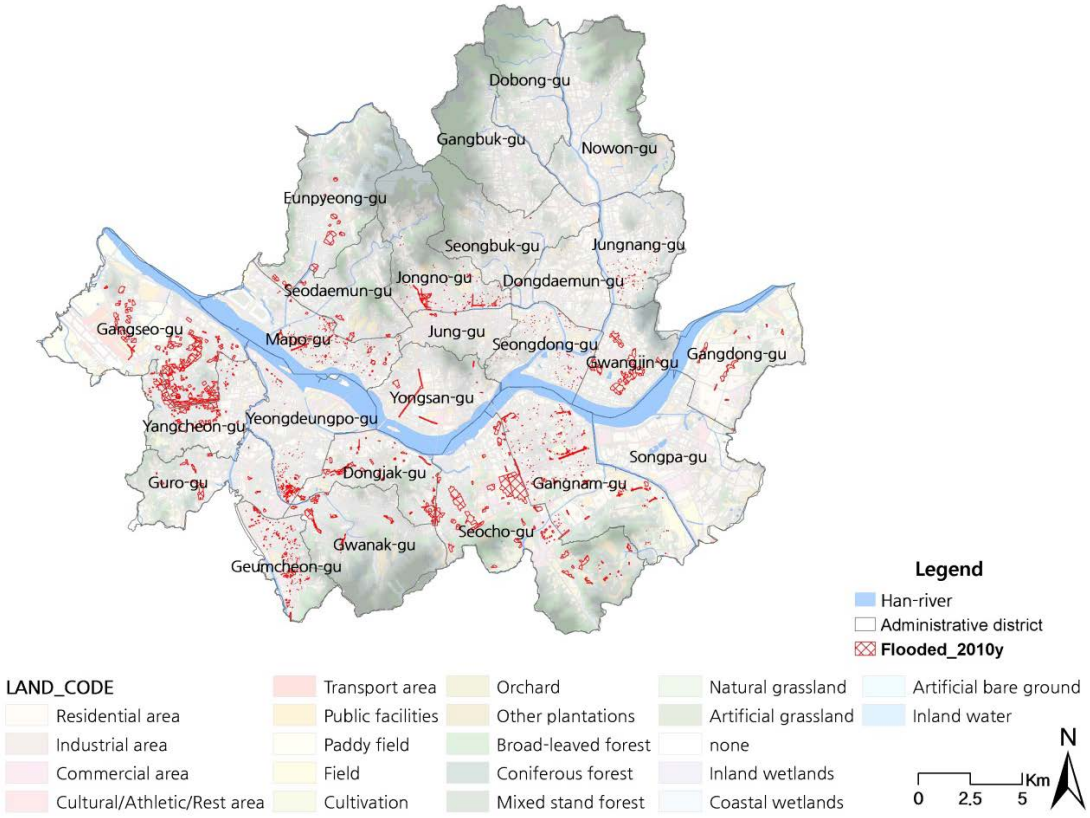


Figure 6. Victims Affected by Flooding (per population 10000, 2010) - Chart

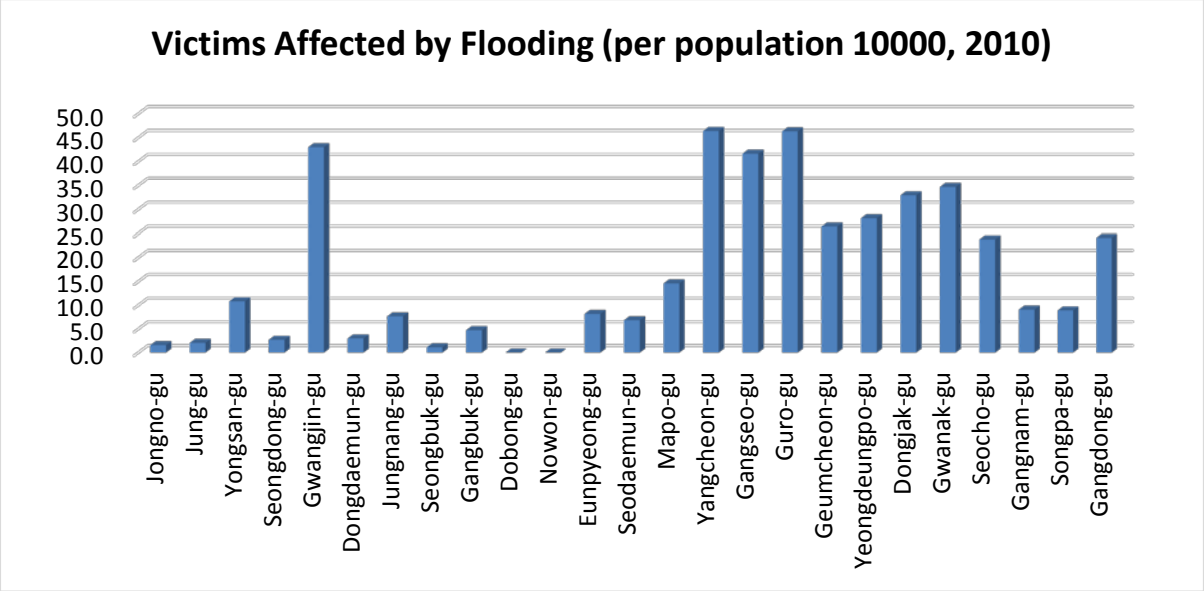


Figure 7. Victims Affected by Flooding (per population 10000, 2010) - Map

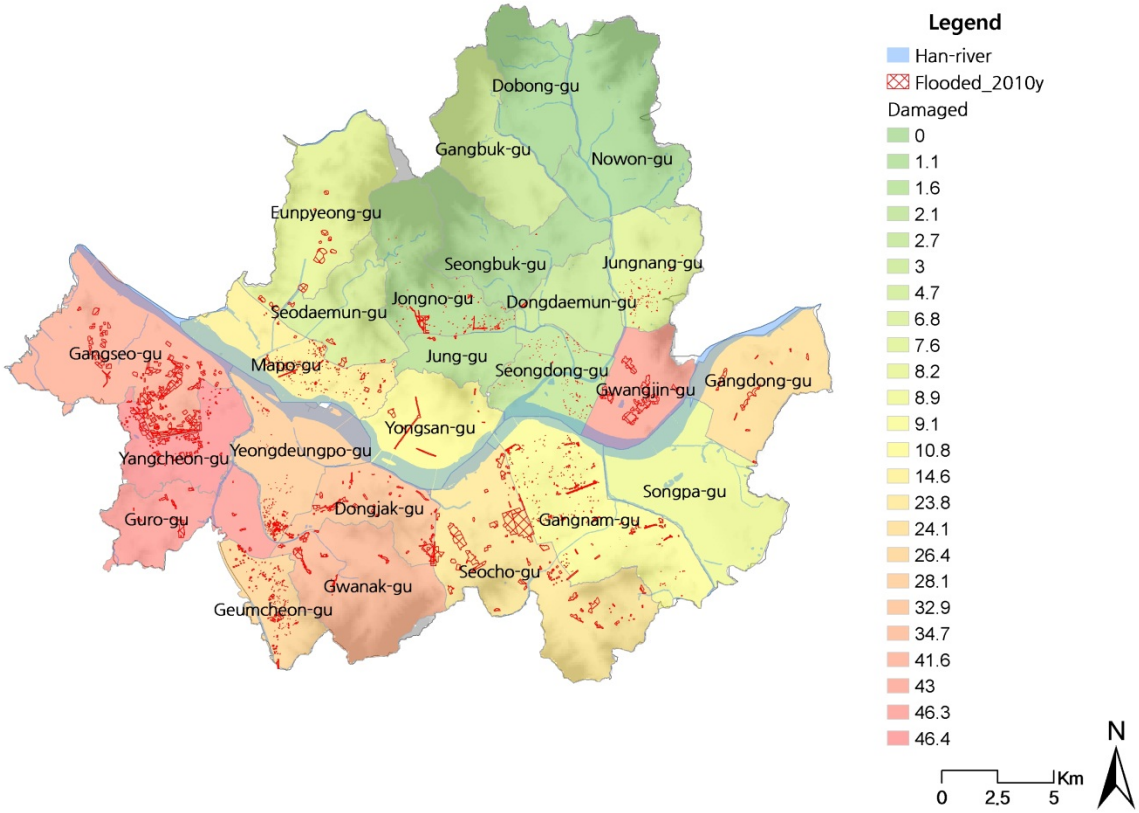
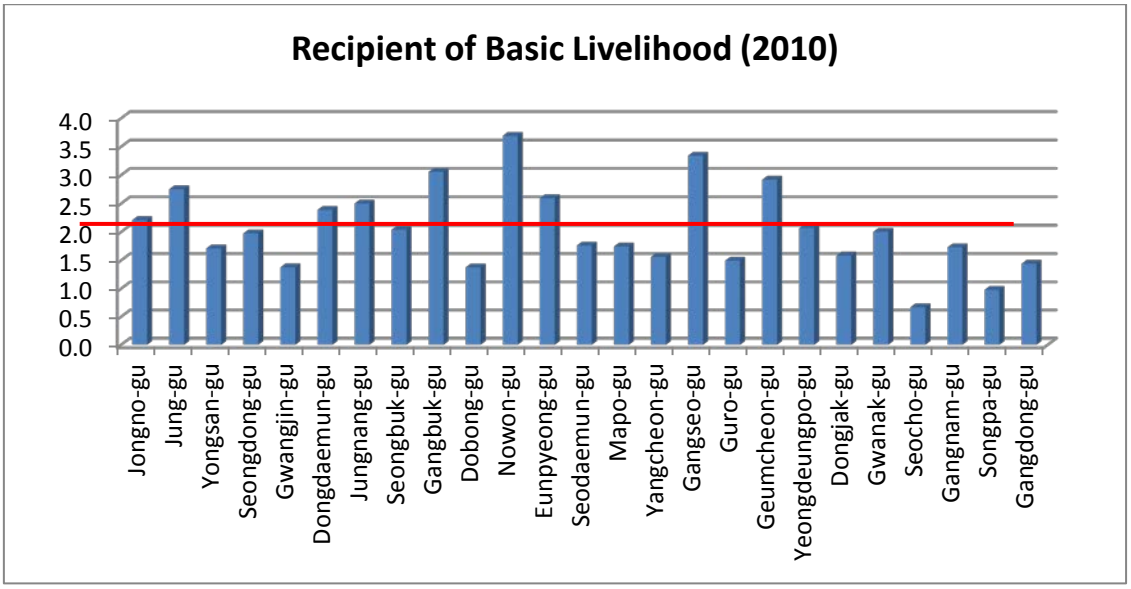


Figure 8. Recipient of Basic Livelihood (2010) – Chart



Average of Seoul: 2.0

Figure 9. Recipient of Basic Livelihood (2010) – Map

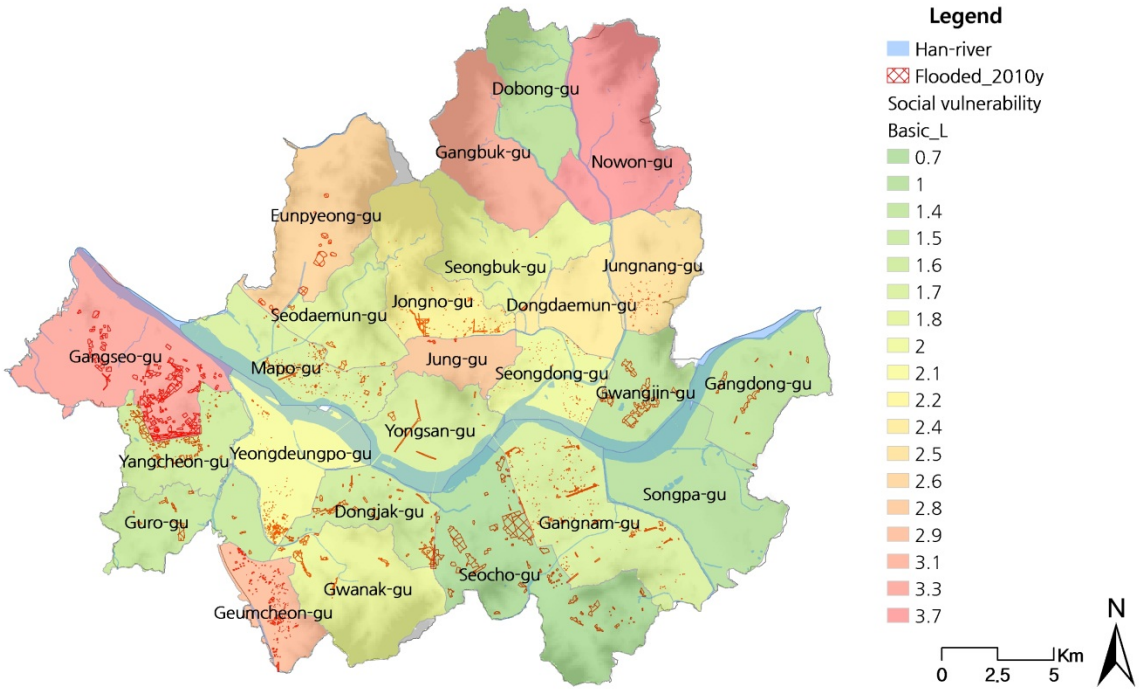
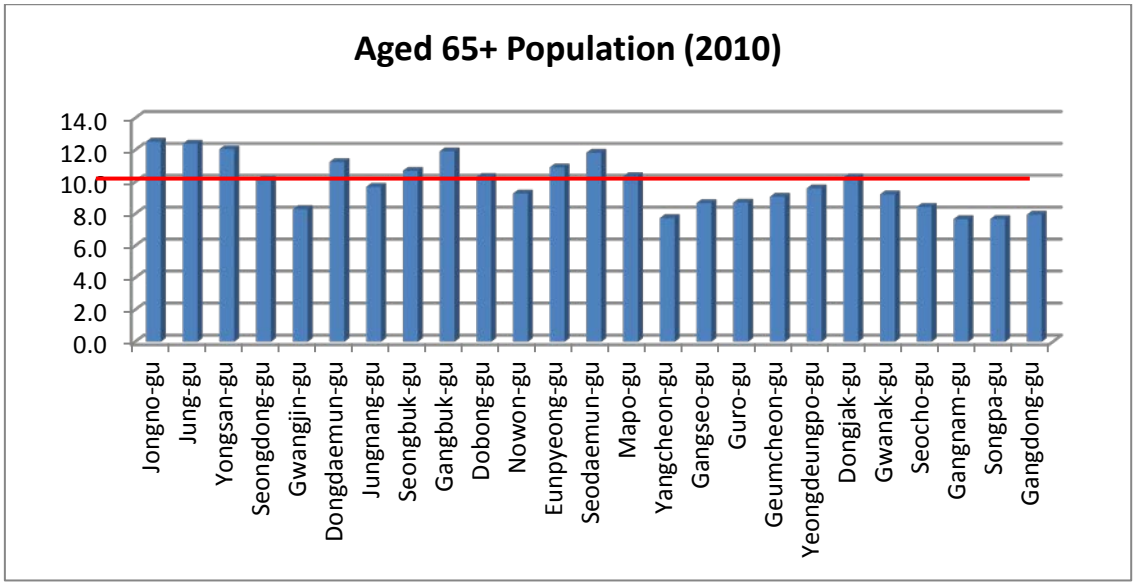


Figure 10. Aged 65+ Population (2010) – Chart



Average of Seoul: 9.9

Figure 11. Aged 65+ Population (2010) – Map

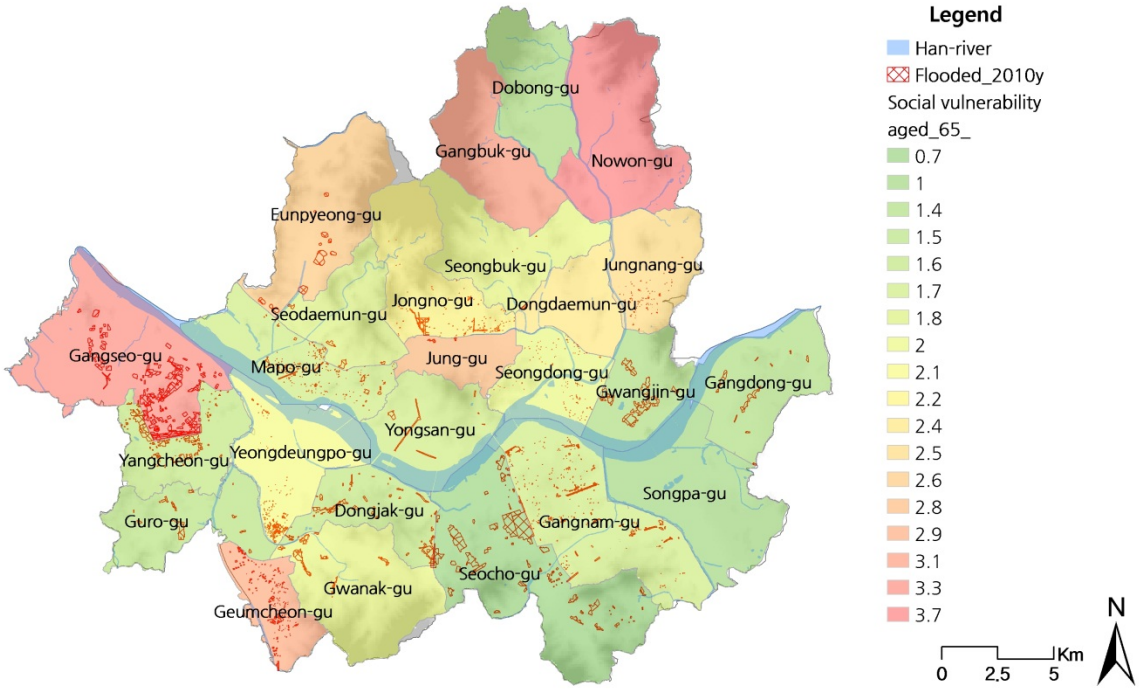
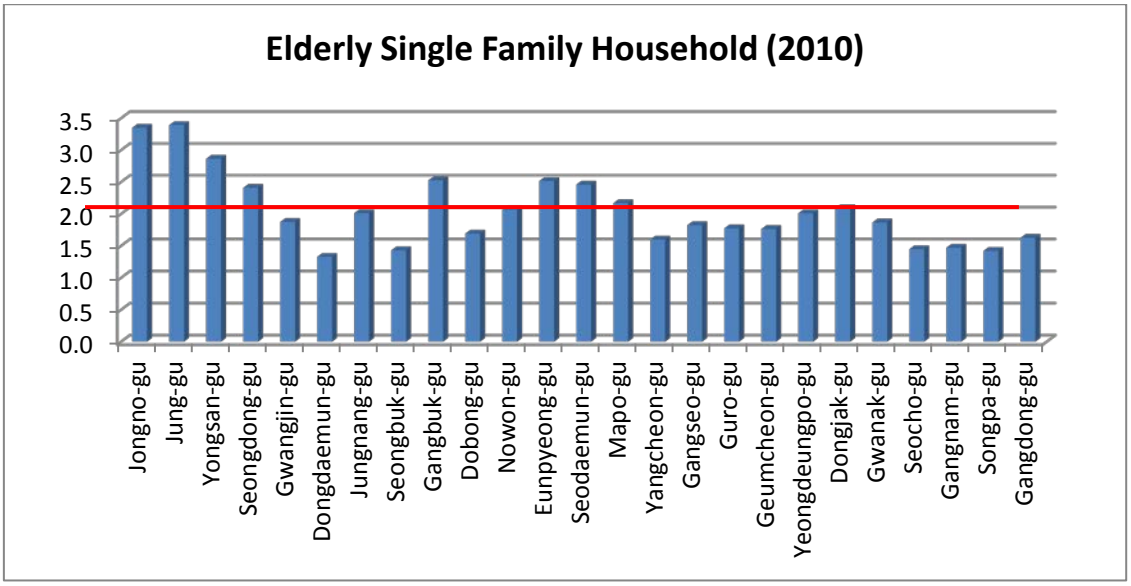


Figure 12. Elderly Single Family Household (2010) – Chart



Average of Seoul: 2.0

Figure 13. Elderly Single Family Household (2010) – Map

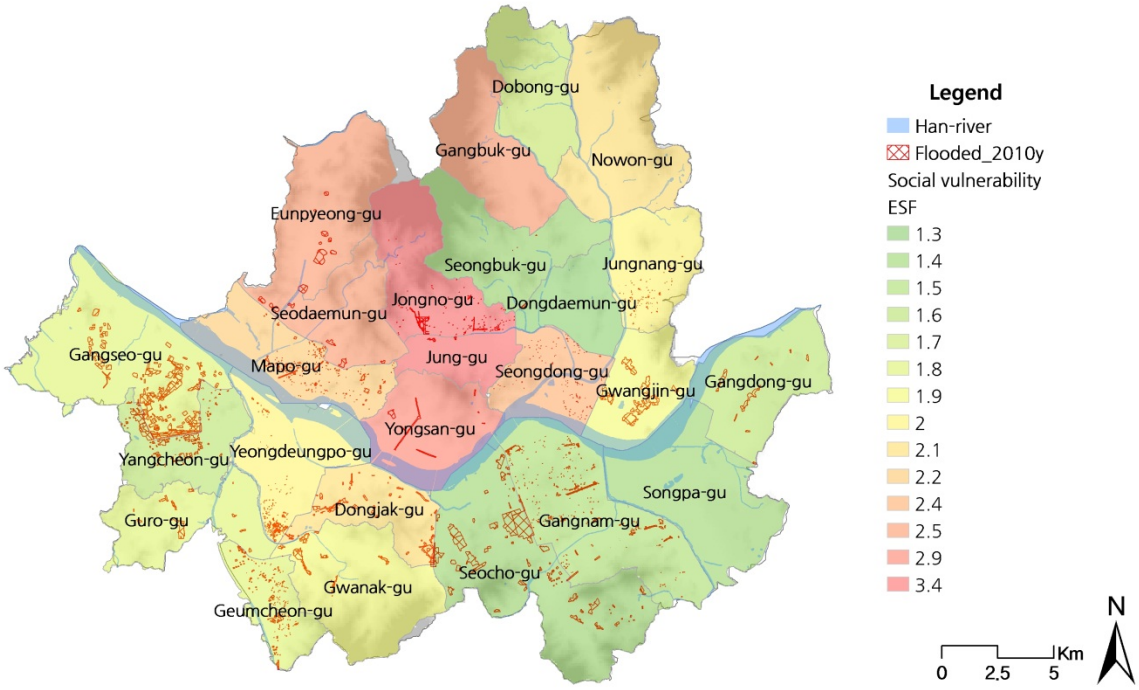
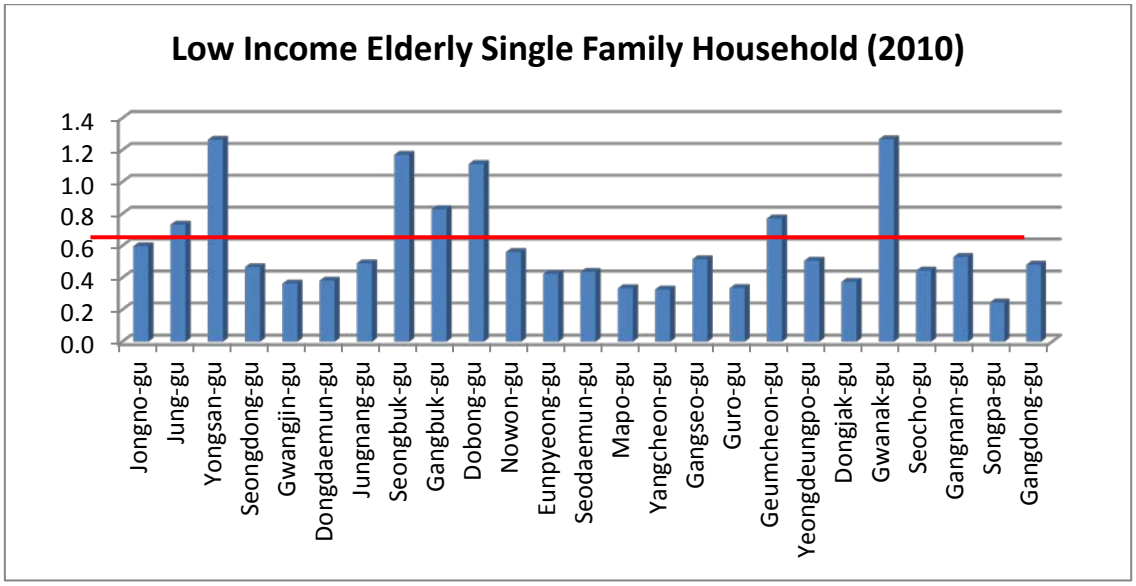


Figure 14. Low Income Elderly Single Family Household (2010) – Chart



Average of Seoul: 0.6

Figure 15. Low Income Elderly Single Family Household (2010) – Map

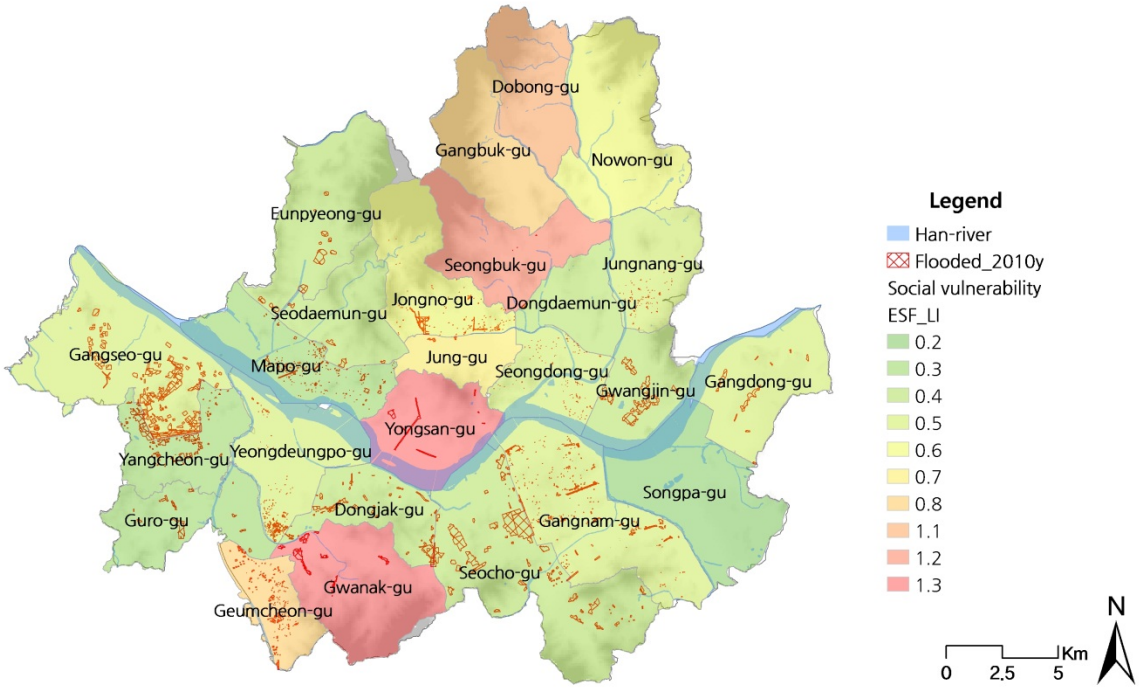
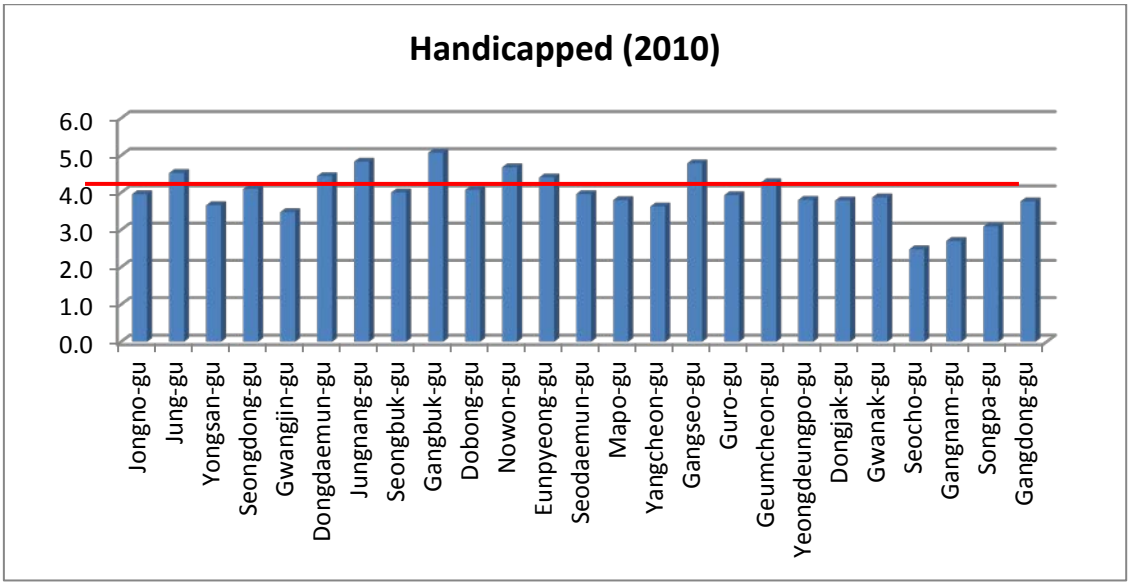


Figure 16. Handicapped People (2010) – Chart



Average of Seoul: 4.0

Figure 16. Handicapped People (2010) – Map

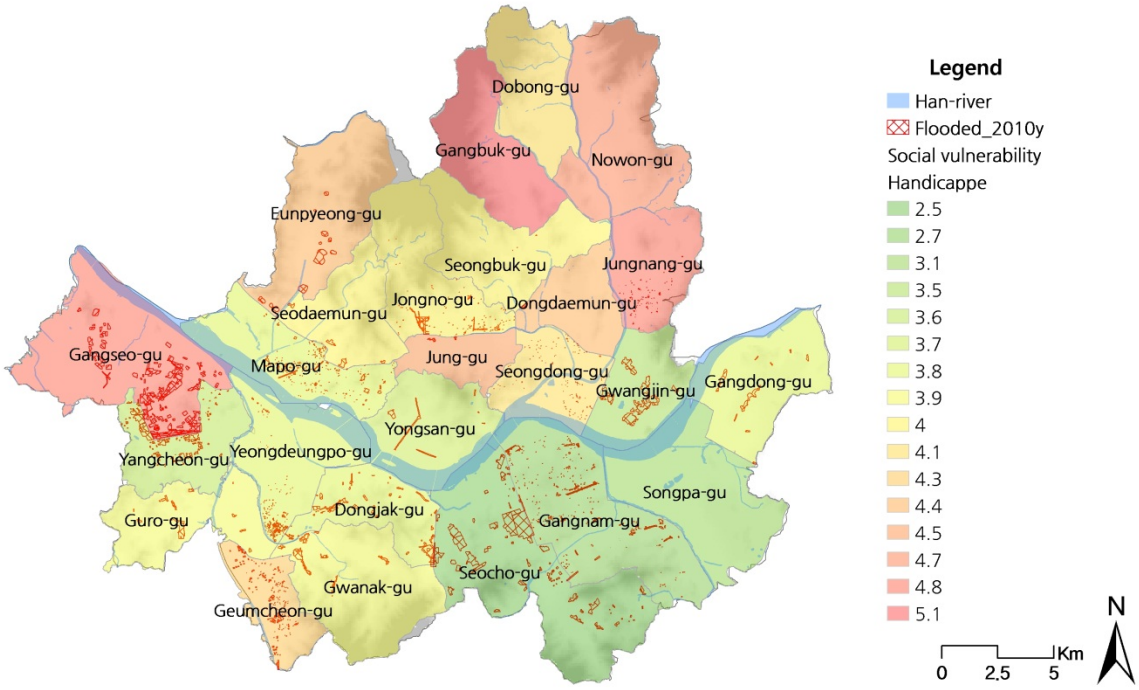
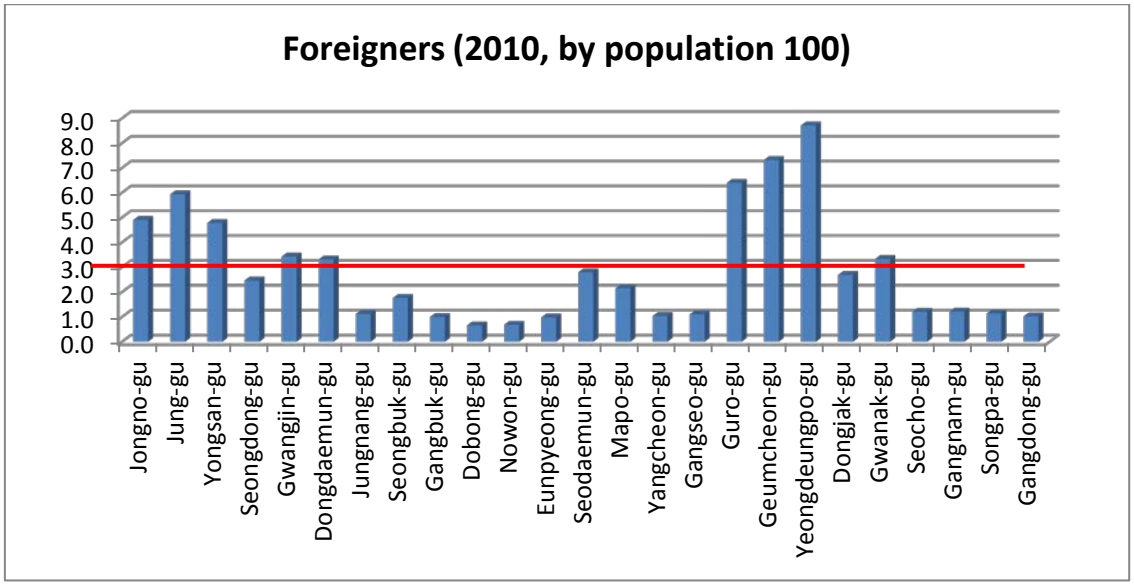
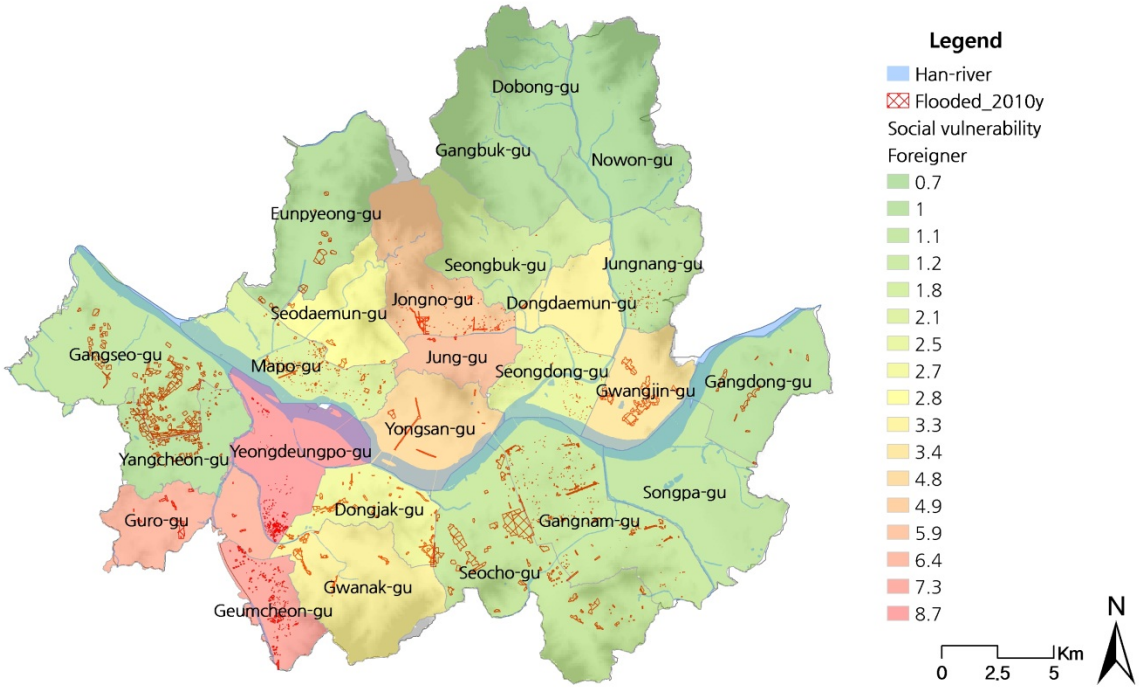


Figure 18. Foreigner (2010) – Chart



Average of Seoul: 2.8

Figure 19. Foreigner (2010) – Map



Among the vulnerability factors, analyzed those factors involved with economic characteristics bring more disaster vulnerability showing bigger variance between districts. That means, recipient of basic livelihood and low income aged single-family population are more related to the vulnerability to flood disasters. It is interpreted that people who are economically impaired have little choice for residential area and easily take the areas of lower housing prices which imply regions of higher flood risks such as low-land or with low infrastructure or combination of several factors. It makes vulnerable persons more vulnerable to the next disaster, and put them into a vicious cycle. Foreigners are also potentially vulnerable people as the number of foreign residents and visitors who have limited access to the disaster information, due to linguistic and cultural barriers, have rapidly increased in the past years[5] and are expected to increase even further in the coming years.

IV. Policy Measures for Urban Floods in Social Aspects

4.1 Tokyo, Japan

Laws and Guidelines

In Japan disasters are managed at three administrative levels: national, prefectural, and municipal. Municipalities respond first in occurrence of disasters, with supports by national and prefectural governments in case of large scale disasters. At the national level, the Cabinet Office is responsible for planning and designing basic policies and guidelines under the Disaster Countermeasures Basic Act (Cabinet Office of Japan 2011).[6] The Minister of State

[5] See Appendix 14.

[6] The Outline of the Disaster Management System is shown in Appendix 15.

for Disaster Management takes a leading role in disaster reduction in the National Government (ADRC 2012) while the Ministry of Land, Infrastructure and Transport (MLIT) is in charge of overall flood risk management, supported by a series of related laws including the River Law, the Flood Fighting Law (1949), the Flood Control Special Accounting Law (1960), and the “First Five Year Plan for Flood Control” (OECD 2006).

To address urban flood risks, “Comprehensive Flood Control Measures” was introduced in 1978 to alleviate the impacts of rapid urbanization on flood risk, targeting improved water control, retaining water and drainage capacities, and damage reduction measures for inundated buildings. With more frequent and localized heavy rainfall, the Specified Urban River Inundation Prevention Act was enacted in 2003, aiming at reinforcing river basin measures through the clear definition of the roles of administrators for river and sewerage, prefectures and municipalities. More recently, Japan adopted the “National Strategy for Risk Management of Large-Scale Flood Disaster” to introduce a series of new measures such as simulation of socio-economic impact and target setting, and improved cooperation and communication with citizens. The MLIT also suggested an “Emergency Action Plan for Torrential Rain Disaster Management” which consists of five elements: to improve disaster information services; to ensure the sharing of disaster information; to maintain and improve the functions of disaster prevention facilities; to rebuild local disaster management capacity; and thorough review of disaster preparedness (OECD 2006).

Tokyo Metropolitan Government (TMG) Countermeasures

After experiencing the extensive damages in the Nagoya metropolitan area by the Tokai heavy rain in September 2000, “Tokyo urban flood control measures Study Group” was established in Tokyo in 2001, followed by the “urban flood emergency exploratory committee” established by the MLIT in 2000. The Study Group developed and compiled

comprehensive measures including not only hardware measures of maintenance on rivers and sewers, but also soft measures including provision of flood information with inundation forecast area diagrams and flood hazard maps, crisis management, development of evacuation and disaster prevention systems and raising of public awareness.[7]

The TMG established a Disaster Prevention website to provide comprehensive information for each stage of a disaster: preparedness, response, and recovery. The site includes concrete action manuals and guides in the event of disasters including actions in the flood[8], TMG's disaster prevention and initial response system, and countermeasures for each type of disasters which also include Countermeasures for Storm and Flood Damage.[9]

Early Warning System, Information and Communication

The Japan Meteorological Agency (JMA) runs real-time observation systems which are closely linked to early warning systems, backing up early evacuation of residents and disaster responses of the disaster management organizations at the national and local government levels. [10] The Central Disaster Management Radio System – disaster-exclusive radio communications networks developed by the Cabinet Office – has also been set up by disaster

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[7] This is a summary of the initiatives by the Tokyo Metropolitan Government (TMG) for flood control measures at the web site of its Bureau of Construction at http://www.kensetsu.metro.tokyo.jp/suigai_taisaku/index/menu01.htm.

[8] Action manuals are provided in the TMG's Disaster Prevention Website at http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000009/index.html

[9] Details can be found at the Disaster Prevention Website of the Tokyo Metropolitan Government (TMG) http://www.bousai.metro.tokyo.jp/foreign/english/index.html which includes detailed information on actions in the event of a storm or flood, on how to help vulnerable persons.

[10] The outline of the Early Warning Systems is attached in Appendix 16. It shows the flow of the weather and disaster information shared to the public.

management organizations, which enable direct connection to disaster management organizations and residents. This system is supported by simultaneous wireless communications systems including outdoor speakers and indoor radio receivers which disseminates disaster information to residents. The Tokyo Metropolitan Government also provides inundation forecast diagrams, flood hazard maps, and action plans in an easily understandable language and pictures in its portal site and by leaflets[11].

Community Resilience

In an effort to enhance disaster reduction awareness and disaster knowledge dissemination, Japanese government has tried to ensure a close combination of "self-help efforts" by peoples' awareness, "mutual-help efforts" by many kinds of community-led organizations, and "public-help efforts" by governments at the national or local levels (Cabinet Office 2011, 38). The government also encourages community-based voluntary disaster reduction organizations, such as flood fighting teams, shares information among those groups, and provides useful information. The "Guidelines for Evacuation Support of People Requiring Assistance during a Disaster" also emphasizes the importance of the role of local communities' disaster management organization and the community's disaster prevention leaders, suggesting detailed information on how to assist vulnerable persons in disaster incidents as well as evacuation exercises and drills for those people (Lee 2008, 39).

TMG's Disaster Prevention website[12] emphasizes the cooperation by communities and

[11] Detailed information can be found at www.bousai.metro.tokyo.jp and http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000009/2000043.html

[12] TMG's Disaster Prevention-Preparation website http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000170/2000074.html urges assistance by communities and neighbors and explains in details how to help the vulnerable

guides to establish a support system with neighbors to protect vulnerable persons with a unified effort in case of an emergency. The guidance includes three key points:

- **Vulnerable persons who need supports**:
  Communicate with people in the community and make them understand your needs

- **Neighbors of the vulnerable persons who need supports**:
  Actively engage in communicating with elderly and disabled people in the community with good understanding on various disabilities

- **When you find vulnerable persons in disaster situation**:
  Provide supports for vulnerable persons in appropriate ways depending on different characteristics.

Evacuation and Shelter

On the point of disaster, evacuation may be started by residents themselves, or by an evacuation order or instruction issued by the mayor of the municipality. The "Guidelines for Producing a Decision and Dissemination Manual for Evacuation Orders and Instructions" were issued by the Cabinet Office to explain the criteria regarding disaster situations, when the mayor needs to issue disaster orders to help a swift decision. The "Guidelines for Evacuation Support of People Requiring Assistance during a Disaster" has been published by the Cabinet Office in 2005 for implementation at the municipal level. The guidelines describe five key points to support vulnerable people (Japan Cabinet Office 2011, 18) (Appendix 17):

- **Improving the information communication system.**
  - Announcement of evacuation preparation information
  - Creation of an assisting unit for people who need supports
  - Clear and confident communications through various means including the internet, emergency call message service, etc.

- **Sharing information regarding vulnerable people during a disaster**
  - Collecting and sharing information on people who need assistance

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persons in a disaster.

- Encouraging exceptional use of personal information in social welfare system for evacuation support systems

- **Establishing a concrete evacuation support plan for vulnerable persons who need assistance in a disaster situation**
  - Establishment of an evacuation support plan for each individual vulnerable person
  - Improving awareness of the importance of community resilience to disasters

- **Assistance at evacuation centers**
  - Setting up of an information desk at evacuation centers for vulnerable persons
  - Creation of welfare evacuation centers

- **Collaboration among related organizations**
  - Continuity of welfare services in disaster situation
  - Wide-area support of health nurses
  - Creation of an evacuation support committee at the municipal level to support vulnerable people

TMG's "Metropolitan Tokyo Ordinance on Measures for Stranded Persons" also includes the information on preventing people from heading back home all at once; providing communication tools and information services; securing temporary shelters; and assisting people returning to their homes.

Recovery

"Act on Support for Livelihood Recovery and Disaster Victims" (enacted 1998 and revised 2004) includes the following measures which can also be flexibly applied when damage assessments are made for inundated houses by flooding (Japan Cabinet Office 2011, 23).

- **Disaster Recovery Project**
  Damaged infrastructure or public facilities can be recovered either by the national government or by the local government with support of the national government.

- **Disaster Relief Loans**
  Persons engaged in the primary industries or SMEs and low-income people who had damage are eligible for various disaster relief loans at a lower interest rate with better conditions.

- **Disaster Compensation and Insurance**
  Damaged persons who are engaged in the primary industries can receive compensation for disaster losses.

- **Tax Reduction or Exemption**
  Some measures can be taken for damaged persons, for reduction, exemption and postponed collection of income and residential taxes.

- **Tax Allocation to Affected Local Governments and Local Bonds Issuance**
  Measures may be taken for the damaged local governments, such as special tax allocations and permission for issuance of local bonds.

- **Designation of Extremely Severe Disaster**
  Extremely severe damage can be designated as an "extremely severe disaster" which brings various special measures for recovery projects.

- **Assistance for Local Government Rehabilitation Plan**
  Assistance can be provided for local government's rehabilitation plans, which will need to be promptly and accurately devised and applied.

- **Assistance for Recovery of Livelihood for Disaster Victims**
  Various financial assistance can be provided for victims to help them in self-supporting efforts.

4.2 London, United Kingdom

Laws and Guidelines

The UK has been establishing several legislations to address emergencies, including flooding, and to support vulnerable people. Manuals and guidelines have been prepared both at the national and local level. Starting from the National Assistance Act in 1948, the UK Cabinet Office established the Civil Contingent Act 2004; Guidance on identifying people who are vulnerable in crisis (2008); "Guidance on Emergency Preparedness" (2006); "Emergency Response and Recovery Guidance" (2013); "Evacuation and Shelter Guidance" (2014). For plan and guidance on flooding, the responsible ministries have prepared the "Multi-Agency Flood Plan" (DEFRA, 2011) and the "National Flood Emergency Framework for England" (DEFRA, 2013). At the local level, the London Borough, in accordance with the

national level guidance by the Cabinet Office or the DEFRA, have published the "Emergency Response Plan for the London Borough of Barking and Dagenham" (2011); "Communicating with the Public Framework, London Resilience Partnership" (2014); and the "Major Incident LESLP Manual" (London Emergency Services Liaison Panel, 2012).

Definition of 'Vulnerable'

The "Cabinet Office Guidance on Identifying People Who Are Vulnerable in a Crisis" is a good reference for guidance on identifying who is vulnerable (Cabinet Office 2008). The guidance provides the principles for identifying vulnerable people as well as the responsibilities of related bodies on how to support the potentially vulnerable people in a crisis. In the "Emergency Preparedness Guidance" of the "Civil Contingencies Act", the vulnerable population is defined as 'people who are less able to help themselves in the circumstances of an emergency' (DEFRA 2011, 34). The Guidance classifies people who should be considered as vulnerable in three categories: those who have mobility difficulties; those with mental health difficulties; and others who are dependent, such as children. Vulnerable groups include: elderly; mobility impaired; visually impaired; hearing impaired; people with long-term medical conditions; people with mental health problems; children with disabilities, special needs or in care; people with learning disabilities; pregnant women and new borns; tourists; prisoners including those in police cells, transit prisoner etc.; homeless, refugees, drug and alcohol addicts (LBBD 2011, 27-29).[13] In terms of communication, non-English speaking residents and transient population are added, for effective and appropriate communication help is needed to overcome language and cultural barriers (Ingleby 2014, 16-

[13] Potentially vulnerable people or groups in flooding events have also been identified in the National Flood Emergency Framework for England (Cabinet Office 2013, 55-56). Refer to Appendix 23 for details.

17).

Communication and Alerts or Warnings

The “London Resilience Partnership (LRP) Communicating with the Public Framework” has been prepared to provide a common understanding and processes for communicating with the public immediately prior to, during and after an emergency at different levels of the LRP, from local to regional, and linking in with national messages, in close linkages with “London Resilience Strategic Coordination Protocol and London Services Liaison Panel (LESLP) Manual” (Ingleby 2014, 4). It provides each level of responders their roles and responsibilities and clear guidelines on how to communicate with the public at each stages of an emergency.[14] It also includes consideration of vulnerable groups: visually impaired; deaf/hard of hearing; older people; non-English speakers (residents); transient population (including English and non-English speaking visitors).

In the event of an emergency in London, the Mayor’s role is to support operational response as the ‘Voice of London’ by providing a unified statement. The Environment Agency provides clear and easily recognized public messages on what to do in the event of possible or actual flooding, and operates a flood warning service via phone or fax, text and email summaries that can automatically be received by flood planners and responders so that they can activate immediate services for vulnerable people as necessary. Floodline Warnings Direct (FWD) is the main flood warning messaging service by the EA. Warnings are issued in three codes: Flood Alert; Flood Warning; Severe Flood Warning. The National Severe

[14] The details of Coordination of Communication; Information to the Public in a Sudden Impact Incident; and Lead responders for communicating with the public in a flooding disaster at each stages of emergency can be referred in Appendices 20, 21, and 22.

Weather Warning Service (NSWWS) is also available on the Met Office website (DEFRA 2013, 80-86).

Community Resilience

The Cabinet Office set out the "Guidance for Emergency Planners and Responders" for planners, particularly for Local Resilience Forums (LRF) to develop local action plans for identifying vulnerable people in four key stages: building networks; creating lists of lists; agreeing data sharing protocols and activation triggers; and determining the scale and requirements. It also recommends setting up a "Community Emergency Volunteers Group" to raise awareness about potential impacts of floods; to know the vulnerable people in their community; and to identify and agree arrangements to use local building(s) as evacuation points and rest centers (Cabinet Office 2008).

Evacuation and Shelter

The "Evacuation and Shelter Guidance 2014"[15] issued by the Cabinet Office sets out the issues for local planners and Local Resilience Forums (LRFs) to develop flexible and tailored plans to local circumstances; to support responders in meeting their legal responsibilities; advice on decision to evacuate, on transport, vulnerable people and sites, and on support for evacuees, pets and animals; and shelter in place and short-term or longer term shelter (HM Government Cabinet Office 2014). According to the guidance, vulnerable groups especially for those who need supports at home, in commercial premises or in schools, should get

[15] This guidance updates the "2006 Evacuation and Shelter Guidance" for local emergency planners. Refer to https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/274615/Evacuation_and_Shelter_Guidance_2014.pdf.

priority support or evacuation (Ibid). It recommends four key stages should be consulted when developing evacuation plans for vulnerable people (Ibid).[16]

- **Building networks**
  Identify vulnerable people by working with those who have better access to up-to-date records of individuals and their needs.

- **Creating lists of lists**
  Since it is difficult to maintain up-to-date list of vulnerable people at the central level, details of organizations that can be contacted in an emergency should be recorded.

- **Agreeing data sharing protocols and activation triggers**
  In order to adjust to changing circumstances, data sharing should be agreed flexibly between responders.

- **Determining the scale and requirements**
  For the purpose of planning resources and equipment, potential scale and requirements of vulnerable people should be estimated in advance

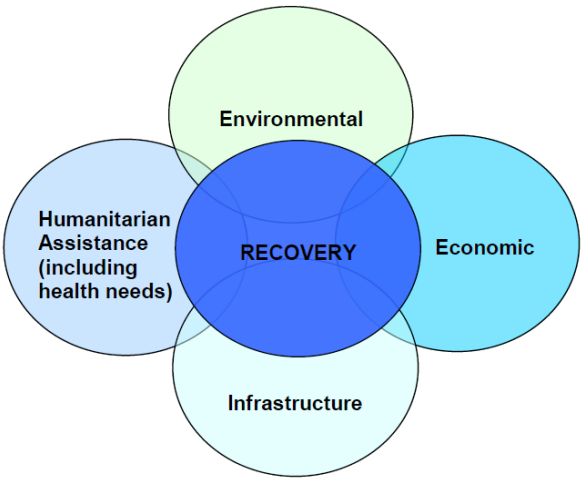
Recovery

In the Emergency Response and Recovery 2013, the Cabinet Office sets an overview of recovering process from emergencies. It accesses the recovery phase as a long and complex process involved with rebuilding, restoring, and rehabilitating the community. To help the affected community for their own management of recovery, it provides recovery guidance for local responders which includes topic sheets[17] on a wide range of recovery issues as the impacts of emergencies are interlinked (Cabinet Office 2013, .86-87).

[16] In the Guidance, clear roles and responsibilities are suggested for each actor such as individuals, responders, local government, voluntary organizations, and etc. at the stages of alert, action, and recovery in a flooding disaster. An overview of the roles and responsibilities is shown in Appendix 24.

[17] Refer to the National Recovery Guidance Topic Sheets (Ibis, 88-89) in Appendix 25.

Figure 20. Framework for understanding the impact of emergencies



Source: Cabinet Office 2013. Emergency Response and Recovery

The Environment Agency also provides the people with practical advice on what to do for better recovery after a flood.

4.3 New York, United States

In the United States, the most notable parts of flood risk managements for social vulnerability are communication systems in preparedness and response and the unique flood insurance system in the recovery and rehabilitation phase.

Guides and Manuals

According to the website of the Federal Emergency Management Agency (FEMA), “The National Incident Management System (NIMS) is a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work together seamlessly and manage incidents involving all threats and hazards—regardless of cause, size, location, or complexity—in order to reduce loss of life, property and harm to the environment. The NIMS is the essential foundation to the National

Preparedness System (NPS) and provides the template for the management of incidents and operations in support of all five National Planning Frameworks."

Figure 21. An Overview of National Incident Management System (NIMS)

Source: Federal Emergency Management Agency website: http://www.fema.gov/national-incident-management-system

The FEMA, under the Department of Homeland Security (DHS), acts as managing partner. It runs multilingual web pages. Disaster Assistance Improvement Program (DAIP) provides disaster survivors with information, support, services and a mechanism to access and apply for disaster assistance through collaborative, data-sharing efforts federal, tribal, state, local and private sector partners.

Roles and Responsibilities

The National Disaster Recovery Framework clearly defines the roles and responsibilities for all levels of government decision-making, for coordination, integration, community

engagement and management, because it is key for successful recovery that all recovery stakeholders have a clear understanding of their roles in pre- and post-disaster. For a successful disaster recovery, the Framework recommends the responsibilities of the Recovery Manager and Recovery Coordinator positions to organize, coordinate and advance the recovery at the local, tribal, territorial and State levels. Newly designated "Federal Disaster Recovery Coordinator" (FDRC) positions as a deputy to the Federal Coordinating Officer (FCO) for all matters of disaster recovery. Among the post-disaster responsibilities of the FDRC, it is notable to promote inclusiveness in recovery by increasing participation of stakeholders, disaster-impacted individuals, such as disabilities, individuals with limited English proficiency, seniors, members of underserved populations and advocates for children so that their needs and contributions are an integral part of the recovery process and outcome.[18]

Information and Communication

In an effort to enhance public awareness on flood risks and preparedness, both federal government and local government publish handy pamphlets about how to prepare against emergencies and what to do during and after flooding. They also run well-organized internet web pages with useful information on the emergency preparedness in different languages, not only for general public but also for specifically targeted vulnerable people such as elderly, disabled, and children.[19] The Federal Emergency Management Agency (FEMA) runs

[18] The FEMA website provides more details in its site of Recovery Leadership Roles and Responsibilities http://www.fema.gov/recovery-leadership-roles-and-responsibilities.

[19] Some examples of such pamphlets are shown in Appendices 26, 27, and 28. For details, also refer to http://www.fema.gov/media-library/assets/documents/90375 and http://www.nyc.gov/html/oem/html/get_prepared/prepared_seniors.shtml.

multilingual web pages in 21 languages to better communicate with non-English speaking people. The Ready, a national public service advertising (PSA) campaign is designed to educate and empower Americans to prepare for and to respond to emergencies including natural and man-made disasters. It provides comprehensive information on how to be informed, making a plan, building a kit, getting involved, plans for business and kids.

The New York City Office of Emergency Management (OEM) provides guides on tips and information to help New Yorkers prepare for all types of emergencies including flooding. The "Ready New York: Flooding" is to inform New Yorkers how they can lower risk for flooding before, during and after the flood and recover from flood damage. The guide is available in 13 languages for more efficient communication with multi-cultural citizens and visitors in OEM's website.

The public safety officials use reliable emergency alerts systems to alert people in the event of natural or man-made disasters through wireless emergency alerts (WEA), Integrated Public Alert and Warning System (IPAWS), NOAA Weather Radio, and SNS.

Community Resilience

The FEMA provides the information on how to get involved within the community. The whole community can participate in programs and activities to make their families, homes and communities safer from risks and threats in various ways: by volunteering to support disaster efforts in their community; being part of the community planning process; joining or starting a preparedness project; and supporting major disasters by donating cash or goods.[20]

There are several ways for Americans to participate in volunteering programs. A

[20] Refer to http://www.ready.gov/get-involved

representative program is the "America's PrepareAthon," a nationwide, community-based campaign for action for individuals, organizations, and communities to prepare for specific hazards through drills, group discussions, and exercises.[21]

Objective Indicators for Disaster Recovery

The Environmental Justice Strategic Enforcement Screening Tool (EJSEAT) has been created by the US Environmental Protection Agency (EPA) to serve as a consistent methodology to identify communities or areas experiencing disproportionate environmental and public health burdens. By setting up clear indicators of critical factors to identify priority areas of potential environmental justice, the EJSEAT provides useful methods to the public, policy makers, and communities with the transparent, practical, scientifically sound standards under which they can seek agency supports and assistance. The normalized EJSEAT scores conducted on a state by state basis form the basis of ranking census tracts for their environmental justice potential (NEJAC 2010)[22].

Flood Insurance

In the United States, there are two categorized natural disaster insurance schemes. One is a unique national scheme represented by the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA); the other is state-backed arrangements such as the Fair Access to Insurance Requirements (called Fair Plans) schemes and Windstorm Plans (NDIR 2011, 81). Individuals who are eligible and have mortgages on their homes should purchase by law a separate flood insurance policy through a

[21] Refer to http://community.fema.gov.

[22] It includes demographic, environment, health and compliance indicators. EJSEAT is composed of 18 individual variables or indicators shown in Appendix 30.

private primary flood insurance company or an insurance company distributing the NFIP. The NFIP, introduced in 1968 to help property owners, renters and business owners in participating communities by providing a means for financial protection against losses from flooding, is the principal means of delivering residential flood insurance in the States. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding.[23] In exchange, the NFIP-FEMA flood insurance offers property damage insurance for flood and identifies and maps the flood hazard plains, while marketing, administering policies, and settling claims under the program are the responsibilities of private insurers and agents, which is interpreted as a significant public-private partnership between the federal government and private homeowners insurers (Paklina 2003, 25). The flood coverage by NFIP is limited to US$250,000 for residential buildings, and US$100,000 for personal property, may be supplemented by purchasing additional coverage from private insurers (Ibid, 6).

Nearly 20,000 communities in the States participate in the NFIP to reduce future flood damages. The main goal of the NFIP was to get many more people covered by flood insurance and at the same time to enforce floodplain management. The program subsidizes the cost of flood insurance (Zhao 2011, 3). Due to recent heavy and frequent flood hazard events and relatively low premiums to cover the damage costs, the NFIP borrows from the US Treasury for times, which becomes eventually the taxpayers' burden. The NFIP's recent focuses are to ensure fiscal soundness by adjusting premium increases, to inform its map updates and to support mitigation and special advocacy for better understanding. In an

[23] Summarized from the introduction of National Flood Insurance Program (NFIP) in the FEMA web site: http://www.fema.gov/national-flood-insurance-program/flood-insurance-reform.

attempt to reform flood insurance, President Obama signed the Homeowner Flood Insurance Affordability Act of 2014 into law in March 2014.

4.4 Seoul, Korea

Guides and Manuals

In accordance with the "Basic Act on Disaster Management and Safety Control," the "5 Year Basic Plans on National Safety Control" are managed and implemented by the "National Emergency Management Agency (NEMA)" to protect the lives and properties of the people against disaster risks caused from urbanization, concentration of population, aging population, climate change and new pandemic diseases, etc. (NIDP 2010, 57). Recently, there has been a movement to revise this legislation to streamline the disaster management in emergencies with a single control tower by the "National Safety Management Council" headed by the Prime Minister in the event of large scale disasters.[24] However, these acts and the plans are mostly on non-natural, man-made disasters. The "Act on Natural Disaster Preparedness" deals with infrastructure management and preparation and management of disaster maps. The NEMA has set up some measures to minimize casualties of vulnerable people, but there seems to be rooms for institutionalization with R&D investments to realize the planned measures. In the NEMA's web site, there is a safety guide for during and after heavy rain incidents, but the information is only for general public without any consideration of the vulnerable people. The "Act on Welfare for Seniors" mentions only general welfare services or health care programs for elderly rather than disaster prevention or preparedness.

[24] Refer to the suggested partial revision on the Framework Act on the Management of Disasters and Safety. An overview of the national disaster management support system can be viewed in Appendix 33. http://eng.nema.go.kr/sub/cms2/2_0.asp

In the act some safety services are included such as wireless paging, U-phone and U-care system. The "Acts on Welfare for Children and the Handicapped" only deal with living emergencies and education (NIDP 2010, 59-68). The legislative supports and guidance are very limited at the national level.

At the municipal level, the City of Seoul prepared the "Seoul Basic Plans for Safety Management – Comprehensive Measures against Disasters and Safety Emergencies" on yearly basis, under the "Ordinance on Disaster Management and Safety Control" in Seoul. Recently, the City of Seoul also prepared the "2014 Countermeasures for Flood Damage" as well as the "Guidebook for Safety against Strom and Flood." However, they are mostly focusing on improvement of infrastructure and other hardware measures and information on what to do for general public before, during and after in the event of storm or flood. Specific measures, guidelines or manuals for the vulnerable populations are expected be prepared and provided to the target people.

Definition of 'Vulnerable'

According to a report by the "National Institute for Disaster Prevention (NIDP),"[25] 'vulnerable persons to disasters' are defined as 'people who are susceptible to disaster risk factors and have difficulties in recovery from damages of disasters'. The vulnerable persons are classified in three categories (NIDP 2010, 10-14):

- Economically vulnerable persons including recipients of the National Basic Livelihood and the second poorest groups who have no basic living safety or ability to manage, and thus have difficulties in self-protection against disasters

[25] Its name has been changed to the National Disaster Management Institute (NDMI) in 2013.

and take much more time in recovery.

- Physically vulnerable persons including elderly, handicapped, foreigner (tourists), infants, and pregnant women who have difficulties in evacuation or response by themselves in the event of disaster.
    - Handicapped – those who have mobility difficulties
    - Elderly – aged over 65 who have less mobility
    - Infants and children – aged under 14 who are lack of judgments in disaster
- Environmentally vulnerable persons including foreign tourists and foreign residents who may be in vulnerable situation temporarily or in the long term due to linguistic or cultural differences.

However, no specific definition of vulnerable persons to disasters was found in the measures from City of Seoul.

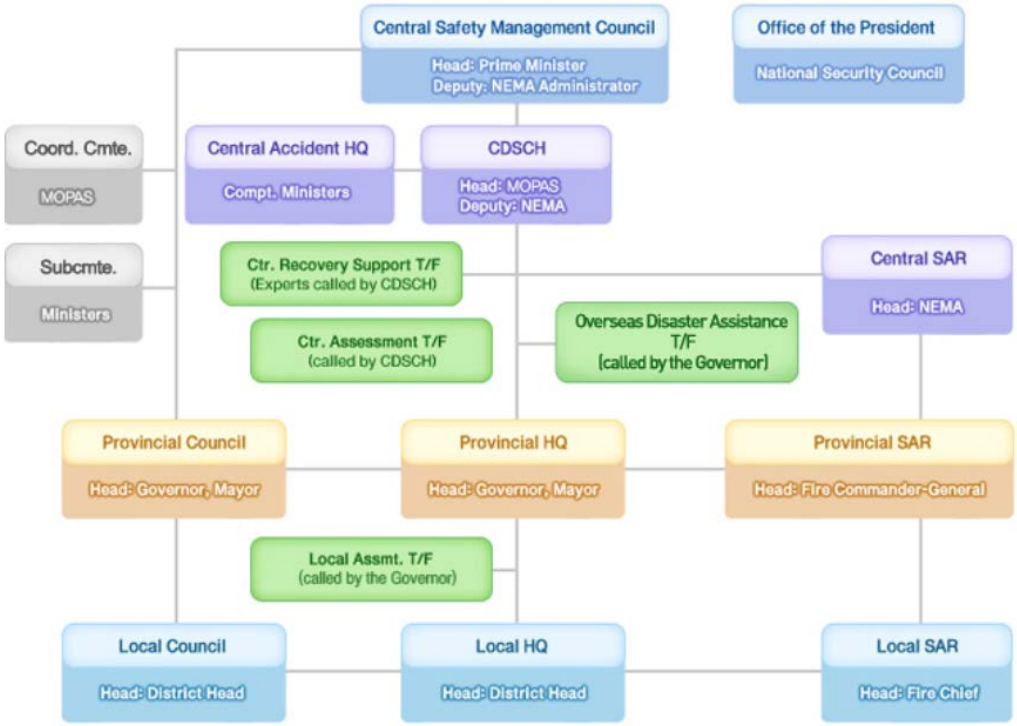
Roles and Responsibilities

At the national level, Korea has developed the National Disaster Management Support System (NDMSS) by the National Emergency Management Agency (NEMA) under the Ministry of Security and Public Administration (MoSPA). In the event of emergency including natural or man-made disasters, the Central Safety Management Council headed by the Prime Minister takes the role for integrated disaster response system and safety network as a control tower, especially in a large scale or multi-typed disaster (Figure 22).[26] The NDMSS is jointly run by the national and local governments and related authorities. The

[26] Refer to Outline of the National Disaster Management Support System in Appendix 32. (NEMA web site: http://eng.nema.go.kr/sub/cms2/2_0.asp)

NEMA also provides the workflow of the NDMSS showing the roles and responsibilities of government or other involved agencies at each level. However, it includes general disaster management roles, without any specific mentioning of who does what for the vulnerable persons in an emergency or disaster incident.

Figure 22. Outline of National Disaster Management Support System (NDMSS)



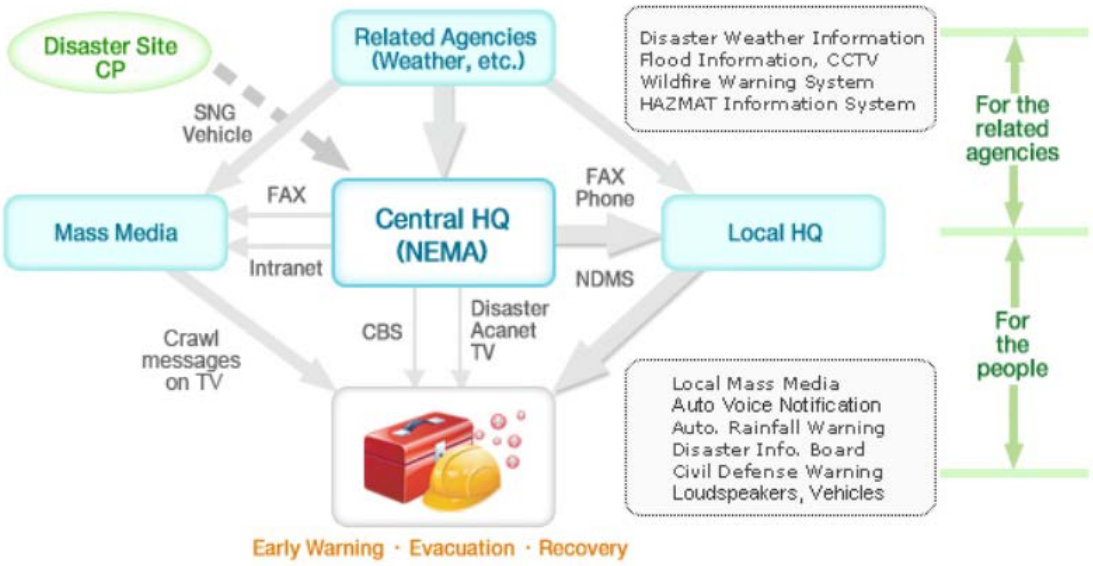
Source: National Emergency Management Agency (NEMA)

In the ‘2014 Measures against Damage from Storm and Flood’ prepared by the City of Seoul, the roles and responsibilities of the city officials and other relevant agencies such as police, fire agency, and community groups in the event of flooding disasters are shown in charts. They are mostly focusing on enhancing preparedness in infrastructure in vulnerable areas and regions that have experienced repetitive flooding, dissemination of information right before or during the disasters, and other general disaster responses. Comprehensive and detailed workflow of clear roles and responsibilities of the central and local level

governments and relevant agencies and communities is required to cover all the stages of a disaster, preparedness, information and warning, response and recovery.

Information and Communication

Figure 23. Dissemination of the Information to the Public



Source: National Emergency Management Agency (NEMA)

The NEMA has developed the measures to improve disaster information dissemination by using various internet-based tools including wireless paging, U-phone and U-care system (NIDP 2010, 59-60). For early warning, evacuation, and recovery, the NEMA acts as a central headquarters' role of all disaster information (Figure 23). The NEMA also prepared an interpretation system for foreigners for better communication in emergencies. The 'Help Me 119 System' run by the NEMA supports the 119 service for foreigners by automatically providing basic information when a 119 report from a foreign-language user is received. The information on emergencies is available in four languages including English, Japanese,

Chinese, and Russian until an interpreter can be connected.[27]

The City of Seoul has also tried to enhance the provision of disaster information and communication. It has developed training and information system by using SNS, KakaoTalk and etc. By compiling all the disaster-related data through monitoring system, river prone flooding warning system, and disaster information system including hazard maps, the City government tried to improve early warning system and preemptive response at the early stage of flooding. It also tried to raise public awareness of flooding risks and how to respond in disaster situation, by providing all necessary disaster information on its web site including the flood hazard map, evacuation routes and shelters, and by publishing the Safety Guide on Storm and Flood.[28]

Community Resilience

The City of Seoul has made efforts to enhance the community resilience, by promoting 'Community-Led Safe Village' program, supporting regional safety leaders programs such as Living Safety Governance, Safety Monitoring Service Group, Regional Self-Disaster Protection Group, and Green Mothers' Association. It also tried to develop more safety education items, community safety campaign, and disaster response network. By sharing all the disaster-related information with communities and general people it helped enhance public awareness and participation by communities.

Evacuation and Shelter

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[27] Chart of communication for foreigner in emergency can be viewed in Appendix 35, provided from NEMA's web site.

[28] All the information is available at Safe City Seoul web site http://safecity.seoul.go.kr:8070/. Sample pages of this information are shared in Appendix 36.

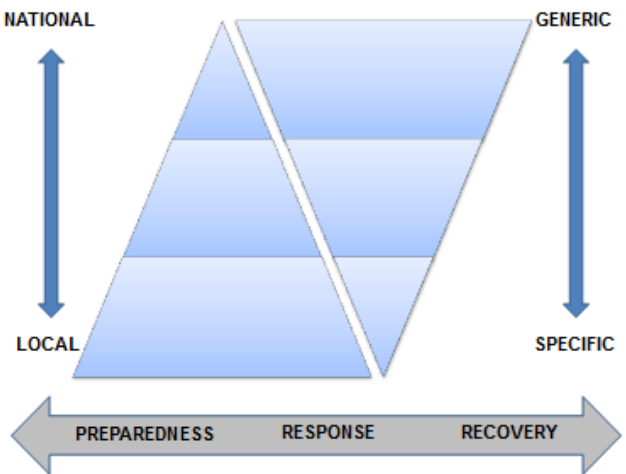
The City of Seoul provides comprehensive and detailed disaster information in its Safe City Seoul web site, including flood hazard maps, inundation forecast map, evacuation routes and shelters for each District and Dong community, so that people can access to all such information prior to flooding events and be better prepared.

Recovery Measures and Flood Insurance

Korea has developed the Storm and Flood Insurance program in the type of voluntary public-private insurance to improve the current disaster relief assistance program and to enhance fast recovery from damages. The Storm and Flood Insurance covering climate disasters such as typhoon, storm, heavy rainfall, flood, tsunami, heavy snow and earthquake, is operated by 5 private insurance companies under overall management by the government (NEMA). The flood coverage is up to 90% (with no limitation in amount) for damage in properties (buildings and greenhouses). Part of the premium is supported by the central government with partial contribution by local governments for 55%~86% of the premium depending on their economic status. The governmental supports are provided to insurers differentiated by the recipients of national basic livelihood, second poorest group, and the general public for 86%, 76% and 55% or 62% of the premium, respectively. Despite the efforts by the NEMA and local governments, the penetration rate is quite low due to its voluntary nature and more importantly budget constraints.

4.5 Comparative Analysis and Policy Implications for Seoul

Figure 24. Framework of Policy Measures to Address Flood Disasters



Through a broad research on

measures, manuals and guidelines to mitigate the social vulnerability risks and to enhance resilience for the vulnerable populations in three other cities including Tokyo, London, and New York, this study conducted a comparative analysis with several key categories for such measures in a master table showing similarities and differences at a glance. The categories include measures from generic to specific, from central to local governmental level, from legislative to community-driven or voluntary participation guidance, as well as covering all steps including preparation, response, and recovery. By doing the comprehensive and comparative analysis lighting vertical and horizontal ways, this study investigated on which area of policy measures the city government of Seoul would have more room for further improvement on climate resilience and social inclusiveness for the vulnerable populations.

In terms of manuals and guidelines under legislative system framework, four countries are quite well established in general disaster management. In the UK, under the Civil Contingency Act, comprehensive Multi-Agency Flood Plan and National Flood Emergency Framework, and several detailed guidances have been prepared by the central government (Cabinet Office) on disaster preparedness, response, and recovery for local planners and responders to refer to. Japan has also set up good structures of flood control managements at the national level, such as Comprehensive Flood Control Measures, National Strategy for Risk Management of Large-Scale Flood Disaster and Emergency Action Plan for Torrential Rain Disaster Management, under the Disaster Relief Act, Disaster Countermeasures Basic Act, and Specified Urban River Inundation Prevention Act. The US Federal Government led by Federal Emergency Management Agency (FEMA) runs the *Ready* campaign program designed to educate and empower Americans to prepare for and respond to emergencies including natural and man-made disasters. In consideration of vulnerable populations, the guidance on manuals, guidelines and measures cover detailed action plans on how to support

those needed help in emergencies and disasters, with clear roles and responsibilities of each central and local government, related agencies and communities.

Under the strong and sound frameworks at the national level, concrete plans and manuals have also been well prepared at the local government level in these countries. The London Borough Emergency Response Plan, Communicating with the Public Framework for London Resilience Partnership and the Major Incident London Emergency Services Liaison Panel (LESLP) Manual are the good examples. Tokyo Metropolitan Government (TMG)'s comprehensive measures prepared by "Tokyo urban flood control measures study group" are included in the Disaster Prevention Website, covering not only hardware measures but also soft measures including provision of information, evacuation, and raising public awareness.

In Korea, there are much more rooms to develop measures to support the vulnerable people. Under the Basic Act on Disaster Management and Safety Control, the 5 Year Basic Plans on National Safety Control has been managed by the National Emergency Management Agency (NEMA). The Acts and Plans are mostly on non-natural or man-made disasters. The Act on Natural Disaster Preparedness deals with management of infrastructure and preparation of disaster maps and etc. Despite the NEMA's efforts in setting up measures to minimize casualties of vulnerable people, there are more rooms to institutionalize them with R&D investment supports. The legislative supports and guidance are very limited at the national level. In this context, Korea needs to develop comprehensive and detailed guidances to tackle disaster emergencies for well preparedness and recovery, in consideration of those needed special supports. The City of Seoul has prepared a yearly Seoul Basic Plans for Safety Management, and recently published '2014 Countermeasures for Flood Damage' and 'Guidebook for Safety against Storm and Flood.' However, these plans and measures are more on hardware issues like infrastructure improvement, focusing on information for

general public in the event of storm and flood. Specific measures or manuals on how to support the vulnerable populations should be adequately addressed and developed.

The definitions of ‘vulnerable persons’ seem to be clearly set up in four countries and cities. It differs by each country and city’s own situation, but mostly, the vulnerable persons in disaster or emergencies include socially vulnerable people such as physically impaired, elderly, low-income people, and non-domestic language users.

As for roles and responsibilities, in Korea the National Disaster Management Support System (NDMSS) by the National Emergency Management Agency includes general disaster management roles, without any specific mentioning clear responsibilities on who does what for the vulnerable persons in an emergency or disaster event. The Seoul city government’s recent measures against damage from storm and flood states the roles and responsibilities by all relevant officials and agencies, but they are mostly focusing on infrastructure preparedness for the vulnerable regions and areas. Government of Seoul has made great efforts to develop programs to support vulnerable people, such as introduction of “Dolbom (care and support) Services” by 7,000 servicing officials for about 21,000 household of vulnerable persons, by establishing sound and up-to-date database of those people. However, there are more rooms to develop in Seoul and Korea, by benchmarking the UK’s Guidance on Emergency Preparedness which shows a good example of the comprehensive and detailed workflow of each level of responders covering all the stages of a disaster.

Seoul is relatively well prepared in terms of communication. At the national level, the NEMA disseminates disaster information by using various IT systems especially for elderly. The City of Seoul has also tried to raise public awareness and to improve early warning system and preemptive response at the early stage of flooding, by compiling and disclosing all the disaster-related information and data including flood hazard maps. However, it also

has limitation of internet or IT-based system since those who have limited access to those facilities due to economic or physical reasons such as low-income or the elderly. It needs to develop more efficient dissemination methods for action plans with more easily understandable languages or pictures for the vulnerable persons like the leaflets and pamphlets in Tokyo and New York. As in New York, Seoul will also need to consider preparing multi-language guidebooks for increasing number of foreigners. In terms of community resilience, City of Seoul tries to promote ‘community-led safe village’ program and ‘regional safety leaders program.’ Considering the importance of supports from first responders in an emergency and disaster situations, it would be good to make references from more concrete measures such as ‘Get Involved’ or ‘America’s PreparAthon!’ program in the United States and the TMG’s supporting system by neighbors for vulnerable persons in Japan, provided in its Disaster Prevention website in detail.

The City of Seoul recently further developed its Safe City Seoul web site by providing more information including flooding hazard map, inundation forecast map, evacuation routes and shelters in the event of flooding. There are also needs to prepare special measures to take care of or to provide dedicated transport facilities for those who have no or limited means to move independently in an emergency situation, such as elderly, the handicapped and sometimes the poor. Supporting measures for the vulnerable people should also be well known, fully understood, and rehearsed by exercises.

Recovery phase is a long and complex process mostly involved with huge amount of money. Thus, it should be well prepared and designed to accommodate various cases or situations. In Japan, there are some exemplary measures to refer to, including disaster relief loans, disaster compensation and insurance, tax reduction or exemption, and tax allocation to local governments and local bonds. The UK government provides comprehensive guidance

for local responders in the Emergency Response and Recovery. The Environmental Justice Strategic Enforcement Screening Tool (EJSEAT) in the US also provides a good example of methodology to identify communities and areas experiencing disproportionate environmental burdens and to appropriately support them, by clear indicators such as demographic, environmental, health and compliance indicators. The city government also needs to consider developing a tool of vulnerability indicators to identify communities or districts to receive differentiated level of assistances for disaster preparedness from city government.

Flood insurance is also an important tool for recovery from flood, based on proper flood risk assessments. Studies have been made in this area, but it seems that there is no silver bullet since every country has different situation and capacity. In Korea flood insurance is bundled with other climate disasters, so called “Storm and Flood Insurance.” The Insurance was introduced to supplement the current disaster relief assistance which covers only small portion of flood damage, by covering up to 90 percent of the actual damage. Operated by five private insurance companies under management of the NEMA, the governmental supports are provided for low income households 76-86 percent of the premium. Due to its voluntary nature and budget constraints, the penetration rate is very low. The federally backed basic insurance coverage by the US’ National Flood Insurance Program (NFIP) has known as good example of flood insurance. However, recently the US government also had to cut the support due to budget issues. The UK’s compulsory, private and bundled insurance system shows much higher penetration rate up to 95 percent thanks to the mechanism of spreading the risk across perils and rating areas and over the bigger population (NDIR 2011, 85-86). To find the most appropriate case for benchmarking, more in-depth researches and budgetary supports are needed in this area.

The comparative analysis on flood disaster measures is prepared in the following master

table in several key categories, showing similarities and differences at a glance.

Table 6. Measures and Guidelines to Address Flood Disasters

– Comparison for four cities focusing more on socially vulnerable class

	London, UK	Tokyo, Japan	New York, US	Seoul, Korea
At All Stages or Preparedness				
Manuals and Guidelines at national & local level	UK central government ▪ National Assistance Act (1948) ▪ Civil Contingent Act 2004 ▪ Multi-Agency Flood Plan (DEFRA, 2011) ▪ National Flood Emergency Framework for England (DEFRA, 2013) ▪ Guidance on identifying people who are vulnerable in crisis (Cabinet Office, 2008) ▪ Guidance on Emergency Preparedness (2006) ▪ Emergency Response and Recovery Guidance (2013) Local (London Borough) ▪ Emergency Response Plan for the London Borough of Barking and Dagenham (2011) ▪ Communicating with the Public Framework, London Resilience Partnership (2014) ▪ Major Incident LESLP Manual (London Emergency Services Liaison Panel, 2012)	▪ River Law (MLIT) ▪ Flood Fighting Law (MLIT, 1949) ▪ Flood Control Special Accounting Law (1960) and the First Five Year Plan for Flood Control ▪ Disaster Relief Act (1947) ▪ Disaster Countermeasures Basic Act (Cabinet Office, 1961) ▪ Comprehensive Flood Control Measures (1978) ▪ Specified Urban River Inundation Prevention Act (MLIT, 2003) ▪ "National Strategy for Risk Management of Large-Scale Flood Disaster" ▪ "Emergency Action Plan for torrential rain disaster management" (by MLIT) - Improve disaster information services - Ensure the sharing of disaster information - Maintain and improve the functions of disaster	▪ Disaster Assistance Improvement Program (DAIP) provides disaster survivors with information, support, services and a mechanism to access and apply for disaster assistance through collaborative, data-sharing efforts federal, tribal, state, local and private sector partners. ▪ Federal Emergency Management Agency (FEMA), under the Department of Homeland Security (DHS), acts as managing partner. It runs multilingual web pages in 21 languages ▪ *Ready* is a national public service advertising (PSA) campaign designed to educate and empower Americans to prepare for and respond to emergencies including natural and man-made disasters, prepared in 13 languages	▪ Basic Act on Disaster Management and Safety Control ▪ Basic Plans on National Safety Control set by National Emergency Management Agency (NEMA) ▪ Act on Natural Disasters Preparedness ▪ Welfare for Seniors Act ▪ Seoul Basic Plans for Safety Management – Comprehensive Measures against Disasters and Safety Emergencies (yearly) ▪ Ordinance on Disaster Management and Safety Control in Seoul ▪ 2014 Countermeasures for Flood Damage ▪ National measures for adaptation to climate change (2012 Revision) set the

		prevention facilities - Rebuild local disaster management capacity - Thorough review of disaster preparedness. ▪ TMG Countermeasures for Storm and Flood Damage ▪ Metropolitan Tokyo Ordinance on Measures for Stranded Persons (2013)		priority to protect the vulnerable classes[29] => There are total 22 measures for vulnerable class => More than half (52%) measures are to address torrential heavy rainfall, flooding, and typhoon => Measures against flooding and typhoon are mostly focused on vulnerable region/area (83%) than vulnerable people and facilities (17%)
Definition of 'vulnerable'	'People who are less able to help themselves in the circumstances of an emergency' in three categories: ▪ those who have mobility difficulties ▪ those with mental health difficulties ▪ others who are dependent, such as children Vulnerable groups include: • elderly • mobility impaired • visually impaired • hearing impaired • people with long-term	In Japan, vulnerable persons to disaster are defined as people who need support or assistance in a disaster, in getting necessary information promptly and properly in evacuating to a safe place. In general, it includes elderly, disabled, foreigners, babies and enfant, and pregnant women (NIDP 2010, 9). Tokyo Metropolitan Government (TMG) urges to protect and support the vulnerable persons in the event of a disaster: • Elderly • The blind	The vulnerable to disasters are defined as people who have difficulties in safely and freely using the basic kit of emergency supplies provided in each stage of disasters (preparedness, response and recovery). It includes: • physically handicapped • people with mental health difficulties • people with language difficulties (non-English speakers) • physically or culturally isolated people • medical or chemical	Vulnerable persons to disasters are defined as 'people who are susceptible to disaster risk factors and have difficulties in recovery from damages of disasters (NIDP 2010, 10). The vulnerable persons are classified in three categories: ▪ Economically vulnerable persons – recipients of the National Basic Livelihood and second poorest groups ▪ Physically vulnerable persons – elderly, handicapped, infants and children ▪ Environmentally vulnerable

[29] Shin, J.Y., Y.S. Yim, N.H. Hong, N.Y. Kim, C.Y. Bae. 2013. "Study on Investigation and Analysis of Climate Change Adaptation Support Measures for Vulnerable Population" *KEI Working Paper* 2013-16.

	medical conditions • people with mental health problems • children with disabilities, special needs or in care • people with learning disabilities • pregnant women and new borns • tourists • prisoners including police cells, prisoner transit etc. • homeless, refugees drug and alcohol	• The deaf • Physically disabled people • Expectant mothers • Children • People with illness • Foreign residents and tourists	dependent people • homeless • physically weak persons • children (NIDP 2010, 10)	persons – foreign tourists and foreign residents who may be in vulnerable situation temporarily or in the long term due to linguistic or cultural differences
Roles and responsibilities	(Cabinet Office Guidance on Emergency Preparedness) Category 1 responders[30]: - making and maintaining plans for reducing, controlling or encouraging community resilience by adopting a good-neighborly attitude - warning & informing including public awareness program and in a crisis - business continuity: local authorities are responsible for providing advice and	Basic Disaster Management Plan prepared by the Central Disaster Management Council clarifies the duties assigned to the Government, public corporations and the local government in implementing measures. For easy reference to countermeasures, the plan also describes the sequence of disaster countermeasures such as preparation, emergency response, recovery and reconstruction according to the type of disaster. <u>Central level</u>:	The National Disaster Recovery Framework clearly defines the roles and responsibilities for all levels of government decision making for coordination, integration, community engagement and management. National Disaster Recovery Framework Pre and Post Disaster Recovery Managers Responsibilities include: • Federal Disaster Recovery Coordinator • Local Disaster Recovery	<u>National level</u> - The Central Safety Management Council headed by the Prime Minister takes the role for integrated disaster response system and safety network as the main control tower. - The National Disaster Management Support System (NDMSS) by the National Emergency Management Agency (NEMA) under the Ministry of Security and Public Administration

[30] Category 1 responders are known as core responders, including the usual "blue-light" emergency services as having responsibilities for carrying out the legislation – local authorities, policy forces, fire services, ambulance services, HM coastguard, NHS primary care trusts, NHS hospital trusts, port health authorities, environment agency, and etc.

	assistance in an emergency - Clear roles and responsibilities for each responders, police, fire brigade, ambulance, and local authority and health authority - For large scale events or problems that fall across organizational boundaries, joint working and support can be facilitated by LRFs and DCLG Resilience Emergencies Division for wider mutual aid agreements.	- Central Disaster Management Council under Cabinet Office with MLIT has main coordinating and decision-making role with formulation and promotion of nation-wide preparedness plans <u>Prefectural and municipal level</u>: - Respective Disaster Management Councils are responsible for elaborating disaster management plans pertaining to disaster preparedness and for day-to-day activities	Managers • State Disaster Recovery Managers • Tribal Disaster Recovery Managers	(MoSPA) works in the event of emergency including natural or man-made disasters. <u>City of Seoul</u> - The Head of Urban Safety Office take the leading role in the event of disaster supported by Director of Water Management.
Communication with the public on warnings /alert	(London Resilience Partnership (LRP) Communicating with the Public Framework) To provide a common understanding and processes for communicating with the public immediately prior to, during and after an emergency at different levels of the LRP, from local to regional, and linking in with national messages, in close linkages with London Resilience Strategic Coordination Protocol and London Services Liaison Panel (LESLP) Manual. It also includes consideration of vulnerable groups: - Visually impaired - Deaf/hard of hearing - Older people - Non-English speakers (residents)	<u>Observation & Forecasting</u>: - The Japan Meteorological Agency (JMA) runs real-time observation system which is closely linked to early warning systems supporting early evacuation of residents and response activities of disaster management organizations. <u>Information & Communication</u> - An online system built by the JMA is linked to disaster management organizations of the national and local governments and media organizations - Disaster management organizations also have set up radio communications networks exclusively for disasters which connect to	▪ FEMA runs multilingual web pages in 21 languages. ▪ The New York City Office of Emergency Management (OEM) provides guides on tips and information to help New Yorkers prepare for all types of emergencies including flooding. ▪ The *Ready*, a national public service advertising (PSA) campaign is designed to educate and empower Americans to prepare for and to respond to emergencies including natural and man-made disasters. It provides comprehensive information on how to be informed, making a plan, building a kit, getting involved, plans for business and kids.	▪ NEMA provides disaster information dissemination by using various internet-based tools including wireless paging, U-phone and U-care system ▪ For early warning, evacuation, and recovery, the NEMA acts as a central role of all disaster information. ▪ The NEMA also prepared an interpretation system for foreigners for better communication in emergencies (through tripartite call with interpretation center). While waiting for connection to an interpreter, basic information is automatically provided to the foreign language user 119 reporters.

	- Transient population (including English and non-English speaking visitors) The Mayor's role as the 'Voice of London' by providing a unified statement Environment Agency 1) provides clear and easily recognized public messages on what to do in the event of possible or actual flooding; and 2) operates a flood warning service via phone or fax, text and email summaries. Warnings are issued in three codes: ▪ Flood Alert ▪ Flood Warning ▪ Severe Flood Warning National Severe Weather Warning Service (NSWWS) is also available on the Met Office website	national and local disaster management organizations and residents. - The Central Disaster Management Radio System developed by the Cabinet Office is supported by simultaneous wireless communications systems including outdoor speakers and indoor radio receivers in disseminating disaster information to residents. - To disseminate flooding information in a timely and efficient manner, the TMG provides inundation forecast diagram, flood hazard map, and action plans in an easily understandable language and pictures in its portal site and by leaflets.	▪ The Ready New York: Flooding is to inform New Yorkers how they can lower risk for flooding before, during and after the flood and recover from flood damage. The guide is available in 13 languages for more efficient communication for multi-cultural citizens and visitors in OEM's website. ▪ Emergency alerts: Public safety officials use reliable systems to alert people in the event of natural or man-made disasters through wireless emergency alerts (WEA), Integrated Public Alert and Warning System (IPAWS), NOAA Weather Radio, and SNS.	▪ The City of Seoul has developed training and information system by using SNS, KakaoTalk and etc. ▪ The City government tried to improve early warning system and preemptive response at the early stage of flooding, by compiling all the disaster-related data through monitoring system, river prone flooding warning system, and disaster information system including hazard maps ▪ Seoul City also enhanced public awareness of flooding risks and on how to respond in disaster situation, by providing all necessary disaster information.
Community Resilience	(Guidance for Emergency Planners and Responders) Intended (for planners, particularly for LRF) for development of local action plans for identifying vulnerable people in four key stages: - building networks	TMG's Disaster Prevention website emphasizes the cooperation by communities and guides to establish a support system with neighbors to protect vulnerable persons with a unified effort in case of an emergency[31]. The guidance includes three key	<u>Get Involved</u>: The whole community can participate in programs and activities to make their families, homes and communities safer from risks and threats in various ways: - Volunteer to support disaster efforts in your community.	City of Seoul: - Promotes 'Community-led Safe Village' - Supporting regional safety leaders programs such as Living Safety Governance, Safety Monitoring Service Group, Regional Self-

[31] TMG's Disaster Prevention-Preparation website http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000170/2000074.html urges assistance by communities and neighbors and explains in details how to help the vulnerable persons in a disaster.

	- creating lists of lists - agreeing data sharing protocols and activation triggers - determining the scale and requirements Setting up a Community Emerging Volunteers Group - raise awareness about potential impacts of floods - knowing the vulnerable people in their community - identifying and agreeing arrangements to use local building(s) as evacuation points/rest centres	points: - Vulnerable persons: Communicate with people in the community and make them understand your needs - Neighbors of the vulnerable persons who need supports: Actively engage in communicating with elderly and disabled people in the community with good understanding on various disabilities - When you find vulnerable persons in disaster situation: Provide supports for vulnerable persons in appropriate ways depending on different characteristics.	- Be part of the community planning process. - Join or start a preparedness project. - Support major disasters by donating cash or goods http://www.ready.gov/get-involved America's PrepareAthon!: A nationwide, community-based campaign for action for individuals, organizations, and communities to prepare for specific hazards through drills, group discussions, and exercises http://community.fema.gov.	Disaster Protection Group, and Green Mothers' Association - Development of safety education items - Community safety campaign - Enhancement of disaster response network - Sharing all the disaster-related information with communities and general people as much as possible
Health consequences of flooding	Vulnerability to the health effects of flooding: - children - pregnant women - the elderly - people with physical, sensory and cognitive impairments - people with chronic illnesses - homeless people - people with language and cultural-based vulnerabilities - tourists Preventing measures in three stages: ▪ Primary Prevention (planned far in advance): structural/ engineering or non-structural/			

	policy and organization ▪ Secondary Prevention (just before or during a flood): identification of vulnerable or high-risk populations before floods, early warning systems, evacuation plans including communication strategies, and planned refuge areas ▪ Tertiary Prevention (during or after a flood to minimize health impacts): Emergency responders should be aware of the 'recovery gap' and familiar with the information in key reference materials in Public Health England, NHS Choices, Food Standards Agency pages			
Response				
Evacuation / Shelter	(Evacuation and Shelter Guidance 2014) Sets out the issues for local planners and Local Resilience Forums - to develop flexible and tailored plans to local circumstances - to support responders in meeting their legal responsibilities - advice on decision to evacuate, on transport, vulnerable people and sites, and on support for evacuees, pets and animals - Shelter in place / short-term	"Guidelines for Producing a Decision and Dissemination Manual for Evacuation Orders and Instructions" by Cabinet Office (2005): to help the mayor's quick decision and to enhance effectiveness of municipalities' evacuation orders or instructions "Guidelines for Evacuation Support of People Requiring Assistance During a Disaster" by Cabinet Office (2005, revised in 2006) - improving the information communication system - sharing information regarding	The FEMA's guidance prepared for the vulnerable populations such as elderly, disabilities and children give a comprehensive guide on how to evacuate and to plan to shelter in place. The Ready web site also provides general guidance for the public. http://www.ready.gov/evacuating-yourself-and-your-family http://www.ready.gov/shelter	The City of Seoul provides comprehensive and detailed disaster information for each District and Dong community, in the 'Safe City Seoul' web site, so that people can access to all such information prior to flooding events and be better prepared. The information includes: - Flood hazard map, - Inundation forecast map, - Evacuation routes and - Shelters

	shelter - Priority support or evacuation should be considered for vulnerable groups, in particular for those who require support at home and for those sheltering in commercial premises or in schools Four key stages should be consulted when developing evacuation plans for vulnerable people: - building networks - creating lists of lists - agreeing data sharing protocols and activation triggers - determining the scale and requirements	vulnerable people during a disaster - establishing a concrete evacuation support plan for vulnerable persons who need assistance in a disaster situation - assistance at evacuation centers - cooperation between relevant organizations (Cabinet Office 2011, 18) TMG's "Metropolitan Tokyo Ordinance on Measures for Stranded Persons"[32] includes: - preventing people from heading home all at once - providing communication tools and information services - securing temporary shelters - assisting people returning home		
Recovery				
Recovery measures and/or indicators of disaster recovery	(Emergency Response and Recovery 2013) Cabinet Office sets an overview of recovering process from emergencies. It accesses the	Act on Support for Livelihood Recovery and Disaster Victims (enacted 1998 and revised 2004) includes measures: ▪ Disaster Recovery Project	The Environmental Justice Strategic Enforcement Screening Tool (EJSEAT) created by EPA to serve as a consistent methodology to identify	

[32] http://www.bousai.metro.tokyo.jp/foreign/english/kitaku_portal/2000188.html

	recovery phase as a long and complex process involved with rebuilding, restoring, and rehabilitating the community. It provides recovery guidance for local responders, comprises of: ▪ topic sheets ▪ a recovery plan guidance template ▪ over 100 case studies The Environment Agency also provides the people a practical advice on what to do to better recover after a flood.	▪ Disaster Relief Loans ▪ Disaster Compensation and Insurance ▪ Tax Reduction or Exemption ▪ Tax Allocation to Local Governments and Local Bonds	communities or areas experiencing disproportionate environmental and public health burdens includes demographic, environmental, health and compliance indicators.	
Flood insurance program[33]	▪ Bundle system ▪ Private insurance ▪ Compulsory Under the Statement of Principles on the Provision of Flood Insurance in 2000 by the Association of British Insurers (ABI) and the government, flood cover is kept to be standard to enable the competitive market to deliver affordable flood insurance for majority of customers. In return, the government ensures that flood risk be appropriately managed. Much higher market penetration up to 95 percent owing to the	▪ Bundle system (with fire insurance) ▪ Public-private shared ▪ Voluntary In Japan, there is no standalone coverage for flood insurance. The property owners can take an option of flood coverage as part of a fire insurance policy. Bundled with fire insurance, the penetration rate is relatively high, about 35 or 49 percent (Paklina 2003, 6). There is no governmental support as reinsurer and individuals carry most part of economic loss of disasters (OECD 2006, 15)	▪ Unique system ▪ Government-led ▪ Semi-compulsory The National Flood Insurance Program (NFIP) provides federally-backed basic insurance coverage against the floods only to eligible communities where the flood risk has been assessed and floodplain management measures have been enforced to reduce future flood damage (Paklina 2003, 16). The flood coverage by NFIP is limited to US$250,000 for residential buildings, and US$100,000 for personal property, may be supplemented	▪ Bundle system (with other climate disasters such as typhoon, storm, tsunami, heavy snow and earthquake) ▪ Public-private insurance (with government support) ▪ Voluntary The Storm and Flood Insurance is operated by 5 private insurance companies under overall management by the government (NEMA). Part of the premium is supported by the NEMA for 55%~86% depending on their economic status. The flood coverage is up to 90% (with no limitation in amount) for damage

[33] The comparison of bullet point parts for flood insurance program is cited from Zhao 2011.

	mechanism of spreading the risk across perils and rating areas and over the bigger part of population (NDIR 2011, 85-86).		by purchasing from private insurers (NDIR 2011, 81).[34]	in properties (buildings and greenhouses).[35]

[34] Summarized from US NFIP web site http://www.fema.gov/office-disability-integration-coordination/preparedness-resources#Tools, Paklina 2003 and NDIR 2011

[35] Summarized from NEMA's web site, http://www.safekorea.go.kr/dmtd/main/SdiwMain.jsp?q_menuid=M_NST_SVC_08

V. Conclusion

The social impacts of flood disasters vary according to different people. The more socially vulnerable or underprivileged people are more likely to suffer from disasters and will take longer recovery times. In the case study of the City of Seoul, it was shown that vulnerable people with economic, physical, and environmental issues such as elderly, handicapped, and low income are confirmed as vulnerable classes in urban flood disasters, when combined with the natural topography and the precipitation characteristics. Special findings from this research are that the vulnerable factors involved with economic characteristics bring more disaster vulnerability showing big variance between districts. That means, a recipient of basic livelihood and low income aged single-family population are more vulnerable to flood disasters. Foreigners are also potentially vulnerable people as the number of foreign residents and visitors who have limited access to the disaster information and cultural barriers has rapidly increased in the past years and is expected to increase even further in the years to come.

A comparative analysis of measures to address flood disasters in three representative cities, such as Tokyo, London, New York, with Seoul provides policy implications for Seoul. Although there have recently been much progress in disaster management, reduction of disaster risks and vulnerability in Seoul, there are still room for further improvements. At the national level, Korea needs to develop comprehensive and detailed guidances and to clearly define roles and responsibilities of responders and agencies at each level, like in the UK, to tackle disaster emergencies for well preparedness and recovery, in consideration of those in need of special support. Specific measures or manuals on how to support vulnerable populations are required to be adequately addressed in city government. Information and communication in disaster preparation and response should also be further developed for the

vulnerable populations, including foreigners, as is being done in Tokyo, London and New York. In order to prevent the vulnerable persons from falling into vicious cycles of vulnerability, central and local government should also prepare programs to enhance community resilience and special support for them in the recovery phase. The city government is also recommended to develop vulnerability indicators to identify communities or districts that need to receive differentiated level of assistances for disaster preparedness from city government.

Considering that Korea is facing a fast aging society with no enough preparation for the future and a fast growing multicultural population, timely and appropriate measures should be introduced and implemented. The central and local governments, relevant agencies and communities need to cooperate in addressing adaptation to disasters with target-specific welfare for vulnerable people, which will enhance social inclusiveness in climate resilience. We should note that aging is not a matter of others but the matter for my sons and daughters' future and even for me.

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1. Precipitation of Heavy Rainfall by Region in Seoul on 21 September 2010

(Measured by Automatic Weather System (AWS), per hour)

	Time / Place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Day Total	4 hour peak rainfall
South-West Region	Kangseo	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	1.0	1.5	4.0	29.5	98.5	71.5	54.0	24.0	2.0	0.0	2.0	1.0	2.5	0.0	0.0	293.0	253.5
	Yangcheon	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.5	1.5	1.5	16.0	71.0	60.5	57.5	49.0	4.5	0.5	1.5	1.0	2.0	0.0	0.0	269.0	238.0
	Youngdeun	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	2.0	1.5	1.0	11.5	72.0	46.5	54.5	55.5	7.0	0.0	1.0	1.0	2.5	0.0	0.0	257.5	228.5
	Dongjak	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.5	4.0	0.5	1.0	8.0	64.0	46.0	60.0	61.5	5.5	0.0	1.5	0.5	3.0	0.0	0.0	257.5	231.5
	Guro	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	1.5	1.0	1.5	7.0	20.5	27.5	73.5	76.5	3.0	0.0	1.0	0.5	5.0	0.0	0.0	219.5	198.0
	Kwanak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	1.5	0.0	0.0	0.0	5.5	18.5	11.5	36.0	73.5	0.5	0.0	0.0	10.5	0.5	0.0	159.5	139.5
	Keumcheo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	3.5	0.5	0.0	1.0	8.0	32.0	32.0	60.5	47.0	0.0	0.5	0.0	8.0	0.0	0.0	194.0	171.5
North-West Region	Eunpyung	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	5.5	4.5	22.5	36.0	47.0	32.0	19.0	4.5	0.5	4.0	0.5	0.5	0.0	0.0	180.5	137.5
	Seodaemu	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.5	0.0	1.5	1.0	2.5	17.5	74.0	75.0	61.5	27.0	6.5	0.0	4.0	1.5	2.0	0.0	0.0	275.5	237.5
	Mapo	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.5	1.5	1.5	19.0	84.0	66.0	66.5	31.0	3.5	0.5	2.0	1.5	2.0	0.0	0.0	280.5	247.5
	Jongno	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	1.0	1.0	2.5	15.0	67.0	71.0	60.5	26.0	7.0	0.0	4.0	1.5	2.0	0.0	0.0	259.5	224.5
	Junggu	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	5.0	1.5	1.5	8.0	64.0	51.5	71.5	43.5	8.0	0.5	4.0	0.5	2.5	0.0	0.0	264.0	230.5
	Yongsan	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.5	1.5	4.0	0.0	1.0	5.0	49.0	47.5	59.0	60.5	28.0	0.0	0.5	0.5	4.5	0.0	0.0	263.0	216.0
North-East Region	Dobong	0.0	0.0	0.5	0.0	0.0	0.0	0.0	1.0	0.0	2.0	3.5	7.5	23.0	11.0	15.5	9.5	9.5	3.5	0.0	8.0	0.5	0.5	0.0	0.0	95.5	59.0
	Kangbuk	1.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	2.0	3.0	4.0	18.5	21.0	28.5	22.5	15.0	4.0	2.5	7.5	0.0	0.5	0.0	0.0	130.5	90.5
	Seongbuk	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	2.5	4.0	17.0	42.0	43.5	27.5	20.0	5.5	1.0	4.0	0.5	1.0	0.0	0.0	170.0	133.0
	Dongdaem	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	6.5	1.0	2.5	8.5	48.5	53.0	57.5	36.0	7.5	0.5	3.0	0.5	2.5	1.0	0.0	229.5	195.0
	Jungnang	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	4.5	0.5	2.5	5.0	43.0	50.0	55.5	48.5	7.5	0.5	3.0	0.5	2.5	2.0	0.0	227.5	197.0
	Seongdong	0.0	0.0	0.0	0.5	0.0	0.0	1.0	0.5	3.0	3.5	0.5	1.5	3.5	57.5	42.5	63.0	59.5	14.5	0.0	3.5	0.5	4.0	0.5	0.0	259.5	222.5
	Kwangjin	0.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.5	3.5	0.5	0.5	3.5	47.5	48.5	57.5	67.5	23.5	0.0	2.5	1.0	4.0	1.0	0.0	263.5	221.0
South-East Region	Kangnam	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.0	3.0	0.5	0.0	2.0	54.5	63.0	50.0	65.5	43.5	0.0	0.5	0.5	8.0	0.5	0.0	293.0	233.0
	Seocho	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	1.5	0.0	0.0	1.5	48.0	51.0	48.5	46.0	51.5	0.5	0.0	0.5	10.0	0.5	0.0	261.0	197.0
	Songpa	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	2.5	0.5	0.0	2.0	46.5	57.5	57.5	52.5	43.0	0.5	0.5	0.0	9.5	1.0	0.0	275.5	214.0
	Kangdong	1.0	0.0	0.0	0.0	0.0	0.5	1.5	0.0	0.5	3.5	0.5	1.0	2.5	51.0	50.0	59.0	72.5	19.0	0.5	5.5	0.0	3.5	2.5	0.0	274.5	232.5

Source: Korea Meteorological Administration, http://www.kma.go.kr/weather/observation/aws_table_popup.jsp

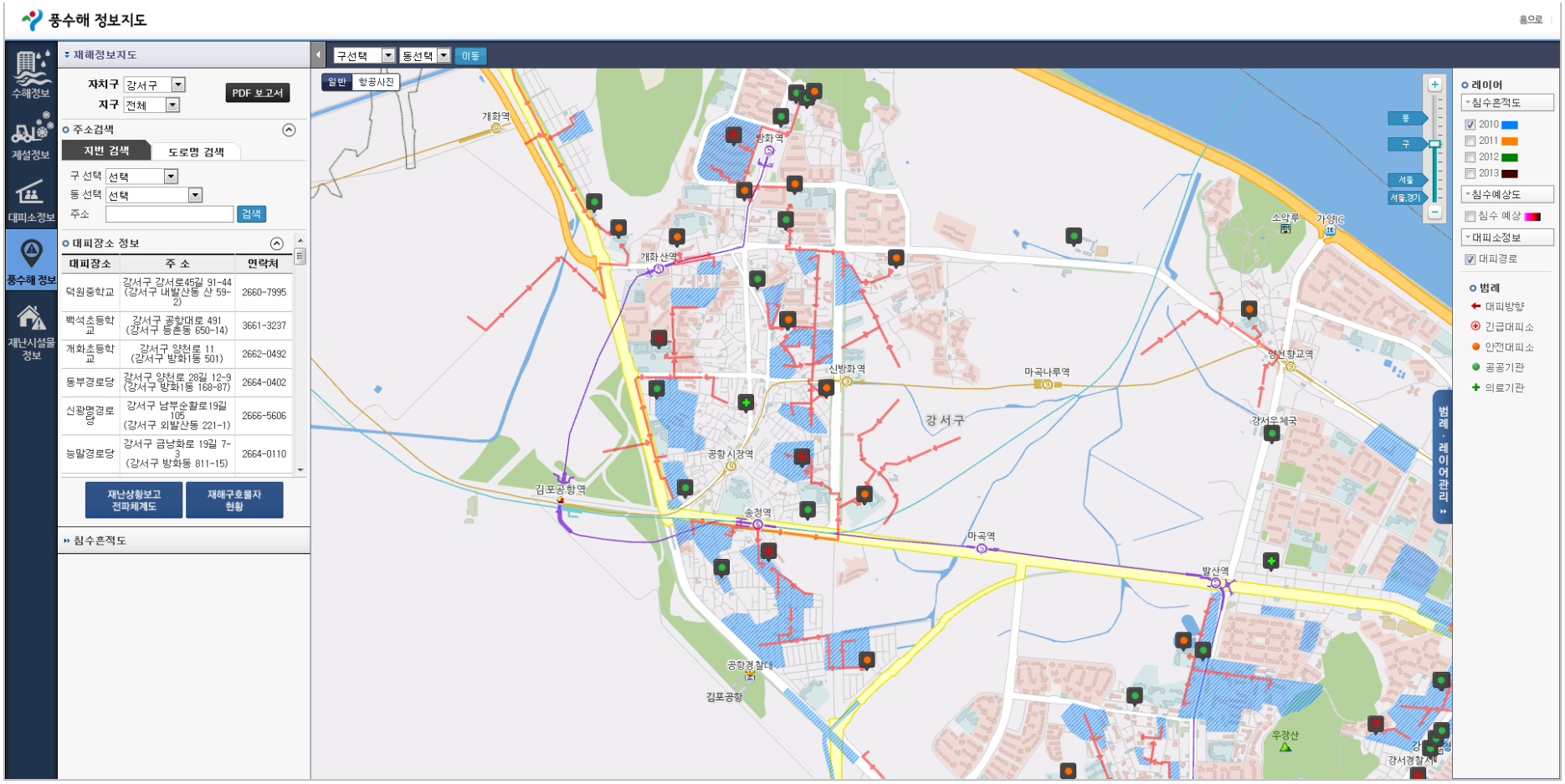
2. Precipitation of Heavy Rainfall by Region in Seoul on 26-28 July 2011

(Measured by Automatic Weather System (AWS), per hour)

	Date	2011.07.26									2011.07.27																
	Time / Place	16	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	2011.7. 26-28 Total	5 hour peak rainfall	3 hour peak rainfall
South-West Region	Kangseo	0.5	29.5	13.0	51.5	12.5	7.5	1.0	0.0	0.0	18.0	25.0	5.5	5.0	5.5	41.5	24.0	11.0	20.5	64.5	19.0	1.0	0.5	4.0	4.0	486.0	161.5	104.0
	Yangcheon	3.5	34.5	2.5	47.5	10.0	10.5	4.5	0.5	0.0	5.0	31.5	8.0	6.0	3.0	48.0	26.5	16.0	29.0	54.5	13.5	1.0	2.5	1.0	8.0	469.5	174.0	99.5
	Youngdeun	3.5	26.0	1.5	47.5	24.0	5.0	15.0	0.0	0.0	3.0	30.5	11.5	7.5	6.0	44.0	29.5	10.0	35.0	50.0	17.0	5.5	2.0	3.5	7.0	512.0	168.5	102.0
	Dongjak	2.0	20.5	4.0	35.5	14.5	9.0	19.5	0.0	0.0	2.5	14.0	36.5	17.0	2.0	35.0	24.5	9.0	51.0	40.0	5.5	1.5	7.0	0.5	5.0	461.5	159.5	100.0
	Guro	7.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	28.0		
	Keumcheo	1.0	14.0	6.0	22.5	0.5	9.5	19.5	0.0	0.5	2.5	13.0	28.0	20.0	4.0	34.0	21.5	24.0	59.0	18.0	6.0	2.5	3.0	0.5	3.0	410.5	156.5	104.5
	Hangang	2.0	26.5	8.0	47.0	19.0	5.5	20.0	0.0	0.0	2.0	23.5	32.0	13.5	9.0	30.5	26.5	10.0	28.0	41.0	10.0	4.5	2.5	1.5	6.0	462.0	136.0	79.0
	Kwanak	0.0	9.0	12.0	19.0	2.0	5.5	15.0	0.0	0.0	0.5	17.0	14.5	24.0	8.5	30.0	36.0	**94.0**	**72.0**	2.0	7.0	6.5	6.0	1.5	1.5	500.5	240.5	**202.0**
	Namhyun	0.0	8.0	15.0	24.5	3.5	3.0	18.5	0.5	0.0	0.0	21.0	17.5	29.0	19.5	27.5	32.5	**86.5**	**80.5**	6.5	3.5	7.5	8.0	2.5	2.0	519.5	246.5	**199.5**
North-West Region	Eunpyung	0.5	63.5	10.5	54.5	25.5	9.5	1.5	0.5	0.0	7.5	30.5	21.0	14.5	13.0	22.0	27.5	2.0	15.5	25.5	28.0	1.0	1.0	6.5	15.0	573.5	163.5	128.5
	Bugaksan	0.0	61.5	13.0	31.5	22.5	10.5	14.5	0.5	0.0	1.0	34.5	21.0	11.0	8.0	21.0	19.5	2.5	14.5	52.5	23.0	0.5	1.5	5.0	19.0	597.5	139.0	106.0
	Seodaemu	1.0	46.0	3.5	43.5	25.0	11.5	13.5	0.0	0.0	2.5	39.5	14.5	7.5	11.5	32.0	22.5	6.5	26.5	30.0	0.0	1.0	0.5	4.5	17.5	539.5	129.5	93.0
	Mapo	3.5	46.5	3.0	54.5	14.5	11.0	6.5	0.5	0.0	4.5	38.0	8.5	5.0	9.5	40.5	26.5	10.5	25.0	63.5	19.5	1.5	0.5	3.0	12.0	572.0	166.0	104.0
	Jongno	0.0	49.5	13.5	42.0	34.5	7.5	24.0	0.0	0.0	1.5	39.0	20.5	8.5	15.5	23.0	22.5	6.0	24.5	57.5	21.0	1.0	1.0	4.5	14.0	587.5	133.5	105.0
	Junggu	0.0	27.0	16.5	25.5	8.0	9.0	19.0	0.5	0.0	1.5	20.0	33.5	10.0	10.5	28.5	23.5	5.5	24.5	42.0	17.0	8.5	1.5	3.0	6.0	459.5	124.0	83.5
	Yongsan	0.5	12.0	12.5	37.5	16.5	19.0	24.5	0.0	0.0	1.5	9.5	49.0	28.0	11.5	23.5	26.0	7.0	29.5	38.0	11.5	1.0	5.0	3.5	10.0	461.0	124.0	79.0
North-East Region	Dobong	0.0	67.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3.0	4.0	28.0	277.0		
	Nowon	0.0	26.5	51.0	43.5	16.5	4.5	32.0	13.0	0.0	1.0	17.5	39.0	21.0	15.5	19.5	11.5	0.5	5.0	35.5	18.5	7.0	1.0	4.0	18.5	576.0	147.5	121.0
	Kangbuk	0.0	65.5	20.0	43.5	16.5	10.0	18.0	2	0	0.5	31.5	20.5	13.0	10.0	16.5	18.5	0.5	2.0	25.0	25.5	1.5	2.0	5.0	27.0	564.5	155.5	129.0
	Seongbuk	0.0	59.0	10.0	36.5	21.5	10.0	20.5	0.5	0	1.0	31.0	24.0	11.5	9.0	21.0	17.0	2.5	7.5	42.5	22.5	0.5	2.5	5.0	23.5	568.0	137.0	105.5
	Dongdaem	0.0	18.5	50.0	55.0	15.0	10.5	34.0	10.5	0.0	1.5	17.5	45.5	20.5	13.5	23.5	19.0	1.5	15.5	49.0	12.0	12.0	1.0	6.0	11.5	481.5	164.5	123.5
	Jungnang	0.0	24.0	46.0	51.5	12.5	11.5	26.0	8.5	0.0	0.5	8.5	58.0	31.5	16.5	16.0	16.5	1.5	15.5	46.0	9.5	9.0	1.0	4.5	8.0	572.5	147.5	121.5
	Seongdong	0.0	11.5	35.5	36.0	9.0	11.0	25.5	4.5	0.0	0.5	5.5	52.5	32.5	18.5	13.0	20.0	9.0	26.5	38.5	8.5	2.0	3.5	8.0	10.0	493.0	136.5	103.5
	Kwangjin	0.0	9.5	41.0	43.5	6.5	11.0	12.5	2.5	0.0	0.5	10.0	36.0	28.5	24.5	8.0	23.0	14.0	38.5	26.0	2.5	1.5	12.0	5.5	6.5	480.0	109.5	94.0
South-East Region	Kangnam	0.0	10.5	20.5	37.5	3.5	11.0	13.5	0.5	0.0	1.0	13.0	27.5	20.5	20.5	17.5	36.5	47.5	58.0	19.5	4.4	1.0	12.0	5.0	5.0	502.9	180.0	**142.0**
	Seocho	0.0	11.5	17.5	28.5	3.5	7.0	15.5	0.0	0.0	0.0	16.5	13.0	19.0	11.5	20.0	30.5	62.5	68.5	13.0	2.0	2.5	17.0	4.0	1.0	364.5	193.0	**161.5**
	Songpa	0.0	12.0	32.5	42.5	14.5	7.5	7.0	0.5	0.0	0.0	13.5	19.5	60.5	44.0	.	.	.	.	.	.	.	.	.	.	334.0		124.0
	Kangdong	0.0	9.5	56	47	26.0	7.0	10.0	1.5	0.0	0.5	11.0	42.0	39.5	37.5	8.5	32.0	14.0	36.0	9.5	4.5	1.5	11.0	7.0	17.5	558.5	159.5	119.0

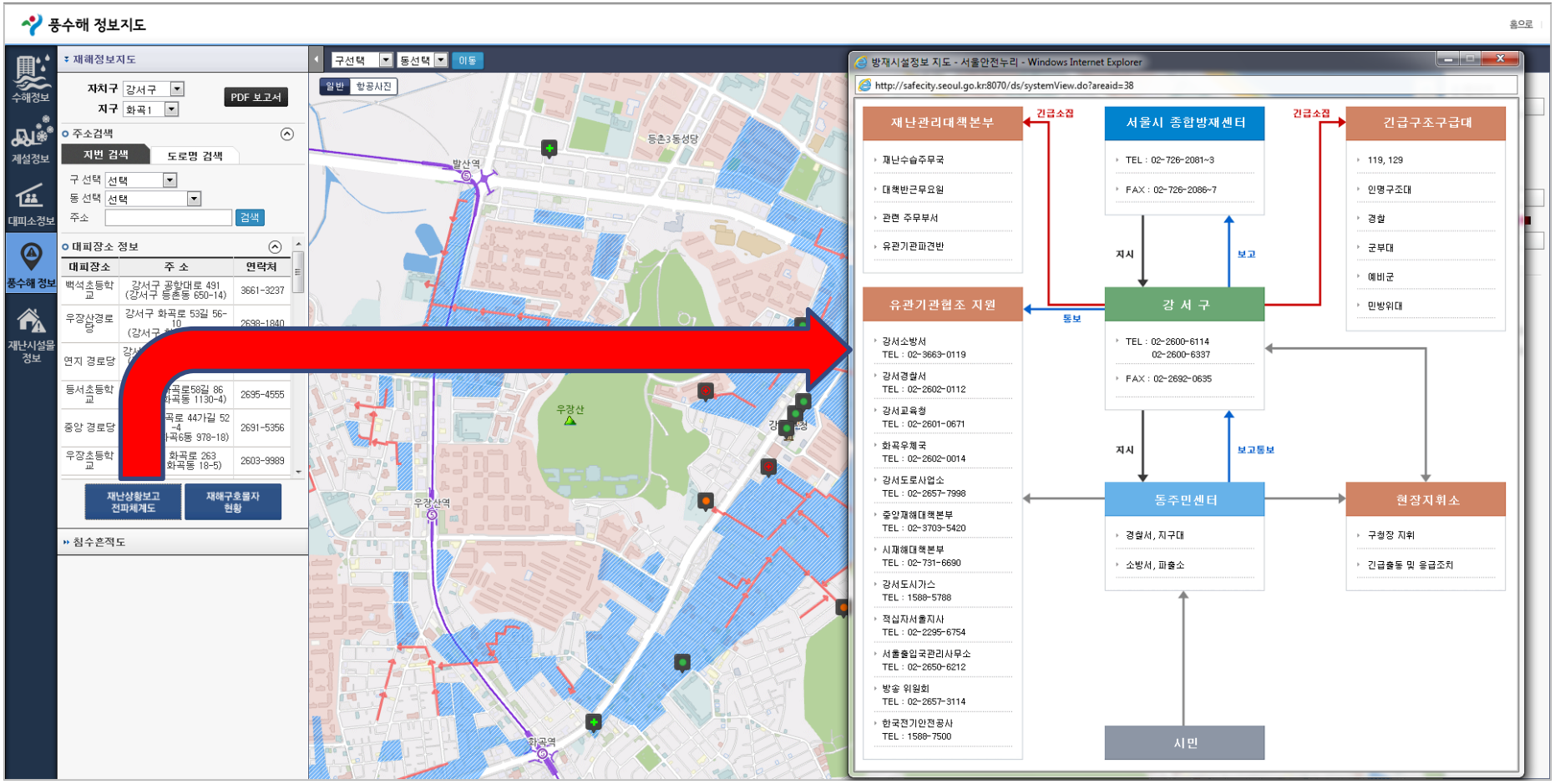
Source: Korea Meteorological Administration, http://www.kma.go.kr/weather/observation/aws_table_popup.jsp

3. Gangseo-gu – Flood Hazard Map (2010) with Information on Evacuation Route, Shelter and Emergency Healthcare Facilities



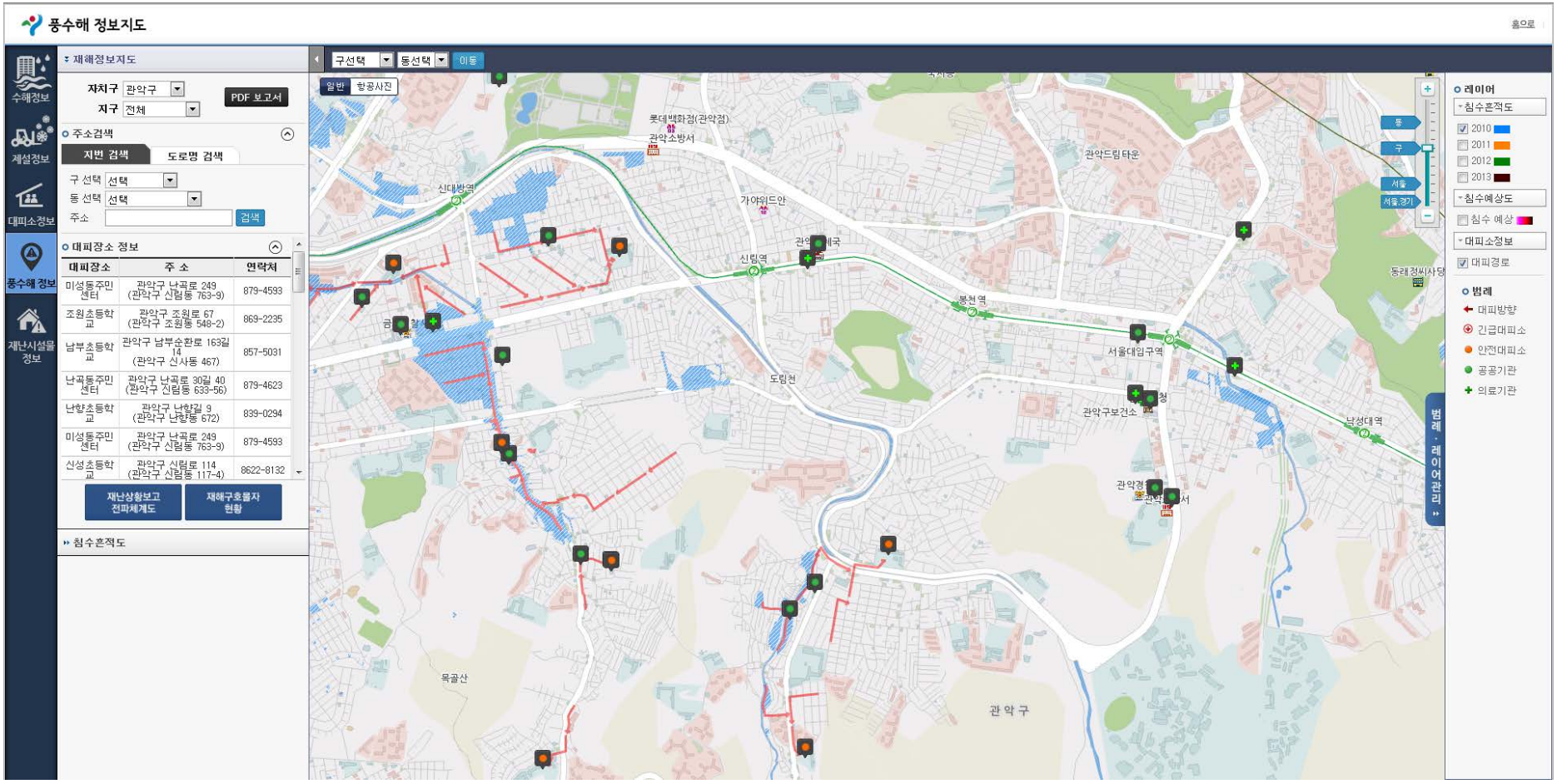
Source: Safe City Seoul web site http://safecity.seoul.go.kr:8070/scmyn_cf/map/cfMap.do?type=clsn

3-1. Gangseo-gu – Overview of Information Flow, Management and Coordination in Emergency (Sample: Hwagok-dong)



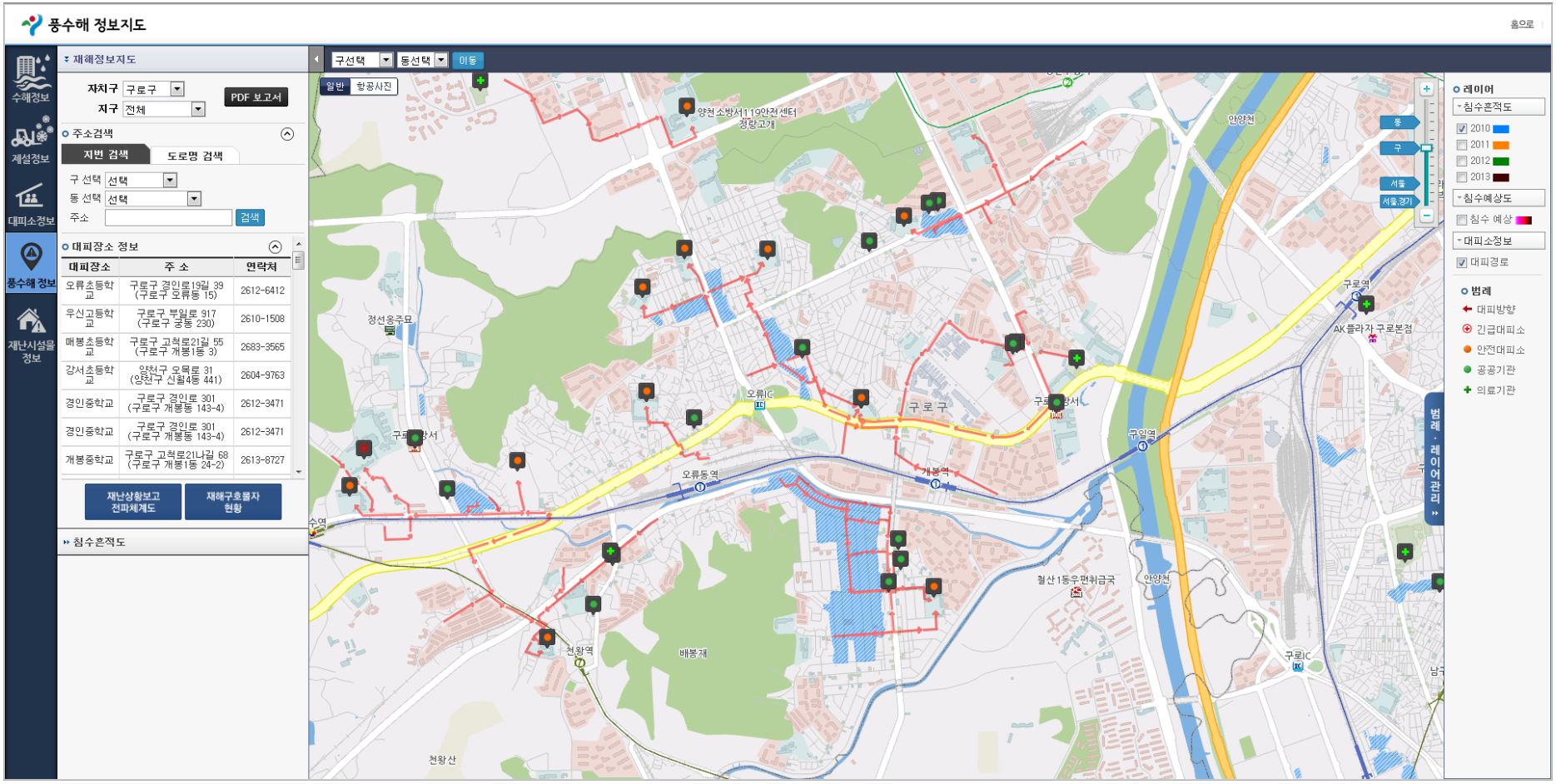
Source: Safe City Seoul web site http://safecity.seoul.go.kr:8070/scmyn_cf/map/cfMap.do?type=clsn

4. Gwanak-gu – Flood Hazard Map (2010) with Information on Evacuation Route, Shelter and Emergency Healthcare Facilities



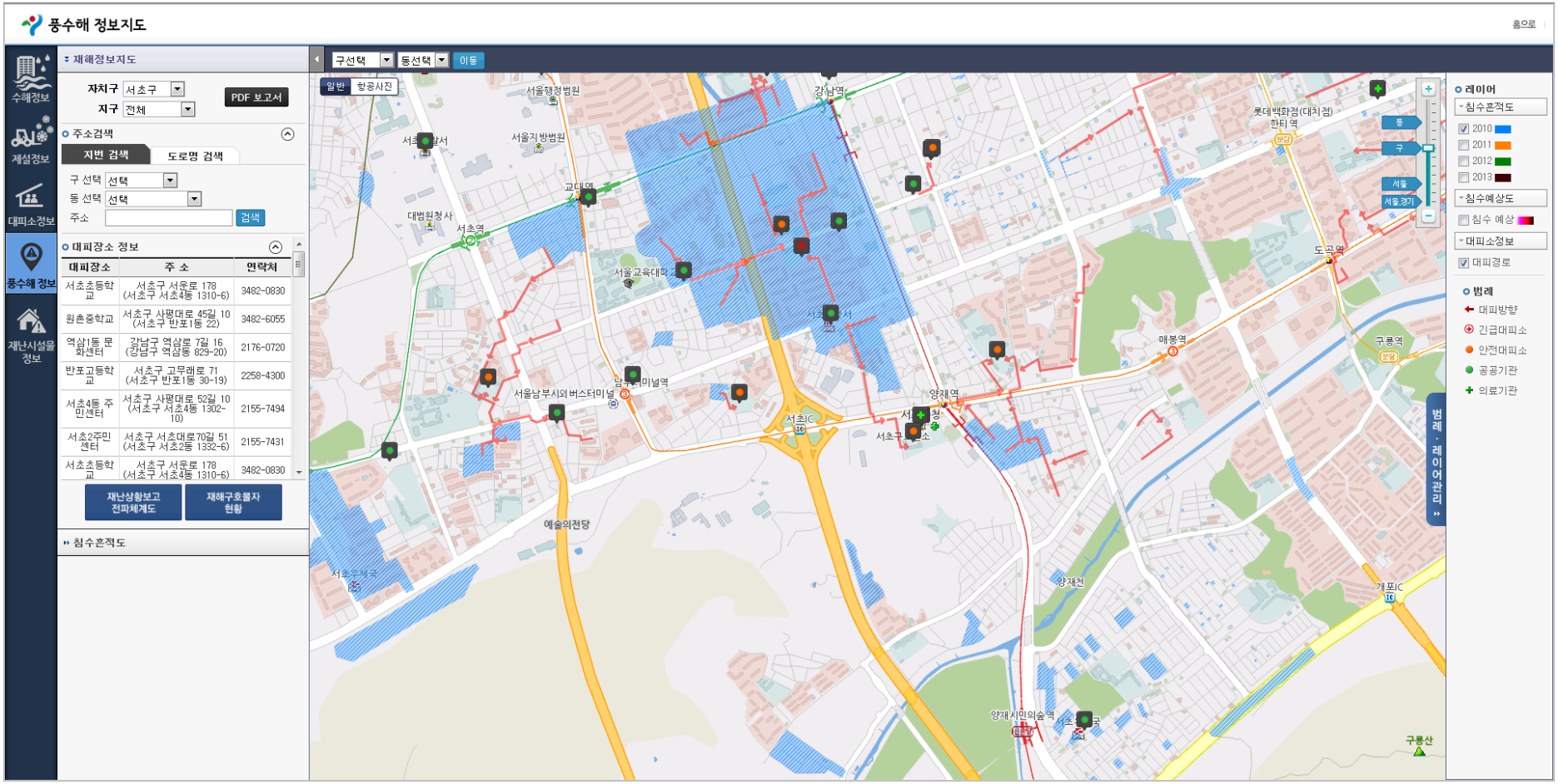
Source: Safe City Seoul web site http://safecity.seoul.go.kr:8070/scmyn_cf/map/cfMap.do?type=clsn

5. Guro-gu – Flood Hazard Map (2010) with Information on Evacuation Route, Shelter and Emergency Healthcare Facilities



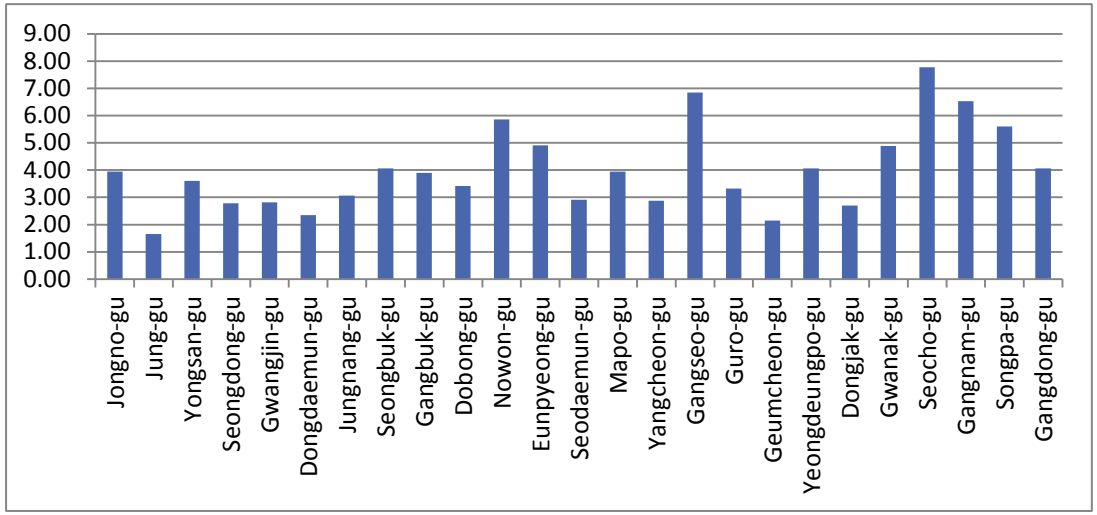
Source: Safe City Seoul web site http://safecity.seoul.go.kr:8070/scmyn_cf/map/cfMap.do?type=clsn

6. Seocho-gu – Flood Hazard Map (2010) with Information on Evacuation Route, Shelter and Emergency Healthcare Facilities



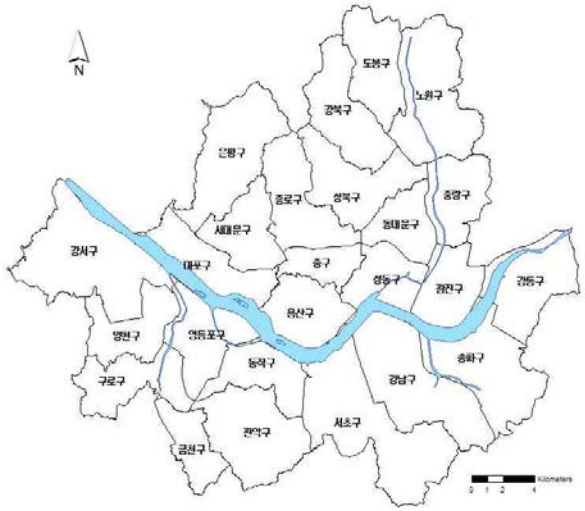
Source: Safe City Seoul web site http://safecity.seoul.go.kr:8070/scmyn_cf/map/cfMap.do?type=clsn

7. Area Proportion of Districts in Seoul



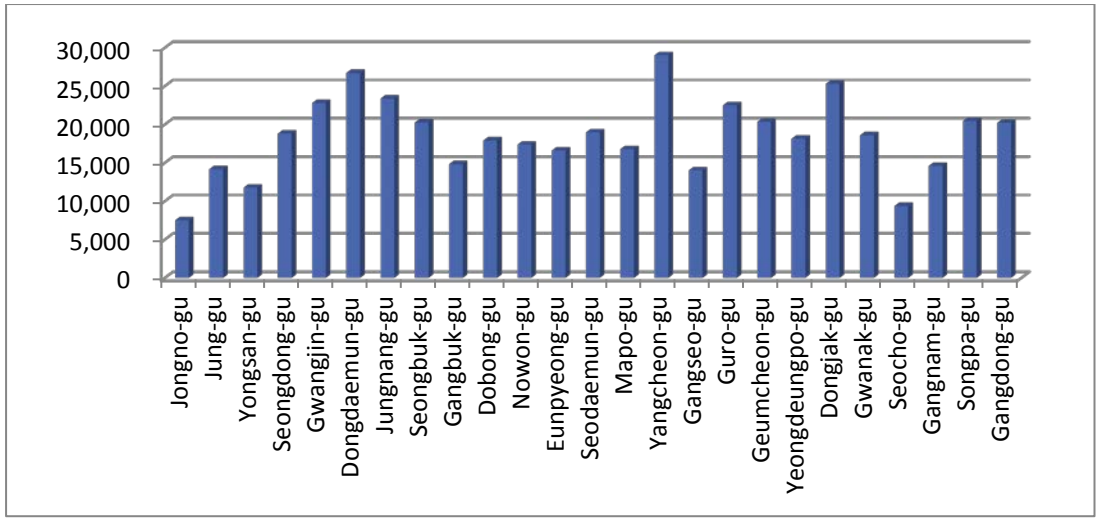
(2010)

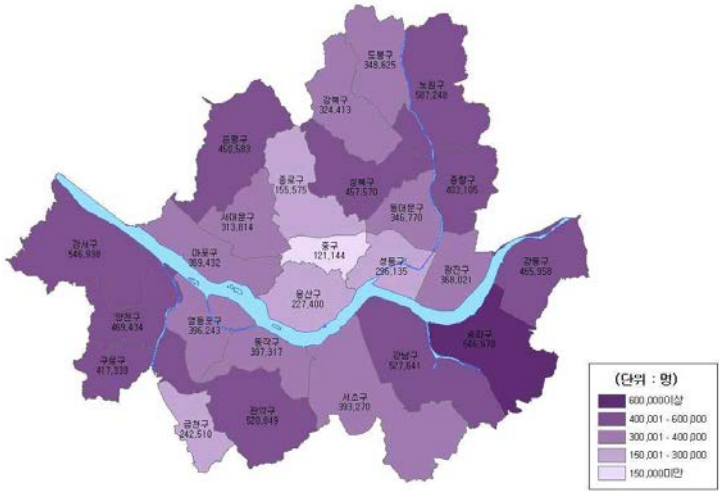
Map of Administrative District



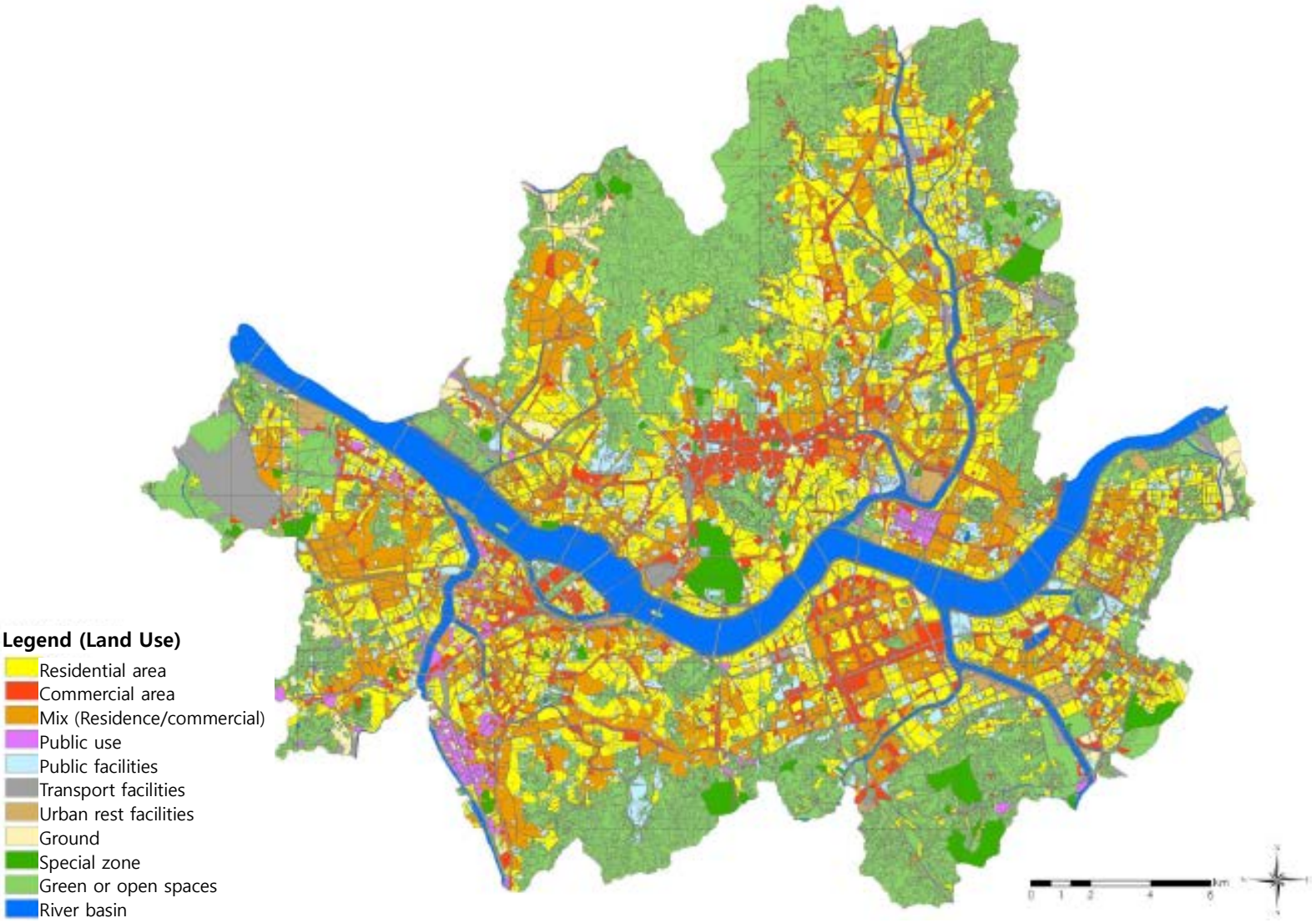
Map of Populations by District

(National Statistics Office, 2010)


30,000
25,000
20,000
15,000
10,000
5,000
0
Jongno-gu
Jung-gu
Yongsan-gu
Seongdong-gu
Gwangjin-gu
Dongdaemun-gu
Jungnang-gu
Seongbuk-gu
Gangbuk-gu
Dobong-gu
Nowon-gu
Eunpyeong-gu
Seodaemun-gu
Mapo-gu
Yangcheon-gu
Gangseo-gu
Guro-gu
Geumcheon-gu
Yeongdeungpo-gu
Dongjak-gu
Gwanak-gu
Seocho-gu
Gangnam-gu
Songpa-gu
Gangdong-gu

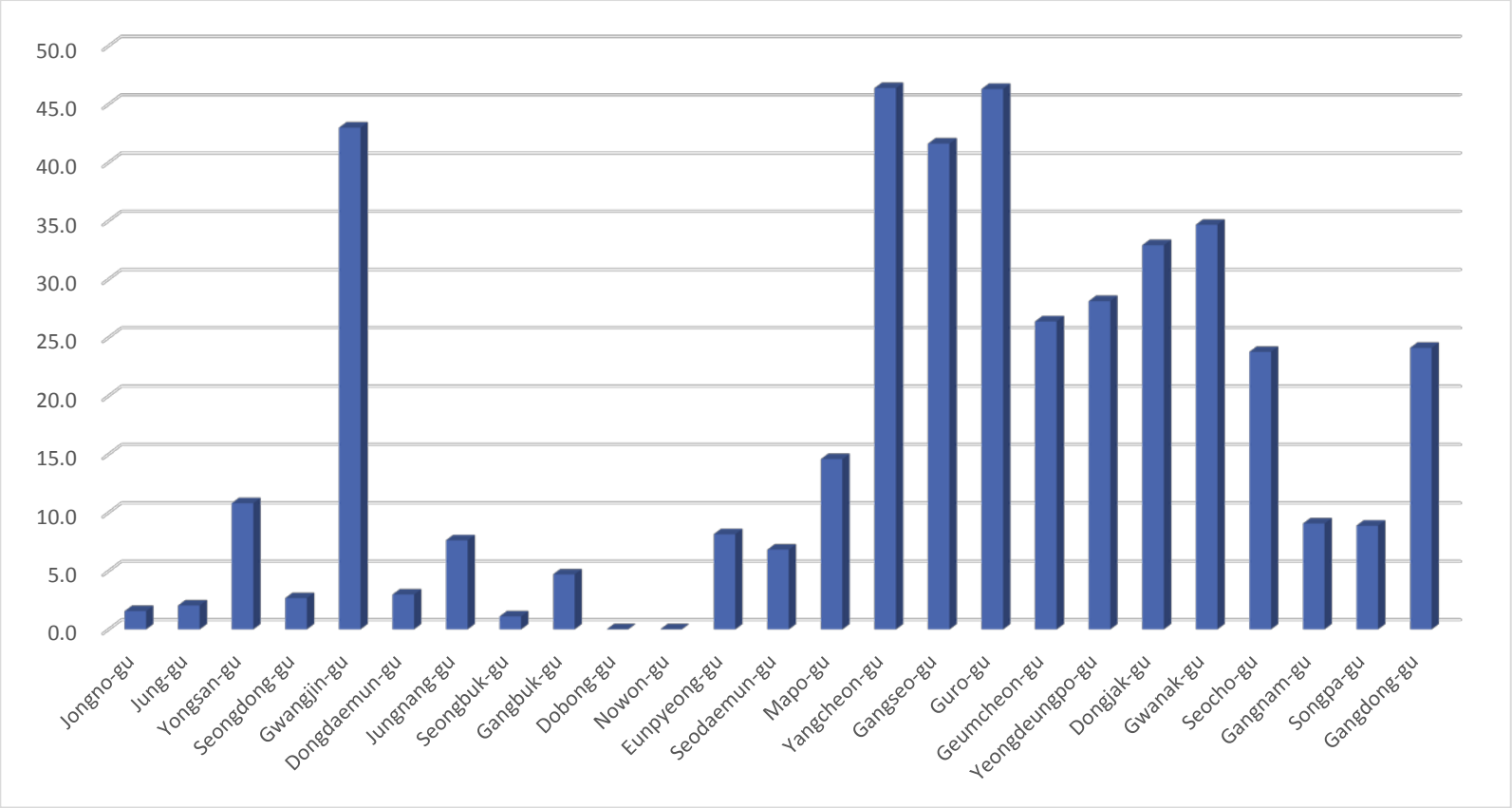

(단위 : 명)
600,000이상
400,001 - 600,000
300,001 - 400,000
150,001 - 300,000
150,000미만

8. Seoul Metropolitan Land Use Map (Seoul, 2010)



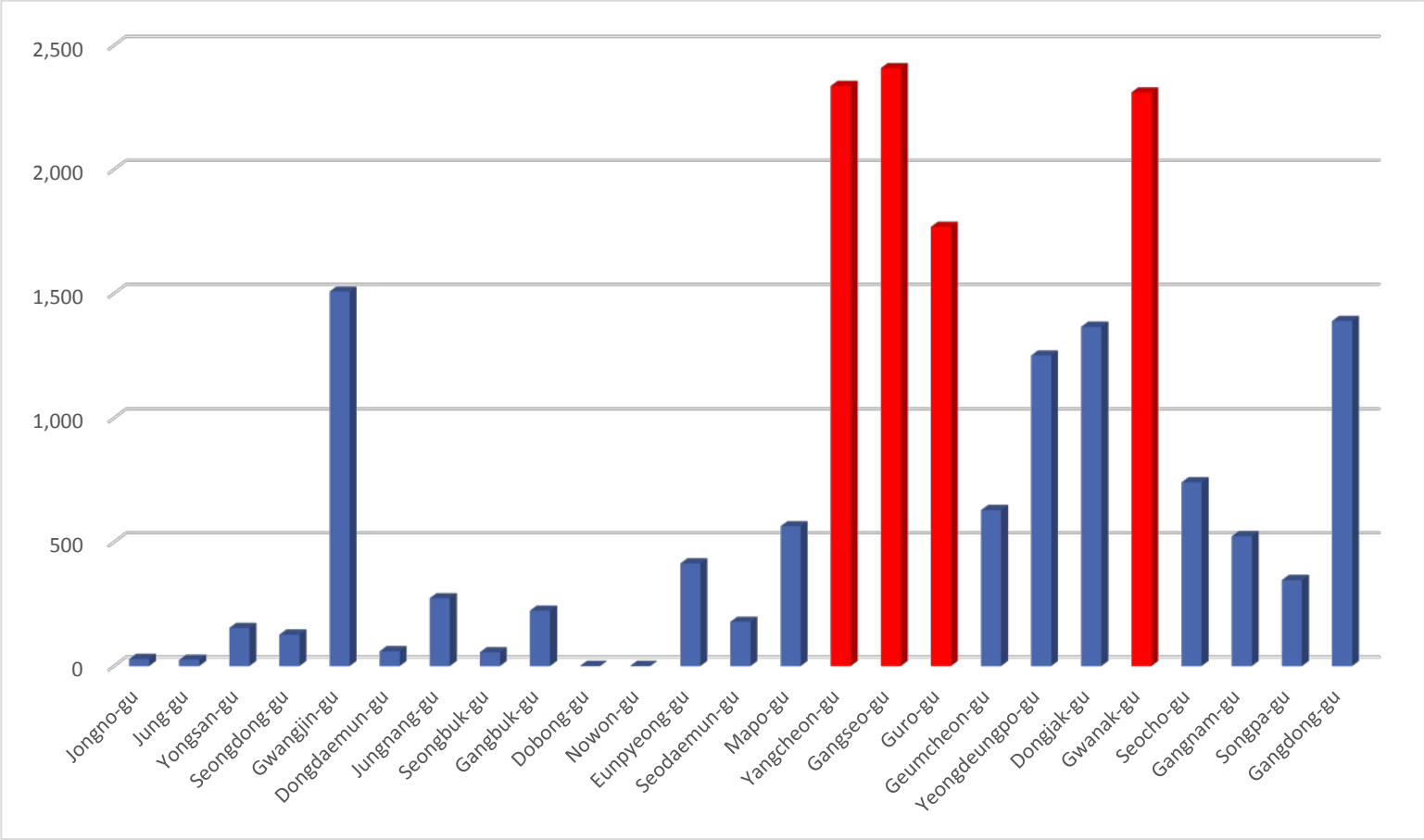
9. Populations Affected by Flooding

(Per 1000 population, 2010)



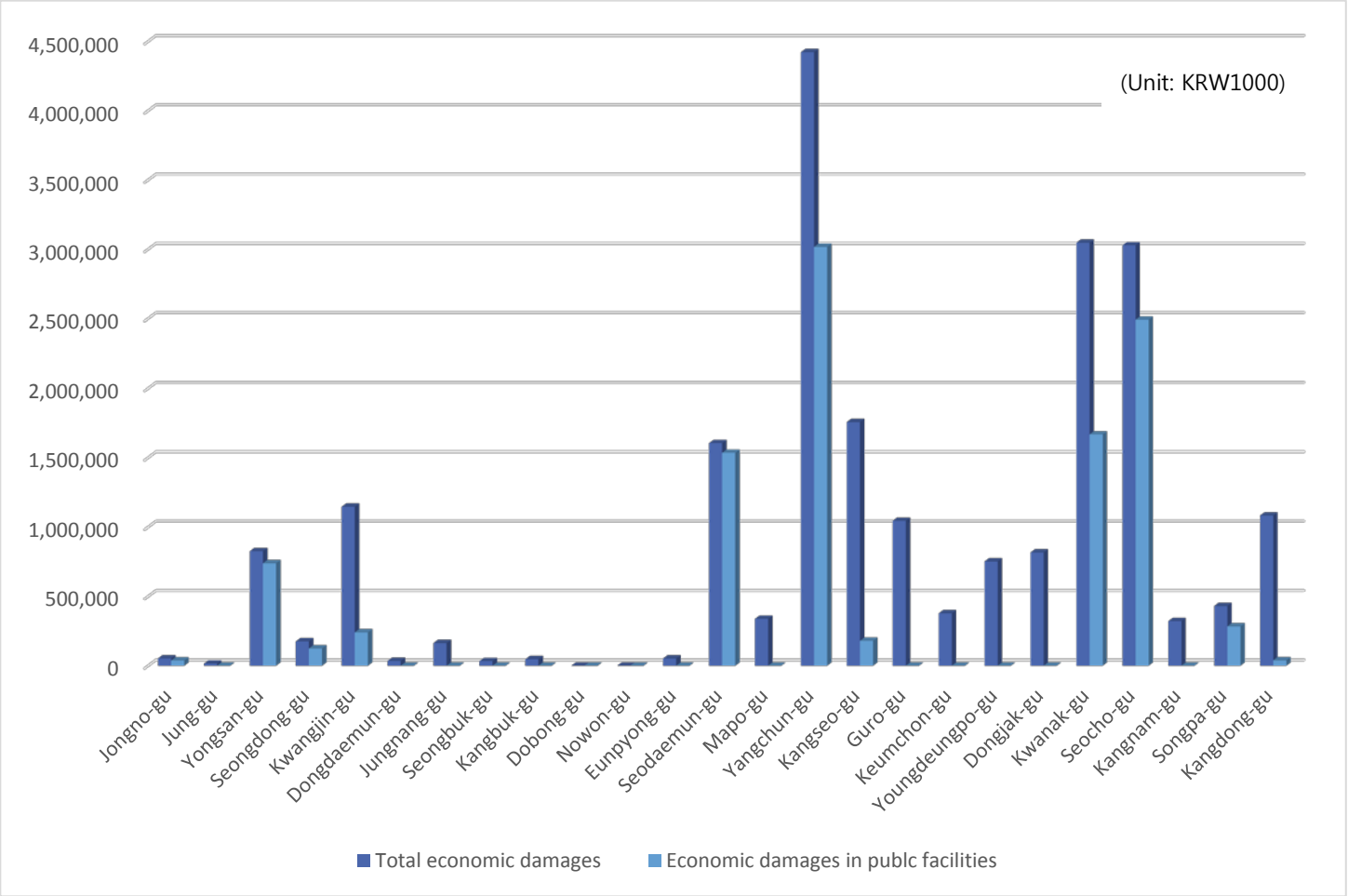
Source: Seoul Metropolitan City Statistics

10. Inundated Houses by Flooding (2010)



Source: Seoul Metropolitan City Statistics

11. Economic Damages by Natural Disasters (2010)



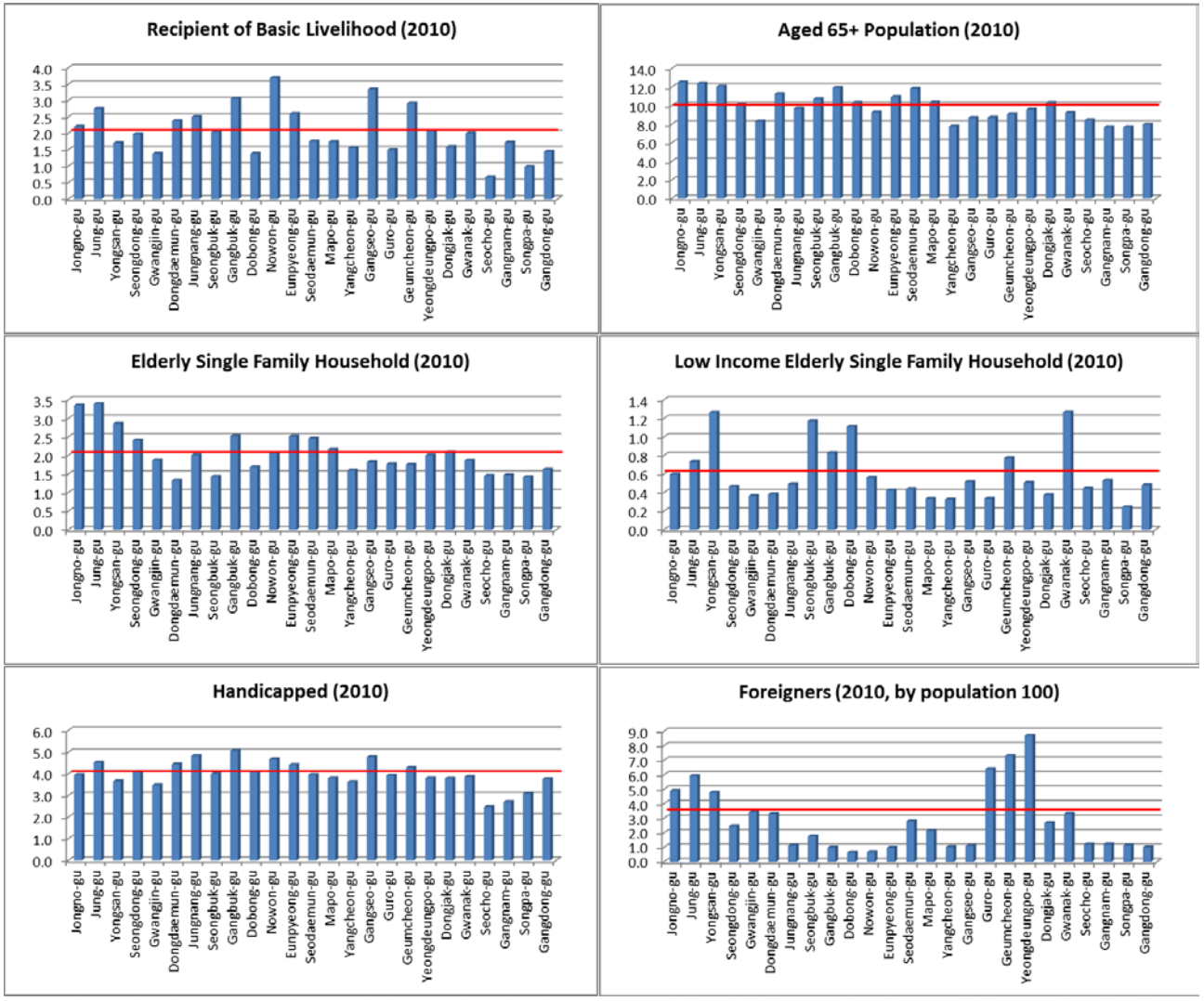
Source: Seoul Metropolitan City Statistics

12. Socio-demographic data by district (2010)

Legend	Basic_L	Aged_65+	ESF	ESF_LI	Handicapped	Foreigner	Foreigner
Vulnerability / Admin.District	Recipient of Basic Livelihood (2010)	Aged 65+ Population (2010)	Elderly Single Family Household (2010)	Low Income Elderly Single Family Household (2010)	Handicapped (2010)	Foreigners (2010, by population 100)	Foreigners (2010)
Jongno-gu	2.2	12.5	3.4	0.6	4.0	4.9	8,784
Jung-gu	2.8	12.4	3.4	0.7	4.5	5.9	8,378
Yongsan-gu	1.7	12.1	2.9	1.3	3.7	4.8	12,290
Seongdong-gu	2.0	10.1	2.4	0.5	4.1	2.5	7,799
Gwangjin-gu	1.4	8.3	1.9	0.4	3.5	3.4	13,312
Dongdaemun-gu	2.4	11.2	1.3	0.4	4.4	3.3	12,557
Jungnang-gu	2.5	9.7	2.0	0.5	4.8	1.1	4,847
Seongbuk-gu	2.0	10.7	1.4	1.2	4.0	1.8	8,760
Gangbuk-gu	3.1	11.9	2.5	0.8	5.1	1.0	3,487
Dobong-gu	1.4	10.3	1.7	1.1	4.1	0.7	2,436
Nowon-gu	3.7	9.3	2.1	0.6	4.7	0.7	4,195
Eunpyeong-gu	2.6	10.9	2.5	0.4	4.4	1.0	4,816
Seodaemun-gu	1.8	11.8	2.5	0.4	4.0	2.8	9,330
Mapo-gu	1.7	10.4	2.2	0.3	3.8	2.1	8,599
Yangcheon-gu	1.6	7.7	1.6	0.3	3.6	1.0	5,222
Gangseo-gu	3.3	8.7	1.8	0.5	4.8	1.1	6,379
Guro-gu	1.5	8.7	1.8	0.3	3.9	6.4	28,931
Geumcheon-gu	2.9	9.1	1.8	0.8	4.3	7.3	19,349
Yeongdeungpo-gu	2.1	9.6	2.0	0.5	3.8	8.7	38,815
Dongjak-gu	1.6	10.3	2.1	0.4	3.8	2.7	11,105
Gwanak-gu	2.0	9.2	1.9	1.3	3.9	3.3	18,302
Seocho-gu	0.7	8.4	1.4	0.4	2.5	1.2	5,301
Gangnam-gu	1.7	7.7	1.5	0.5	2.7	1.2	6,975
Songpa-gu	1.0	7.7	1.4	0.2	3.1	1.1	7,865
Gangdong-gu	1.4	7.9	1.6	0.5	3.8	1.0	5,068
Seoul Average	**2.0**	**9.9**	**2.0**	**0.6**	**4.0**	**2.8**	**10,516**

Source: Seoul Metropolitan City Statistics

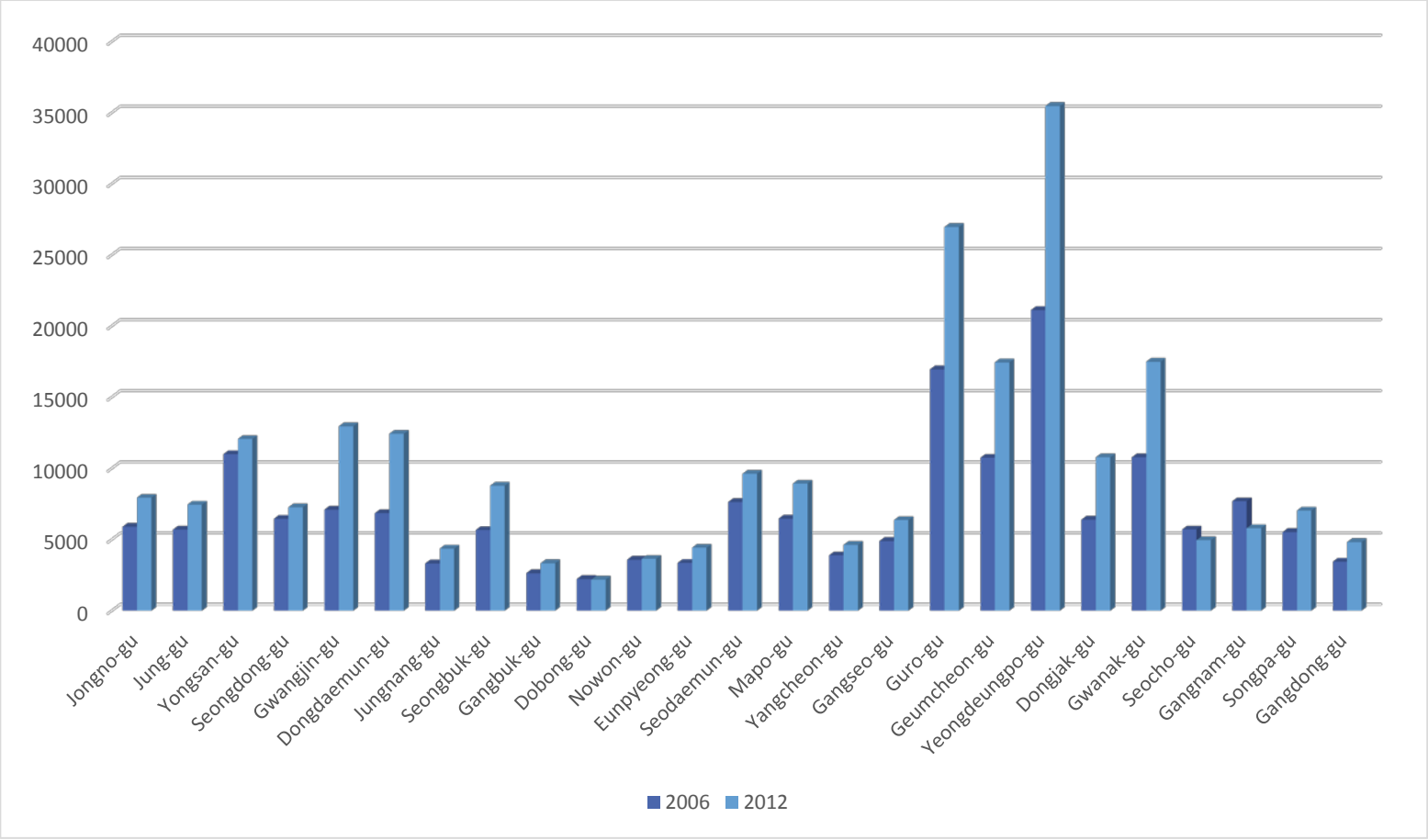
13. Socio-demographic charts by vulnerability factors (2010, chart)



Source: Seoul Metropolitan City Statistics

14. Changes in Registered Foreign Residents

(By District, comparison between 2006 and 2012)

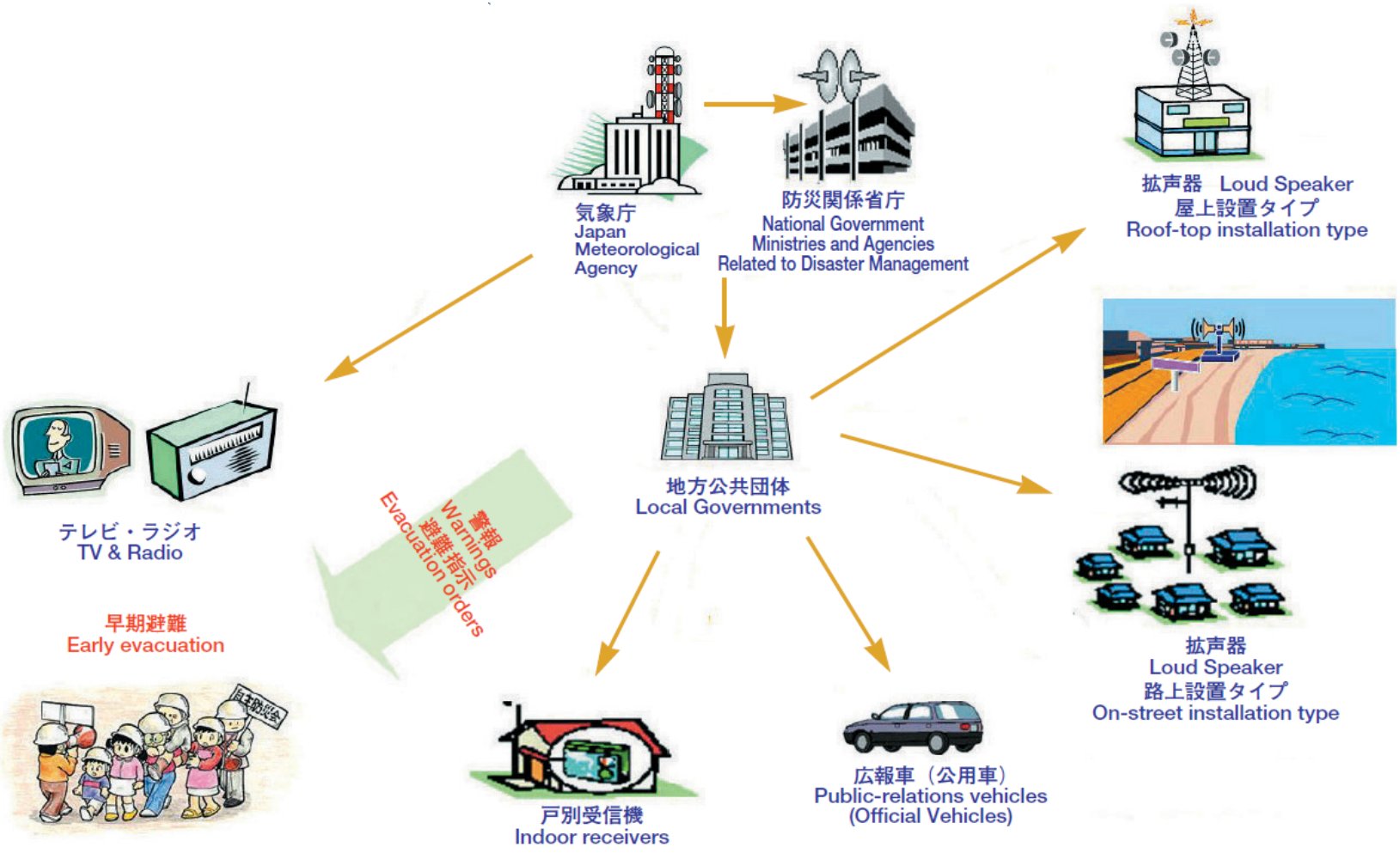


Source: Seoul Metropolitan City Statistics

15. Japan: Outline of the Disaster Management System in Japan

Source: Cabinet Office, Government of Japan. “Disaster Management in Japan” (English version)

16. Japan: Outline of Early Warning Systems in a Disaster



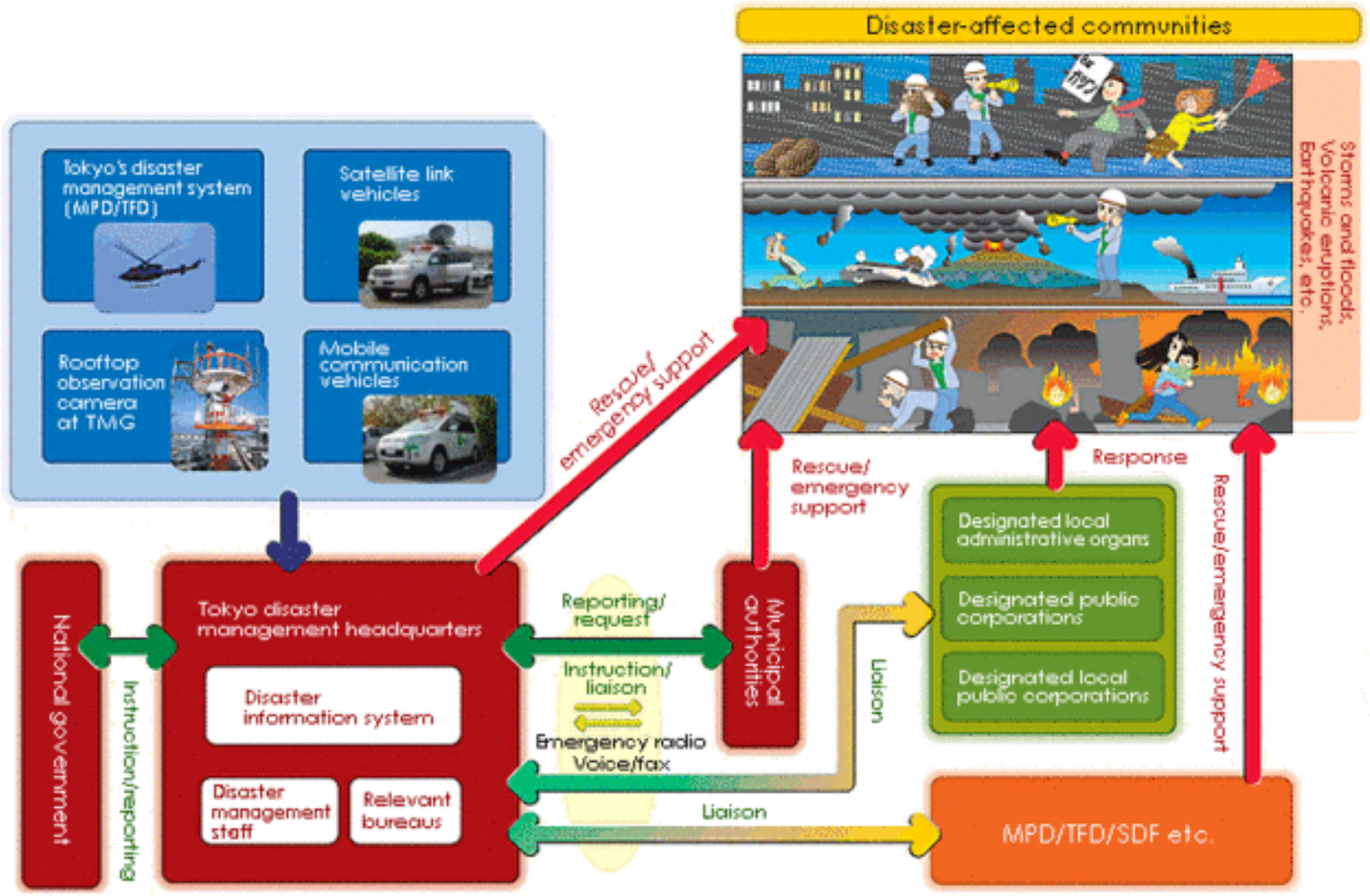
Source: Cabinet Office, Government of Japan. “Disaster Management in Japan” (English version)

17. Japan: Outline of Guidelines for Evacuation Support of People Requiring Assistance during a Disaster

災害情報の伝達体制の整備 Improving the information communications system	○避難準備情報の発令 Announcement of evacuation preparation information ○災害時要援護者支援班の設置 Establishment of a support unit for people requiring assistance ○インターネット、災害用伝言ダイヤル等多様な手段の活用による通信の確保　等 Secure communications by making use of various means such as the Internet, emergency call message service, etc.
災害時要援護者情報の共有 Sharing of Information concerning people requiring assistance during a disaster	○同意・手上・関係機関共有方式による要援護者情報の収集・共有 Collection and sharing of information on people requiring assistance in various ways ○関係機関共有方式（個人情報の避難支援体制の整備のための目的外利用・第三者提供）の積極的活用　等 Promotion of exceptional use of social welfare-related personal information to prepare evacuation support systems
災害時要援護者の避難支援プランの具体化 Creating a tangible evacuation support plan for people requiring assistance during a disaster	○要援護者一人ひとりの避難支援プランの策定 Creation of an evacuation support plan for each individual requiring assistance ○防災に強いまちづくりの重要性の明確化　等 Recognition of the importance of making communities resilient to disasters
避難所における支援 Assistance at evacuation centers	○避難所における要援護者用窓口の設置の促進 Establishment of an information desk for people requiring assistance at evacuation centers ○福祉避難所の設置・活用の促進　等 Establishment of welfare evacuation centers
関係機関間の連携 Collaboration among related organizations	○福祉サービスの継続 Continuity of welfare services in disaster situation ○保健師、看護師等の広域的な応援 Wide-area support of health nurses ○要援護者避難支援連絡会議（仮称）の設置　等 Establishment of a committee on evacuation support of people requiring assistance at the municipal level

Source: Cabinet Office, Government of Japan. “Disaster Management in Japan” (English version)

18. Japan: Tokyo Metropolitan Government's Disaster Prevention System



Source: TMG's Disaster Prevention Website http://www.bousai.metro.tokyo.jp/foreign/english/taisaku/2000023/2000104.html

19. Japan: Guides on Disaster Preparation for Vulnerable Persons

in the TMG's Disaster Prevention Website

Tokyo Metropolitan Government
Disaster Prevention Website

▸ Sitemap Site search Google™カスタム検索 Search How to search this site 東京都
Mobile site Japanese Change color Change font size S original L Smartphone

Home | Disaster Information | Disaster Prevention Information | TMG Disaster Measures

Home > english > Disaster Prevention Information > Disaster Preparation > Vulnerable Persons

Listen ▸ How to use the text-to-speech function

Vulnerable Persons

ツイート 0 シェア 0

Protect vulnerable persons with a united effort

In the event of a disaster, it is sometimes difficult for elderly, disabled people, expectant mothers, children, people with illnesses, and foreign residents to evacuate promptly and properly. It is advisable to make a conscious effort to establish a support system with neighbors to prepare in case of an emergency.

1. People in need of support

Try to have contact with people in the community, and help them understand your needs. Also participate in safety drills as much as possible to strengthen local cooperation.

2. Neighbors of people in need of support

Actively communicate with elderly and disabled people in your community, and let them know that they should not hesitate to ask for help in an emergency. It is vital that you have an understanding of a variety of disabilities, and assist those in need regularly.

3. If you find vulnerable persons in a time of disaster

Support for vulnerable persons differs depending on their unique characteristics. Refer to the following and learn these special situations.

Elderly

- When an elderly person needs help, try to employ the aid of several people.
- If it is urgent, carry the person on your back or on a stretcher to safety.

The blind

- Walk slowly with the blind person, placing your hand on the elbow of the arm not holding a cane.
- When you give them directions or describe where they are, use numbers on a clock face as examples for orientation.

english

- Disaster Prevention Information
- Disaster Preparation
  - Against a disaster
  - Before a disaster occurs
  - Preventing furniture from falling
  - Preventing furniture and appliances from falling
  - Undergo an earthquake-resistance test
  - Countermeasure for confinement in elevator
  - BCP（Business Continuity Plan）
  - Fire corps
  - List of fire stations in 23 wards
  - Medical care and first-aid
  - List of Tokyo DMAT Designated Hospitals
  - List of disaster base hospitals
  - Disaster prevention civil organizations
  - Vulnerable Persons
  - Volunteering during a disaster

The deaf

- Write brief, easy-to-understand messages.
- You can also write out letters on the palm of your hand with your finger.
- When you talk, face the deaf person. Speak slowly and enunciate clearly.

Physically disabled people

- Speak calmly. If you cannot give support by yourself, ask someone for help.
- Transport wheelchairs on stairs using three or four people. The rider should be facing front when going up stairs, and backwards when going down.

Foreign residents and tourists

- Communicate using gestures, and try not to isolate them.

For inquiries concerning this page please contact:

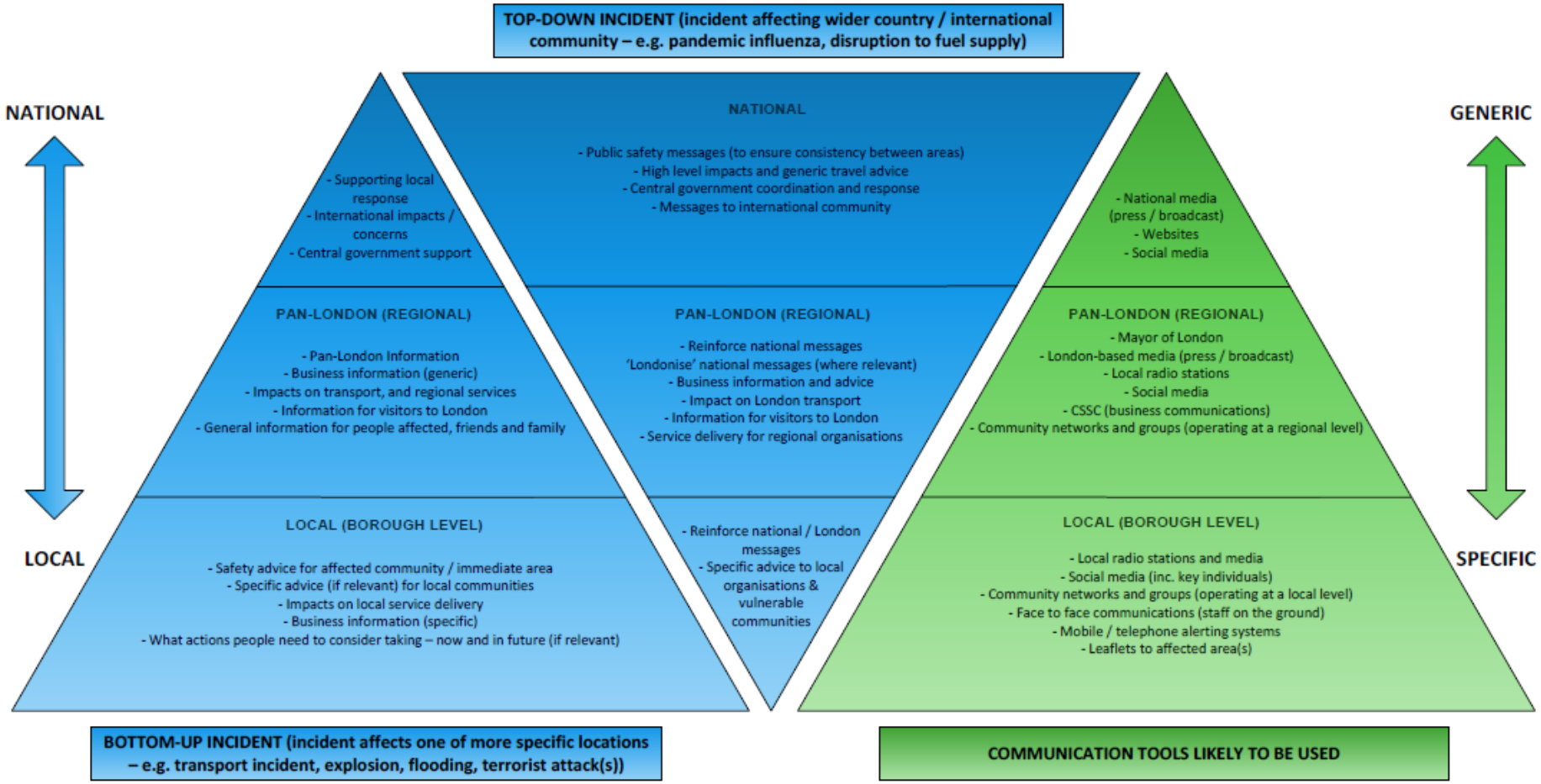
Division,Bureau of General Affairs for queries on this page.
telephone:03-5388-2453 E-mail:S0000040@section.metro.tokyo.jp

ID 2000074

Source: TMG's Disaster Prevention Website
http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000170/2000074.html

20. UK: London Resilience Partnership - Coordination of Communications

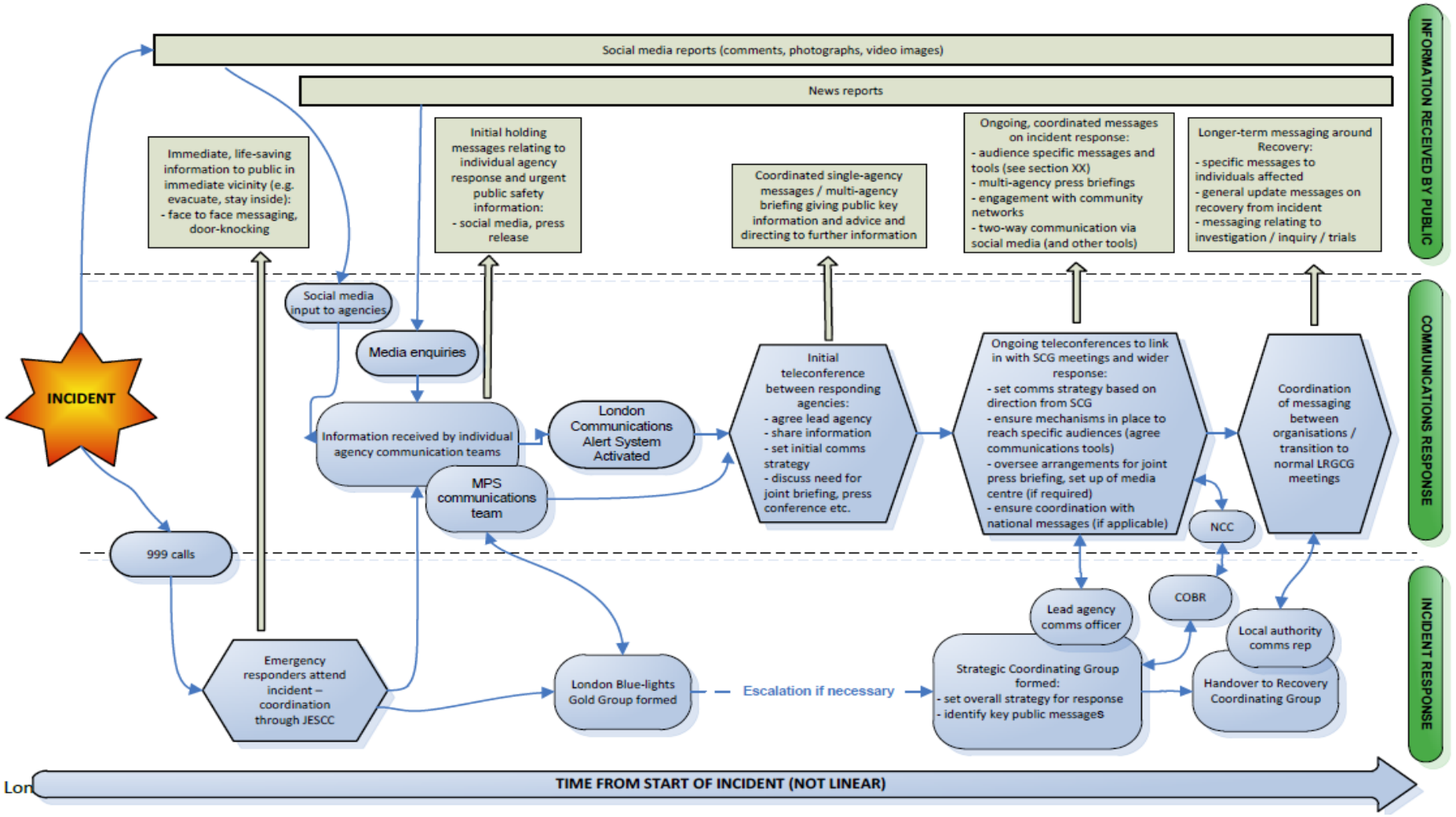
Likely content and tools for public messaging



Source: London Resilience Partnership Communicating with the Public Framework V1 2014, 22

21. UK: London Resilience Partnership - Information to the Public in a Sudden Impact Incident

Process for coordination of information to the public in a no-notice incident



Source: London Resilience Partnership Communicating with the Public Framework V1 2014, 23

22. UK: Lead responders for communicating with the public - Flooding

Ref ID	Risk sub-category	Risk Rating	Lead Responder			Other key agencies
			Raising awareness	Response	Recovery	
H19	Major coastal and tidal flooding affecting more than two UK regions	High	Environment Agency	Police	Local Authorities	LFB, NHS, utility companies, transport companies
H21	Severe inland flooding affecting more than 2 UK regions	Very High	Environment Agency	Police	Local Authorities	LFB, NHS, utility companies, transport companies
HL16/ HL17/ HL19/ HL20	Local coastal / tidal flooding / Local fluvial flooding / Localized, extremely hazardous flash flooding	High	Environment Agency	Police	Local Authorities	LFB, NHS, utility companies, transport companies
HL18	Local / Urban flooding fluvial or surface run-off	Very High	Environment Agency, GLA (Drain London)	Police, Local Authorities	Local Authorities	LFB, NHS, utility companies, transport companies
H44	Reservoir dam failure/collapse	Medium	Environment Agency, Local Authorities	Police	Local Authorities	Reservoir owner, LFB, NHS, utility companies, transport companies

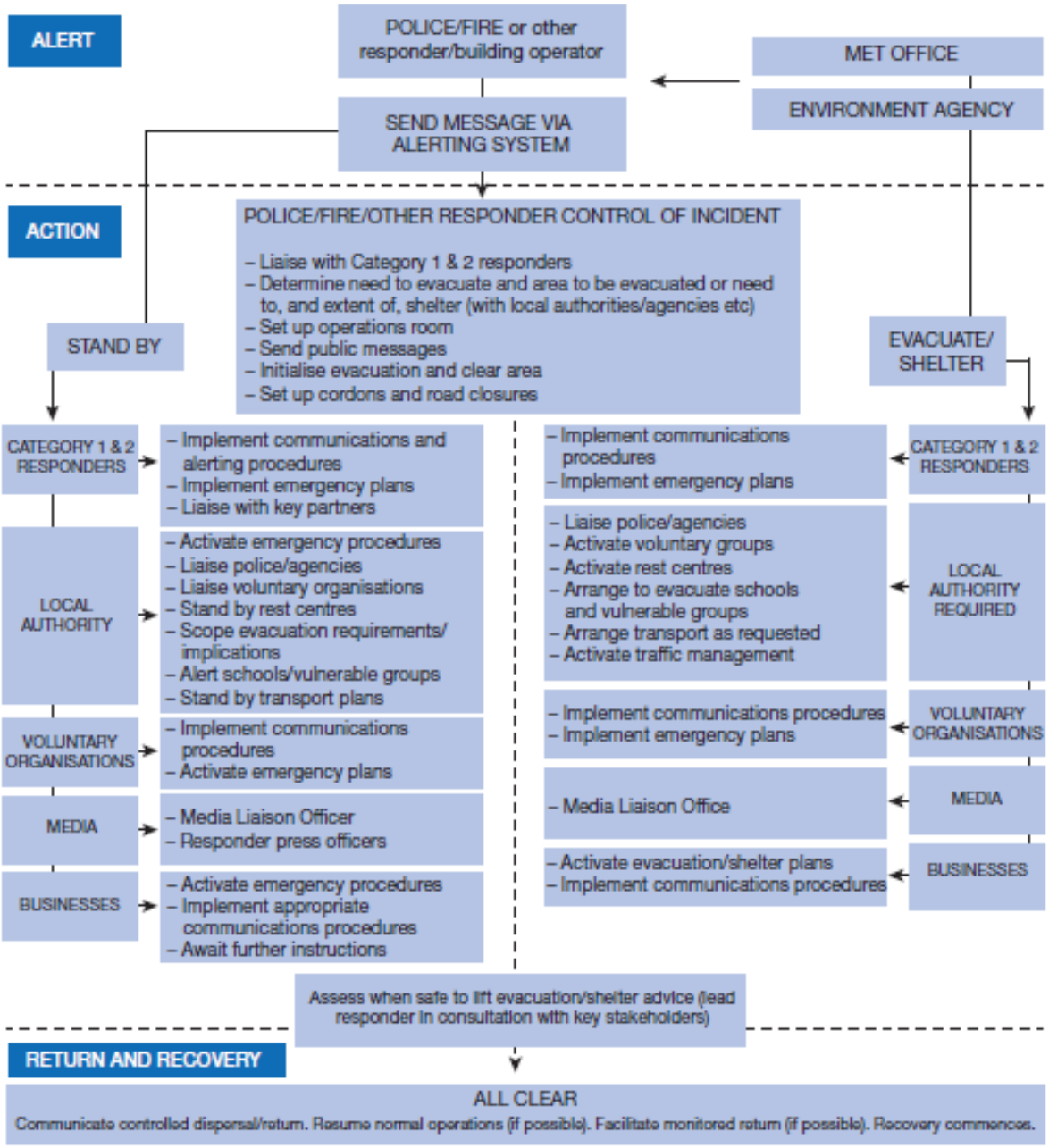
Source: London Resilience Partnership Communicating with the Public Framework V1 2014, 36

23. UK: Potentially vulnerable people/groups

Potentially Vulnerable Individual/Group	Examples and Notes	Target through the following organizations/agencies
Children	Where children are concerned, whilst at school the school authorities have duty of care responsibilities. Certain schools may require more attention than others.	LEA schools through Local Authorities and non-LEA schools through their governing body or proprietor. Crèches/playgroups/nurseries
Older People	Certain sections of the elderly community including those of ill health requiring regular medication and/or medical support equipment	Residential Care Homes Help the Aged Adult Social Care Nursing Homes
Mobility impaired	Wheel chair users; leg injuries (e.g. on crutches); bedridden/non movers; slow movers; bariatric patients.	Residential Care Homes Charities Health service providers Local Health Authorities
Mental/cognitive function impaired	Developmental disabilities; clinical psychiatric needs; learning disabilities.	
Sensory impaired	Blind or reduced sight; deaf; speech and other communication impaired.	Charities e.g. the Deaf Council Local groups
Temporarily or permanently ill	Potentially a large group encompassing not only those that need regular medical attention (e.g. dialysis, oxygen or a continuous supply of drugs), but those with chronic illnesses that may be exacerbated or destabilized in the event of evacuation, or because prescription drugs were left behind.	NHS England local area teams, GP surgeries Other health providers (public, private or charitable hospitals etc.) Community nurses
Individuals supported by health or Local Authorities		Adult's Social Services Children's Social services GP surgeries
Individuals cared for by relatives		GP surgeries Careers groups
Homeless		Shelters, soup kitchens
Pregnant women		GP surgeries
Minority language speakers		Community Groups Job Centre Plus
Tourists		Transport and travel companies Hoteliers
Travelling community		Local Authority traveler services Police liaison officer

Source: Cabinet Office. The National Flood Emergency Framework for England 2013, 55-56

24. UK: Overview of the roles and responsibilities in an evacuation



Source: Cabinet Office. Evacuation and Shelter Guidance 2014, 59

25. UK: National Recovery Guidance Topic Sheets

Generic Issues	Recovery structures and processes
	Social media
	Training and exercising
	Data protection and sharing
	Mutual Aid
	Military Aid
	Working with the media
	The role of elected members
	VIP visits and involvement
	Impacts on local authority performance targets
	Inquiries
	Investigations and prosecutions
	Coroner‘s Inquests
	Inquiries into deaths in Scotland
	Recovery evaluation and lessons identified processes
	Impact assessments
	Reporting
	Voluntary sector
Humanitarian aspects	Needs of people - health
	Displaced People
	Foreign nationals
	Community engagement
	Commemoration
	Community cohesion
	Needs of people - non-health
	Financial support for individuals
	Investigation and prosecutions
	UK residents affected by overseas emergencies
	Non-resident UK nationals returning from overseas emergencies
	Mass fatalities
Environmental Issues	Environmental pollution and decontamination
	Recovery from a CBRN Incident
	Dealing with waste
	Animal health and welfare
Economic Issues	Economic and business recovery
	Financial impact on local authorities
Infrastructure Issues	Access to and security of sites
	Utilities
	Repairs to domestic properties
	Historic environment
	Site clearance
	Dealing with insurance issues
	Damaged school buildings
	Transport

Source: Cabinet Office 2013. Emergency Response and Recovery, 88-89

26. US: Information for Elderlies in the Event of Flooding

Pamphlet provided in the *Ready* Program by the FEMA

3 Be Informed

Some Of The Things You Can Do

to prepare for the unexpected, such as assembling an emergency supply kit and making an emergency plan are the same regardless of the type of emergency. However, it's important to stay informed about what might happen and know what types of emergencies are likely to affect your region. For more information about specific types of emergencies, visit www.ready.gov or call 1-800-BE-READY.

Be prepared to adapt this information to your personal circumstances and make every effort to follow instructions received from authorities on the scene. Above all, stay calm, be patient and think before you act. With these simple preparations, you can be ready for the unexpected.

Prepare For Emergencies Now.
Information For Older Americans.

www.ready.gov

This information was developed by the Federal Emergency Management Agency in consultation with AARP, the American Red Cross and the National Organization on Disability.

AARP · American Red Cross · Ready · FEMA

Ready

Prepare. Plan. Stay Informed.

Prepare For Emergencies Now:

Information For Older Americans.

FEMA

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Preparing Makes Sense for Older Americans. Get Ready Now.

Woman with hand on her chin in a thoughtful pose.

The likelihood that you and your family will recover from an emergency tomorrow often depends on the planning and preparation done today. While each person's abilities and needs are unique, every individual can take steps to prepare for all kinds of emergencies from fires and floods to potential terrorist attacks. By evaluating your own personal needs and making an emergency plan that fits those needs, you and your loved ones can be better prepared. This guide outlines commonsense measures older Americans can take to start preparing for emergencies before they happen.

Preparing makes sense for older Americans.

Get Ready Now.

1 Get a Kit

Of Emergency Supplies

The first step is to consider how an emergency might affect your individual needs. Plan to make it on your own, for at least three days. It's possible that you will not have access to a medical facility or even a drugstore. It is crucial that you and your family think about what kinds of resources you use on a daily basis and what you might do if those resources are limited or not available.

Basic Supplies: Think first about the basics for survival – food, water, clean air and any life-sustaining items you require. Consider two kits. In one kit put everything you will need to stay where you are and make it on your own for a period of time. The other kit should be a lightweight, smaller version you can take with you if you have to leave your home. Recommended basic emergency supplies include:

- Water, one gallon of water per person per day for at least three days, for drinking and sanitation
- Food, at least a three-day supply of non-perishable food and a can opener if kit contains canned food
- Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert and extra batteries for both
- Flashlight and extra batteries
- First aid kit
- Whistle to signal for help
- Dust mask to help filter contaminated air and plastic sheeting and duct tape to shelter-in-place
- Moist towelettes, garbage bags and plastic ties for personal sanitation
- Wrench or pliers to turn off utilities
- Local maps
- Pet food, extra water and supplies for your pet or service animal

Include Medications and Medical Supplies: If you take medicine or use a medical treatment on a daily basis, be sure you have what you need on hand to make it on your own for at least a week. You should also keep a copy of your prescriptions as well as dosage or treatment information. If it is not possible to have a week-long supply of medicines and supplies, keep as much as possible on hand and talk to your pharmacist or doctor about what else you should do to prepare.

If you undergo routine treatments administered by a clinic or hospital or if you receive regular services such as home health care, treatment or transportation, talk to your service provider about their emergency plans. Work with them to identify back-up service providers within your area and the areas you might evacuate to. If you use medical equipment in your home that requires electricity to operate, talk to your health care provider about what you can do to prepare for its use during a power outage.

Additional Items: In addition, there may be other things specific to your personal needs that you should also have on hand. If you use eyeglasses, hearing aids and hearing aid batteries, wheelchair batteries, and oxygen, be sure you always have extras in your home. Also have copies of your medical insurance, Medicare and Medicaid cards readily available.

Include Emergency Documents: Include copies of important documents in your emergency supply kits such as family records, wills, power of attorney documents, deeds, social security numbers, credit card and bank information, and tax records. It is best to keep these documents in a waterproof container. Include the names and numbers of everyone in your personal support network, as well as your medical providers. Also be sure you have cash or travelers checks in your kits in case you need to purchase supplies.

2 Make a Plan

For What You Will Do in an Emergency

The reality of a disaster situation is that you will likely not have access to everyday conveniences. To plan in advance, think through the details of your everyday life. If there are people who assist you on a daily basis, list who they are, and how you will contact them in an emergency. Create your own personal support network by identifying others who will help you in an emergency. Think about what modes of transportation you use and what alternative modes could serve as back-ups. If you require handicap accessible transportation be sure your alternatives are also accessible. For every aspect of your daily routine, plan an alternative procedure. Make a plan and write it down. Keep a copy of your plan in your emergency supply kits and a list of important information and contacts in your wallet. Share your plan with your family, friends, care providers and others in your personal support network.

Create a Personal Support Network: If you anticipate needing assistance during a disaster, make a list of family, friends and others who will be part of your plan. Talk to these people and ask them to be part of your support network. Share each aspect of your emergency plan with everyone in your group, including a friend or relative in another area who would not be impacted by the same emergency who can help if necessary. Make sure everyone knows how you plan to evacuate your home or workplace and where you will go in case of a disaster. Make sure that someone in your personal support network has an extra key to your home and knows where you keep your emergency supplies. Practice your plan with those who have agreed to be part of your personal support network.

Develop a Family Communications Plan: Your family may not be together when disaster strikes, so plan how you will contact one another and review what you will do in different situations. Consider a plan where each family member calls, or e-mails, the same friend or relative in the event of an emergency. It may be easier to make a long-distance phone call than to call across town, so an out-of-town contact, not in the impacted area, may be in a better position to communicate among separated family members. You may have trouble getting through, or the phone system may be down altogether, but be patient. For more information on how to develop a family communications plan visit www.ready.gov.

Deciding to Stay or Go: Depending on your circumstances and the nature of the emergency, the first important decision is whether you stay or go. You should understand and plan for both possibilities. Use commonsense and available information to determine if there is immediate danger. In any emergency, local authorities may or may not immediately be able to provide information on what is happening and what you should do. However, you should monitor television or radio news reports for information or official instructions as they become available. If you're specifically told to evacuate or seek medical treatment, do so immediately. If you require additional travel time or need transportation assistance, make these arrangements in advance.

Consider Your Pets: Whether you decide to stay put in an emergency or evacuate to a safer location, you will need to make plans in advance for your pets and service animals. Keep in mind that what's best for you is typically what's best for your animals. If you must evacuate, take your pets with you, if possible. However, if you are going to a public shelter, it is important to understand that only service animals may be allowed inside. Plan in advance for shelter alternatives that will work for both you and your pets; consider loved ones or friends outside of your immediate area, pet-friendly shelters and veterinarians who would be willing to take in you and your pets in an emergency. For more information about pet preparedness, visit www.ready.gov.

Staying Put: Whether you are at home or elsewhere, there may be situations when it's simply best to stay where you are and avoid any uncertainty outside. Consider what you can do to safely shelter-in-place alone or with friends, family or neighbors. Also consider how a shelter designated for the public would meet your needs.

There could be times when you will need to stay put and create a barrier between yourself and potentially contaminated air outside. This process is known as "sealing the room." Use available information to assess the situation. If you see large amounts of debris in the air, or if local authorities say the air is badly contaminated, you may want to take this kind of action. For more information about "sealing the room," visit www.ready.gov.

Evacuation: There may be conditions in which you will decide to get away, or there may be situations when you may be ordered to leave. Plan how you will get away and anticipate where you will go. Choose several destinations in different directions so you have options in an emergency. Ask about evacuation plans at the places where you spend time including work, community organizations and other places you frequent. If you typically rely on elevators, have a back-up plan in case they are not working.

Fire Safety: Plan two ways out of every room in case of fire. Check for items such as bookcases, hanging pictures, or overhead lights that could fall and block an escape path. Check hallways, stairwells, doorways, windows and other areas for hazards that may keep you from safely leaving a building during an emergency. Secure or remove furniture and objects that may block your path. If there are aspects of preparing your home or workplace that you are not able to do yourself, enlist the help of your personal support network.

Contact Your Local Emergency Information Management Office: Some local emergency management offices maintain registers of older people so they can be located and assisted quickly in a disaster. Contact your local emergency management agency to see if these services exist where you live or visit www.ready.gov to find links to government offices in your area.

Source: Federal Emergency Management Agency (FEMA) http://www.fema.gov/media-library/assets/documents/90375

27. US: Information for People with Disabilities in the Event of Flooding

Pamphlet provided in the *Ready* Program by the FEMA

4 Get Involved

In addition to your personal preparedness, consider getting involved in neighborhood and community emergency preparedness activities. Assist emergency planners and others in considering the preparedness needs of the whole community, including people with disabilities and others with access and functional needs. Communities are stronger and more resilient when everyone joins the team. People with disabilities often have experience in adapting and problem solving that can be very useful skills in emergencies. To find out more about potential volunteering and emergency response training opportunities, go to http://www.ready.gov/volunteer.

This information was developed by the U.S. Department of Homeland Security in consultation with AARP, the American Red Cross and the National Organization on Disability and updated by the FEMA Office of Disability Integration and Coordination.

AARP · Emergency Preparedness Initiative · American Red Cross

FEMA · Ready · citizen corps

FEMA R-6 Catalog No. 0977-4

Ready

Prepare. Plan. Stay Informed..

Prepare for Emergencies Now: Information for People with Disabilities

FEMA

www.ready.gov

Prepare for Emergencies Now: Information for People with Disabilities.

Your ability to recover from an emergency tomorrow may depend on the planning and preparation you do today. This guide provides tips which individuals with disabilities and others with access and functional needs, and the people who assist and support them, can take to prepare for emergencies before they happen.

1 Be Informed

It is important to know what types of emergencies are likely to affect your region. For more information about specific types of emergencies, visit www.ready.gov/be-informed.

Be prepared to adapt this information to your personal circumstances and make every effort to follow instructions received from authorities on the scene. Above all, stay calm, be patient and think before you act. With these simple preparations, you can be ready for the unexpected.

2 Make a Communications Plan

A disaster can interfere with your ability to communicate with your family, friends and coworkers. It is vital to have backup plans for staying in touch with your support network, and for your network to be aware of where you will shelter or evacuate.

Create a Personal Support Network
Everyone should make a list of family, friends and others who will be part of your plan. Include a relative or friend in another area who would not be affected by the same emergency, and who can help if needed. Make sure everyone knows how you plan to evacuate your home, school or workplace, and where you will go in case of a disaster. Make sure that someone in your personal support network has an extra key to your home and knows where you keep your emergency supplies. Teach them how to use any lifesaving equipment or medicine in case of an emergency. If you use a wheelchair, oxygen or other medical equipment, show friends how to use these devices so they can move you or help you evacuate. Practice your plan with your personal support network.

If you undergo routine treatments at a clinic or hospital, or if you receive regular services at home such as home health care, meals, oxygen, or door-to-door transportation, talk to your service provider about their emergency plans. Work with them to identify back-up service providers within your area and the areas you might evacuate to. If you use medical equipment in your home that requires electricity to operate, talk to your health care provider about a back-up plan for its use during a power outage.

Create a Personal Support Network (con't)
Talk to your employer and co-workers about the assistance you might need in an emergency. This is particularly important if you need to be lifted or carried. Talk about any communication difficulties, physical limitations, equipment instructions and medication procedures that might arise during an emergency. Always participate in exercises, trainings and emergency drills offered by your employer or in your community.

Develop a Family Communications Plan
Your family may not be together when disaster strikes, so plan how you will contact one another and review what you will do in different situations. For more information on how to develop a family communications plan, visit http://www.ready.gov/family-communications.

Deciding to Stay or Evacuate
Depending on your circumstances and the nature of the emergency, the first important decision is whether to stay or go. You should understand and plan for both possibilities. Use common sense and available information to determine if there is immediate danger. In any emergency, local authorities may not immediately be able to provide information on what is happening and what you should do. However, you should monitor television, radio, Internet, or social media news reports for information or official instructions as they become available. If you're specifically told to evacuate or seek medical treatment, do so immediately. If you require additional travel time or need transportation assistance, consider ways you might make these arrangements in advance.

Staying Put
Whether you are at home or elsewhere, there may be situations when it's simply best to stay where you are and avoid any uncertainty outside. Consider what you can do to safely shelter-in-place alone or with friends, family or neighbors. Also consider how a shelter designated for the public would meet your needs. Work with local emergency managers and others in your community on preparing shelters in advance to meet access and functional needs (go to www.fema.gov/about/odic to learn more about functional needs support services in general population shelters). If you have options and decide to stay put and shelter in place, consider that you may be without electricity, phone service and accessible roads for days or longer.

Evacuation
There may be situations in which you decide to leave, or are ordered to leave. Plan how you will get away and anticipate where you will go. Choose several destinations in different directions so you have options in an emergency. Ask about evacuation plans at the places where you spend time including work, school, community organizations, and other places you frequent. If you typically rely on elevators, work with others to develop back-up plans for evacuation in case they are not working. When traveling, consider alerting hotel or motel workers if you will need help in a disaster situation. Keep your equipment with you in an evacuation, if at all possible. If you must leave your wheelchair, bring your cushion.

Consider Your Service Animal and Pets
Whether you decide to stay put or evacuate, you will need to make plans in advance for your service animal and pets. Keep in mind that what's best for you is typically what's best for your animals. If you must evacuate, take your pets with you if you can. However, if you go to a public shelter, it is important to remember that by law only service animals must be allowed inside. Plan in advance for shelter alternatives that will work for both you and your animals. For more information about service animal/pet preparedness, visit http://www.ready.gov/animals.

Fire Safety
Plan two ways out of every room in case of fire. Check for items such as bookcases, hanging pictures, or overhead lights that could fall and block an escape path. For more fire safety tips, go to http://www.usfa.fema.gov/citizens/disability/.

Contact Your Local Emergency Information Management Office
Some local emergency management offices maintain registries for people with disabilities. Some registries are only used to collect planning information; others may be used to offer assistance in emergencies. If you add your name and information to a registry, be sure you understand what you can expect. Be aware that a registry is NEVER a substitute for personal preparedness. Even if the registry may be linked to first responders, assistance may not be available for hours or days after a disaster. Contact your local emergency management agency to see if these services exist where you live, or visit www.ready.gov/ to find links to government offices in your area.

3 Build an Emergency Kit

The reality of a disaster situation is that you will likely not have access to everyday conveniences. To plan in advance, think through the details of your everyday life. You should include the following in your planning:

Basic Supplies
Think first about survival basics - food, water, first aid, and tools. Plan to make it on your own for at least three days. Consider two kits. In one kit put everything you will need to stay where you are and make it on your own for a period of time. The other kit should be a lightweight, smaller version you can take with you if you have to leave your home. For more information on what should go into a basic kit, please refer to www.ready.gov/basic-disaster-supplies-kit.

The second step is to consider how an emergency might affect your individual needs. During emergencies, you may not have access to disaster assistance, a medical facility or even a drugstore. It is crucial that you and your family think about what kinds of resources you use on a daily basis, and what you might do if those resources are limited or not available.

Include Important Documents in Your Kit
Include copies of important documents in your kit, such as family records, medical records, wills, deeds, social security number, charge and bank account information, and tax records. Also be sure you have cash or travelers checks in your kits in case you need to purchase supplies. It is best to keep these documents in a waterproof container. If there is any information related to operating equipment or life-saving devices that you rely on, include those in your emergency kit as well. Also make sure that a trusted friend or family member has a copy of these documents. Include the names and numbers of everyone in your personal support network, as well as your medical and disability service providers. If you have a communication disability, make sure your emergency information includes instructions for the best way to communicate with you. Even if you do not use a computer yourself, consider putting important information onto a portable thumb drive for easy transport in an evacuation.

Finances
Signing up for direct deposit or the Direct Express card is a simple but important step that can help protect your family's access to funds in case an emergency happens. If you or those close to you are still receiving Social Security or other federal benefits by check, please consider switching to one of these safer, easier options today.

- Arrange electronic payments for your paycheck and federal benefits.
- The Direct Express® prepaid debit card is designed as a safe and easy alternative to paper checks for people who don't have a bank account. Sign up is easy, call toll-free at (877) 212-9991 (phone), (866) 569-0447 (TTY) or sign up online at www.USDirectExpress.com.

Depending on your needs, additional items for your Go Kit might include:

- Copies of medical prescriptions, doctors' orders, and the style and serial numbers of the assistive devices you use
- At least a week's supply of any medication or medical supplies you use regularly, or as much as you can keep on hand
- Medical alert tags or bracelets or written descriptions of your disability and support needs, in case you are unable to describe the situation in an emergency
- Medical insurance cards, Medicare/Medicaid cards, physician contact information, list of your allergies and health history.
- A list of the local non-profit or community-based organizations that know you or assist people with access and functional needs similar to yours.
- Extra eyeglasses; backup supplies for any visual aids you use
- Extra batteries for hearing aids; extra hearing aids if you have them (or if you have insurance coverage for them)
- Battery chargers for motorized wheelchairs, or other battery-operated medical/assistive technology devices
- Supplies for your service animal. You can find more tips at http://www.ready.gov/animals
- A laminated personal communication board, if you might need assistance with being understood or understanding others
- If you use a motorized wheelchair, have a light weight manual chair available for emergencies. Know the size and weight of your wheelchair, in addition to whether or not it is collapsible, in case it has to be transported.
- If you have allergies or chemical sensitivities, be sure to include items that you are able to use for personal hygiene and for cleanup.

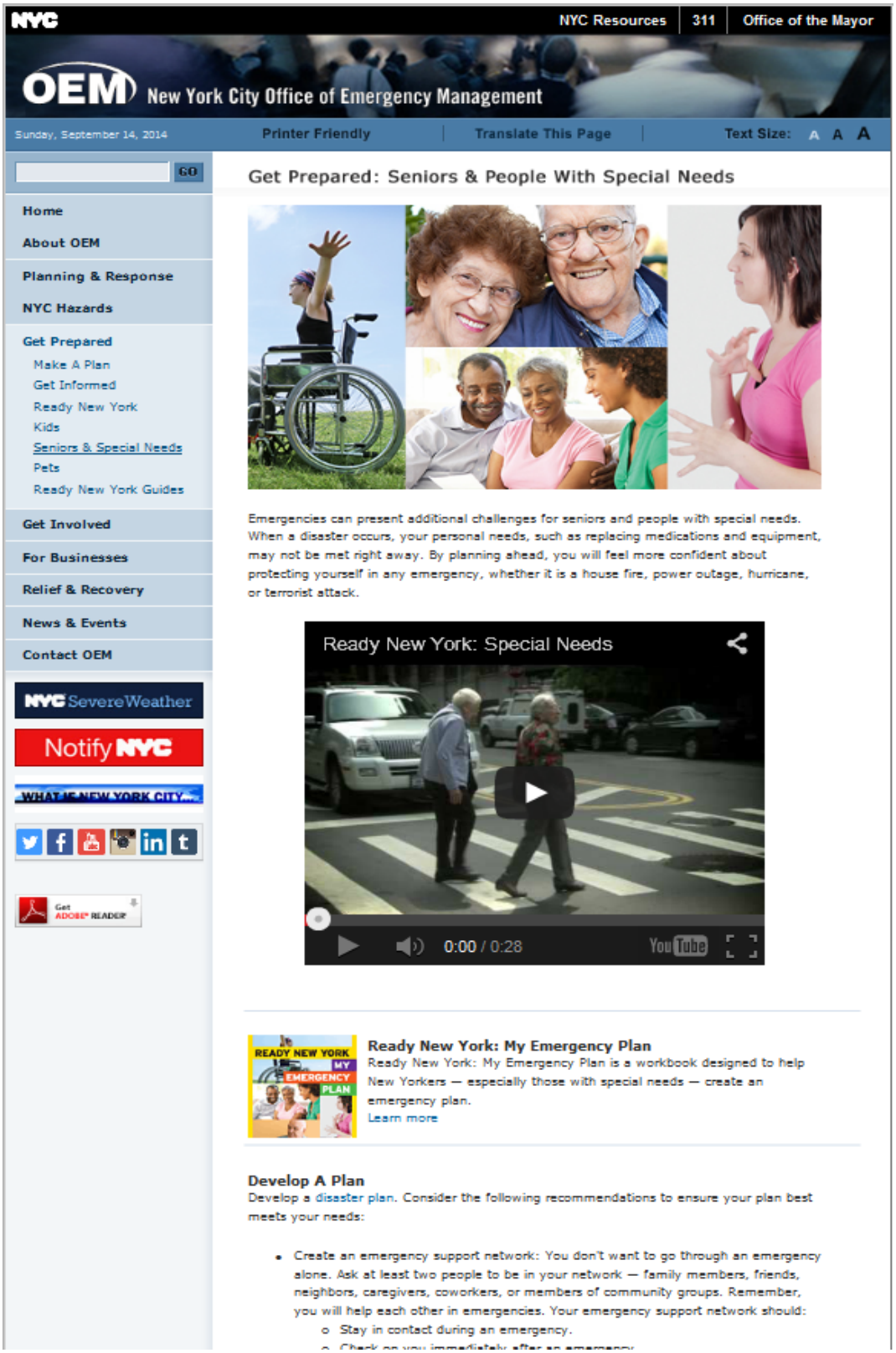
Source: Federal Emergency Management Agency (FEMA) http://www.fema.gov/media-library/assets/documents/90360

28. US: Ready New York Pamphlet – Flooding

Multi-lingual Flooding Guide (sample in Korean)

Source: The City of New York. 2008. Ready New York: Flooding Guide

29. US: NYC Preparedness for Seniors and People with Special Needs



Source: The City of New York web site
http://www.nyc.gov/html/oem/html/get_prepared/prepared_seniors.shtml

30. US: Environmental Justice Strategic Enforcement Screening Tool (EJSEAT) Indicators

Demographic indicators are derived from the 2000 census and include:

- percent persons below the poverty line
- percent persons over 25 not having high school diplomas,
- percent persons under 5 years old
- percent persons over 64 years old
- percent households linguistically isolated
- percent persons who are minorities (African American, Hispanic, Native American, or Asian/Pacific Islanders)

Environmental indicators are derived from the National Air Toxics Assessment (NATA) and the Risk Screening Environmental Indicators (RSEI) databases and include:

- NATA cancer risk
- NATA neurological and respiratory hazard index
- NATA non-cancer diesel particulate matter (PM)
- particulate matter (PM)-2.5 concentration
- ozone concentration (8-hour average)
- averaged RSEI risk-related scores for all federally permitted industrial facilities in the census tract

Health indicators, obtained at the county-level for all states and tribal territories in the U.S. but imputed to individual tracts within their respective counties, include:

- rate of infant mortality
- rate of low birth weight

Compliance indicators have been obtained from a variety of databases and include:

- a number of facility registry system (FRS) facilities per square mile
- a computed measure of inspections
- a computed measure of violations
- a computed measure of formal actions

Source: 2010 National Environmental Justice Advisory Council (NEJAC), Nationally Consistent Environmental Justice Screening Approaches
http://www.epa.gov/environmentaljustice/nejac/recommendations.html

31. US: National Flood Insurance Program (NFIP) Pamphlet

Flood Insurance Requirements for Recipients of Federal Disaster Assistance

For more information about the NFIP
and flood insurance, call
1-800-427-4661
or contact your
insurance company or agent.

For an agent referral, call
1-888-435-6637
TDD 1-800-427-5593

http://www.fema.gov/business/nfip
http://www.floodsmart.gov

F-695 (8/11)

National Flood Insurance Program

Flood Insurance Requirements for Recipients of Federal Disaster Assistance

FEMA

Flood Insurance Requirements for Recipients of Federal Disaster Assistance

When property owners receive financial assistance from the Federal Government following a Presidentially declared disaster, they may be required to purchase flood insurance coverage. This requirement is mandated under the National Flood Insurance Reform Act (NFIRA) of 1994. It is imposed when a building has been damaged and is located in an area that is at high risk of flooding. These high-risk areas are called Special Flood Hazard Areas (SFHAs).

The NFIRA requirement applies to insurable buildings and personal property, located in SFHAs, that have been damaged by the disaster event. Financial assistance can come in the form of Federal disaster assistance grants or loans.

▶ **If you are a homeowner** and receive Federal financial assistance, flood insurance coverage must be maintained at the address of your home even if the damaged building is replaced by a new one. If you sell your home, you are required to inform the new owners that they must maintain flood insurance coverage on the building. Often, an existing flood insurance policy can be transferred to a new owner with no lapse in coverage.

▶ **If you are a renter** and receive Federal financial assistance, flood insurance coverage must be maintained on the contents for as long as you live at the flood-damaged rental property. The requirement for flood insurance is lifted once you move from the building.

▶ **If you receive a Certificate of Flood Insurance from FEMA**, flood insurance has been provided under a Group Flood Insurance Policy following a Presidential disaster declaration. This policy provides minimum building and/or contents coverage in exchange for a small premium.

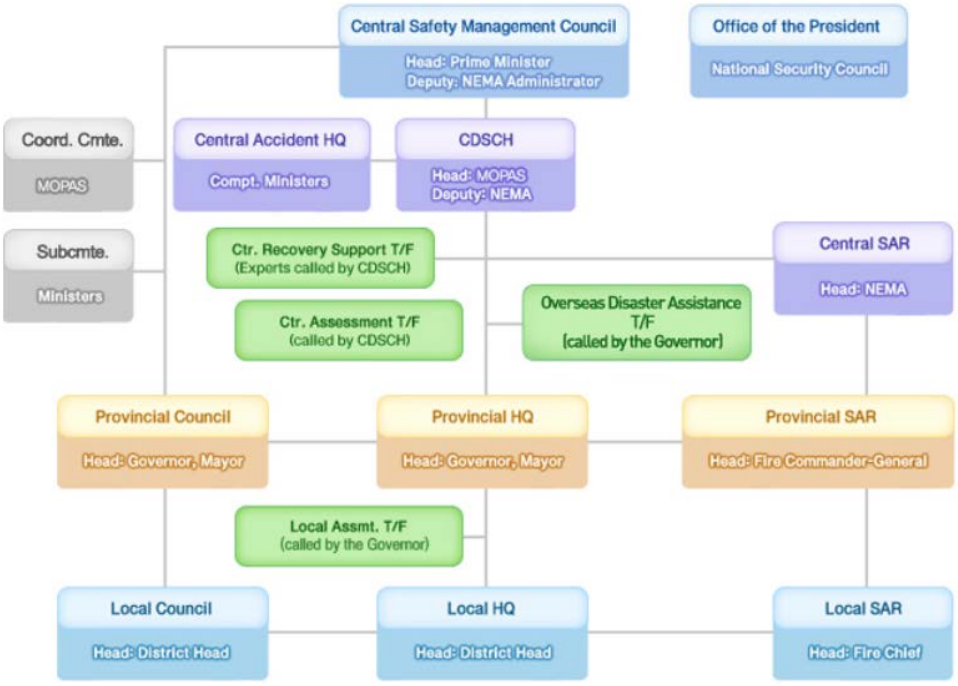
- Group Policies have a term of 3 years, after which you will be required to purchase and maintain a Standard Flood Insurance Policy through the National Flood Insurance Program (NFIP) until you are no longer the homeowner or renter at that location. In order to avoid any lapse in coverage, it is important to apply for your new coverage at least 30 days before the expiration of the Group Policy.
- You may cancel your participation in the Group Policy at any time during its policy term, provided that you have purchased your own NFIP flood insurance coverage.

Even without the NFIRA requirement, it is a wise decision to purchase flood insurance. But, because Federal law mandates the purchase of flood insurance as a condition of disaster funding, an applicant who does not comply with the NFIRA flood insurance obligation may become ineligible for future disaster assistance. *It's that important.*

With all that you are going through, don't let this vital coverage slip through the cracks. Protect yourself and your family from future financial loss by purchasing and maintaining flood insurance coverage.

Source: Federal Emergency Management Agency (FEMA)
http://www.fema.gov/media-library-data/20130726-1630-20490-6612/f695_firequirements_11aug11.pdf

32. Korea: Outline of National Disaster Management Support System (NDMSS)



Source: National Emergency Management Agency (NEMA)
http://eng.nema.go.kr/sub/cms2/2_0.asp

City of Seoul's Disaster Management System for Storm and Flood

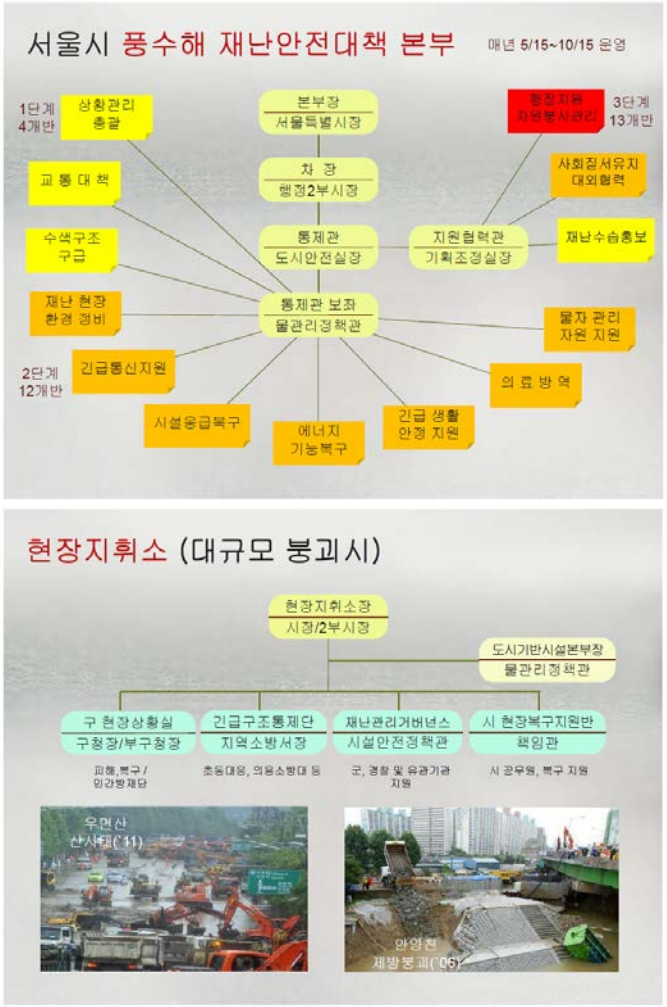
Source: City of Seoul 2014 Measures against Damage from Storm and Flood in Seoul

33. Korea: Overview of the Roles and Responsibilities in Disaster Management

Disaster Management at the national level

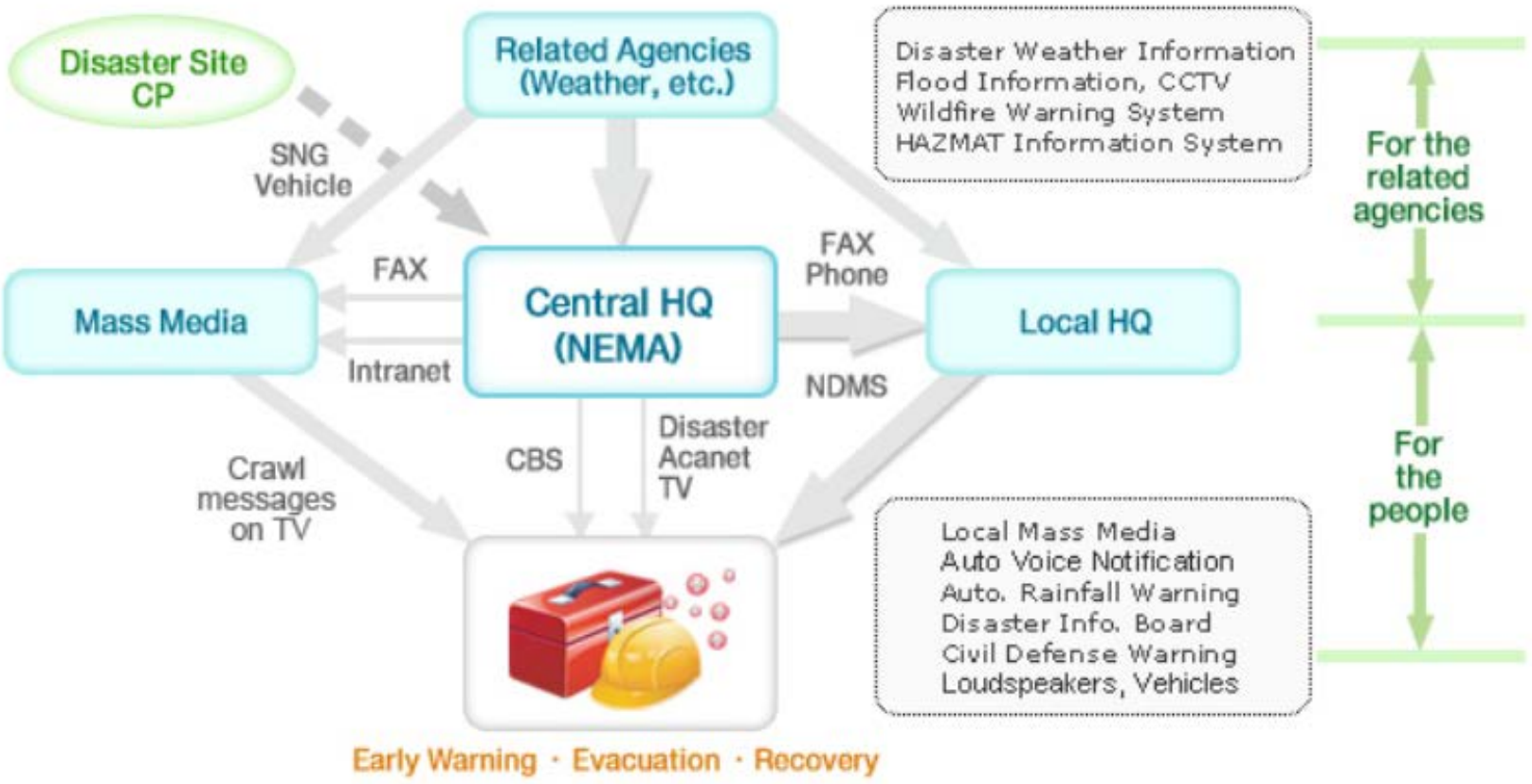
Source: National Emergency Management Agency (NEMA)
http://eng.nema.go.kr/sub/cms2/2_0.asp

Disaster Management in City of Seoul



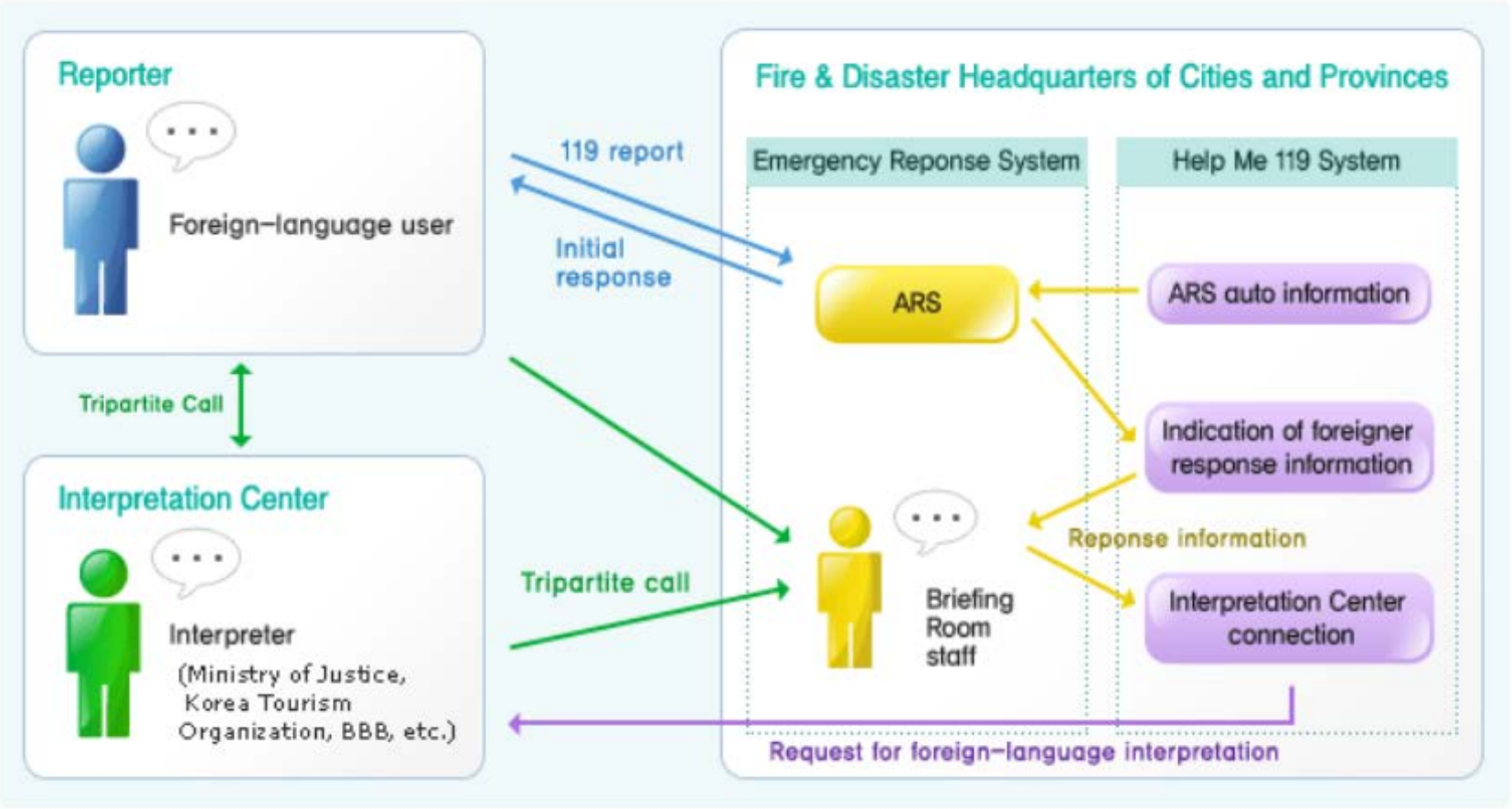
City of Seoul 2014 Measures against Damage from Storm and Flood in Seoul

34. Korea: Dissemination of the Information to the Public



Source: National Emergency Management Agency (NEMA)
http://eng.nema.go.kr/sub/cms2/2_0.asp

35. Korea: Communication for Foreigners in Emergency



Source: National Emergency Management Agency (NEMA)
http://eng.nema.go.kr/sub/cms2/2_0.asp

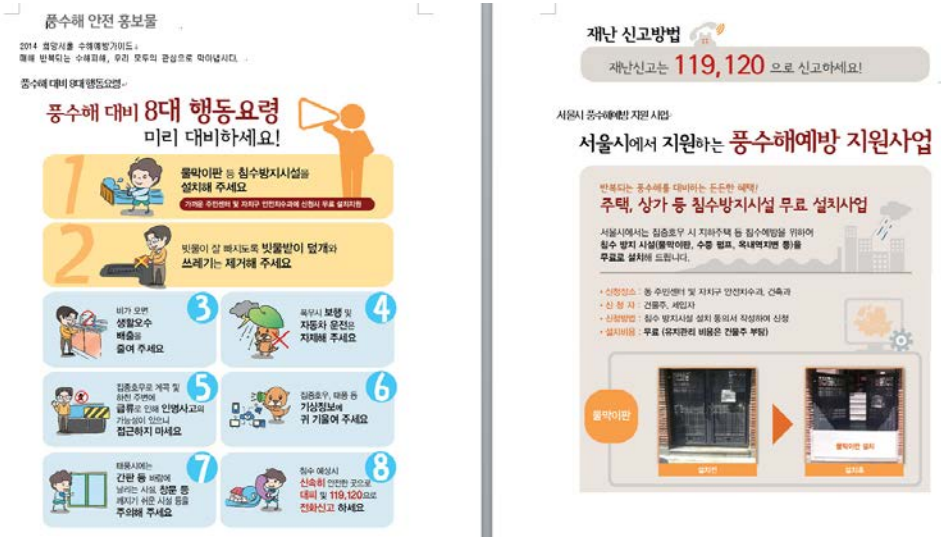
36. Korea: Seoul Basic Plans for Safety Management, Measures, Guidebook, Action Plans in Storms and Floods

Seoul Basic Plans for Safety Management
– Comprehensive Measures against Disasters and Safety Emergencies

2014 Countermeasures for Flood Damage'

'Guidebook for Safety against Strom and Flood

Public Information on Action Plans against Storm and Flood



Source: Safe City Seoul web site: http://safecity.seoul.go.kr:8070/scmyn_cf/seoulSafePolicy/seoulFloodCntrPR.do

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