

Disaster Management and Role of Local Government: Lesson from Hull's Experience*

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최근 들어 글로벌 기후변화와 그 영향으로 이전과는 비교하기 어려운 규모의 자연적 재난이 빈번하게 발생하고 있다. 이러한 자연적 재난의 발생에 효과적으로 대응하기 위해 정부의 계획과 대응이 필요하게 되었다. 2007년 영국은 이전에 보기 어려운 폭우로 인해 홍수 피해를 입었는데, 헐 시티(Hull City)는 그 피해가 가장 극심한 곳 중의 하나였다. 홍수 피해를 입으면서 헐 시티는 새로운 형태와 규모의 이전에 볼 수 없었던 홍수로 인한 자연적 재난에 대비하기 위한 방안을 마련하기 시작했다. 2011년 서울시도 기록적인 폭우로 인해 도시의 일부가 물에 잠기고, 산사태로 큰 피해를 입었다. 본 연구는 헐 시티와 서울시의 폭우로 인한 홍수 피해를 중심으로 지방정부의 재난관리 방안, 특히 홍수 재난 관리에 대한 방안을 도출하였다. 본 연구의 결과는 기후변화로 인해 예측하기 힘든 자연적 재난에 대한 지방정부의 역할과 대응방안에 도움을 줄 수 있을 것이다.

주제어: 재난관리, 홍수관리, 헐 시티, 서울시

I. Introduction

In the world, any countries exposed to natural and man-made hazards and disasters, which have the potential to cause significant loss of life and property, as well as serious damages to the environment and the economy of their countries. The natural hazards and disasters to which most countries are exposed consist primarily of the effects of weather system that include land borne flooding, wind damage, coastal flooding and the ground shaking effects of earthquakes. Landslides pose a minor threat but hurricanes(or Typhoons), earthquakes and tsunamis are the natural hazards and disasters that pose the greatest threat to citizens of the world. Also of concern in the

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category of natural hazard and disaster are health related events such as pandemics. In contrast, apart from natural hazard and disaster, any countries are also susceptible to a number of technological hazard and disaster. These include large-scale fires from industrial sites, chemical and oil spills, aircraft accidents involving the transportations of toxic and hazardous material on land and sea, large-scale marine accidents related to mass transportation of people and on-land transportation accidents(VI, 2009: 5).

Disasters result in a significant amount of damage and losses around the world every year(Ofori, 2001). There has been a distinct increase in the number and scale of natural disasters over the past decade, and the impact in terms of human, structural and economic losses has increased considerably. According to official statistics issues by the Centre for Research on the Epidemiology of Disasters(CRED) and the United Nations International Strategy for Disaster Reduction(UN/ISDR) in 2010, natural disaster have caused the death of more than 780,000 people over the past ten years and destroyed a minimum of around £ 600 billion worth of property and infrastructure. Among disasters, floods are the most common form of natural disasters, and the property damage by the disaster has continuously increased(Kim, *et. al.*, 2007: 1). Floods happen almost every year in the world, especially during summer season in which heavy rains occur frequently in the UK and South Korea. Both countries have experienced the flooding disasters recently and damaged tremendously in local level.

On the other hands, in recognition of the devastating and long term impacts of disasters the importance of disaster risk reduction has been widely recognized by the researchers and the policy maker all over the world. Enormous challenges are associated with implementing disaster risk reduction initiatives and therefore inter disciplinary strategic, tool and approaches are required to ensure proper management and resourcing of risk reduction efforts(Haigh and Amaratunga, 2010). Disaster mitigation and response is a multi agency and multi sectoral activity and most countries have established national disaster response agencies, which may be decentralized to regional, local and village levels(Osei, 2007: 218). It has been benefited that the local government is the first responder and the one responsible for community development and sustainable disaster risk reduction(UN/ISDR, 2010: 6). It has further recognized the need of empowering the local government as a key priority to encourage democratic decision-making involving the citizens all key stakeholders at the local level in order to ensure effective implementation of disaster risk reduction measures(Malagoda, *et. al.*, 2010: 10).

This study is to explore the role of local government in contributing to disaster risk reduction and response and to discuss the challenges faced by local government in implementing disaster

management. First, a brief explanation has been presented regarding the nature and impact of disaster management and the importance of disaster management in the current context. Second, a review of existing research study has been used to identify the role and the challenges faced by the local government in implementing disaster management. Literature review method has been used to review the role of the local governments in disaster management and the data and information has been gathered from research papers on various electronic databases along with conference proceeding and reports published by various institutions. Third, a brief comparative study is done on the nature and structure of local government in between the UK and South Korea. Finally, the study analyses flood management of both countries as a case study.

II. Understanding of disaster management

1. Definition of Disaster management and system

Disaster management system can be viewed as four interrelated sub-phases. The first is damage assessment, in which losses and their magnitudes are identified. The second is needs assessment, in which initially required response is identified. The third is prioritization of response measures, in which required response matches with available resources. If response demand is greater than the current available resources, decision makers must establish priorities or act for external resources. The fourth is actual response, in which crisis resources are deployed, and decisions are disseminated to responders and the population at large. During the four sub-phases, crisis response activities face challenge of reducing the influence of crises cause to society, the economy, and the lives of individuals and communities and they continuously adapt their behavior and make quick decisions to tackle unpredicted events(Khalil, *et al.*, 2010: 2). The domain of disaster system is characterized as a virtual environment of required distributed control, huge amount of data which are modular, decentralized, changeable, ill-structured, and complex as well as uncertainty, ambiguity with different objectives, and limited resources which continually vary(Field, 2008). Design of disaster management system must be include: filtering and data fusion methods; decision-making and machine learning methods for determining actions in response to states; interaction mechanism to manage the interaction between multiple actors and to model collective behavior and system architecture studies of different system organizations(Basak, *et al.*, 2011: 343).

In comparison to developed nations, developing countries typically lack education, funding, and equipment to reduce their vulnerability(McEntire and Mathis, 2005). Both developed and developing nations are affected by technology, industry, and culture. Developed countries are facing increased technological disaster as computers become more integrated into every part of their lives. In contrast, developing countries may lack the familiarity with new forms of technology that could reduce or cause disasters. Each group faces adverse risks associated with hazardous material incidents, even though manufacturing plants are increasingly being moved to the developing world. People and governments in both developed and developing countries continue to make mistake regarding disasters. They can be found guilty of down playing risk, augmenting social susceptibility, relying too heavily on technical remedies, and failing to strengthen emergency management institutions.

2. Role of local government in disaster

Local governments has been identified as one of the key stakeholder in disaster risk reduction and response process as they are in charge of critical development functions to reduce and respond disaster risks, such as land use planning, urban development planning, public works, construction safety and licensing, social services and responding to the need of the poor and the under privileged and implementation and strengthening of the decentralization process(UN/ISDR, 2010: 8). Due to this significant role of the local government in disaster risk reduction and response, the UN/ISDR has specifically addressed the 2010-2011 campaign to local governments in disaster the theme of "Building resilient cities." Before examining this potential role of the local government in disaster risk reduction and response, it is important to understand the structure and the composition of local government. The term local government encompasses urban and rural communities of different size and levels which includes regional, provincial, metropolitan, city, township and village councils(The Incheon Declaration, 2009: 2). Usually countries distribute functional responsibilities between the central government and sub-national governments along various dimensions including fiscal, administrative and political(Col, 2007: 2). It is noted that the duties, structure, composition and the terminology of local government may vary across the world.

Local government is a huge service provider to the local community. Some local governments provide services to the general public directly or may arrange to do so by third parties. Local governments are responsible for providing a vast range of services in accordance with both the wishes of the community it serves and the requirements of central government either on a

statutory or discretionary basis(Yorke, 2007). Usually the powers of the local government are derived from legislation and by Acts of Parliament(SPICe Briefing, 2002). Some powers are 'mandatory' while others are 'voluntary' allowing authority to provide services if it desires.

Disaster management require a multidisciplinary approach which involves partnerships of various organizations and community groups(Haigh and Amaratunga, 2010: 10). Government agencies need to play a critical role during the time of a disaster. In many developing countries, national disaster management authority or the ministry handles disaster management affairs. The activities and functional responsibilities of such institutions are not often decentralized, or authority of such institutions not adequately delegated to lower levels of the government machinery(APDC, 2007). In most countries, the central government retains authority over disaster management programs with centralized decision making and resources, which often focus on developing response capabilities rather than proactive mitigation, and the local government action for disaster management is often given a lower priority(Bendimerad, 2003: 9). Therefore, after a major disaster, decision-making tends to be a centralized process, possibly due to media pressure or the inevitable high political profile of such events(Blaikie, 1994: 10). This has to be viewed as a hindrance for achieving the disaster resilience at community and local levels(APDC, 2007). As a result there is a strong need for decentralization of disaster management with adequate powers to local government in order to facilitate building safer communities and to support sustainable development(Malagoda, 2010: 12).

3. Flood risk disaster

The unusual weather was linked to the location and strength of the jet stream and unusually high sea temperatures(Environment Agency, 2007: 7-8). The jet stream is a ribbon of strong winds which strongly influences where the weather systems that bring rain to the land will develop and move. For much of summer, the jet stream is further south and stronger than is typical, resulting in more rain bearing depressions. The warmer sea temperatures created more rain clouds. Summer rainfall can often be very heavy but only last a short time. What was particularly unusual this year was the amount of heavy rain and the length of time it lasted. In summer the rain is partly absorbed by the dry ground. Once the ground became saturated by June and July, the scene was set for future downpours to lead very quickly to localised and, if sustained, widespread river flooding. Many reservoirs that normally have some capacity to absorb run-off were also filled by the June and early July rain. In urban areas paved surfaces behave like saturated soil. If the rain is very heavy, the gullies and drains will not be able to cope.

Excess water fills low-lying areas, rapidly causing flooding. More localised heavy rain caused flooding at other times throughout the early summer.

Generally, central government is responsible for managing flooding from rivers, but it is not role of the central government to monitor flows of water in urban drainage systems or small ditches. However, this water invariably drains into the main rivers with extensive floodplains. Although the rainfall was very extreme, the amount of rain does not directly relate to river flooding. This is because rainfall varies with time and geography, and once it is on the ground it can travel through the network of drains, small ditches and eventually rivers in many different ways depending on the season, soil conditions and the nature of the floodplain.

Flood have brought a direct impact. There were several deaths caused by the floods. Many thousands of people had their lives and livelihoods devastated by the events and are still having to cope with the traumatic consequences. We know that insurance claims from the homes and businesses flooded are approaching few billions. Other costs amount to around a billion pound. According to the emergency services, previous summer saw the greatest number of search and rescue missions - stretching resources to the limit. Critical infrastructure was damaged and many essential services disrupted. The flooding of the water treatment works meant over hundred thousand homes are without normal water supplies for up to few weeks.

4. Research design

The flooding cases of Hull city and Seoul are evidently similar in many flooding cases. In other words, in 2007, Hull's flooding experience shows that the case resembles Seoul' flooding of 2011 to great surprise. Therefore, this study chose case study as a research method for comparison between both cities. This research begins with the purpose of producing knowledge about the disaster management in the UK and South Korea in the field of policy, as well as through academic study. furthermore, some identification of disaster management and role of local government is undertaken as the literature review. Moreover, the research fieldwork is the case study work. In the research fieldwork, the actual shape for the UK and South Korea is identified and evaluated from the information and data collected and analyzed, while the results are investigated through the opinions and ideas amassed. In the case study fieldwork, two cases are studied to give a more specific and comprehensive shape to disaster management and role of local government in both countries. Finally, the research synthesis includes comparison of the both cases and recommendations for a more desirable local government in both countries. The research

synthesis is obtained through the comprehensive analysis of the research results: literature review findings and fieldwork results.

III. Case Studies: Flooding of the UK and South Korea

1. Overview of disaster management in both countries

The evolution of emergency management of the UK took its first steps after World War II. The growing of nuclear attack of the Civil Defense Act of 1948, which aimed to decrease the possibility of civilian casualties during the Cold War. The central government felt confident in letting local governments deal with and manage possible emergencies. Even though local organizations and agencies were flexible in requesting regional and national resources through appropriate lead government departments, the central government did not put mandatory requirements for them to cooperate local efforts.

The Civil Contingencies Act(CCA) of 2004 introduced a single framework for civil protection in the UK and brought new changes to the table such as replacing and updating former Civil Defense and Emergency Power legislations(O'Brien and Read, 2005: 355). The structure of emergency management in the UK is decentralized. Most emergencies and incidents, based on scale or complexity, are handled at local level with no involvement of Central Government(Civil Contingencies Secretariat, 2009). In other words, local government manages and responds against disasters firstly. Local agencies are always the first responders and the ones who carry the burden of emergency management. In most cases, the police are considered one of the leading responding actors in local disasters. When police are given the task of responding to disasters at the local level, the Police Gold Commander is appointed by the local Chief Officer with the primary mission of managing the response. The Police Gold Commander is usually chaired by Strategic Coordination Group(SCG) which comprises senior representatives and executive authority from local organizations. The SCG normally coordinates its activities with COBRA(or COBR: Cabinet Office Briefing Room), if activated, through Government Liaison Officer(GLO)(Kapucu, 2009: 438). In contrast, the United Kingdom labels their emergency management programme in terms of a laudable goal: the UK Resilience. In 2004, the UK passed the Civil Contingencies Act. The Act was responsibilities, training, and powers(O'Brien and Read, 2005: 355). The UK Resilience gives local governments to handle issues at their level. However, it is still unclear to

whom the local government should report and information does not flow smoothly between the national and local governments. This has a potential to create confusion when disaster strikes. As such, there have been questions about the UK Resilience approach(O'Brien and Read, 2005: 356).

On the other hand, in South Korea, there are categories for a disaster definition: natural, industrial and national disaster. Natural disaster is defined as a disaster caused by natural phenomena, and it includes typhoon, storm, heavy rainfall and snowfall, drought, earthquake. Industrial disaster is defined as a disaster caused by accident, and it includes fire, explosion, chemical and biological accident, severe traffic accident. Finally, national disaster is defined as a disaster caused by the malfunction of infrastructure, such as energy and water transportation, finance.

South Korean government began to comprehensively manage all kinds of disaster by establishing "the Emergency and Safety Management Basic Act of 2004" in March 2004. Based on the previous experiences from the above acts, such as the Civil Defense Basic Act of 1975, the Natural Disaster Counter-Measure Act of 1995, and the Emergency Management Act of 1995, the government tried to management social emergencies(including those relating to critical infrastructure and key resources) as well as natural disaster and manmade emergency through this Act. In contrast, lower-level governments(called local governments) have setup their own 'Section of Emergency management' in each institution, to primarily handle flood with typhoon. Fire stations are also located in each local community to handle fire accidents. Furthermore, police stations in each community play a major role in taking care of terrorism in South Korea than other emergencies(Yi, *et. al.*, 2009). An increasing number of business corporations are setting up their own business continuity plans(BCP) in local and regional governments 2004(Choi, & Kim, 2012: 63).

2. Flooding disaster of Hull City in the UK

Flooding is similar to fire accident. It may not happen very often, but when it does, it is usually expensive to repair. In the summer of 2007, the United Kingdom sustained widespread flooding caused mainly by unseasonably low pressure systems during June and July which dumped record amounts of water on certain areas that were simply not equipped to deal with such a volume of water(Edwards, *et. al.*, 2007). Of course, flooding is not a new phenomenon, but the last 10 years have seen damage rise to new levels that are now causing to take flood mitigation much more seriously. There have been many significant floods during the last 10 years,

whilst the floods of 2007 were exceptional they were by no means the only notable ones as the below table demonstrates. Overall, this created a crisis for the government and hundreds of thousands of affected residents who even now are in the process of recovering and rebuilding their lives. As the flooding involved many towns, cities, regions and as such many facets of local as well as central government, this report will concentrate on the mitigation measures put in place and the level and effectiveness of the disaster response in one city particularly hard hit by the floods, Kingston upon Hull.

Many of the issues faced in the crisis situation in Hull were similar to those faced across the country to a lesser extent. Hull was particularly vulnerable to begin with in its low-lying position but in recent years the pumping system had been significantly upgraded and this indeed may have averted a catastrophe(Brown, 2004: 81). Given the fact that the flooding was a 1 in 150 year event and the city was assessed as a 1 in 30 year flood risk, it is encouraging that key civil infrastructure did not fail(Coulthard, *et al.*, 2007: 4). Flooding occurred because the drainage system was full to capacity as were all waterways so effectively there was nowhere to pump to.

Hull was the worst affected area during 2007 floods. 15,900 houses in 240 streets were flooded, representing on in five properties. On-sixth of the annual rainfall fell in 12 hours. As 95 % of Hull is below sea level, clearly flooding is always going to be a risk for the city. Although the pumping system performed well in the circumstances, there was no contingency plan in place in the event of the system being overwhelmed(Coulthard, *et al.*, 2007: 32). A problem appeared during the crisis regarding co-operation between multiple agencies in charge of different areas of the drainage system: the Environment Agency, Hull City Council and Yorkshire Water. No agency accepts responsibility for any elements outside their own terms of reference and this is undoubtedly a problem nationwide(http://www.itv.com/news/index_a8b619ded8eafc678d2a2002df644101.html). During the summer floods, Prime Minister Gordon Brown announced a review of the handling of floods and the infrastructure much of which was bequeathed by the Victorians(Oliver and Sturcke, 2007: 1). One has to wonder why it took a major disaster before the government would listen to calls for a drainage system overhaul when 3 years ago they were warned that a flood disaster was imminent with current drainage capabilities(Wintour and McVeigh, 2007: 5).

Concerns have been raised about flood warning systems in place in Hull and across the UK. Although the Environment Agency operates an automated system warning its flood line subscribers of danger from flooding, this system only deals with coastal, estuarine or river flooding. There is currently no provision to warn of flooding caused by heavy rainfall(Coulthard, *et al.*, 2007: 35). This problem exists at a national level and as such must be addressed by central government. Mea

nwhile affected residents are left to wonder why a system like this was not in place given the inherent topographical vulnerability of Hull. Local residents and councillors were unhappy at the lack of media coverage afforded Hull given the scale of devastation and there has been some suggestion that if the flooding had occurred in the Home Counties(around London) the response would have been quicker and aid for recovery would be much greater. For these reasons City Council leader Carl Minns dubbed Hull "the forgotten city"(<http://news.bbc.co.uk/1/hi/england/humber/6270236.stm>).

The floods of Hull city in 2007 are thought to have caused 13 direct deaths. The damage has affected thousands of businesses, tens of thousands of homes and further affected up to a million people(Edwards, 2007). Estimated damages are over £3 billion. Many local governments of the UK were struck the flooding of 2007 and particularly suffered great damages from flooding in Hull.

3. Flooding disaster of Seoul Metropolitan in 2011

Rapid urbanization and industrialization but lacking sufficient infrastructure for disaster management were contributed more in property damage and life loss(Kim, *et al.*, 2007: 16). Especially, in rural area, most warning systems are poorly organized, and it became clear that those areas are highly vulnerable. Although declaring special disaster zones, thereby offering generous compensation, and passing a supplementary budget bill are needed for the victims to be recovered quickly, it is not better than prevention or an effective warning system of a natural disaster. South Korea is constantly hit by typhoons and the floods caused by the torrential rainfall associated with typhoons are the major costly disasters in the country. Although the government and public in Korea clearly understand the forces of typhoons and its effect to the society, there are still many problems and considering points in the disaster countermeasures. Especially, during the rainy season from June to September, South Korea receives about 70% of its annual precipitation of 1,283mm.

In July 2011, the torrential rains have set off flash floods and landslides throughout the country, killing 41 people and sending 12 missing. It is horrible out there, and with landslides like the one above it's hard to feel safe. Damage to South Korea's capital Seoul and surrounding areas total up to hundreds of millions of dollars. Around 4,500 citizens have been forced out of their homes with many houses out of power. Seoul metropolitan has been pummeled with strong rain for 26th to 28th July, 2011. About 15 inches(400mm) fell in Seoul in just 17 hours. Fast-moving muddy water filled streets in Seoul on Wednesday, with people scrambling to the roofs of their partially

submerged cars. Water filled some underground stations and spewed from sewers. People in on flooded underground station using shovels, brooms and a wooden board in an effort to keep more rain from coming in. This natural disaster crippled a city, left lives in chaos and caused colossal economic loss in the region to the tune of an estimated \$ 3,840m. The vast impact on the southern Seoul area(called 'Kangnam') made the most extensive flooding whilst triggering a massive relief.

A combined failure of central, provincial and local governments to put in place mitigation measures against heavy rainfall has clearly occurred. This authorized a flood protection system to be built by the Emergency and Safety Management Basic Act of 2004 and was projected to be complete since 2004. This system was supposed to mitigate against the most extensive rainfall characteristic of the region. However, in 2011, the disaster management system of Seoul was not use to turn against the extensive flooding. In Seoul, many homes and buildings were flooded and damaged by the heavy rainfall and major roads were also closed down due to flooding. Particularly, 13 people were buried alive in a landslide of Mt. Umyeon and many homes and buildings destroyed by the landslide. The landslide was regarded as some of the worst disaster to ever hit South Korea.

Thousands of houses & buildings and roads in southern Seoul and surrounding capital areas were submerged by the deluge, and the landslide of Mt. Umyeon led to death many people. Though they often bring death and destruction, monsoon rains are an annual phenomenon in South Korea and are repeated every year.

IV. Comparison and Recommendations

1. Overview of comparison

The flooding cases of Hull city and Seoul are evidently similar in the world of many flooding cases. In other words, in 2007, Hull's flooding experience looks like Seoul' flooding in 2011(see <Table 1>). Flooding occurred because the drainage system was full to capacity as were all waterways so effectively there was nowhere to pump in both cities. Furthermore, a problem appeared during the crisis regarding co-operation between multiple agencies in charge of different areas of the drainage system; the central, regional and local levels. Moreover, no agency accepts responsibility for any elements outside their own terms of reference and this is undoubtedly a

problem nationwide. In addition, the cenral government operates an automated system warning its flood line subscribers of danger from flooding, but both cities were seriously accepting that and did not respond properly against flooding disaster. Finally, although much more snow than expected hit in both cities, both local governments again faces bitter criticism from the public and political parties for what they called inappropriate, belated measures to address the crisis.

<Table 1> Disaster management for flooding risk disaster

	Hull City	Seoul Metropolitan
Related Law	-The 2004 Act of Civil Contingencies	-The Emergency and Safety Management Basic Act of 2004
Government Agency for disaster management	-Central: Environment Agency -Local: Hull City Council & Yorkshire County Council	-Central: National Emergency Management Agency -Regional & Local: Seoul Metropolitan & Districts
Major reasons of flooding disaster	-Capacity exceeded of Drainage system -Co-operation between multiple agencies -Evasion of responsibility between governments -The delayed response	-Capacity exceeded of Drainage system -Co-operation between multiple agencies -Evasion of responsibility between governments -The delayed response -Excessive development in urban area
Responding measures for flooding prevention	-Flood forecasting and warning -Standards of flood protection -Development in the flooding and temporary flood defences -Flood ambassadors/surgeries and resilience	-The Expansion of drainage system -Sublation of excessive development -Flood forecasting and warning

On the other hands, floods of both countries had a terrible experience and were an entirely new experience for two cities. In terms of life and economic loss, the flooding in Hull does not come close to the catastrophe in Seoul. There aren't simply comparing both cases. The torrential rain claimed an estimated 41 to the 11 killed in the UK summer flood 2007. Seoul in particular saw mass displacement of its population some of whom still cannot return to uninhabitable conditions whilst in the UK, most people have already returned to their homes and started to rebuild.

<Table 2> Comparing lives lost and economic loss between the UK and South Korea

	The UK 2007	South Korea 2011
Lives lost	11	41
Economic lost	£3 billion	£2.1 billion

The heavy rain of Seoul 2011 caused economic loss of around £2.1 billion to the £3 billion

estimated to be caused by the UK summer floods. It is important to realize that even though the scales of these disasters are slightly different, we can draw many similarities between the respective disaster management strategy inadequacies.

2. Disaster management measures and response of both countries

Natural disaster occurs anytime and anywhere without any notice. People generally notice the initial response and rescue effort and governments are commended or criticized accordingly, when a natural disaster occurs in the world. This study has revealed some lesser known facts and shows that these governments of both countries were forewarned about these disasters and should have ensured that appropriate mitigation measures were taken.

Seoul metropolitan government has been an increase in the budget for prevention and reduction of disasters every year. In Seoul, the incomplete flooding system have been finished several decades previous but was not equipped to combat a torrential rain of July 2011 magnitude. The responsibility for this does not fall on any person or organization, though many people in Seoul hold the local governments accountable for their design of the flood protection system whilst other assign blame to the central government for lack of funding. Seoul metropolitan government spent a budget of staggering proportion, the flood protection systems, such as pumping system, debris barrier, and rain drain, have not been proved against the flood of July 2011.

On the other hand, in Hull of the UK, a city in a similarly vulnerable topographical position, the pumping system is relative up to date compared to elsewhere in the UK. However, the decision was made to protect Hull from a 1 in 30 year flood event when in reality the city was hit by a 1 in 150 year event. Suggestions have been made following the summer floods to provide additional areas to pump water into because in June all waterways and sewers were full to capacity. The affected residents are left to wonder why additional measures were not put in place to protect against a 1 in 150 year flood before the event given the vulnerability of the city.

Beginning of the torrential rain in Seoul, local governments considered as a general case, because the rainfall was not affected by a typhoon. Therefore, it was quite obvious central and local governments were unprepared for a flooding disaster. Flood and landslide warning were issued, and so the villagers evacuated lives lost and their homes and buildings. In the UK, to a somewhere lesser extent, a similar lack of foresight meant that there was no warning system in place to account for flooding due to extreme rainfall. Moreover, in each case, a lack of action in the face of scientific warnings that such events were likely has cost dearly in terms of life and

economic losses. Despite the knowledge that Seoul was one of the most at(natural and manmade) risk cities in the country, funds were diverted away from the project meant to protect it. In recent years scientists and engineers have repeatedly warned of the carnage that would ensue if a torrential rainfall results flooding in Seoul, but local government and people were still caught unawares when the disaster struck. In the UK, despite the fact that the Met office warned the government in the spring of likely widespread flooding in the summer no additional mitigation measures were undertaken and residents were not properly prepared for a crisis that the government knew was probably on its way.

The emergency response from these governments of both countries to these disasters has created a mood of resentment within sections of the affected communities who felt that they were neglected in one way or another. In Seoul speculation has been endless as to the possible political, social and economic motives that could have delayed the disaster response effort. Besides this sinister possibility, there was a plethora of mistakes made which influenced the speed and efficiency of the response. As outlined previously, not enough central and local governments were positioned in the area prior to rainfall and landslides, there was poor communication between agencies and different levels of government leading up to and during the crisis and bureaucratic mix-ups caused inevitable delays and missed opportunities to minimize the scale of casualties and losses. In contrast, in Hull many residents felt that the government was not as concerned for their region as it might have been the flooding occurred in the Home Counties. However, given the lack of co-ordination between agencies and the uncertainty over responsibility for overall flood response, the problem seems more likely to be rooted in a poorly specified chain of command and network of responsibility. The army was not called in when it was entirely feasible to do so and would have taken pressure off the Humberside Fire and Rescue Services who were operating outside of their remit already.

3. Flood risk management: Lessons from Hull's experience

1) Flood forecasting and warning

Government constantly monitor rainfall, river and sea conditions. Government also uses information provided by the office on rainfall and severe weather forecasts, weather radar, tide levels and wind conditions(Environment Agency, 2007: 10). Together with the office, the government has a development programme to look at ways of making rainfall forecasts more

reliable, accurate and timely.

Government staff spent time at the office and took part in daily telephone conferences before and during the flooding. This helped them to understand and act upon rain forecasts during the floods. Heavy rain in late June, and particularly July, was well forecast. Other forecasts over the summer proved less accurate. This highlights how difficult it is to rely just on rain forecasts to predict the impact of flooding and to avoid raising false alarms too frequently since this could lead to people not taking action.

Government feeds these data into Agency, which predicts river and tide levels for certain places and allows us to warn people at risk and government professional partners. The computer models generally proved satisfactory at predicting river levels. Less accurate predictions on the timing of floods may have been due to the lack of data on such extreme summer floods in the past, as many rivers rose far quicker than during any previous flooding. River levels were less accurate. In many cases, accurate forecasts were available 12 to 24 hours before levels were reached.

On the other hands, government flood warning service warns people about flooding from major rivers. The service does not cover the risk of flooding from sewers, drains, groundwater or ditches. Government issues government flood warnings when monitored river or sea levels reach a threshold or trigger level, or when our forecasts show that high levels are imminent. Government tries to be as specific as possible about which areas will be affected before we issue a warning. But, we have to strike a balance between being accurate and alerting people soon enough so they can react appropriately. We aim to give at least two hours'notice of flooding. But, in some places where catchments respond very quickly to rain, we cannot always do this. Radio broadcasts are the minimum standard of warning in areas where many people live and work. Government also use loudhailers and sirens in some areas. People were confused about the purpose and role of sirens in Lincolnshire during the floods and also who operates them. Routes that vehicle-mounted loudhailers planned to use were flooded by surface water and so were impassable. In many of the places affected by the summer floods, we provide a free service called Floodline Warnings Direct. This service lets people know about the risk of flooding through a telephone call, text or fax message. Government estimates that 85 per cent of people who signed-up for this free service were sent a warning in good time, and over 73 per cent of people accepted the message. This difference is because people had not told us of changes to their contact information or when the government called them their numbers were unobtainable. Government is currently doing a survey to evaluate how people responded to our warnings and what action they took to reduce the impact of the floods.

Government is not currently responsible for surface water flood risk. Government forecasting and warning systems therefore are not designed to deal with the widespread surface water flooding that occurred. Whether cost effective and reliable warning systems will be technically feasible or viable remains to be seen. Urban drainage systems are complex and dynamic, changing rapidly with development, and it would be a costly challenge to map and model these and provide detailed warnings. Research has been completed to develop a surface water flood alert system for our professional partners. This uses existing topographical data to identify susceptible locations. Contingency plans are then produced to ensure appropriate action is identified and practiced before alerts are given. The necessary rainfall alerts are currently not available on a routine basis but upgraded the office computers will create the capability needed. Government should look at the feasibility of extending our current warning system to cover these forms of flooding as far as science and technology can reasonably allow. This would depend on the necessary resources being available.

2) Standards of flood protection

It is impossible to guarantee flood protection in all circumstances. It may not be technically possible, and there is always a risk that even where there is a flood defence there will be times when conditions are so severe that it is overwhelmed. Government policy recognises this, and looks to reduce flood risk where it is cost-effective, practical and environmentally appropriate. New surface water drainage systems are typically designed to cope with an event likely to happen once in 30 years on average. This compares with design standards of between one in 50 years and one in 100 years for new river flooding protection schemes(Ibid, 2007: 15). Many older surface water drainage and river flood defences have lower standards of protection. During the summer, about one fifth of the properties flooded by rivers suffered because flood defences were overwhelmed. People are becoming more at risk from all types of flooding because of climate change.

Standards of protection available from flood defences(for example, walls, embankments, flood storage areas, pumping stations) in the areas flooded this summer varies widely, from undefended to defences protecting against flows expected only once in 100 years on average. In a few cases our flood defences did not perform as expected. Government lost power supplies at six sites, but only after they had been overwhelmed. Government was in the middle of a project to improve a flood defence and a number of properties flooded. Responsibility for a number of watercourses has

transferred in the last two years to us from local authorities, and we are still learning how these rivers react to flood situations.

3) Development in the floodplain and Temporary flood defences

By definition all 19,000 homes flooded from rivers in the summer are in the floodplain. Government does not routinely collect data on the age of property flooded by rivers. However, data the Hull city collected on a limited sample of 580 of the 19,000 properties indicates that around 28 per cent of these were built in the last 25 years. Floodplain development was one of the main concerns people raised at our flood surgeries. The Government' planning policy on development in flood risk areas was updated in January 2007.

On the other hands, government has only recently used temporary defences as one of the ways in which the government protects people and property from flooding. The government puts them up during flooding and remove them after the event. They can be used in different locations. 'emountable' defences are different as they have permanent components and are used only in specific locations. Government has used temporary defences as short-term measures, whilst permanent defences are repaired or new defences are being built. The government have also used them in places where permanent defences are not cost effective. But, there can be a major risk in using them. Government were unable to install them in time this summer because of severe flooding problems on the roads. This meant we could not transport the barriers from our depot which had been chosen as the base for the defences after discussions with local communities. Government temporary defences proved invaluable at sub-station where electricity supplies for 500,000 people were under threat. If the government had not intervened, the impact of the floods would have been far worse for many people. Temporary defences have proven to be useful and government now need to review with professional partners who is best placed to own and deploy this equipment in future flooding situations.

4) Flood ambassadors/surgeries and resilience

People welcomed and supported our flood ambassadors and post-event surgeries. Many staffs took on the role of flood ambassadors and went round to homes offering advice and listening to concerns. This is extremely useful as we learn first hand what is concerning people. Flood surgeries were especially successful when we linked in with our partners and held events quickly

after the floods. The events allow people affected by flooding to share their experiences, ask questions, and allow us and our professional partners to listen, learn and explain. Attending these events after the floods, as well as responding to the very high level of ministerial, parliamentary, local government, business and customer queries, has been a considerable pressure.

People and communities at risk need to be better prepared for flooding. It is reasonable to assume that the impacts of future flooding of the magnitude seen in 2007 could be reduced if properties were more resilient, and people were better prepared to protect their belongings and increase chances of rapid recovery.

The central government and local government could all play a leading part in this work. Relevant parts of the building regulations could include measures for flood resistance(preventing water entering) and resilience(reducing damage if water does get in). Insurance companies could use conditions or vary premiums to encourage flood resistance and resilience as is done for home security.

V. Conclusion & Recommendations

1. Recommendations for Seoul metropolitan

Seoul faces numerous challenges in disaster management for mitigation and prevention of natural and manmade events every year. Therefore, this study has enabled to Seoul to offer an idea of the disaster management, and its relationship with their sustainable development and safety society. First, Seoul metropolitan and district governments should set up the disaster prevention and facilities improvement for better flood preparation and response. These government undertake to watch for 24 hours as a monitoring and warning system of disaster like Hull City. Sometimes, the rainfall is completely unpredictable because of global warming, so the local governments improve drainage system. The system needs to increase underground road water pump capacity.

Second, Seoul metropolitan and district governments should work out a manual to prepare the unexpected disaster like flood. The manual of disaster management consists of six parts: standard, work, field, command, citizen and citizen manual in multi-complex facilities(see <Table 3>).

Third, local governments establish disaster prevention system as basic guideline and index. The disaster & safety guideline includes common standard for urban safety and specialized guideline

for different disaster types. In contrast, the developed safety index should contain to measure local disaster vulnerability & risk and potential risk & the level of safety. Furthermore, flood map should be opened to the local communities and public to help them what to do the real emergency situation. In addition, local community based flood disaster management systems are being developed for effective preparedness against the flood risk.

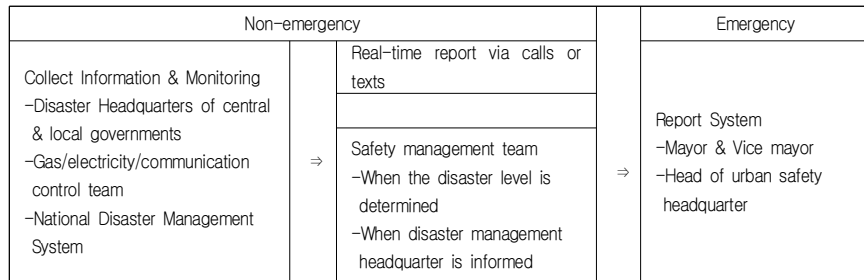
<Table 3> The disaster management manual

Manual	Subject
Standard manual	Standard manual for type of emergency
Work manual	Process and actual work manual for department in charge
Field manual	Mission and process manual for field agencies(ex. Fire station and police station)
Command manual	Mayor's or bureau head's command card for each emergency level
Citizen manual	Responding to disaster, disaster prevention tips
Citizen manual in multi-complex facilities	Fire, building, gas and electricity

※ Notice: The table is drawn based on Seoul Metropolitan Government(2011).

Finally, local governments of both countries need to prepare the prompt response & recovery system. The system includes monitoring and response(see <Figure 1>). After the events of both countries, although the recovery process was handled well(Trada, 2009), areas to be improved are:

- More effective and co-ordinated leadership of recovery at local, regional and national level, leading to better co-ordinated recovery of local communities
- More certainty for local government about what financial support they can expect to receive from government to help meet the costs of recover.



<Figure 1> The Prompt Response & Recovery System

2. Conclusion

The role of the local governments in disaster management has been widely recognized in academic literatures and government documents, but number of gaps does exist in the actual situation. The research has produced few recommendations so far through Hull's experience. These recommendations can lead to for improvement of disaster management in Seoul metropolitan and district governments. Therefore, it is of utmost important to build capacity and empowering local governments to help them acquire knowledge and resources and to provide them with appropriate decision making authority in order to ensure effective contribution in disaster management in Seoul metropolitan and district governments.

Almost every year, any countries exposed to natural and man-made hazards and disasters, which have the potential to cause significant loss of life and property, as well as serious damages to the environment and the economy in the world. Especially, flooding hazards and disasters to which most countries are exposed consist primarily of the effects.

Flooding disaster occurs anytime and anywhere without any notice. People generally notice the initial response and rescue effort and governments are commended or criticized accordingly, when a natural disaster occurs in the world. This study has revealed some lesser known facts and shows that these governments of the UK and South Korea were forewarned about these disasters and should have ensured that appropriate mitigation measures were taken. Local governments of the UK and South Korea underwent great hardship because of flooding, in 2007 and 2011, respectively. The flooding led to damage loss of life and economic in both countries, even though both countries prepared for the worst situation through the flood protection system, such as pumping system, debris barriers and rain drain.

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李賢雄: 서울시립대학교 대학원 도시행정학과 박사과정을 수료하였으며, 현재 한국과학기술원(KAIST) 공공혁신·전자정부 연구센터 연구위원이다. 주요 관심분야는 공공혁신, Big DATA와 전자정부, 도시 및 지방행정, 도시재난관리, 사회적기업과 복지정책 등이다(hulee@business.kaist.ac.kr).

崔絢載: 서울시립대학교 대학원 도시행정학과 박사과정을 수료하였으며, 현재 서울특별시의회 사무처 운영전문위원실 입법조사관으로 재직하고 있다. 주요 관심분야는 도시 및 지방행정, 지방의회제도, 도시재난관리, 정보화정책, 문화정책 등이다. 주요 논문으로는 “지방정부 문화정책의 평가와 필요성에 관한 연구(2011)”, “한·일 지방정부의 위기관리 체계에 관한 연구(2012)”가 있다(paul@seoul.go.kr).

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Disaster Management and Role of Local Government: Lesson from Hull's Experience

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In these times of escalating concern over global warming and its effects on weather patterns, as well as the size and frequency of natural disasters, it seems fitting to analyse and discuss how effectively governments are planning for disasters and whether they are responding to them appropriately. During the summer of 2007 the United Kingdom experienced some of the worst flooding in its history, with the city of Hull amongst the worst affected. An examination of the government handling of mitigation measures and disaster response in this instance raises comparisons to the 2011 heavy rain related flooding in Seoul, South Korea. These events are especially appropriate for comparison given the vulnerability of each city and general feeling of dissatisfaction among residents. This paper examines each event individually and presents a comparison of the actions and inactions of each local government. The result is a call for stronger and more decisive measures to combat climate change and protect vulnerable populations more efficiently against natural disasters.

Key words: disaster management, flood risk management, Hull city, Seoul