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# How to Overcome Some New Disastrous Events in Korea

## - Natural, Manmade, and Social Disaster -

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The purpose of this paper is to suggest some implications and measures to overcome the new disastrous events, including natural, man-made, and social disasters, in the future. This article reviewed some theoretical discussions such as definitions and characteristics of disaster, functions and strategies of disaster management, including mitigation, preparedness, response, and recovery, analyzing the following four cases, such as typhoon Rusa in 2002, Hebei Spirit Oil Spill in 2007, Foot-and-Mouth Disease during 2010-2011, and Heat Wave and Power Crisis in 2013. This paper suggested five implications and measures to cope with the new disastrous events: securing transparency and integrity in safety management, international cooperative efforts, tight policy networks, enhanced professional leadership, increased social capital in disaster management.

**Key words**: disaster management, natural disaster, man-made disaster, social disaster

## Ⅰ. Introduction

Every year, hundreds of disasters occur in Korea. Most disasters, including natural and man-made disasters, can be handled by local governments. Unfortunately, however, local governments in Korea are becoming more and more vulnerable to these disasters. Recent natural and man-made disasters have increased public and official consciousness of real and potential hazards and the need to prepare for possible disasters. That attention to disaster preparedness may be fleeting, however, despite the magnitudes of the tragedies(Waugh, 1988: 111). Natural disasters easily qualify as severe events and are responsible for property losses. The severity of these events is easy to calculate in terms of both the amount of physical destruction incurred and the economic costs involved. Natural disasters can also cause serious physical injuries, psychological trauma, and even death(Schneider, 1995: 14). Man-made is a rapidly increasing



phenomenon of technological society. It occurs as the result of human failure or error, or the malfunction of some structure or system designed by human, and hence the creation of increasingly complex systems enhances the potential for catastrophic mishap. Natural and technological disasters are both sudden and powerful. Whilst there is sometimes an element of warning in natural disaster, there is generally none in man-made catastrophe. Lack of warning makes avoidance difficult. There may only be seconds from the realization that something is wrong to the impact, as in aircraft crashes(Hodgkinson & Stewart, 1991: 36).

New technology is adding to the list of disaster agents at an ever-increasing rate. There is a proliferation of high-rise office buildings and hotels that subject their inhabitants to fire threats not ever experienced before. Our modernized cities are also becoming more dependent on technology and specialization, making us more vulnerable to disasters(Auf Der Heide, 1989: 6). Both types of disaster, natural and man-made disaster, can cause visible damage to a familiar environment, but some technological disasters do not have this effect. Transport disasters often occur in a location unfamiliar to the survivors and inaccessible to the bereaved or even the rescuers. The invisible threat of environmental poisoning, such as nuclear pollution from an accident like that at Chernobyl or Fukushima, may be catastrophic yet cause no visible damage. This may make acceptance of the reality more difficult(Hodgkinson & Stewart, 1991: 36).

Nowadays Korea has experienced the new types of disaster, such as an exceptionally large and powerful typhoon, severe heat wave, torrential rain, oil spill, a highly infectious disease, blackout, impact of atomic plant explosion, and so on, not experienced before. It's our mission to provide countermeasures for these newly emerging disasters. The purpose of this paper, therefore, is to suggest some implications and measures to overcome the new disastrous events, including natural, man-made, and social disasters, in the future.

## Ⅱ. Disaster and Management Strategies

### 1. What's a disaster?

What, exactly, constitutes a disaster? Over the years, the word "disaster" has come to mean many people. In most cases, it's used as a generic term for "something bad has happened". Social science researchers have argued that disasters are social constructions. That is, that they are defined by the nature of their impact on social systems. An event occurring where there is no

population does not usually rise to the level of a disaster unless it produces cascading effects that have an impact on society. As society grows more complex, conflicts between human activity and natural processes may have unintended consequences(Canton, 2007: 38-39). Simply stated, no physical agent or event has a social meaning outside of a social context. Floods inundate unpopulated flood plains; earthquakes occur on the floor of the ocean; blizzards blanket barren tundra. Such a disaster event is meaningless with respect to disaster and crisis behavior. The essence of a disaster event, therefore, lies in its social, not physical, consequences. Similar types of events, producing similar levels of physical disruption, can produce a disaster or crisis condition in one social context, and have no such effect in a different social setting(Wenger, 1978: 25-26).

Disaster means the events or the situations which are destructive, calamitous, and often deadly or injurious to human being. The term disaster describes events that have resulted in extensive negative consequences. Disasters and emergency events generate extraordinary conditions among individuals and the social systems they affect. Briefly, emergency events are difficult to anticipate, thereby inhibiting planning. Because disasters have the potential for negative consequences, they tend to generate a feeling of crisis, that is, a sense of urgency and concern about emergency actions(Lewis, 1988: 167).

Disasters, including natural, man-made/technological, and critical infrastructure disaster, easily qualify as triggering mechanisms and severe events. First, we can define natural disaster as events or situations which can cause severe damage by natural phenomenon. There are lots of various kinds of natural disaster, such as typhoon, storm, flood, earthquake, tsunami, landslide, extreme heat, heavy snow, and so on(Lee, 2012: 86-87). Second, man-made/technological disaster can be defined as violent events that have a negative impact on human beings by human error or cause. For example, man-made/technological disaster are conflagration, gas explosion, building collapse, airplane crash, oil spill, release of chemicals, and so on. Third, critical infrastructure crisis can be defined as a situation that was paralyzed on the human, physical, and functional system which may affect the people's security, national economic and social vitality and identity, and the key function of government, by causes of terrorism, mass protest and violent strike, riot, disasters, and so on(Lee, 2012: 88; Lee, 2013: 5-6).

Some characteristics of disaster agents not only influence the types of community tasks that are created but relate to the ability of the community to handle them. These disaster agents differ in their frequency, predictability, controllability, their cause, and so on. Disasters, especially, can be caused by earth movements, floods, fires, wind, poison, explosions, etc. A basic distinction often made is that between man-made and natural disaster. Such a distinction may have important



implications for subsequent action. In natural disasters a heightened concern is expressed for other persons who are similarly affected. On the other hand, in man-made disasters, while concern exists, considerable resentment is directed toward the presumed human source; energy is also often directed toward placing blame for the event(Dynes, 1970: 51-52).

## 2. Functions and Strategies of Disaster Management

### 1) Mitigation

Ways to deal with the national emergency management problem that appear rational and effective at the national level may be perceived as unwieldy, irrational, and inefficient from the perspective of a single community. Perceived risk, then, is a factor that shifts according to which level of government is being examined. The paradox for mitigation effectiveness is that local governments, though least likely to perceive emergency management in general as a key priority, are at center stage in terms of responsibility for overall emergency management(Cigler, 1988: 46). Mitigation involves deciding what to do where a risk to the health, safety, and welfare of society has been determined to exist and then implementing a risk reduction program(Sylves, 2008: 21). Mitigation is sustained action taken to reduce or eliminate the risk to human life and property from hazards. Mitigation can take the form of physical, bricks-and-mortar projects or of planning and community education. Regardless of the form it takes, however, mitigation is a highly cost-effective investment for local governments and the nation. By protecting a community against disaster before disaster strikes, mitigation saves lives, property, time, money, and resources. The mitigation process can also unite disparate stakeholders in an effort to achieve shared public goals. Ultimately, mitigation works to create a more resilient, more sustainable community(Godschalk, 2007: 90).

The primary intent of mitigation is to ensure that fewer communities and individuals become victims of disasters. The goal of mitigation is to create economically secure, socially stable, better built, and more environmentally sound communities that are out of harm's way(Haddow, *et. al.,* 2008: 77). According to Godschalk & Brower(1985: 64), community hazard mitigation strategies seek three major goals:

1. containing or modifying the hazard, as with structures such as dikes or seawalls,

2. protecting people and facilities in hazard areas, as wi고 building elevation and flood-proofing requirements,

3. limiting uses of hazardous areas, as with land-use and density regulations.

The first goal seeks to change the nature of the threat; the second, to decrease vulnerability to damage; and the third, to reduce exposure of people to the threat.

And the following widely accepted mitigation tools are used to reduce risk(: hazard identification, design and construction applications, land-use planning, financial incentives, insurance, and structureal controls(Haddow, *et. al.,* 2008: 77).

### 2) Preparedness

Because large-scale disasters are infrequent, emergency responders do not have an opportunity to practice and repeat disaster-related tasks until they become routine. The infrequent nature of disasters also means, therefore, that the need for preparedness is obscured; pressing daily problems get priority(Tierney, 1985: 77). All organizations in the private, public, and government sectors are susceptible to the consequences of a disaster and must consider preparedness. For example, preparedness focuses not only on getting essential government services, such as utilities and emergency services, functioning at predisaster levels but also on assisting businesses in quickly reopening to the public. Both these ke functions of preparedness help minimize the required time for the affected population to return to predisaster life(Haddow, *et. al.,* 2008: 184). Disaster preparedness protects lives and property and facilitates rapid recovery. Preparedness consists of plans, procedures, and resources that must be developed in advance. These are designed not only to support a timely and effective emergency response to the threat of imminent impact, but also to guide the process of disaster recovery(Lindell, *et. al.,* 2007: 11).

Functionally, disaster preparedness overlaps somewhat with disaster mitigation and is perhaps most closely associated with disaster planning, although it includes a number of other activities involved in implementing and testing emergency plans and preparing for disaster response. Preparedness can be defined as "any activity that develops operational capabilities for responding to an emergency," including the development of (1) emergency management organization; (2) emergency operations planning; (3) resource management; (4) direction and control; (5) emergency communication; (6) alerting and warning; (7) emergency public information; (8) continuity of government; (9) shelter protection; (10) evacuation; (11) protective measures; (12) emergency support services; (13) emergency reporting; (14) training and education; and (15) exercises and drills(Waugh, 1988: 113; McLoughlin, 1985: 166).

Preparedness is everyone's job. Not just government agencies but all sectors of society: Service



providers; businesses, civic, and volunteer groups; industry and neighborhood associations; as well as every individual citizen should plan ahead for disaster. As such, preparedness programs are developed to target each audiences to educate, promote, and test preparedness(Haddow, *et. al.,* 2008: 189). For this, emergency manager should be sure there is a risk communication program to encourage households, businesses, and other government agencies to adopt preparedness measures of their own. Communication with these social units is an important component of community emergency preparedness because when these units are prepared for disasters, they will need less help from emergency responders, who will be able to focus more of their efforts on special facilities, such as hospitals and nursing homes, and on dispersed population segments with special needs, such as people with limited mobility(Lindell & Perry, 2007: 132).

### 3) Response

Emergency response begins when the event occurs. In some cases, hazard-monitoring systems alert authorities of an imminent disaster. Warnings, such as weather forecasts, can provide time to activate the emergency response organization before impact. In other cases, such as earthquakes, preimpact prediction is not available. However, a rapid assessment of the impact area can quickly direct resources to the most damaged areas. Response entails providing emergency aid and assistance, reducing the probability of secondary damage, and minimizing problems for recovery operations. Disaster response objectives include protecting lives, limiting property loss, and overcoming the disruptions that disaster cause. Consequently, emergency response activities include securing the impact area, evacuating the threatened areas, conducting search and rescue for the injured, providing emergency medical care, and sheltering evacuees and other victims(Sylves, 2008: 23; Lindell, *et. al.,* 2007: 12).

Response can be defined, therefore, as activities taken immediately before, during, or directly after an emergency that save lives, minimize property damage, or improve recovery. As for response activities, it is necessary to be equipped with emergency plan activation, activation of emergency systems, emergency instructions to the public, emergency medical assistance, manning emergency operations centers, reception and care, shelter and evacuation, and search and rescue, and so on(McLoughlin, 1985: 166).

The five response-related principal challenges that are critical to the effectiveness of an emergency response plan are (1) understanding the responses of citizens to disasters, (2) managing the convergence of resources and people on the disaster scene, (3) limiting the

likelihood of role abandonment by emergency workers who are responding to the demands of disaster operations, (4) obtaining disaster declarations, and addressing communications among responders during operations(Perry & Lindell, 2007: 161). In short, the response phase represents a period in time in which new needs are generated, leading to new demands for services. Because the demands are unique, the traditional or routine ways in which a system – individual, organization, or society – has coped with service demands may no longer be appropriate. Thus new coping techniques must be developed and utilized in the midst of the event(Lewis, 1988: 168).

#### 4) Recovery

When disaster strikes, communities and their residents can be thrown quite literally into another world. Normal, day-to-day social and economic functioning are disrupted and may cease altogether in the most severe events. Recovery is, therefore, a process of healing for communities and their residents. While recovery is often conceptualized as a phase of activity distinct from response, beginning after the emergency has receded, early coping behavior in fact initiates the recovery process while the community and its citizens are continuing response efforts. The processes of recovery continue through the days and weeks after the disaster event. For both households and communities struck by the disaster, the period of recovery may need to extend well beyond the weeks and months that follow the immediate impacts of the disaster event(LaPlante, 1988: 217-220).

Disaster recovery is to provide immediate support during the early postdisaster period necessary to return vital life support systems to minimum operation levels, and continuing to provide support until the community returns to normal(Sylves, 2008: 24; Lee, 2011: 268). Recovery usually has two phases, short term and long term. Short-term recovery overlaps with response and may include "search and rescue, damage assessments, public information, temporary housing, utility restoration, debris clearance, handling of donations. Long-term recovery addresses the basic dimensions of a community's existence: permanent housing, economic conditions, the environment, the infrastructure such as roads and bridges, and lifelines. Each dimension may be affected by social and psychological conditions that affect individual and collective abilities to move through the long-term recovery period. In this context, recovery can be defined as follows; short-term activities that restore vital life-support systems to minimum operating standards and long-term activities that return life to normal(Phillips & Neal, 2007: 208; McLoughlin, 1985: 166).



## III. Some Recent Disastrous Events in Korea

### 1. Typhoon Rusa in 2002

At 03:00 PM on 31 August, 2002, Rusa approached and hit the Goheung peninsula located in the Jeonnam province of Korea with winds of 140 km/h. It was able to maintain much of its intensity due to warm air and instability from a nearby cold front. At that times, typhoon Rusa hit Korea with severe gale and storm, causing extensive damage throughout the whole country and especially in the Gangneung area. Even on a single day, typhoon Rusa recorded up to 879.5mm of rainfall in the Gangneung area and this was equivalent to 62% of the average annual rainfall(1,401.9mm) in this particular area. Rusa weakened while moving through the country, dropping heavy rainfall that peaked at 897.5 mm in Gangneung. A 24 hour total of 880 mm in the city broke the record for the highest daily precipitation in the country, exceeding the previous record set in 1981 by 300 mm. It became the highest daily rainfall in the country's history, However, the heaviest rainfall was localized. Over 17,000 houses were damaged, and large areas of crop fields were flooded.

Before Rusa affected South Korea, KMA(Korea Meteorological Administration) issued high sea warnings on August 29. Airports were closed in the southern portion of the country, and dams let out water to prevent excessive flooding. Rusa affected much of Korea with heavy rainfall and high winds.

Following the storm, damaged buildings polluted rivers in South Korea with chemicals and heavy metals. The country utilized 30,000 soldiers to assist in cleaning up and repairing storm damage. Much of Gangneung lost power and water; as a result, relief supplies were sent to the affected citizens. By ten days after Rusa struck the country, power lines were restored and transportation returned to normal. Residents in the country raised about $60 million(₩72.1 billion won) in disaster relief, the highest such total for a disaster in the nation. On September 13, the Korean government declared 203 cities and counties as disaster areas, which entitled 8,714 families who sustained storm damage to receive government loans. The combined storm damage and floods preceding the storm caused the nation's economy to contract during the third quarter of 2002. The 2003 fiscal year reported a $300 million deficit for non-life insurance companies, mostly due to losses from the typhoon. Crop damage from Rusa caused the price of rice to increase to their highest levels since 1980. About a year after Rusa hit, many residents remained homeless and were residing in temporary shelters(wikipedia, 2013. 10. 2).

Rusa brought the largest amount of rain since modern meteorological monitoring began in 1904. It caused property damage worth $4.45 billion(₩5.2 trillion KRW) in Korea. Damage was heaviest in Gangneung, where about 36,000 homes and 622 military buildings were flooded. At the airbase in Gangneung, floods submerged 16 jet fighters. Along the coast, high winds damaged 640 boats and about 200,000 marine buildings, and 265 industrial buildings were also damaged. Compared to other parts of Korea, the Gangneung area recorded the largest amount of damage.

Flooding and the landslides disrupted the country's infrastructure; the storm destroyed 274 bridges and damaged roads and rails at 164 locations. Rusa killed 300,000 livestock and flooded 85,000 hectares(210,000 acres) of crop fields, representing 6% of the country's agricultural lands, mostly affecting fruit and vegetables. Across the country, 88,625 people were forced to evacuate due to the typhoon, and 17,046 houses were damaged. High winds left 1.25 million people after blowing down 24,000 power lines. There were 213 deaths in the country, and another 33 were missing and presumed dead; This made Rusa the deadliest typhoon in the country in more than 43 years. The reasons for this worst damage are climate change, concentrated urban growth, aging infrastructure, and so on.

## 2. Hebei Spirit Oil Spill Disaster in 2007

During the last decades, there have been a number of serious shipping accidents that have resulted in release of large amounts of oil into the marine environment. Such large oil spills are generally associated with collision or grounding accidents of oil tankers. The consequences of some of these accidents have been particulary grave in terms of financial loss and local damages to the environment. These accidents have therefore received substantial press coverage that has resulted in increased public awareness of oil spill risks in most parts of the world(Vanem, Endresen, *et. al.,* 2008: 1354). Some of the best-known oil spill accidents in Korea are those of Sea Prince(1995) and Hebei Spirit(2007).

The Hebei Spirit oil spill was a major oil spill in Korea that began on the morning of 7 December 2007, with ongoing environmental and economic effects. Government officials called it Korea's worst oil spill ever, surpassing a spill that took place in 1995. At about 7:30 on 7 December 2007, a crane barge owned by Samsung Heavy Industries being towed by a tug collided with the anchored Hong Kong registered crude carrier Hebei Spirit, carrying 260,000 tonnes of crude oil. The incident occurred near the port of Daesan on the coast of Taean County. The barge was floating free after the cable linking it to the tug snapped in the rough seas(Lee, 2011: 5-8).



The collision punctured three of the five tanks aboard the Hebei Spirit and resulted in the leaking of some 10,800 tonnes of oil. The spill occurred near Mallipo Beach in Taean County, considered one of Korea's most beautiful and popular beaches. The region affected by the spill is home to one of Asia's largest wetland areas, used by migratory birds, and also contains a national maritime park and 445 sea farms. It was initially believed the oil spill would not spread due to the cold winter temperatures. However, unseasonably warm weather, combined with strong waves and unexpected wind directions, caused the spill to expand beyond initial expectations.

By January 2008, approximately 4,153 tons of crude oil spilled had been collected by utilizing some 268,710 kilograms of oil absorbents and other cleanup devices. At that times, it has been reported that the regional office of the Ministry of Maritime Affairs and Fisheries had twice tried to warn the barge captain that the barge was too close to the tanker two hours before the incident but was unable to do so. The barge captain is also under investigation for moving through the area in rough weather. The tanker is reported to have been at anchor when it was hit by the barge, which had broken free from its towing lines.

The accident occurred apparently due to communication problems between the oil tanker, the barge and the regional maritime affairs and fisheries office. The office tried to make radio contact with the barge carrying the crane twice, just two hours before the accident to warn that it was too close to the tanker. But it failed to do so. The office and Samsung Heavy Industries, the owner of the barge, blamed each other for the failure. Another problem is that the authorities have failed to take timely and appropriate action to prevent the spread of the leaked oil. Thus, disaster control officials could not prevent oil from reaching beaches and fish farms. One day after the accident, the central government declared a state of disaster in the affected areas. We have to learn a valuable lesson from the oil spill because such a disaster could incur irrevocable damage to the marine ecological system. It could take more than a decade to restore the destroyed areas. It is imperative to take bold measures to prevent the recurrence of such an accident as well as to set up a quick response system to cope with potential disasters(The Korea Times, 2007. 12. 9)

## 3. Foot-and-Mouth Disease during 2010-2011

Foot-and-mouth disease is a highly contagious disease caused by foot-and-mouth disease virus(FMDV: family Picornaviridae, genus Aphthovirus). FMDV serotypes O, A, and Asia 1 are widespread in Southeast Asia. In Korea, small-scale outbreaks of FMDV infection caused by

serotype O occurred in March 2000, May 2002, and April 2010, and an outbreak caused by serotype A occurred in January 2010. In contrast, an outbreak during November 2010-April 2011 was much more widespread(Park, *et. al.,* 2013: 655). Foot-and-mouth disease is an infectious and sometimes fatal viral disease that affects cloven-hoofed animals, including domestic and wild bovids(wikipedia, 2013. 10. 2). The virus causes a high fever for two or three days, followed by blisters inside the mouth and on the feet that may rupture and cause lameness. Foot-and-mouth disease(FMD) has severe implications for animal farming, since it is highly infectious and can be spread by infected animals through aerosols, through contact with contaminated farming equipment, vehicles, clothing or feed, and by domestic and wild predators. Its containment demands considerable efforts in vaccination, strict monitoring, trade restrictions and quarantines, and occasionally the elimination of animals. Susceptible animals include cattle, water buffalo, sheep, goats, pigs, antelope, deer, and bison.

Korea was hit by the rarer type A FMD in January, and then suffered type O infection in April. The most serious case of foot-and-mouth outbreak in South Korea's history started in November 2010 in pig farms in the city of Andong, and has since spread in the country rapidly. More than 100 cases of the disease have been confirmed in the country, and in January 2011, Korean officials started a mass cull of approximately 12%, or around three million in total, of the entire domestic pig population, and 107,000 of three million cattle of the country to halt the outbreak.

From 29 November 2010 to 07 January 2011, Korea government has officially reported to the OIE a total of 97 outbreaks occurring on 27 swine farms, two dairy farms and 68 Hanwoo beef cattle farms in five Provinces and the metropolitan city of Inchon. The FMD outbreak was first identified on two pig farms in Kyongsangbuk-do Province on 29 November 2010. Subsequently, the disease spread to the north of the country.

The government has been fully engaged in combating the ongoing spread of FMD by applying the following mandatory measures: stamping out, quarantine, movement control inside the country, screening, zoning, disinfection of infected premises/establishment(s), prohibition of vaccination before 25 December 2010, that then became allowed after 25 December 2010 for cattle in Gyeongsanbuk-do, Gangwon-do and Gyeonggi-do. Nearly 100 livestock markets were shut down throughout the country. Most of the end of year celebrations, that include gifts of beef, were cancelled to help stop movement of the disease.

With the joint input of the Ministry of Public Administration and Security and the Ministry for Food, Agriculture, Forestry and Fisheries, the central anti-disaster headquarters has taken charge



of the quarantine, decontamination and vaccination efforts currently underway and have pooled all available resources in an effort to end the outbreaks, including utilizing the police to help curb the disease that has continued to spread despite nationwide quarantine efforts. The country's alert level will be raised to "red" – the highest in a four-tiered response scheme-to reflect the seriousness of the situation.

Cattle and pigs on the affected farms and within 500m around the affected farms have been culled and buried as a pre-emptive measure. As of 10 January 2011, more than 1.3 million animals(cattle, pigs, goats and deer) on over 3,000 farms have been culled. There are 3.4 million head of cattle and around 10 million pigs in the country, along with a large number of goats and deer that are susceptible to FMD. Losses are estimated to exceed $888 million USD.

Related to the latest outbreak, the most severe in Korea's history, the government announced, near the end of December 2010, that it will opt for vaccination in cattle and a decision on 06 January 2011 to opt for vaccination also in pigs, after the nationwide quarantine and decontamination efforts failed to prevent the disease from spreading. As of 9 January 2011, the government expanded the use of vaccines to all animals in the infected regions to protect the last FMD virus-free provinces in the country.

The outbreak quickly spread nationwide across a large distance. This rapid spread occurred for several reasons: 1) the first infection was in a pig-farming complex and pigs excrete the virus in large amounts; 2) detection of the first infection was delayed; 3) FMDV-contaminated feces from the index pig-farming complex was moved to other provinces to be recycled for use as fuel on November 17, before the first outbreak; 4) the virus has increased stability during the winter months, enabling it to be transmitted more easily; 5) culling of infected animals was not implemented quickly enough by affected farms; and 6) the distance between farms in the area was small(Park, *et. al.,* 2013: 657).

Even if the source of the introduction of FMD virus into Korea is still uncertain, this new FMD event illustrates once again the vulnerability of countries and territories free of FMD located close to endemic areas and provides an indication of the risks associated with the porous nature of borders and the increased flow of informal movements of people, animals and products in populated areas. FAO and OIE encourage the promotion of regional approaches to control FMD in endemic settings, in particular by free countries such as was the case with Japan and Korea, where livestock play an important role for national consumption, as well as for external markets. Regarding control measures, use of vaccination strategies as a rapid response to outbreaks have heavy implications in terms of the social and economic benefits of introducing vaccination in

regions previously recognized FMD free without vaccination by the OIE. The impact of animal culling after vaccination, in particular in swine, and risk communication issues, are of paramount importance to consider in the rationale and formulation of adequate management strategies for the FMD crisis in Korea(http://www.glews.net). A vaccination program was effective in controlling the outbreak, and FMD incidence declined rapidly after its completion in Korea(Park, *et. al.,* 2013: 658).

### 4. Heat Wave and Power Crisis in 2013

Korean people has experienced nationwide heat wave which occurred for weeks between June and mid August, 2013. And in those times, 10 people died of heat stroke or heat exhaustion. The number of people who have died from heat stroke or heat exhaustion has increased for about two months. The hot weather has come at the worst time for Korea, putting a severe strain on the country's struggling power grid. The energy supply had already been suffering from technical problems, including the shutdown of some nuclear reactors. Government officials had warned of an imminent energy crisis. At the same time, to try to prevent shortages, government authorities ordered sweltering workers in government offices to turn off the air-conditioning and avoid using elevators. The order has come two days after the city of Gimhae clocked a temperature of 39.2 degrees Celsius(102.6 degrees Fahrenheit), the highest in Korea in more than a decade. In 2013 summer, also, Japanese cities have experienced the highest temperature ever recorded in the country and some parts of China have been sweltering under a record-setting run of baking hot days. After the hottest July in at least 140 years, Shanghai in China experienced four consecutive days during which the thermometer went above 40 degrees Celsius(104 degrees Fahrenheit). According to the Shanghai Meteorological Bureau, that's the first time the city of 23 million inhabitants has had a run of temperatures that high(http://edition.cnn.com/2013/08/13/world/asia-heat).

For weeks in 2013 summer, temperature have remained at an unusually high level across the nation, In some areas, including the city of Ulsan and Gimhae in the southern part of Korea, the temperature rose to 40 degrees Celsius, setting new highs. To cope with power shortages, the government took unprecedented measures. It placed a temporary ban on air conditioning at all government and public offices during a period when the nation's power demand was expected to reach its annual peak. Some businesses voluntarily shortened their work hours, putting up with production disruptions. Such efforts in business sector helped authorities to maintain the power



reserve at above 4 million kilowatts.

However, the nation's power crisis has worsened following the shutdown of two of its 23 nuclear reactors due to the substandard parts used in them. On top of that, several other reactors have been out of operation for regular maintenance or inspection. More fundamentally, it needs to start serious efforts to rein in power consumption in the industrial sector. According to OECD data, per capita industrial electricity consumption in Korea was 4,617 kilowatts in 2011, almost double the OECD average of 2,445 kilowatts. In contrast, Korea's per capita residential electricity consumption was 1,240 kilowatts in 2011, about half the OECD average of 2,448 kilowatts. Theses both figures clearly show what the government should do to manage the power crisis. It needs to gradually break away from its energy-intensive structure(The Korea Herald, 2013. 8. 14: Editorial).

## IV. Implications and Measures for the Future

Securing Transparency and Integrity in Safety Management For preventing and responding to disasters, it is assumed that all governmental units take their safety and emergency management obligations seriously. The public officials and employees must understand that their role is important in nature for giving people safety. They must also be ware of how their actions relate to those of others involved in safety management process. In summer 2013, almost Korean people experienced terrible heat wave occurred for weeks. Korea depends on atomic plants to generate more than one-third of its electricity. But six of its 23 reactors are offline, including three shut since May to replace control cables supplied with forged safety certificates. Korean government have arrested dozens of officials and parts makers on bribery and forgery charges in their investigation of the scandal over false documents(Reuters, 2013. 9. 9). The responsibility clearly lies with Korea Hydro and Nuclear Power(KHNP), the state-run company that's responsible for the country's nuclear plants. Corruption at KHNP has led to nearly a quarter of the country's 23 nuclear reactors to stop. With few reactors online, concerns over a nationwide blackout loomed. The corruption scandal at KHNP started with mounting safety concerns. Investigators found thousands of substandard parts with fake warranties installed in reactors. Control cables that shut down reactors in the event of an emergency failed safety checks but were still installed in several nuclear reactors with forged safety certificates. The Korean media came to name the tightly-knit, insular nuclear community as "the nuclear mafia(The Korea Times, 2013. 9. 1)." For acquiring the normal state of safety and disaster management, especially during times of crises, it is necessary

to secure transparency and integrity related with operating procedure in disaster management.

International Cooperative Efforts As a global issue, disaster and emergency management is finding greater public support. The principal reason for the increased global interest is the unusual damage and number of recent catastrophes. Major disasters such as nuclear accidents, unprecedented typhoons and floods, global pandemic, climate change and global warming occurred frequently and the international media provided graphic accounts of the devastating situations. The human and economic costs of disaster are addressed internationally through the activities of UN, but concerns have been raised about the slow adoption of adequate mitigation programs(Waugh, 1998: 752). Because recent disasters are beyond the management capabilities of a nation, we need to establish the international collaborative system for coping with global disasters together. It is important for global society to remain sensitive to and defend the universal value of humankind, especially for protecting life, health, and human right. Failure to make international cooperation can put our basic notions of security, safety, and humanity at risk.

Tight Policy Networks Efficient disaster management, rather than mere response to disasters has received increased attention from policy participants such as volunteers. Policy participation might be described in terms of what the individual is expected to do, such as stop one activity and start another, intensify an activity, abandon an activity or change a belief(Schneider & Ingram, 1990: 85). Policy network can be defined as an assortment of interrelated policy actors interested in pursuing a matter of public policy. Policy actors are drawn to some robust, substantive event, and engage in social interaction for the purpose of sensemaking and, possibly, policy action. Decisions, actions, group conflict, and policy change take place as a consequence of network interactions. As they interact, network participants socially construct meaning and thereby reinforce one another's sense of the importance of the set of issues at hand. The network may lose its attraction as events and issues lose their salience. With loose boundaries, people can leave. If they stay, there must be some attraction(Fox & Miller, 1998: 1699, 1702). For example, by 25 April 2008 a total of 1.76 million people had taken part in the cleanup efforts on the contaminated coast, and 1.11 million of them were volunteers(Taean-gun, 2008). Because volunteer activities tended to be temporary and unorganized, this loose network structure caused some chaos and inefficiency, especially in the early stage. To fully utilize the resources in a policy network, a more permanent and tight system would be an option. It would help coordinate various participants and help them exchange information and cooperate closely even in the early stage of a disaster response(Lee & Park, 2008: 123). In addition to this, it is necessary that, for achieving the policy goal efficiently, multi-organizational relationships, which is comprised of subsets of



members within view a programme as their primary or an instrumentally important interest, have to be established(Lee, 2000). It is clear that the existing policy networks to activate the disaster management need to be tightened and strengthened.

Enhanced Professional Leadership Emergency management operations have little respect or credibility within the overall governmental system. The general impression is that the officials who work in this area are untrained and unprepared for their duties. This leads to the overall impression of an inept, ineffective emergency management system(Cook, 1989; Schneider, 1995: 38-39). In the relatively advanced disaster management systems for emergencies, too, important components are scarcely prepared at all. The subject of emergency management is complex for a variety of reasons. Obviously, there are many kinds of disasters. Rational handling of each kind requires different understandings about cause-effect nexuses, appropriate technology, planning approaches, changes of key actors and actions - all depending on whether it is before, during, or after the disaster. It is necessary to develop production functions for either known occupational specialties or required skill mixes - i.e., knowledges, skills, and abilities(Siegel, 1985: 107). As for increased professionalism, when a society is hit by a crisis, members of that society will look to their leaders to hear how they interpret the situation and what they plan to do to restore a state of normalcy(Boin, *et. al.,* 2013: 84). Especially, in the disaster-stricken situation, professional leadership equipped with knowledges, skills, and abilities is needed to manage disaster effectively.

Increased Social Capital in Disaster Management Social capital can defined as features, such as trust, norms and networks, that can improve the efficiency of society by facilitating coordinated actions. Social capital is productive, and can best be measured in its productive effects, such as through spontaneous cooperation(Putnam, 1993; Muetzelfeldt & Smith, 2002: 57). This emphasizes the importance of good neighbourliness, social trust and a high level of participation in a range of institutions, organizations and practices in civil society and the state(Fukuyama, 2001). Social capital may act as both an input to and an outcome of collaborative processes. Social capital facilitates the cooperation necessary for collective action, and thus can be seen as an input. Because it facilitates collaboration, social capital increases the likelihood that a collaborative effort will succeed. Emergency management requires coordination of a wide range of organizations and activities, both public and private. Without social capital, we can not perform disaster management activities effectively for protecting individual life and property, attaining organizational goal, and securing social value. It has become clear that social capital is needed for cooperative and effective disaster management and good governance for participation of citizens.

## Ⅴ. Conclusion

In Korea, natural and man-made disasters remain as major problems until now. In addition, there will be new disastrous events in Korea. As we have examined some cases in this paper, Korea will experience more and more unprecedented disasters in the future. In this paper, therefore, the research goal is to suggest some implications and measures to overcome the new disastrous events, including natural, man-made disasters, in the future. For achieving this goal, this paper reviewed some theoretical discussions such as definitions and characteristics of disaster, functions and strategies of disaster management, including mitigation, preparedness, response, and recovery. Furthermore, I analyzed four recent cases as some new disastrous events; typhoon Rusa in 2002, Hebei Spirit Oil Spill in 2007, Foot-and-Mouth Disease during 2010-2011, and Heat Wave and Power Crisis in 2013. After theoretical review and case analysis, I suggested five implications and measures to cope with the new disastrous events which may occur in the future. Those are as follows;

(1) It is necessary to secure transparency and integrity related with operating procedure in disaster management to acquire the normal state of safety and disaster management.

(2) We need to establish the international collaborative system for coping with global disasters together because disasters are beyond the management capabilities of a nation.

(3) The existing disaster management policy networks need to be tightened and strengthened to fully utilize the resources. It would help coordinate various participants and help them exchange information and cooperate closely even in the early stage of a disaster response.

(4) Professional leadership equipped with knowledges, skills, and abilities is needed to manage disaster effectively in the disaster-stricken situation.

(5) Social capital is needed for cooperative and effective disaster management and good governance for participation of citizens. We can do disaster management activities more effectively for protecting individual life and property, attaining organizational goal, and securing social value with increased social capital.

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