A Comparative Legal Study on East Asia Disaster Management Law and Policy: With Special Reference to Korea, Japan, and Taiwan's Experience

*Hsing-Hao Wu

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* Associate Professor, Department of Financial and Economic Law, National University of Kaohsiung, Taiwan; S.J.D, School of Law, Indiana University-Bloomington. The author welcomes comments and can be reached at hsiwu@nuk.edu.tw, Mail Address: 700, Kaohsiung University Rd., Nanzih District, Kaohsiung 811, Taiwan.

Ⅰ. Introduction

Due to long and ineffective global negotiation on reaching a binding agreement in terms of greenhouse gas reduction since the UNFCC COP17 held in Durban, the mitigation of global warming has encountered greatest challenges ever to achieve remarkable accomplishment in reducing greenhouse gas emission. However, the COP21 held in Paris in December 2015 has finally achieved notable breakthrough in reaching the Paris Agreement which aims at establishing a single, global, and binding force mechanism in reducing greenhouse gases and controlling the temperature risen threshold under 2°C. The rising of greenhouse gas in the atmosphere has thus resulted in increase of extreme weather events worldwide. For instance, millions of people who live in low latitude of coastal regions have suffered some of the worst effects of global warming, such as increasing frequency of typhoon, flood, debris flow, and sea levels rise.

Asia is deemed as one of the most vulnerable regions on earth to the impact of global warming. For those countries in North East Asia region, in particular Korea, Taiwan, and Japan are vulnerable to extreme climate events such as typhoons and heavy rains. Heavy rainfall frequently resulted in urban flood and landslides disaster in mountainous areas. For instances, the Morakot Typhoon stroked Taiwan on August, 8, 2009, has resulted in death of 461 people and damages of 3.3 billion U.S. dollars and thus triggered a unprecedented disaster reconstruction and rehabilitation regime to settle victims. Although most indigenous people were displaced victims that were compensated by government to relocate to newly built community funded by donation and government spending in the aftermath of Morakot Typhoon, Professor Yeh argued that the relocation policy may be inconsistent with operation guideline issued by the U.N. Interagency Standing Committee which deems the relocation of internally displaced people as final resort.[1] The heavy rainfall resulted in landslide in Pindong prefecture and destroyed a village and took more than five hundred lives overnight. In 2010, Typhoon Fanapi brought extreme rainfall that resulted in serious floods and severe property damage in southern Taiwan. In Korea, severe flood caused by record breaking heavy rainfall during the period of July 26-28, 2011 had left 50 people dead and 10 missing in Seoul and Gyeonggi region.

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1) *See* Jiunn-Rong Yeh, Climate Change Governance and Law 1, 287-289 (National Taiwan University Press 2015) (in Chinese); Anton Ming-Zhi Gao, *The Rule of Law and Climate Adaptation in the Asian Region The Special Reconstruction Regime after Extreme Weather from the 2009 Morakot Typhoon in Taiwan*, 9 Carbon & Climate L. Rev. 5, 9-16 (2015). (The note provides an overview and analysis of the special regime for reconstruction and disaster relief measures in the post Morakot Typhoon disaster.)

There was 99.5mm of rainfall per one hour and a total of 530mm of rainfall in Seoul and its surrounding areas; this is ranked the third highest hourly rate recorded in the country since 1907. In Japan, heavy rainfall of about 120mm per hour stroke Hiroshima Prefecture on August 20, 2014. Thus, the Hiroshima city government issued an advisory evacuation to over 160,000 residents in susceptible landslides areas. According to police authority, over 70 people were confirmed dead because the series of landslides that swept away residential housing. In short, the frequent occurrence of extreme weather events as a result of uncontrollable global warming effects will thus increase the risk of large-scale natural disasters in East Asia, such as severe flood, landslide, and drought.

In addition to flood disaster, great earthquakes occurred in East Asia region and brought great damages in recent years. On September 21, 1998, a major earthquake known as "921 Nantou Great Earthquakes" occurred in central Taiwan, which destroyed thousands of houses and killed nearly four thousand people. On March 11, 2011, the greatest M9.0 levels earthquake, which is the "Great Eastern Japan earthquake" stroked North East Japan and triggered tsunami waves that are 9 meters high. The tsunami hit the Fukushima Daiichi nuclear power plant and resulted in power outages. Due to unexpected natural disasters events and ineffective and confusing emergency response decision-making have finally resulted in the meltdown of nuclear reactors and caused radiation leakage. The Great East Japan earthquake has provided the country and the world an important lesson to revisit existing disaster responses and nuclear safety policy framework in the face of unpredictable disasters. It is well recognized in international setting that the newly established "Sendai Framework for Disaster Risk Reduction" (Sendai Framework) has highlighted that climate change will increase natural disaster risks worldwide, it thus requires nations, in particular for those most vulnerable countries or regions to climate change risks to adopt comprehensive disaster risk reduction measures that aims at achieving the goals of sustainability and disaster risk reduction.[2]

In short, in the face of global climate change, the cluster disasters frequently occur worldwide. The severity and the likelihood of occurrence for large-scale natural disasters will significantly increase as a result of extreme weather events. In this

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2) The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is a voluntary-based agreement which recognizes disaster risk reduction shall be made collaboratively among the State, local government, private sectors, and NGOs. The Sendai Framework was adopted at the Third UN World Conference of Disaster Risk Reduction held in Sendai, Japan, on March 18, which establishes seven targets and four priorities for active action in reducing disaster risks, *available at* http://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf (last visited Jan. 7, 2016).

regard, future policy-makers shall take into an account of various factors of natural disasters driven by climate change and develop innovative approach to disaster management. These factors include the severity, unpredictability, synergies, and frequency of natural disaster as a result of extreme weather events. In response to the severe natural disaster occurring in unpredictable places and time due to climate change, disaster management decision-makers shall carefully examine the competency of existing disaster law and policy framework focusing on the following key issues such as interrelationship between land use planning and disaster prevention, appropriation of available resources for sound disaster prevention planning, cross-sectors and coordination mechanism with relevant multi-stakeholders at all levels, emergency response efficiency, disaster rehabilitation and reconstruction, compensation and reparation mechanisms. This study will first discuss the new challenges for disaster management law and policy in the face of climate change. The recent law and policy development that aims at tackling large-scale disasters in Korea, Japan and Taiwan as a result of extreme weathers will then to be explored and analyzed. Finally, the article will provide some practical recommendations for policy-makers to develop appropriate disaster management approaches to address the issues concerning large-scale natural disasters as a result of climate change.

Ⅱ. Disaster Management in the face of Climate Change

A. Climate Change Poses Great Challenges to Disaster Management

In the face of global climate change, cluster disasters occur frequently worldwide. The East Japan earthquake provides the world an important lesson to revisit existing disaster responses and nuclear safety policy framework in the face of unpredictable disasters due to climate change. Both severity and likelihood of occurrence for natural disasters will significantly increase because of the climate change. The climate change will not only increase the frequency of natural disasters, it also imposes the unpredictability of occurrence of large-scale disasters in terms of time, place, and degree of damages. In this regard, future policymakers for disaster management shall take into account various factors of natural disaster caused by climate change. They are severance, unpredictability, synergies, and frequency of occurrence of natural disasters resulted from extreme weather events. In response to the severe natural disaster occurring in unpredictable places and time, disaster management decision makers shall carefully examine the competency of existing disaster law and policy framework focusing on the following key issues: the degree of integration between the land use management and disaster prevention, appropriation

of available resources for implementing sound disaster risk reduction measures, coordination mechanism for disaster management authorities at all levels, emergency response efficiency, sustainable disaster rehabilitation and reconstruction policy and victims compensation mechanisms. Once the incompetence of existing disaster management framework to prevent climate change risks has been identified, adjustment and revision of relevant law and policy shall be made to support the development of sound disaster prevention approaches in response to climate risks in timely manner. For instance, the existing environmental impact assessment law shall be amended to incorporate climate change vulnerability analysis as one of important screening instruments in identifying the environmental and socio-economic impacts as a result of potential development project. Moreover, major construction or development projects shall propose their disaster prevention planning that are required by amended regional planning, urban planning and construction related law and regulation.

B. The Necessity of Integrating Disaster Management Approaches under Climate Change Adaptation Framework

Ever since the establishment the international cooperative to tackle climate change issues, there are two tracks of responsive mechanism that aims at reducing this global challenge. One is the mitigation of greenhouse gas emission that results in global warming effects and the other is the development of climate change adaptation measures against the adverse effects resulting from climate change. The United Nation Framework Convention Climate Change (UNFCCC) defines the term climate change adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities."[3] While implementing adaptation approaches to climate change policy objectives, policymakers are responsible for seeking appropriate approaches to reduce the vulnerability of social and biological systems to climate change effects in certain regions. This adaptation has gained its growing importance in the context of international efforts in addressing global warming and its impacts to social and ecological systems.

The Cancun Adaptation Framework developed by UNFCCC sixteenth conference of contracting parties, further emphasizes that adaptation must be addressed with the same priority as mitigation and requires appropriate institutional arrangements to enhance the adaptation actions.[4] An integrated, comprehensive, and

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3) UNFCCC, *Glossary of climate change acronyms*, *available at* http://unfccc.int/essential_background/glossary/items/3666.php (last visited Jan. 8, 2016)

operational adaptation initiative shall comprise of significant components followed by various stages. First, states shall conduct in-depth scientific analysis that aims at identifying potential vulnerable regions and specific groups of populations to climate change and assessing potential environmental and socio-economic impacts as a result of climate change.

At the planning stage, it is vital for policy makers at various government levels to incorporate climate change adaptation measures into relevant social, economic and environmental policies. Finally, policy makers shall develop comprehensive rules in implementing the proposed action programs to build resilience of socio-economic and ecological systems. The success of climate risk reduction measures, however, depends on the efficiency of follow-up monitoring and dynamitic improvement of such climate change risk reduction measures.[5]

In international setting, the Cancun Framework has called for the active participation of all relevant stakeholders, such as international, regional and national organizations, both in public and private sectors to support to implement adaptation actions at all levels. Because many disaster risk reduction measures in response to climate change involve flood and landslides prevention construction or land use planning and regional and urban planning, the development of adaptation measures shall also take into account disaster prevention and disaster risk reduction considerations. In so doing, the development of disaster prevention measures shall be incorporated in the comprehensive climate change adaptation plan at various levels and also in existing land use and urban planning. In recognizing the strong relationship between disaster management and land use planning, relevant government authorities should propose climate change adaptation plan in a coherent fashion by taking into account the interrelationship between the vulnerable analysis, land use control, and disaster management policy.[6]

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4) UNFCCC Decision1/CP.16, Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010, at 3 (distributed on Mar. 15, 2011); *available at* http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf (last visited Jan. 8, 2016)

5) *Id.*, at 5-6.

6) Gavin Smith, Dylan Sandler, Mikey Goralnik, Assessing State Policy Linking Disaster Recovery, *Smart Growth, and Resilience in Vermont Following Tropical Storm Irene*, 15 Vt. J. Envtl. L. 66, 100-102 (2013); Philip Berke, Gavin Smith & Ward Lyles, *Planning for Resiliency: Evaluation of State Hazard Mitigation Plans Under the Disaster Mitigation Act*, 13 Natural Hazards Rev. 139, 143-45 (2012) (describing the potential for integrating climate change adaptation, and land use policies under Federal, State, and community hazard mitigating plan in U.S.).

Ⅲ. The Necessity of Amending Existing Disaster Law and Policy in Response to Large-Scale Natural Disasters in Relation to Climate Change: Case Study on Japan, Korea, and Taiwan's Experience

There is a great necessity to develop a comprehensive disaster prevention, climate risks reduction law and policy framework in response to the extreme weather events. Because Japan, Korea, and Taiwan have faced similar socio-economic impacts as a result from climate change, their rich experience in establishing sound and comprehensive disaster management law and policy framework and innovative approaches in response to large-scale natural disasters would provide a valuable lesson and model legislation for other countries that are small/medium sized, highly populated, and vulnerable to multiple natural disasters as a result of extreme weather events.

A. Japan's Experience in Developing Disaster Prevention and Risk Reduction Law and Policy the aftermath of Great East Japan Earthquake

Japan is well known for its comprehensive legal framework concerning the disaster management. Other East Asian countries such as Taiwan and Korea has also suffered and slowly recovered from numerous natural disasters like Japan, such as earthquakes, typhoons, and landslides. In response to numerous and compound natural disasters, these countries have established comprehensive legal framework in addressing disaster management issues. For instance, Japan has adopted strict standards for earthquake proof building and which have been proved successfully in reducing human life loss and property damages due to the Great East Japan Earthquake. According to Japanese National Police Administration's statistical analysis, 92% of death of during Great East Japan Earthquake was caused by drowning. Because the earthquake indirectly triggered tsunami and Fukushima nuclear disaster, nearly forty thousand people were evacuated and displaced in refugee shelters. The radiation leakage was so severe that the implementation of reconstruction project near the Fukushima Daiichi was nearly impossible. In addition, the radiation pollution spread throughout the nation, even across borders, because of the windblown and radioactive contamination found in the food chain. According to Cabinet Office of Japan's estimation, the financial cost of damage resulting from the earthquake could reach 360billion dollars.[7]

Although the United States and EU disaster prevention and relief law do not have significant amendments since the East Japan earthquake, there are certain measures to be taken such as strengthening capacity to respond to large-scale disasters and conducting evaluation and stress tests for nuclear power plants in response to the tsunami or earthquake.[8] On the other hand, the Japanese government has moved forward for law and policy development in response to large-scale disaster such as East Japan earthquake rehabilitation related special regulations, Basic Act for Tsunami Countermeasure Act, amendment to Disaster Countermeasure Basic Act, and amendment to regional disaster prevention plan.[9] The core aims of such legal development are to strengthen the capacity on communications, efficiency of rescue operations, and establishment of wide area disaster prevention and relief networks in response to catastrophe. In implementation, the Japanese government has proposed new policy framework and approaches to specifically enhance catastrophe preparedness. Moreover, the Japanese Parliament passed numerous amendments to Disaster Countermeasure Basic Act to provide the legal foundation shortly after the East Japan earthquake. The main feature of amendment is to achieve three major objectives aiming at coping large-scale disasters. First, the amendment strengthens the capacity of emergency response for wide areas. Second, the amendment strengthens the capacity of disaster relief and displaced refugee assistance. Third, the amendment enhances disaster prevention capacity to prevent or mitigate the damage as a result of catastrophe.[10] The following article will highlight and discuss the main features of the legal development since the Great East Japan Earthquake in 2011.

1. Strengthening the emergency response capacity in wide-areas

During the early period when the Great East Japan earthquake occurred, telecommunication between the local authority and disaster command office has

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7) See BBC News, Japan quake: Loss and recovery in numbers, Mar. 11, 2012, *available at*, http://www.bbc.com/news/world-asia-17219008 (last visited on Jan. 16, 2016).

8) *See* Charles Miller et al., *Recommendations for Enhancing Reactor Safety in the 21st Century*, at vii-viii (2011), *available at* http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf (last visited Jan. 17, 2016).

9) *See generally*, Japan National Institute for Land and Infrastructure Management, *Initiative by the National Institute for Land and Infrastructure Management in Response to 2011 Great East Japan Earthquake, available at* http://www.nilim.go.jp/english/earthquake/Summary%20-%20East%20Japan%20Great%20Earthquake%20Disaster.pdf (last visited Jan. 17, 2016).

10) Prime Minister Noda to the 180th Session for the Diet, *available at* http://www.kantei.go.jp/foreign/noda/statement/201201/24siseihousin_e.html (last visited Jan. 17, 2016).

been terminated due to severe damage of telecommunication infrastructure. In order to enhance wide-area's local emergency response capacity to handle large-scale disasters, amendment to Chapter Third of Disaster Management Plan of Disaster Countermeasure Basic Act (DCBA) has been made to enhance the basic infrastructure and efficiency of disaster early warning and information transmission system.[11] The amendment authorizes national government to support local authorities in enhancing disaster response capacity. Moreover, the establishment of coordinated framework that comprises of governments at all leva land NGOs as well as the greater enhancement of wide-area's first –aid emergency response capacity are highlighted. In doing so, the amendment includes the expansion of scope of the national government's authority to take emergency disaster response actions that used to be vested in local government's exclusive authority. The amendment also requires the inclusion of State's assistance measures necessary to be adopted in the context of regional disaster prevention plan.[12]

2. Strengthening the capacity of disaster relief and displaced citizen

The East Japan earthquake has resulted in a great amount of displaced citizens. The return date for displaced citizens due to radiation pollution from the Fukushinma nuclear accident remains indefinite. Thus, the DCBA adds Chapter Seventh on "Shelter" that specifically addresses the issues for providing prompt shelters for displaced citizens as a result of large-scale disasters. The amendment authorizes the establishment of effective distribution system to provide necessity to a displaced citizen. It further authorizes the creation of designated regional shelter center providing temporary housing for cross administrative region's refugee.[13] Recognizing the fact that many victims killed by the earthquake and tsunami were senior citizens, the amendment requires local authorities to investigate and prepare for name lists illustrating disable or senior citizen that are in need of special attention when disaster occurs.[14]

3. Enhancing Local Authority's disaster prevention capacity

The amendment specifies the importance of disaster prevention to mitigate the degree of damages as result of catastrophe. First, the amendment strengthens disaster prevention training and education to help people upgrade their self-help ability to

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11) *See* Japan Disaster Countermeasure Basic Act, art. 51.

12) *See id.*, art. 5.

13) *See id*., art. 49-4.

14) *See id*., art. 49-10.

prevent or mitigate disaster damages. Second, the amendment expands the members of disaster countermeasure organization committee in prefectures (city, township and village) to include experts designated by the Governor of the prefectures (city, township and village).[15] Third, the amendment modifies the model in developing regional disaster management plan from "up-to bottom" to "bottom-up," the regional disaster management plan will thus to be proposed by residents and submitted to government for final approval.[16] The role of government under the amendment has been thus to be changed to develop relevant guidelines on regional disaster prevention plan and to create a model disaster relief plan that helps local residents to prepare for their own proposal of local disaster prevention plan.

4. Necessity of Enhancing Local Disaster Response Capacity: Case Study on Kumamoto Prefecture's Review on 2012 North Kyushu Flood

Kumamoto Prefecture is in the center of Kyushu, which is one of the four major islands of the Japan. Kumamoto Prefecture is notable of Mt. Aso, which is one of the largest active volcanoes located in the east of Kumamoto Prefecture. The Kumamoto is also renowned for its rich historical heritage, agricultural products and world-class quality underground water hidden beneath layers of rocks and sediments of Mount Aso. The underground water is also the primary drinking water supply source to Kumamoto Prefecture's 14 municipalities.[17] However, Kumamoto has suffered from local impacts as a result of climate change. The urbanization along with changing patterns of rainfall has gradually dried out the groundwater. In addition, the extreme weather events have resulted in natural disasters and caused great damages in Kumamoto Prefecture. For instance, a record breaking torrential rainfall triggered serious flood and landslides in North Kyushu on July 12, 2012. The estimated highest rainfall is over 120mm per hour and 549.5mm per day near the Aso region.[18] The widespread flood and landslide caused 23 deaths, 2 people missing, and great damages to 4,453 public and residential buildings in various administrative regions such as Kumamoto City and Aso city. The spread of flood caused the local government

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15) *See id*., art. 15.

16) *See id*., art. 42.

17) ICLEI, *Kumamoto's 'Project to flood' wins UN-Water Award*, *available at* http://www.iclei.org/cn/details/article/kumamotos-project-to-flood-wins-un-water-award.html (last visited Jan. 19, 2016).

18) *See* Kumamoto Prefecture Office of Disaster Management, The Large-Scale Flood Disaster Response and Investigation of Kumamoto PrefecturE, Final Report, at 4 (2012) (in Japanese).

to issue an advisory evacuation to 40,000 residents.[19] As for disaster management framework in Kumamoto, the Kumamoto Prefecture had established a comprehensive typhoon and flood disaster management plan in place and which consists of several subordinated plans concerning disaster prevention, emergency response, and disaster rehabilitation and reconstruction. Each subordinated plans illustrates institutional arrangement, detailed operational procedure, and coordinated mechanism among various disaster response units. The main feature of the Kumamoto's flood disaster management plan is the clear identification of certain agencies' and individual's responsible task, check list, and operational guideline for the coordinated framework.

Although the disaster management plan provides an ideal model in terms of disaster preparedness and emergency response, there has been a tradition in Japanese local government to conduct in-depth examination and investigation after a certain large-scale disaster occurs to identify flaws and to further develop countermeasures. The North Kyushu flood which occurred in 2012 was not an exception. The investigation report of the 2012 flood developed by the Kumamoto Prefecture Disaster Management Office has observed several drawbacks of the existing disaster management framework and gave suggestions for improvement. Several important self-examination and suggestive responses will be discussed in the following article.

a. The effectiveness of disaster information transmission is relevantly slow

Disaster information transmission and broadcasting is very important for disaster affected residents for timely evacuation and reduction of property damages. Although the Kumamoto Comprehensive Disaster Information Network and the Disaster Administrative Wireless Transmission Network both operated functionally during the flood, still lack of disaster awareness and competent skills to operate disaster information transmission system existed among the public servants, self-disaster organization and citizens. The lack of awareness had eventually resulted in slow transmission of evacuation advisory by special disaster countermeasure headquarters. Thus, the investigation report proposes that various disaster and implied disaster information approaches should be adopted to enhance the disaster information transmission. These disaster information transmission approaches may include disaster warning e-mails and text message services, home visit by local disaster prevention organizations, and phone calls.[20] Moreover, intensive training programs should be implemented to train citizen and ordinary public servant in addition to the disaster management responsible public servants.[21]

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19) *Id*., at 3.

20) *Id.*, at 68-69.

21) *Id*., at 70.

b. The Ineffective Emergency Evacuation Due to Difficult Conditions

Since the torrential rain fell in the midnight of July 12, it was very difficult to evacuate people in the region in timely manner the rain thus resulted in large number of casualties. Therefore, the investigation report proposes cities and towns to plan for speedy evacuation route and promptly methods to inform residents with respect to issuing of advisory evacuation. According to the report, local authorities are advised to plan and undertake coordinated disaster emergency evacuation drills and also test the effectiveness of newly planned evacuation route.[22] In addition, disaster responsible departments of local authorities should develop certain guideline to determine whether to issue preventive (early) evacuation at daytime based on weather forecast's estimated rainfall accumulation amount.

c. The Refugee Shelter Needs Prior Inspection of Safety and Competence for Communication and Storage of Rescue Resources

The investigation report finds that some refugee shelters were temporary opened to settle evacuated people that have not been designated by regional disaster management plan.[23] However, these shelters lack prior safety inspections and sufficient equipment such as communication system, emergency electricity generators, and temporary toilets. Therefore, investigation reports proposes that new shelters consistent with strict earthquake-proof standards shall be identified and designated on the basis of flood and landslide hazard mapping. The shelters designated for flood and landslides shall be equipped with standard equipment and necessary rescue resources in order to provide refugee first aid needs and comforts.[24]

B. The Growing Importance of Enhancing Local Climate Change Adaptive Capacity and Its Financial Mechanism

1. The Background

In order to response to slow progress in mitigating global warming at national government level, some local governments have taken the lead in developing local initiatives to reduce the greenhouse gases. These local authorities have adopted various greenhouse gas reduction and climate risk reduction approaches based on a certain city or region's size of population, energy consumption patterns, infrastructure,

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22) *Id*.

23) *Id*., at 75.

24) *Id*., at 76-77.

and industrial structure characteristics. It is also critical that the development of adaptation measures shall take into account a certain region's geographic, climate, and historical records of natural disaster in order to meet local residents' needs. In other words, the progress of adaptation measures is eventually to be measured at local level. The key for a city or a region to survive when large-scale natural disasters occur as a result of extreme weather events relies on enhancement of local community's adaptive capacity and resilience building. In this regard, local authority is the ideal entity to develop climate change adaptation plans and conduct local assessments in identifying certain community's greatest vulnerability to climate change and appropriate disaster risk reduction measures.

The national government, on the other hand, should undertake its primary mission dealing with climate change adaptation in terms of incorporating adaptation measures into a sustainable long-term policy and law framework at the national level. In implementation, the national government should first develop national guidelines for local government to develop their climate change adaptation plans. The national government also should prioritize financial supports the implementation of climate change adaptation plans applied by various local governments. Finally, the national government should be responsible for providing technical assistance to the local governments in developing local vulnerability and climate risk assessment. It is also critical that weather agency at central government as well as research institutes funded by the state should provide relevant data and statistics for local government to develop community-based adaptation and disaster risk reduction measures.

2. Local Initiative in Establishing Climate Change Adaptation Financial Mechanism: Kaohsiung City's Experience

Kaohsiung City is one of the five special municipalities in Taiwan and it is located in the southwestern part of Taiwan. It is by area the largest municipality (2,947.62 km^2), and the second most populous city (by urban area) with the total population of approximately 2.77 million. Since the Kaohsiung city has merged with the Kaohsiung County on December 25, 2012, the Greater Kaohsiung encompasses various kinds of natural landscapes and artificial facilities including seashore, carriage harbors, heavy industrial parks, mountainous areas, dense residential buildings, and multistory commercial estates. The diversity of Kaohsiung city's geographic features creates the complexity for city governance in terms of climate change adaptation and disaster prevention.

In addition, Kaohsiung city is classified as tropical monsoon climate, with the estimated average rainfall per year as 2549.4mm. The climate change has indeed resulted in temperature rise in Kaohsiung. The temperature has raised 0.8℃ in last 100 years, which is higher than world average statistics (0.74℃). In accordance to

Taiwan Central Weather Bureau statistics, Kaohsiung suffers an average of three to four typhoons annually normally during the period from July to September. In recent years, increasing frequency of extreme weather events including typhoons had brought heavy rainfalls in Kaohsiung city. For instances, Typhoon Morakot in 2009 and typhoon Fanapi in 2010 had both brought precipitations exceeding 500mm in a single day. The record breaking rainfall resulted in serious landslides that killed 491 lives in mountainous area, and also caused urban flooding disasters in Ganshan and Nantsu district. Most recently, Kaohsiung has suffered from heavy rainfalls due to the moist air during the period from August 12 to August 14 in 2014. The estimated rainfall per day was over 350mm. The torrential rainfall flooded Kaohsiung city and forced the closure of schools and government offices in northern Kaohsiung city.

It is notable that these extreme weather events have proved that the Kaohsiung city is one of the most vulnerable metropolises to climate change. Building a city resilient to climate change has thus become one of the primary responsibilities for Kaohsiung city governance in the years to come. The city's adaptation to climate change may take place by increasing investment on building climate risks resilience infrastructure such as the enhancement of urban drainage system and embankment. Meanwhile, the software installation such as vulnerability assessment, disaster early warning system and disaster information communication network is also critical. Any investment on the implementation of climate change adaptation plans, however, comes with great costs. Although the national government should be responsible for most of the costs in enhancing climate resilient actions to local impacts resulting from extreme weather events, limited resources and prioritization of financial assistance from the national government may delay timely response to the climate change related risks. In addition, Kaohsiung city is the largest heavy industry city and thus produce the most greenhouse gas emission among all local authorities in Taiwan. In accordance to the city's statistics, the total CO_2 emission is 63,624,500 tons and the industry sector alone contributed 81.54% of total CO_2 emission.

Responding to climate change mitigation and establishment of a resilience city to climate change, Kaohsiung city has proposed local ordinances bill allowing the city government to levy climate change adaptation fees from certain industry. In September 2011, The Kaohsiung city government first introduced the proposals namely "Kaohsiung City Climate Change Adaptation Fees Levy Ordinance Bill" and "Kaohsiung City Climate Change Adaptation Fund Management Ordinance Bill" to the City Council. The concept of this innovative financial mechanism is to levy climate change adaptation fee from industries based on their greenhouse gas emissions. The proposed Ordinance stipulated that certain industry's CO_2 emission exceeding 10,000 tons has legal responsibility to pay for climate change adaptation fees. The collected climate change adaptation fees in addition to the funding from

air pollution discharge fees required by the national Air Pollution Control Act will become the primary financial sources of newly established Kaohsiung City Climate Change Adaptation Fund. The Fund will be served as Kaohsiung city's financial mechanism in funding the climate change adaptation assessment and implementation programs as well as subsidies to local industry applying for implementation of industry-based GHGs emission reduction programs approved by local government.

However, the Ordinances Bill is now under review of the City Council. Some city councilors, scholars, and Ministry of Treasury have already expressed their concerns in terms of the legitimacy for levying carbon-based adaptation fees. They argue that carbon-based adaptation fees do not change its nature as carbon-tax because GHGs emission is the subject matter that flows across various administrative regions. The levy of GHGs emission-based tax (fee) is thus the privilege for national government required by law. Although the ultimate fate of Kaohsiung's efforts in establishing a financial mechanism to support local climate change adaptation actions is still unknown, Kaohsiung's experience has nevertheless provided an innovative funding model to undertake climate change mitigation as well as adaptation actions at local government level.

C. Establishing a Single and Coordinated Institutional Framework in Response to Large-Scale Disaster: Case Study of Recent Korea's Institutional Reform

1. Background

Because the climate change may induce the occurrence of extreme weather events and thus result in large-scale disasters in some vulnerable regions, government may need proper institutional framework to effectively respond to large-scale natural disasters. The discussion of establishing proper institutional framework in response to large-scale disaster begins with the discussion of the nature of large-scale disaster. The features of large-scale disaster could be categorized as below: (1) large number of refugees: large numbers of people need to be evacuated and relocated in temporary shelters; (2) large number of casualties: large numbers of people are killed directly or indirectly by natural disasters; (3) great economic loss: great properties damages and personal liability reach high level in a single event causing long-term effects, since reconstruction for disaster affected areas requires great amount of financial and human resources thus it creates long-term negative impacts to social security and economic growth; and (4) the disaster results in long-term public health and environmental concerns, such as disposal for large number of wastes or disease after flood.

Historically, Korea has not suffered severe natural disasters such as earthquakes or hurricanes in comparison with those countries in East Asia like Japan, Taiwan or Philippines. Recently, several extreme weather events have impacted Korea and resulted in large-scale disasters bringing great challenges to the Korean government. For instance, the severe flood caused by historical record breaking heavy rainfall during the period of July 26-28, 2011 had killed 49 people and left 10 missing in the Seoul and Gyeonggi region. During that period rain fell 99.5mm per hour and total of 530mm of rain fell in Seoul and its surrounding areas. After this unprecedented flood disaster in Korea, the Korean government was called upon to examine the existing legal and institutional framework in relation to disaster management; and whether it is appropriate to tackle large-scale natural disasters under the implication of climate change promptly.

2. The Establishment of Ministry of Public Safety and Security in Korea

The institutional reform has been called upon to implementation in repose to a large-scale disaster incident. In November 19, 2014, the Ministry of Public Safety and Security was established by reorganizing the existing disaster prevention and response government organization in response to the Sewol Ferry incident. The sinking of Sewol occurred in the morning of 16, April 2014 en route from Incheon to Jeju. The Sewol carried 476 people, mostly high school students. The disaster caused the death of more than 300 passengers and 2 rescue staffs. The Korean government was heavily criticized by victim's families and general public for slow and poorly coordinated rescue operations.[25] After in-depth discussion and evaluation, Park Geun Hye, the President of Korea, calls for newest institutional reform in the cabinet level to establish a comprehensive and institutional framework that aims at integrating existing disaster emergency response authorities under a single and comprehensive institutional framework.[26] The proposal of this institutional reform plan was shortly endorsed by the National Assembly. The revised bill for the National Government Organization Act passed by the National Assembly has officially established the Ministry of Public Safety and Security since November 19,

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25) *See* Jeong Hunny, *Three-pronged effort to investigate Sewol,* The Korea Herald, Aug. 12, 2014, *available at* http://www.koreaherald.com/view.php?ud=20140812000978 (last visited Feb. 2, 2016); BBC News, Aug. 12, 2014, *Sewol trial: South Korea coast guard was 'ill-equipped*, , *available at* http://www.bbc.com/news/world-asia-28752727 (last visited Feb. 2, 2016).

26) *See South Korea launches new safety agency after criticism over handling of April ferry disaster,* Fox New, Nov. 18, 2014, *available at* http://www.foxnews.com/world/2014/11/18/south-korea-launches-new-safety-agency-after-criticism-over-handling-april.html

2014.

In implementing the newly promulgated legislation, National Emergency Management Agency, Korea Coast Guard, National Fire Service, and a Public Safety branch of Ministry of Security and Public Administration have been merged into newly established Ministry to prevent and efficiently respond to natural disasters as well as public safety crises. Ministry of Public Safety and Security is a Cabinet organization directly supervised by the Prime Minister.[27] The Ministry first incorporates former National Disaster Management Agency to implement disaster risk reduction measures that tackle all kinds of disasters notwithstanding man-made or natural disasters throughout the entire disaster prevention and emergency response and disaster recovery stages. Ministry of Public Safety and Security also incorporates public safety management, civil defense, and central fire service.[28] The reorganization of this newly established Ministry is a reasonable and far-sighted act to integrate public safety and security authority under a single command system because natural disasters would inevitably involve public security issues. For example, in the aftermath of Hurricane Katrina, New Orleans City requested National Guard to step in to restore the city's security disorder caused by insufficient local police powers.[29] Moreover, the Japanese National Security Council discussed the necessity for taking certain measures in response to national defense risks during the Great East Japan Earthquake while most of manpower's of Japanese Self-Defense Forces was sent to disaster relief missions.[30] It is also notable that the recent institutional reform of Korea not only performs parallel integration that tackle all kinds of disasters and public safety concerns but also performs vertical integration of the disaster management office, national police, and fire service agency under this umbrella institutional framework.

The vertical integration is expected to address certain institutional fragmentation issues that have criticized in many jurisdictions such as in Japan and Taiwan.

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27) *See* Ministry of Public Safety and Security, *Main Business of Ministry of Public Safety and Security* , *available at* http://www.mpss.go.kr/en/mpss/business/ (last visited Jan. 21, 2016).

28) The organization chart of Ministry of Safety and Security, *see* Figure 2.

29) *See* Lipton Eric and Schmitt Eric, New York Times, Sep. 9, 2005, *Political Issues Snarled Plans for Troop Aid*, , *available at* http://www.nytimes.com/2005/09/09/us/nationalspecial/political-issues-snarled-plans-for-troop-aid.html (last visited Jan. 22, 2016).

30) More than 100,700 Japan Self-Defense members have deployed to disaster relief missions during the peak period of Great East Japan Earthquake. Hidehiro Hamaya & Kazuo Matsuura eds., Disaster and Protection of Citizens 1, 70 (Swara Press.,2012).(in Japanese)

Therefore, the institutional reform of Korean government deserves a credit for trying to actively tackle those longstanding problems of institutional fragmentation in relation to disaster management. In addition, the Korean institutional reform also aims at solving other institutional arrangement drawbacks such as overlapping authorizations among various government branches in relation to disaster relief, and lack of full compliance or cooperation between the disaster management command tower and frontline units.[31]

3. The Analysis of Korea's Institutional Reform Experience

Similar to Korea, Taiwan and Japan adopted a similar institutional approach for establishing ad hoc Committee type of disaster relief commanding post at both national and local government level to serve as emergency response commanding tower before the certain degree of disaster required by laws it met. The Committee Members at the cabinet level are comprised with head of responsible disaster relief Ministry or entities and chaired by the President or the Prime Minister.[32] The main aim for establishing the ad hoc Committee is to make final decision instantly instead of bottom-to-up reporting system. The decision-making, however, may need strong information collecting and analysis and expert policy-making suggestions from bureaucratic staffs or experts to assist the Committee in making promptly emergency response command. In this regard, lack of integration of disaster prevention and emergency rescue authorities under single and comprehensive institution may create gaps between the emergency decision-making and strong data collection and analysis support from relevant bureaucratic institutions. The ad hoc Committee operates on a temporarily basis therefore, it may not be fully aware of the long-term disaster plans made by disaster management responsible institutions. Thus, the ad hoc Committee is incompetent to serve as the commanding tower for disaster rescue operations. Since the institutional framework of the Korean Ministry of Safety and Security integrates disaster prevention planning and emergency responsive decision-making under the single institutional framework, the Minister will be more experience and competent to serve as commanding tower when large-scale disaster occurs.

However, there are certain issues that need to be examined for future operation of the new institutional framework. First, on one hand, the new institutional framework that integrates public safety and disaster management authorities may enhance the coordinated operation in terms of emergency response. But, on the other hand, the

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31) *See* Comparative Chart for Taiwan, Japan, and Korea's institutional framework.

32) *See* Japan Disaster Countermeasure Basic Act, art. 11.

enlargement of the new institution that deals with disaster management and public security missions, if not enhancing the sufficient resources, could dilute the disaster management capacity of the institution. The argument is based on the criticism of the integration of U.S. Federal Emergency Management Agency (FEMA) under the Department of Homeland Security in the aftermath of 911 terrorist attack incidents. The reorganization of FEMA has established National Incident Management System that not only deals with all kinds of disasters but also the prevention of threats imposed by potential terrorist attack.[33] Second, even though the Korean Ministry of Safety and Security integrates various government institutions under a single commanding system, it has to be proven in the future whether the new institute obtains sufficient resources and well trained manpower to respond to all kinds of disasters; instead of simply reorganizing the already existing institutions within the national government.

Ⅳ. Recommendations for Developing Sound Disaster Management Law and Policy in the Face of Climate Change

In the face of global climate change, disaster management law and policy shall adopt innovative and comprehensive approach to enhance the capacity and institutional response to the uncertain patterns of natural disasters and the degree of harm as their results. East Asia has been deemed as one of the most vulnerable regions to climate change. Accordingly, the disaster management experience in the East Asian countries also provides valuable lessons through actual disaster responsive experience and law and policy reform in the aftermath of certain large-scale disasters.

By examining and analyzing the legal and policy development in Korea, Japan, and Taiwan as discussed earlier, this article provides the following recommendations to the disaster management policymakers to develop integrated and promptly legal responses to climate change related disasters.

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33) *See* Federal Emergency Management Agency (FEMA), *National Incident Management System*, *available at* https://www.fema.gov/national-incident-management-system (last visited Jan. 27, 2016); *See* William L. Waugh Jr., *Shelter from the Storm: Repairing the National Emergency Management System after Hurricane Katrina: Quick Read*, 604 Annuals of American Academy 288, 292-293 (2006), *available at* http://cretscmhd.psych.ucla.edu/nola/volunteer/FoundationReports/Synopsis.pdf(last visited Jan. 3, 2016).

A. The integration of climate change adaptation, land use, and disaster management policy

In response to climate change that triggers large-scale natural disasters, there is a great necessity for policy-makers to propose legal and policy reform to establish a coherent climate change adaptation policy framework. The integrated policy framework shall integrate cross-sectors decision-making with respect to building resilience via urban and regional planning, and developing disaster prevention approaches to mitigate potential disaster risks das a result of extreme weather events. Since the U.N. Cancun Adaptation Framework requires contracting parties to develop a national climate change adaptation plan.plan. many countries have established national climate change adaptation plan based on U.N. Cancun Adaptation Framework model.

The adaptation plan acts as an umbrella policy guiding framework that gathers relevant authorities to develop coherent and sound land use policy based on climate change analysis, and at the same time achieving the objective of implementing disaster prevention measures. In response to Sendai Framework's guideing principle for developing and strengthening relevant policies, plans, practices and mechanisms need to aim at coherence across sustainable development, food security, health and safety, climate change and variability; policymakers shall seek to integrate adaptation measures, land use and disaster risk reduction policy.[34] In practice, a comprehensive institutional framework should be estabished that facilitates cross-sectors' policy-makers to discuss and to develop climate change adaptation, land use and disaster prevention policy in a coordinated fashion. As discussed earlier, Korea's experience in establishing a permanent, comprehensive institutional framework at high governmental level has demonstrated potential to perform such institutional function to integrate climate change adaptation, land use, and disaster prevention policy-making under a coordinate decision-making body. It is notable that developing transparent planning procedure and accountable scientific evidence is vital in building a strong link between climate change adaptation, land use and disaster prevention. The scientific basis for developing an integrated approach to address climate risks is to use vulnerability analysis as an important policy instrument. Analyzing and identifying disaster-prone areas and residents that are most vulnerable to extreme weathers events could provide policy-makers sound scientific basis to develop land use restriction planning and to determine appropriate climate related risk reduction measures that meet the objectives of protecting citizen's lives and property rights. In practice, urban planning and

34) See Sendai Framework, *supra* note 3, at 13.

zoning law should be amended to require major construction or large-scale development projects. For those land developers who apply for the approval of construction permit, they will be required by law to propose their disaster risk reduction measures in compliance with the local and regional climate change adaptation plan as well as the disaster prevention plan.[35]

B. Institutional Reform Aims at Strengthening Collaboration between National Government, Local Authorities, NGOs, and Armed Forces

Learning from past disaster experience, the key to prompt emergency response lies on the efficiency of coordinated approach adopted by all relevant disaster responsible authorities. As many have observed in Great East Japan Earthquake and Morakot Typhoon, the early success of emergency response to large-scale and unexpected natural disasters depends heavily on the local authorities and their first-aid capacity. On the other hand, the National government plays it role as a commanding tower and coordinators to collect and redistribute necessary disaster rescue as well as recovery resources. Learning from the 2012 North Kyushu flood, the local authority is responsible for determine the timing of evacuation and implementing order. Thus, it is critical to enhance local authority's quality and expertise of emergency decision-making and disaster response readiness. Japanese legal development in the aftermath of Great East Japan, as mentioned earlier, has provided a lesson for imposing heavier legal responsibility to national government to implement disaster prevention measures and to provide appropriate support to local authority including technical and financial supports. Moreover, national government should actively provide training programs to civil servant and volunteers responsible or capable for emergency response and disaster relief operations.[36] Many large-scale disasters have been supported heavily by NGOs in terms of gathering and distributing mass resources to rescue teams and displaced citizen. The volunteer-based firefighter corps or rescue teams in Japan, Korea, and Taiwan has

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35) Philip R. Berke et al., *Integrating Hazard Mitigation into New Urban and Conventional Developments*, 28 J. Plan Educ & Research 441, 450 (2009); National Acedemy of Science, Disaster Resilience: A National Imperative R8 (2012); Gavin Smith, Dylan Sandler, Mikey Goralnik, *Assessing State Policy Linking Disaster Recovery, Smart Growth, and Resilience in Vermont Following Tropical Storm Irene.*, 15 Vt. J. Envtl. L. 66, 101-2 (2013).

36) The National Incident Management System established by FEMA has provided intensive training programs to state and local officials and other stakeholders directly involve with emergency response operations.

all proved themselves as significant rescue forces in many large-scale disasters. For instance, The International Search and Rescue Operation Taiwan (International Headquarters S.A.R. Taiwan) has been established since 1981 and they have actively participated in numerous large-scale natural disasters incidents in Taiwan and overseas.[37] The members of S.A.R. Taiwan are range from retired military personnel, disaster relief specialists, and staffs from academic institutions or citizen groups. International Headquarters S.A.R. Taiwan has recently deployed rescue teams to support rescue missions to the earthquake in Nepal (2014), Japan (2011), and to a local community in Typhoon Fanapi and Typhoon Morakot. By recognizing the importance of NGOs, national government shall provide sufficient financial and technical training support to registered NGOs in order to enhance local authority's emergency response capacity. The military assistance is also considered the primary supporting powers when large-scale disasters strike.

As mentioned earlier, the military or civil defense forces played a vital role in disaster rescue and recovery operations in 2011 Seoul Flood, Great East Japan Earthquake, and Morakot Typhoon. Experiencing such disasters, we have learned that a great amount of manpower, heavy equipment's, and airborne transportation is in great need when large-scale disasters occur. Only the military or civil defense power could provide large manpower's, heavy equipment and airborne transportation in executing disaster rescue and recovery operations. Thus, it is critical to first clarify the legal status of military in overall disaster management framework and how they could enhance local authority's emergency response capacity. In Taiwan, due to the claims made by many administrators of local governments criticizing that requesting military assistance usually were ineffective due to complicated application process through chain of command system. In response, Taiwan Disaster Prevention and Protection Act was called upon to amend the related provision by authorizing military commanders to actively deploy rescue assistance team or provide assistance upon the request from head administrators of local authorities when a large-scale disaster occurs.[38]

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37) *See* Introduction to International Headquarter S.A.R, Taiwan (official website), http://www.rescue.org.tw/internal%20reports/Internal_rescue.html (last visited Feb. 26, 2016).

38) *See* Article 34 sec. 4; sec. 5. If the municipal, or county (city) government, or the central disaster prevention and protection operation regulating authorities fails to cope with the disaster, it may request supports from the national army. However, the national army shall actively support responsive measures of major disaster rescue. The Ministry of National Defense shall mobilize reserved servicemen's organizations to support responsive measures of major disaster rescue as provided in the preceding paragraph. The procedures

To implement the law, local government should consult with the Ministry of Defense to incorporate local armed forces as one of official emergency response units designated under the local disaster prevention plan. In short, it is crucial to establish collaborative mechanism for disaster management authorities at all levels notwithstanding public or private entities to increase the efficiency of emergency response and disaster rehabilitation.

In order to enhance the communication and collaborated efforts between the national government, local authorities, NGOs, and Armed Forces in executing emergency responsive measures, an institution designed for disaster management at national government level is necessary. Therefore, this article suggests an institutional reform to establish of a permanent, comprehensive government institution at the cabinet–level that aims at integrating disaster management, public safety, and civil defense policymaking authorities under a single institutional framework model from Korea's experience in establishing the Ministry of Public Safety and Security as discussed earlier. It is expected that collaborative disaster management actions could be effective when implemented under an integrated disaster prevention plan and a single command institutional arrangement. In practice, however, the responsible Ministry shall develop the National Disaster Management Plan that involves various stakeholders including representatives from national and local governments, NGOs, public and private corporations. Moreover, the Ministry shall implement national or regional joint disaster prevention drills in accordance to national or regional disaster prevention plan. For instance, the Japan Disaster Countermeasures Basic Act requires the disaster management responsible agency to implement comprehensive disaster prevention drill that involves NGOs, officials and staffs of national, regional, and local governments, police forces, firefighters, Self-Defense Forces, and even the U.S. military forces.[39] Moreover, On March 3, 2016, Taiwanese government held

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for requesting rescue support or active support for responsive measures of disaster rescue from national army, arrangement and dispatch of national defense force, commanding and coordination, negotiation and communication, education and training of disaster rescue affairs, the schedule of duty operation and other relevant operation regulations as prescribed in the fourth paragraph therein shall be duly enacted jointly by the Ministry of National Defense and the Ministry of the Interior. Law and Regulation Database of Republic of China, *available at* http://law.moj.gov.tw/Eng/LawClass/LawSearchNo.aspx?PC=D0120014&DF=&SNo=34 (last visited Jan. 12, 2016)

39) Japan Disaster Countermeasure Basic Act, art. 49-2; Cabinet Public Relations Office, *Disaster Prevention Day Drills for FY2015, Japan Prime Minister in Action*, *available at* http://japan.kantei.go.jp/97_abe/actions/201509/1article1.html (last visited Feb. 26, 2016).

a large-scale joint disaster relief drills in central Taiwan. And over 800 military personnel along with police, firefighter, and civil rescue teams participated in the drill to exercise rescue and emergency evacuation procedures.[40]

C. Enhancing Regional (Wide-Area) Local Authority's Disaster Response Capacity

As discussed earlier, the local authorities are responsible for initial emergency response, issuing evacuation orders, and collecting and reporting information of disaster status to the State. Instead of imposing primary legal obligation on the city (township) as required by disaster management framework legislation in East Asian countries, the enhancement of regional disaster response capacity is more cost-effective approach to tackle large-scale disasters. Learning from various large-scale disaster experiences, a lack of sufficient manpower, state-of-art disaster relief equipment and well-trained disaster management experts is frequently criticized in many jurisdictions.[41] As Sendai Framework's guiding principle has emphasized that the empowerment of local authorities to reduce disaster risks in terms of resources and decision-making responsibilities is essential, it is thus vital to strengthen local authority's emergency response capacity, disaster relief resources and expertise.[42] It is notable that many local government offices and disaster command posts were disconnected with disaster relief information system or shut down because severe damages to government buildings and telecommunication cut-off by the Great East Japan Earthquake. The communication black-out had undermined the effectiveness of early deployment of emergency response units, information gathering, and reporting the latest status in severe damaged areas.[43] In order to strengthen the disaster relief and emergency response capacity at subnational-level government administrations, especially in small and medium-sized countries, disaster management related legislation should be amended to first reassign the legal responsibility among national, large city or equivalent self-governing authority, and local government administration at basic level such as

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40) *Military joins local government disaster drill in central Taiwan,* Taiwan News, *available at* http://www.taiwannews.com.tw/etn/news_content.php?id=2899956

41) Gavin Smith, *Planning for Post-Disaster Recovery: A Review of the United States Disaster Assistance Framework* (Public Entity Risk Institute 2011).

42) See *supra* note 34.

43) Hidetoshi Sotook, 311 Compound Disaster 1, 119-121 (Iwanami Press 2012) (in Japanese); Disaster and Protection of Citizens 1, 100 (Sanwa Press 2012) (in Japanese).

smaller city and township. Due to a lack of sufficient financial resources and manpower, especially for those countries suffering from financial difficulties as a result of aging society with declining birthrate, smaller cities, townships, and villages, are no longer competent to perform its role in implementing local disaster countermeasures required by existing legislation.[44]

In this regard, instead of imposing broad and full legal responsibility to cities (townships) to provide first aid assistance and implementation of other disaster relief measures required by existing law, related legislation should be amended to require cities (townships) to exercise their legal duty by adopting preventive approach to reduce disaster risks, maintained for disaster prevention facilities, and the enhancement of community disaster awareness.

The core of disaster risk reduction measures for a city is the establishment of Community Disaster Management Plan. This plan shall encompass the identification of disaster-prone areas and designation of evacuation route and refugee shelters.

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44) *See e.g.,* Taiwan Disaster Prevention and Protection Act, Art. 10: "The township (city) offices establish the township (city) disaster prevention and protection councils in charge of the following missions: 1. To authorize the regional disaster prevention and protection plan developed for the township (city); 2. To authorize essential disaster prevention and protection policy and countermeasures; 3. To promote and command refugee accommodation and settlement, organizing, reporting and evaluation of disaster situations, execution of emergency response measures, removal of barriers in the site of disaster, and implementation of disaster rescue countermeasures; 4. To promote community disaster prevention and protection affairs; and 5. To carry out any other items as regulated by the law or regulations." *See also* Japan Disaster Basic Countermeasure Act (Act No. 223 of 15 November 1961; revised June 1997), Art. 5: "In the interest of protecting the area of a city, town or village, the life and limb of its residents and their property from disaster, the city, town or village as a local government at the base shall have the responsibility to formulate, with the cooperation of related agencies and other local governments a disaster prevention plan pertaining to the area of said city, town or village, and to implement said plan as provided by law. 2. The mayor of the city or town or the head of the village shall, in order to fulfill responsibilities under the preceding paragraph, endeavor to employ to the highest degree all capacities of the city, town or village, by keeping the organization of firefighting agencies, flood prevention units etc. in good condition, and by consolidating organizations related to disaster prevention of public groups within the area of the city, town or village and voluntary disaster prevention groups (referred to as "voluntary disaster prevention groups" in art. 8 para. 2) among the residents in a community spirit of mutual help. 3. Firefighting agencies, flood prevention units and other agencies of the city, town or village shall, in performing their respective business; act in concert in order that the responsibilities of the city, town or village as prescribed under the preceding paragraph may be fulfilled."

Moreover, the local authority shall gather urban planning, present land use, past disaster records, and residents' information for the purpose of hazard mapping, enhancing community disaster awareness, and participating joint disaster relief drill organized by higher level of the government.

Since cities and townships are more compatible to perform first aid disaster rescue, collecting casualties and property damage information, and report outposts. Japan's legal development in the post Great East Earthquake has amended the Disaster Countermeasures Basic Act for authorizing national government to implement certain legal obligation, such as the establishment of Nationwide Comprehensive Disaster Information Network and Disaster Administrative Wireless Transmission Network which Japan have adopted and effectively operated for years in interconnecting the disaster management system among the state, regional, and local authority at basic level.[45] Moreover, national government is required by the amendment to provide intensive training for disaster relief responsible staffs to ensure effective operation of the disaster communication system when large-scale disasters occur.

However, the strengthening of wide-area local authority capacity in terms of emergency response and disaster relief would be an alternative approach to implement disaster countermeasures at local authority level. Japan has adopted wide-area (Inter-prefecture) emergency rescue and medical support mechanisms that integrate regional local police forces, fire departments, Japanese Coast Guard, Japanese Self-Defense forces, and disaster management departments by signing the Inter-prefecture Mutual-Aid Agreements for Collaborative Disaster Response among neighboring self-governed entities since the amending Disaster Countermeasures Basic Act in 2012.[46] The amendment of disaster management framework legislation should first authorize the establishment of wide-area (regional) disaster management center that operates as regional branch office of disaster management responsible authority at national government level. The amendment further authorizes the regional disaster management center to develop regional disaster management plan in consultation with relevant local governments and to implement the plan after the final approval by national government. In implementing the plan, regional disaster management center could facilitate regional disaster management meeting and hold annual regional disaster prevention drill. As discussed earlier, the development of climate change adaptation plan should incorporate land use planning and disaster risk reduction measures in

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45) *See* Tokyo Metropolitan Government, Tokyo Disaster Prevention Plan, at 22 (2014) *available at* http://www.bousai.metro.tokyo.jp/foreign/english/bousai/2000008/2000190/2000280.html (last visited Feb. 27, 2016).

46) *See* Noriko Okubo, *Disaster Management in Japan: Towards Comprehensive and Collaborative Flood Control,* 9 Carbon & Climate L. Rev. 32, 33 (2015).

order to deal with climate related risks. The regional disaster management center thus could be an ideal forum to coordinate cross-sectors policy-making. In other words, regional disaster management center is responsible to constantly examine the consistency and coherence of regional climate change adaptation measures, disaster risk reduction measures, and further to propose new approach to reconcile differences or to fill the gap observed among climate change adaptation measures, disaster management, and land use planning.

When a large-scale disaster strikes, at emergency response stage, regional disaster management center is responsible for coordinating and dispatching available emergency response and disaster relief resource of the region in accordance to regional disaster management plan to disaster-stricken areas upon requests from disaster-stricken local authorities. When certain disaster exceed the regional emergency response capacity, regional disaster management center should report or upon request by local authority directly to ad hoc headquarter of disaster management at national government for requesting larger and special supportive disaster relief resources or determining whether to declare state of emergency.

At the disaster recovery stage, regional disaster management center is responsible for open and operation of regional emergency shelters, conducting wide-area damaged status evaluation, gathering relevant regional damaging information, and filing and deliver field reports and inventory of disaster relief and recovery listing relevant resource needed to national government. The enhancement of wide-area disaster management capacity by establishing permanent regional disaster management centers authorized by law is arguably a more effective approach to coordinate State, regional, and even overseas resource for disaster relief and recovery in response to large-scale disasters as a result of extreme weather events.

D. Strengthening Financial Mechanism for Climate-Related Risk Reduction

Facing the increasing disaster risks as a result of climate change, climate change adaptation actions along with disaster risk reduction measures requires a huge financial resource input to implement them. This article suggests the development of innovative financial mechanism that act as alternative funding systems to traditional budget allocation approach to support disaster management. For instances, urban redevelopment for the purpose of disaster prevention, flood control infrastructure construction, or building resilience city require sustainable financial mechanism to support them. In the face of climate related disaster risks, government at various levels inevitably would be call upon to enhance existing disaster response measures. The strengthening of disaster risk reduction measures in response to large-scale disaster requires the

development of innovative financial mechanism in addition to ordinary state subsidy mechanisms. For instance, some commentators argue that government shall introduce government-supported disaster insurance to compensate victims of catastrophe as a result of extreme weather events in case that traditional insurance markets fail to provide full coverage or even insurability of large-scale disaster.[47] However, the role of government and the degree of intervention to disaster insurance market is varied ranging from providing mandatory comprehensive coverage system that provides additional coverage as a result of natural disasters, acting as primary insurer or reinsurer of last resort.[48]

The government-supported disaster insurance program could help to provide additional coverage for victims of large-scale disaster. It is considered much wiser and tax-payer saving approach to address the certain issue regarding a lack of adequate and efficient budget allocation in financing disaster recovery and rehabilitation. But, the ex ante financial mechanism are mostly depending on traditional tax-based budget appropriation system. There is a great necessity to design innovative financial mechanism acting as alternative financing means to support disaster prevention and risk reduction.

The Kaohsiung City's local initiative, as discussed earlier, provides a lesson for policy-makers to establish a levy system allowing national government or local authority to collect climate change adaptation fees from certain industry promulgated by responsible government agency. The fee rate is fixed based on greenhouse gas emission emitted per year. The collected fees would become the primary source of the Climate Change Adaptation Fund. The Fund is operated by the government authority and supervised by governing board that consists of government officials, scholars, attorneys, and accountants. The governing board of the Climate Change Adaptation Fund could be call upon and determine whether to finance certain disaster prevention measures or enhancement of regional or local emergency response capacity programs. By introducing the climate change adaptation levy system, climate change adaptation and disaster prevention measures could be supported by major greenhouse gas emitters and in the meantime meeting the goal of seeking environmental justice.

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47) Howard C. Kunreuther, Erwann O. Michel-Kerjan, *Insurability of Large-Scale Disaster, and Emerging Liability Challenge*, 155 U. Pa. L. Rev. 1795, 1840-42 (2007).

48) *See* Veronique Bruggeman, Michael Faure, and Tobias Heldt, *Insurance against Stimulation of Insurance Markets for Catastrophic Events*, 23 Duke Envtl. L. & Pol'y Forum 185, 240-241 (2012); Raymond J. Burby, *Flood Insurance and Floodplain Management: The U.S. Experience*, 3 Env't Hazard 111-22 (2001)

E. Enactment of Special Legislation in Response to Large-Scale Disasters

In response to large-scale disasters as result from climate change, the development of certain legislation in addition to basic disaster framework legislation may provide timely and effectively legal response to address legal hurdles for enhancing preventive approach to prevent and mitigate certain types of large-scale disasters. Thus, the development of special legislation that aims at addressing certain types of disaster in Japan is worth to be examined. Japan has promulgated several special legislation that aim at developing countermeasures to prevent and mitigate certain type of disasters with imminent threats such as tsunami, debris flow, and large-scale earthquake.[49] It is notable that in response to anticipated large-scale earthquake near Tokyo metropolitan area, Japan has promulgated several special legislation, namely the Act on Special Measures concerning Advancement of Countermeasures against Disasters of Tonankai and Nankai Earthquakes, Act for Special Measures against a Capital Inland Earthquake, and Special Measures for Promotion of Tonankai and Nankai Earthquake Disaster Management. These three special legislations aims at strengthening regional disaster resilience and enhancing regional disaster response capacity to prevent and mitigate anticipated large-scale earthquake in Kanton wide-areas.

In Korea, there are many of special legislations in place that also aim on tackling certain type of disaster, such as special act on countermeasure to earthquake, agriculture and fishery disaster, steep-slope land disaster have been promulgated.[50] It is also notable that in addition to framework legislation to disaster management, Korea has established a series of special legislation on emergency response and disaster relief, such as Disaster Relief Act and Act on Rescue and Aid in the River and at Sea. Taiwan, on the other hand, adopts a "one fits for all" approach to deal with all kinds of natural disaster under the basic framework legislation of Disaster

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49) Japan Ministry of Land, Infrastructure, Transport, and Tourism comprehensively list effective special legislation in response to certain types of natural disasters and its content. For instances, Act on Promotion of Sediment Disaster Countermeasures for Sediment Disaster Prone Areas, Landslide Prevention Act, Flood Prevention and Protection Act, and Act on Regional Development in Tsunami Disaster are illustrated. *See* Japan Ministry of Land, Infrastructure, Transport, and Tourism (official website), http://www.mlit.go.jp/river/hourei_tsutatsu/index.html (last visited Mar. 21, 2016).

50) *See* Korea Legislation Research Institute Statutes of Republic of Korea Database, *available at* http://elaw.klri.re.kr/eng_mobile/partList.do?seq=12 (last visited Mar. 15, 2016).

Prevention and Protection Act. The special legislation with respect to disaster management could only to be found in a few post-disaster compensation and reconstruction special and temporary legislation for certain large-scale disaster including the Morakot Typhoon Post-disaster Reconstruction Special Act and the 921 Temporary Act for Post-Earthquake Reconstruction. The intensive legislation aim at coping with large-scale disaster or consolidating legal foundation for emergency response, disaster relief, and rehabilitation in Korea and Japan; however, provide good lesson for other countries in establishing a comprehensive "rule of law" legal framework that comprises of a basic framework legislation as well as special legislation that deals with special disaster or certain stage of overall disaster management. The existing disaster management legal framework of Korea, Japan, and Taiwan is illustrated.[51] (Table 1)

Ⅴ. Conclusion

The deadlock of global efforts in mitigating global warming has resulted in frequency and severance of extreme weathers events worldwide. Climate change has indeed caused serious local impacts that dramatically change the way of life and brought great challenges to local governments in establishing resilience city and communities in response to climate change. Great East Japan Earthquake and other notorious typhoon rainfall causing serious flood and landslides disasters have provided policy-makers important lessons to reexamine the effectiveness and competence of existing climate change adaptation planning and disaster management measures. Furthermore, it is also important to establish fair and sustainable financial mechanisms to deal with climate change adaptation actions and disaster risk reduction measures in the face of climate change challenges. Taiwan has suffered and slowly recovered from numerous nature disasters like her neighboring state Japan and Korea, such as earthquake, typhoon, and landslide. In this regard, international disaster management policymakers are encouraged and advised to carefully examine the legal development and practical experience derived from actual and painful large-scale disaster experience in these East Asia countries.

To sum up, this paper concludes the initial survey and study by providing several recommendations for disaster policymakers develop effective disaster responsive programs and appropriate climate change adaptive measures. First, governments at various levels should work closely with national and local universities or research

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51) A Comparative Chart for Effective Disaster Management Related Legal Framework in Korea, Japan, and Taiwan, *see* Table 1.

institutions to conduct local assessment in identifying local vulnerability to climate change and analyzing features of natural disasters as a result of extreme weathers. The outcome of the assessment will then provide policymaker scientific basis to develop related local ordinances, policy, and action plans. Second, local governments should establish a coordinated institutional framework that oversees cross-agencies actions in terms of disaster management and climate change adaptive programs. The Korea's experience has provided a great lesson for policymakers to establish a well-organized, sophisticated institutional framework which clearly designates all relevant government authorities' legal responsibilities to be undertaken at disaster risk reduction, emergency responses, and reconstruction stages. In implementing climate change related assessment and actions programs needs enormous investment, the establishment a financing mechanism managed by local governments is critical to adopt timely responses to local impacts as a result of climate change. Kaohsiung's experience provides an innovative model for local governments to levy fees or local tax to build resilience city to cope with large-scale disasters as a result of extreme weather. In response to climate related risks such as sea level rise, torrential rainfall, drought, urban flood, landslides; local governments are encouraged to share their climate change governance experience and establishes its own sound and systematic climate change adaptation framework that aims at integrating vulnerability assessment, urban planning, land use policy, and disaster management approaches. In other words, future climate change governance as well as disaster management should embrace the concept of "think globally, act locally" in developing innovative and effective action plans to reduce large-scale disaster risks as a result of climate change.

Appendix

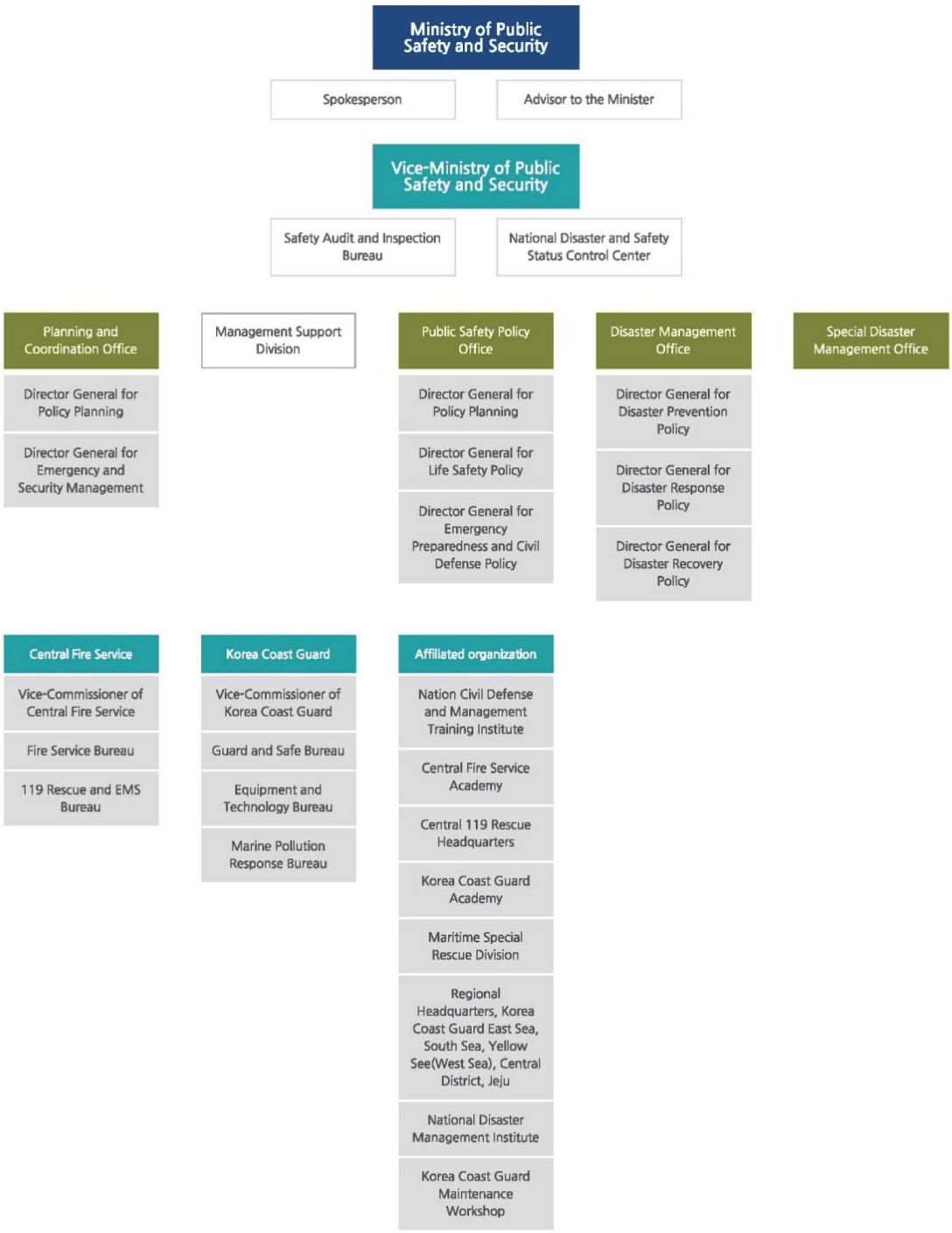
Table 1
A Comparative Chart for Effective Disaster Management Related Legal Framework in Korea, Japan, and Taiwan

Selected Law and Regulation	Japan	Taiwan	Korea
Basic Framework Legislation for Disaster Management	Disaster Countermeasure Basic Act	Disaster Prevention and Protection Act	Framework Act on the Management of Disasters and Safety
Special Framework Legislation for Disaster Prevention	Basic Act for National Resilience Contributing to Preventing and Mitigating Disasters for Developing Resilience in the Lives of the Citizenry, Act on Special Measures for Earthquake Disaster Countermeasures Act on Special Measures for Large-scale Earthquakes, Act on Special Measures for Disaster Prevention in Typhoon-prone Area		Framework Act on Countermeasure Against Natural Disaster Act, Act for Prevention of Agricultural and Fishery Disaster, Special Act on the Projects for Reducing Disaster Risk and Relocation Plan Act on Safe Management of Reservoirs and Dams and Disaster Prevention caused by them
Special Legislation for Emergency Response	Act on Firefighter Centralization for Regional Disaster Countermeasure Enforcement Special Measures of Nuclear Disaster Act	Nuclear Emergency Response Act	Framework Act on Civil Defense, Act on Rescue and Aid in the River and at Sea, Emergency Resources Management Act, Act on Measures for the Protection of Nuclear Facilities, etc. and Prevention of Radiation Disaster

Selected Law and Regulation	Japan	Taiwan	Korea
Special Legislation for disaster Rehabilitation and Reconstruction	Act on Reconstruction from Large-Scale Disasters, Act on the Statement of Principles and Organization of the Great Hanshin-Awaji Earthquake Revival, Basic Act on Reconstruction in Response to the Great East Japan Earthquake, Act on Special Zones for Reconstruction in Response to the Great East Japan Earthquake, Restoration Agency Establishment Act	Morakot Typhoon Post-disaster Reconstruction Special Act (abolished) 921 Temporary Act for Post-Earthquake Reconstruction (abolished)	Disaster Relief Act Framework Act on Disaster Relief and Disaster Reconstruction Cost Support Criteria
Special Legislation for Earthquake Countermeasure	Act on Special Measures concerning Advancement of Countermeasures against Disasters of Tonankai and Nankai Earthquakes Act on Special Measures against a Capital Inland Earthquake Special Measures for Promotion of Tonankai and Nankai Earthquake Disaster Management.		Act on the Countermeasures to Earthquake
Special Legislation for Tsunami Countermeasure	Act on Promotion of Tsunami Countermeasure; Act on Regional Development in Tsunami Disaster		

Selected Law and Regulation	Japan	Taiwan	Korea
Special Legislation for Sediment and Landslide Countermeasure	Landslide Prevention Act, Act on Promotion of Sediment Disaster Countermeasures for Sediment Disaster-Prone Areas		Prevention of Steep Slope Disasters Act
Special Legislation for Active Volcanoes Countermeasure	Act on Special Measures for Active Volcanoes		
Local Initiatives	Tokyo Metropolitan Ordinance for Earthquake Disaster Measures, Shizuoka Prefecture Ordinance for Promoting Earthquake Countermeasures	Taipei Metropolitan Ordinance for Fire Disaster Prevention	
Organization Act for Establishing State Disaster Management Responsible Institution	Act on Establishment of Ministry of Land, Infrastructure, Transport and Tourism	Organization Act on National Fire Agency, Ministry of the Interior	National Government Organization Act (concerning the establishment of the Ministry of Public Safety and Security)

Figure 1


Ministry of Public Safety and Security
Spokesperson
Advisor to the Minister
Vice-Ministry of Public Safety and Security
Safety Audit and Inspection Bureau
National Disaster and Safety Status Control Center
Planning and Coordination Office
Director General for Policy Planning
Director General for Emergency and Security Management
Management Support Division
Public Safety Policy Office
Director General for Policy Planning
Director General for Life Safety Policy
Director General for Emergency Preparedness and Civil Defense Policy
Disaster Management Office
Director General for Disaster Prevention Policy
Director General for Disaster Response Policy
Director General for Disaster Recovery Policy
Special Disaster Management Office
Central Fire Service
Vice-Commissioner of Central Fire Service
Fire Service Bureau
119 Rescue and EMS Bureau
Korea Coast Guard
Vice-Commissioner of Korea Coast Guard
Guard and Safe Bureau
Equipment and Technology Bureau
Marine Pollution Response Bureau
Affiliated organization
Nation Civil Defense and Management Training Institute
Central Fire Service Academy
Central 119 Rescue Headquarters
Korea Coast Guard Academy
Maritime Special Rescue Division
Regional Headquarters, Korea Coast Guard East Sea, South Sea, Yellow See(West Sea), Central District, Jeju
National Disaster Management Institute
Korea Coast Guard Maintenance Workshop

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