

DEVELOPING TRAINING COURSE FOR URBAN DISASTER PREVENTION

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Abstract

UN ISDR is trying to encourage the implementation of a National Platform for urban disaster risk reduction in each of the member states. This will be done through the Hyogo framework that was announced during January of 2008. Our baseline assessment is that there is a lack of research on urban disaster and urban disaster risk reduction in regards to standardizing definitions, identifying types, utilizing available mitigation/emergency services, etc.

Urban disaster prevention includes reduction, preparation and emergency response. Before developing a disaster management training course, it is necessary to conduct research to identify several cities and the types of disasters that can happen in these particular cities. Next, we must figure out how to apply the planned disaster reduction measures.

After carrying through those objectives, this treatise will describe our design of the training courses in terms of the subject, the course title, the course overview, the needed credit hours, and the time table. This research is a contribution to the National Urban Disaster Prevention Project as it primarily focuses on the topic of urban disaster.

A. Introduction

Due to the effects of global climate change, persistent typhoon, torrential rain, and drought events are expected to persist in the future in ever-increasing size and scope. Their combined effect with other natural and human-made disasters in the context of our aging society and changing social structure poses an unprecedented level of destruction and damage. If our past focus in creating disaster coping strategies lay in emergency management and protection of lives and property, our urgent task today is to plan ahead to reduce the risk and vulnerability to the disasters. The first step in fulfilling this task is to acquire a firm and clear understanding of disaster risk and vulnerability. At a time when disasters are no longer limited in their size

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and scope to an individual nation but affect the entire globe at large, it is crucial that every nation joins hands to cooperate closely with other nations.

According to the UNHABITAT forecast, 58% of the world's population will be urban by 2040. The global trend of urbanization and the consequent increase of the principal underlying causal factors for urban disasters portend great loss of life and property damage in the coming future. Aging population and densely populated inner city areas also add to the seriousness of damage during disaster events. Aging population in particular implies delays during evacuations as the elderly population struggle to respond efficiently, yielding to helpless loss and damage. The rapid aging of population in Northeast Asia poses a special concern; already one-fifth of Japanese population is aged 65 or older, and with the rapid aging of both Korea and China, the population aged 60 or older is projected to outnumber the population aged fewer than 15 by 2040 in Northeast Asia.

In the past the primary focus of international disaster reduction activities was on the management of natural disasters affected by global climate change, and various researches were conducted to meet the need. The research on the disaster risks particular to urban areas following urbanization and on urban disaster reduction methodology, however, remains comparatively inadequate. Therefore we have a pressing need to develop a comprehensive and sustainable strategy based on a systematic methodology to reduce urban disaster risks that result from urbanization and aging population.

In this paper, we first define the term city and then examine the various possible types of urban disasters. The definition of city can vary considerably across different nations and regions so it is necessary to establish a standard definition that can accommodate its manifold nature. Also, there are many different types of possible urban disasters and the classification of these disasters is different for each individual, country, and institution. This paper investigates the disaster statistics of cities selected according to the detailed standard set forth in our definition of city, and thereby investigates possible urban disaster types. On the basis of our investigation, we will then set the object for the urban disaster prevention strategy and propose an urban disaster prevention training curriculum.

B. Theory and Method

1. Concept of Urban Disaster Prevention

City Definition

According to the 2004 analysis by the German reinsurance company Munich Re Group conducted on the world's 50 major cities, 30% of the global population lived in cities in 1950, 50% in 2004, and 60% of the global population were predicted to be urban by 2030. Today, 9% or an estimated 280 million people of the global population live in megacities. An estimated 350 million people are expected to live in megacities by 2030.

Research on the structure and nature of city has been conducted by scholars in various fields including urban planners, geographers, sociologists, public administration scholars, and analysts in insurance businesses like the Munich Re Group. It is difficult, however, to come up with a precise definition which captures the substance of city. This is because city is not a static but a highly dynamic thing which changes and adjusts itself according to the changes in the environment. The definition of city, therefore, is expressed very differently through several different standards used by individuals, groups, and nations.

No unified international standard has been set for the city definition, but Japan's Urban Studies and Planning defines city as "a permanent settlement in human society which is distinct from rural areas, which serves as a concentrated residential area for population that engages in secondary and tertiary industries as opposed to agriculture and food production industry 1).

Understanding the nature and concept of city solely through the traditional model which merely considers the existence of fortresses and markets, the population size, and the contrast to rural places, however, poses serious limitations. The definition is now generally determined by dividing city into human/physical, social/economic/cultural, and functional aspects.

In regards to the human and physical aspect, city is where a large optimum population occupies a relatively small area in concentrated residence, and where there is a relatively high population density. In regards to the social/economic/cultural aspects, city is a place with a low ratio of primary industry, which instead holds a high ratio of mainly non-agricultural secondary and tertiary industries, and is a community consisting of intellectuals and professionals with a variety of services and wealth. In the functional aspect, city takes the function as an administrative, economic, and cultural center, and is defined as a frontier ground for human civilization where people create and develop unique cultures 2).

As such, this research takes into consideration the human, physical, social, economic, cultural, and functional aspects of city and selects population size, population density, industrial economy, and city infrastructure as the basis for defining city <Table 1>. Population size being the most basic parameter amongst these for the definition of city, we further break up the term into city, big city, and megacity, and consider industrial economy and city infrastructure as the main representative variables of city's distinct functional aspect. This is because in order to understand city's diverse, complex, and dynamic character, it is logical to include parameters that can represent its distinct functional aspect, and that lie outside the physical factors. Thus, on the basis of the definition of city, we select these parameters to be applied consistently in all the various areas of urban disaster prevention research.

Table 1. Specific Criteria on City Definition

Basic/functional factor	Population density	Industrial economy	City infrastructure
Small size population (city of 20,000-300,000)	Small size population/ Top.middle.low population density = (Riga, Attapu, Agogo) *	Small size population/ Top.middle.low industrial economy = (Bedok, Artem, Moron)	Small size population/ Top.middle.low city infrastructure = (Hefa, Banes, Gitega)
Medium size population (big city of 300,000-1,000,000)	Medium size population/ Top.middle.low population density = (Melaka, Cuenca, Batha)	Medium size population/ Top.middle.low industrial economy = (Nayarit, Tangerang, Bogor)	Medium size population/ Top.middle.low city infrastructure = (Tainan, Tallinn, Colombo)
Large size of population (megacity of more than 1,000,000)	Large size population/ Top.middle.low population density = (Beijing, Nairobi, Rondonia)	Large size population/ Top.middle.low industrial economy = (Perth, Amman, Kinshasa)	Large size population/ Top.middle.low city infrastructure = (Uusimaa, Izmir, Conakry)

Type of Urban Disaster

Disaster Management in the U.S is represented by the National Response Framework. The Incident Annex- one of the three major annexes developed by the NRF Resource Center- lists seven commonly occurring disaster/emergency types in the U.S as biological emergency, catastrophic emergency, cyber emergency, food and agricultural emergency, mass evacuation, nuclear/radiological emergency, and terrorism.

In contrast to the U.S, Japan's unique geopolitical position requires a greater emphasis on earthquake, storm and flood disasters. In the case of our country, the Basic Policy for National Safety Management classifies disaster types into 16 categories. These are storm and flood, snow, drought, earthquake, tidal wave, aviation, railway and road, maritime, radiation, electricity/oil/gas, explosion/fire, facility/installation/equipment, telecommunication, toxic materials/environmental pollution, and industrial emergencies.

In putting together the disaster type classification systems of the U.S, Japan, and Korea, we can see how there is a great variety of disasters including natural disaster, human-made

disaster, and other emergencies. Urban disaster types are classified very differently according to each individual, institution, and nation's standards, and for this reason, understanding urban disaster types can pose similar challenges as in understanding the term city.

For the purpose of this treatise, we selected 27 cities in accordance with the detailed standards set in our city definition <Table 1>. Then as <Table 2>, <Table 3>, and <Table 4> show, we thoroughly anglicized the most frequently occurring disaster types in these cities on the basis of the statistical information. According to the analysis, the most commonly occurring disaster types are largely divided into two categories: natural disasters and human-made disasters. There are 5 types under the natural disasters category including storm and flood, earthquake, drought, yellow dust, and heavy snow, and 7 types under the human-made disasters category including fire, collapse, explosion, traffic accident, environmental pollution, chemical/biological/radiological disasters (CBR), and lifeline.

Table 2. Extent of Occurring Disaster in Cities with Small Size Population

City/Disaster		Natural disaster (unit: Top.Middle.Low) *					Human-made emergency (unit: Top.Middle.Low) *						
		Flood	Earthquake	Drought	Yellow dust	Heavy snow	Fire	Collapse	Explosion	Traffic accidents	Environ. pollution	CBR	Lifeline * *
Riga(Latvia)	Top pop density	Top	Low	Mid	Low	Top	Mid	Mid	Mid	Mid	Mid	Top	Mid
Attapu(Laos)	Mid pop density	Top	Low	Top	Low	Low	Mid	Mid	Mid	Top	Mid	Top	Mid
Agogo(Ghana)	Low pop density	Top	Mid	Top	Low	Low	Mid	Top	Top	Top	Mid	Top	Top
Bedok(Singapore)	Top indus eco	Mid	Low	Mid	Top	Low	Mid	Mid	Mid	Mid	Top	Top	Mid
Artem(Russia)	Mid indus eco	Top	Top	Top	Mid	Top	Top	Top	Mid	Top	Top	Top	Mid
Moron(Mongolia)	Low Indus eco	Top	Top	Top	Top	Top	Mid	Top	Top	Top	Top	Top	Top
Hefa(Israel)	Top city infra	Top	Mid	Top	Low	Low	Top	Top	Top	Top	Mid	Top	Mid
Banes(Cuba)	Mid city infra	Top	Mid	Top	Low	Low	Top	Mid	Mid	Top	Mid	Top	Top
Gitega(Burundi)	Low city infra	Top	Mid	Top	Low	Low	Mid	Top	Mid	Top	Top	Top	Top

Table 3. Extent of Occurring Disaster in Cities with Medium Size Population

City/Disaster		Natural disaster (unit: Top.Middle.Low) *					Human-made emergency (unit: Top.Middle.Low) *						
		Flood	Earthquake	Drought	Yellow dust	Heavy snow	Fire	Collapse	Explosion	Traffic accidents	Environ. pollution	CBR	Lifeline * *
Melaka(Malaysia)	Top pop density	Top	Top	Top	Mid	Low	Top	Top	Top	Top	Top	Top	Top
Cuenca(Ecuador)	Mid pop density	Top	Top	Top	Low	Low	Top	Top	Top	Top	Top	Top	Top
Batha(Chad)	Low pop density	Top	Low	Top	Low	Low	Mid	Mid	Mid	Top	Top	Top	Mid
Nayarit(Mexico)	Top indust econ	Top	Top	Top	Low	Low	Top	Top	Mid	Top	Top	Top	Top
Tanger(Morocco)	Mid indust econ	Top	Top	Top	Low	Low	Top	Top	Top	Top	Top	Top	Top
Bogor(Indonesia)	Low indust econ	Top	Top	Top	Mid	Low	Top	Top	Mid	Mid	Top	Mid	Mid
Tainan(Taiwan)	Top city infra	Top	Top	Mid	Top	Mid	Top	Top	Top	Top	Mid	Top	Top
Tallinn(Estonia)	Mid city infra	Top	Low	Mid	Low	Low	Mid	Mid	Mid	Top	Mid	Mid	Top
Colombo(Sri Lanka)	Low city infra	Top	Top	Top	Top	Low	Mid	Top	Mid	Mid	Top	Top	Mid

Table 4. Extent of Occurring Disaster in Cities with Large Size Population

City/Disaster		Natural disaster (unit: Top.Mid.Low) *					Human-made emergency (unit: Top.Mid.Low) *						
		Flood	Earthquake	Drought	Yellow dust	Heavy snow	Fire	Collapse	Explosion	Traffic accidents	Environ. pollution	CBR	Life line * * *
Beijing(China)	Top pop density	Top	Mid	Top	Top	Top	Top	Mid	Top	Top	Top	Top	Top
Nairobi(Kenya)	Mid pop density	Top	Top	Top	Low	Low	Mid	Top	Mid	Top	Top	Top	Top
Rondonia(Brazil)	Low pop density	Top	Mid	Top	Low	Low	Top	Top	Mid	Top	Top	Top	Top
Perth(Australia)	Top indust econ	Top	Top	Top	Low	Mid	Top	Top	Mid	Low	Low	Mid	Mid
Amman(Jordan)	Mid indust econ	Top	Top	Top	Low	Low	Top	Top	Mid	Top	Low	Top	Top
Kinshasa(Congo)	Low indust econ	Top	Top	Mid	Low	Low	Mid	Top	Mid	Top	Top	Top	Top
Uusimaa(Finland)	Top city infra	Top	Low	Low	Low	Top	Mid	Low	Mid	Mid	Low	Mid	Mid
Izmir(Turkey)	Mid city infra	Top	Top	Mid	Low	Mid	Top	Top	Mid	Top	Mid	Top	Top
Conakry(Guinea)	Low city infra	Top	Top	Mid	Low	Low	Mid	Mid	Top	Top	Top	Top	Top

* When either the natural or human-made disaster that broke out between 1990 and 2008 is related to any item such as frequency (more than 5 times), victims (more than 100 people), and damages (more than \$100,000 US), that disaster or emergency will be recorded as unit 'Top' in the table. When either the natural or human-made disaster that broke out during the same period is related to any item such as frequency (2-4 times), victim (10-99 people), and damages (\$10,000-100,000 US), that disaster or emergency will be recorded as unit 'Mid'. When either the natural human-made emergency that broke out during the same period is related to any item such as frequency (0-1 time), victim (0-9 people), and damages (less than \$10,000 US), that disaster or emergency will be recorded as unit 'Low'. In addition, unit 'Low' will include either natural disaster or human-made emergency, which has not shown any statistic number.

* * Lifeline includes electric power, gas, communication, water supply, and sewer.

Summarizing the data in <Table 2> , <Table 3> , and <Table 4>, in the case of cities with small size population (20,000-300,000) as listed in <Table 2>, it was shown that storm and flood and CBR rated as top occurrences in each of the natural and human-made disaster categories. In the case of big cities with medium size population (300,000-1,000,000) as listed in <Table 3>, it was shown that storm and flood and collapse, traffic accident, environmental pollution, and CBR rated as top occurrences respectively. In the case of megacities with large size population (more than 1,000,000) as listed in <Table 4>, storm and flood, and CBR and lifeline rated as top occurrences respectively. A unique discovery we made was that regardless of the city size, storm and flood and CBR (especially epidemics) consistently rated as top occurrences in the natural and human-made disaster categories respectively. A matter of still greater interest, however, is that of the many different types of natural and human-made disasters, all of the 12 disaster types that were selected for the purpose of this research were found as surprisingly frequent occurrences in almost all the cities.

2. Object of Urban Disaster Prevention

It is essential to determine now the object of urban disaster prevention on the basis of the aforesaid definition of city and urban disaster types. Firstly, the urban disaster prevention of this research will deal mostly with the 5 types of natural disasters and the 7 types of human-made disasters that occur in the 27 cities selected according to the basic parameter of population size, and the functional aspects of population density, industrial economy, and city

infrastructure. Although variations according to the size, character, and complexity of each specific natural or human-made disaster will arise, it holds true that the 12 disaster types affect the environment, facilities, and services of all the 27 cities. Such environment, facilities, and services pertain to each of the selected city's entire region.

The specific objects of urban prevention will include the ① environment, ② facilities, and ③ services for each city. The three major objects of urban prevention will constitute of the following:

① Environment - topography; watercourse; and climate;

② Facility: housing; public facilities (public buildings, schools, cultural facilities, athletic facilities, etc), transportation facilities (roads, railways, ports, airports, parking lots, etc), utilities supply facilities (utilities services equipment, water/electricity/gas supply facilities, broadcasting/ telecommunication facilities, utility tunnels, etc), industrial facilities (plant facilities, industrial compounds), disaster prevention facilities (detention reservoir, anti-fire facilities, etc), environmental sanitation facilities (sewage and wastewater treatment facilities, garbage disposal facilities, etc), public health and hygiene facilities (crematoria, cemeteries, charnel houses, etc)

③ Services: long-distance telecommunication and ICT, energy, banking and insurance, transportation, medical and emergency rescue services, government sector and its administration (including not only general administration related to urban disaster prevention, but also postal services and food management).

C. Result

Two Approaches for the Training Course

1. Strategy & Target Trainees

The implementation of the Urban Disaster Prevention Training Course as proposed through this research is to consist of two parts: online and offline curricula. The online curriculum will be Web-based and the offline curriculum will take place through intensive training camps. The required courses and credit hours will be determined for the online curriculum, and the application for the offline curriculum will be limited to those who fulfill the online education requirements. The training is to be given first to the public disaster prevention service employees in all the countries across the world, then it is to be expanded to civil branches including businesses, disaster prevention related organizations, research centers, NGO's, and in some case, to ordinary citizens. Through this training program, we look forward to fostering sympathetic participation in the subject of urban disaster prevention among diverse people drawn from both public and private sectors, and to achieving an increased mutual understanding and cooperation for urban disaster prevention.

2. Online Course & Subject Overview

The online curriculum(web-based) will consist of a total of 5 courses including the Characteristic Features of Urban Disaster, Urban Disaster Prevention Concept, Urban Disaster Management, Prevention Technologies, and Prevention Community. These 5 course areas will then be divided into 17 classes.

In the 'Characteristic Features of Urban Disaster' course, types and characteristic features of natural disaster, human-made disaster and other possible urban disasters will be presented through the examination of the disaster impact in each of the disaster cases. The 'Urban Disaster Prevention Concept' course will provide a general introduction on urban studies, followed by presentations on urban environment, urban facility disaster prevention, and maintenance of city function and services during disaster events. The 'Urban Disaster Management' course will present the 4 stages of urban disaster prevention

(prevention•preparation•response•recovery), the establishment of urban disaster prevention policy and plan, and decision-making and situation management system. The ‘Urban Disaster Prevention Technology’ course will present the different types of disaster reduction technologies and the application of Information and Communication Technology. Lastly, the ‘Urban Disaster Prevention Community’ course will consist of presentations on urban emergency evaluation system, international cooperation, civilian cooperation, and support for the urban disaster prevention industry for effective urban disaster management. The following table 5 shows the online Urban Disaster Prevention Curriculum chart with an overview of the course content.

Table 5. Outline of Online Education Curriculum Course

Training course	Class	No. of class	Class hour	Note
1. Characteristic Features of Urban Disaster	•Natural Disaster (I)(Flood (typhoon.flood.heavy rain.strong wind.storm wave.heavy snow, etc.))	1	2	- Theory
	•Natural Disaster (II)(Feature of earthquake, tsunami, slope, and yellow dust, damage type, and disaster cases)	1	2	- Theory
	•Human-made Emergency(Feature of fire, collapse, explosion, traffic accident, CBR, and environmental pollution, damage type, and disaster cases)	1	2	- Theory
	•Urban Emergency(Response to climate change to include urban disaster type, emergency case, extreme weather, and others)	1	2	- Theory
2. Urban Disaster Prevention Concept	•City Studies Introduction(Studying city and city administration & analyzing social and environmental problem according to the urbanization and its concept)	1	2	- Theory
	•City Environment(Feature of facility disaster, feature of social and cultural environment, cases of environment disaster)	1	2	- Theory
	•Urban Facility Disaster Prevention(Feature of critical infrastructure)	2	4	- Theory
	•City Function and Services(- Kinds and feature of urban public services & alternatives to keep essential function in the city)	1	2	- Theory
3. Urban Disaster Management	•Urban Emergency Management (Prevention.Preparedness.Response.Recovery)	4	8	- Theory (2hours in each phase)
	•Establishment of Urban Disaster Prevention Policy and Plan	1	2	- Theory
	•Decision-making and Situation Management System(Situation management system including command, control, and situation report for emergency response during emergency)	1	2	- Theory
4. Urban Disaster Prevention Technology	•Disaster Prevention Technology(Types of disaster reduction technology such as urban critical infrastructure, energy, urban watercourse, and others for urban disaster prevention)	1	2	- Theory
	•Information and Communication Technology (Emergency management system for urban disaster prevention, monitoring system by using USN.CCTV, understanding GIS including urban area, urban facility, etc., & and others)	1	2	- Theory
5. Urban Disaster Prevention Community	•Urban Emergency Evaluation	1		- Theory
	•International Cooperation(International Disaster Prevention Community)	1	2	- Theory
	•Civilian Cooperation(Voluntary Activity)	1	2	- Theory

3. Offline Course & Subject Overview

The offline education is to consist of a total of three courses including ‘Management and Technology for Urban Disaster Prevention’, ‘Team Project for Urban Disaster Prevention’,

and ‘Experiencing Urban Disaster Prevention.’ These 3 course areas will then be divided into 9 classes, where students will spend time in learning through theory, practice, and class discussion. The training period is to last 2 weeks and the total credit hours of the education curriculum are to be 70 hours.

Firstly, the ‘Management and Technology for Urban Disaster Prevention’ course will consist of theory education, practice, and class discussion on the general content learned online. Secondly, in the ‘Team Project for Urban Disaster Prevention’ course, students will design and develop strategies and establish scenarios for the 4 stages of urban disaster prevention (prevention•preparation•response•recovery), and go through urban disaster prevention response training, project evaluation and feedback in teams. Finally, in the ‘Experience on Urban Disaster Prevention’ course students will visit disaster prevention industries, sites, and Emergency Operations Center (EOC), and observe how urban disaster prevention technologies are being utilized in various businesses. In addition, the course will provide students the opportunity to experience about disaster coping strategies during natural disaster and human-made disaster at Gwacheon's Urban Disaster Prevention Experience Center. The following table C-6 shows the offline curriculum classification system with an overview of the course content.

Table 6. Offline Curriculum Classification System

Training course	Class	No. of class	Class hour	Note
1. Management and Technology for Urban Disaster Prevention	▶Management for Urban Disaster Prevention, Practice, & Discussion	1	10	- Theory, Practice, & Discussion
	▶Technology for Urban Disaster Prevention, Practice, & Discussion	1	24	-Theory, Practice, & Discussion -Disaster reduction technology for urban disaster prevention, monitoring by using USN.CCTV, working on GIS and DB including urban facility, etc.
2. Team Project for Urban Disaster Prevention	▶Design and Development of Strategy and Plan	2	5.5	- Theory & Practice -Hazard evaluation, vulnerability evaluation, impact analysis, and risk management, -Establishment of strategy on mitigation, response, and recovery & policy development, -Establishment of EOP and SOP
	▶Establishment of Incident Development Scenario	2	2	-Theory & Practice -natural disaster & human-made emergency, -Environment, facility, & service, and -Development of time Line scenario
	▶Disaster Prevention Response Training	2	3.5	- Theory & Practice
	▶Project Evaluation and Feedback	2	1.5	-Theory & Discussion
3. Experience on Urban Disaster Prevention	▶Visits to Urban Disaster Prevention Site	1	5	- Disaster Prevention /ICT business
	▶Visits to Urban Disaster Prevention Business Places	1	5	- Disaster Prevention Business Place
4. Culture Experience	▶Korean Culture Experience			- Utilizing Saturday
5. Education Activities for Urban Disaster Prevention	▶Orientation	1		- Introducing Curriculum
	▶Graduation Ceremony	1	1	- Granting Certificates

D. Discussion.

The impact and damage of urban disasters continue to exacerbate due to climate change and urbanization, placing densely populated inner city areas under great risk for loss of lives and property. The accelerating climate change and urbanization in our reality today call for a systematic and effective disaster management strategy. We believe that the on/offline Urban Disaster Prevention Training Curriculum proposed in this treatise will foster a professional force in urban disaster prevention all across the world and thereby provide a framework for systematic urban disaster prevention. For an active application of the Urban Disaster Prevention Training presented in this treatise, it remains our duty to raise interdisciplinary and intersectional partnerships and to develop a certification system for the trained professionals.

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