

Paper:

Proposal for Development Cooperation to Enhance the Capacity on Disaster Emergency Response in Developing Countries : A Case Study of Curriculum Development in the People's Republic of China

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Although the importance of Disaster Risk Reduction (DRR) has been recognized internationally as exemplified by the UN World Conference on DRR, funding for emergency relief teams and relief supplies accounts for approximately 66% of the total amount paid for emergency management as a part of international cooperation. Stable economic development requires improvement of DRR and also the mitigation of damage. This paper: 1. Identifies the challenges for enhancing the capacity for emergency management in China; and 2. Examines methods of development cooperation that could help to resolve the above-mentioned challenges. The challenges in China have been brought to light through the Project “Japan-China Cooperation Plan of Earthquake First-Aid Capacity Training” to enhance capacity for earthquake emergency management under JICA’s Technical Cooperation. The timeline analysis for emergency management and after action review were used to assess the China’s emergency management framework and systems. The system and framework of China were also examined by comparing international systems and frameworks such as ISO22320, Japanese DRR system and the United States system. Based on this, curriculum and texts were developed for the National Earthquake Response Support Service (NERSS) to train the personnel engages in earthquake risk management in China. Guidance curricula were developed for the beginners and the intermediate user, which effectiveness was verified by instructional design.

Keywords: after action review, timeline, instructional design, emergency response, development cooperation

1. Introduction

1.1. Background of the Paper

Based on the 1987 United Nations General Assembly resolution on “International Decade for Natural Dis-

aster Reduction,” Japan, as a country of frequent disasters affected, held the UN World Conference on Disaster Risk Reduction (DRR) three times, beginning in 1994. At the 2nd UN World Conference on Disaster Management in 2005, the Japanese Government stressed that investment in disaster prevention is more significant than post-disaster responses. This concept was reflected in the Hyogo Framework for Action (HFA). Based on the HFA the Japanese Government has advocated the initiative on international cooperation for disaster prevention and has given high priority to improving and strengthening disaster prevention systems in developing countries through Official Development Assistance (ODA). At the 3rd UN World Conference on DRR held in Sendai City in March 2015, the Japanese Government promoted “Build Back Better” (BBB), and the mainstreaming of DRR as an important factor for DRR. Consequently, international society agreed that, further technical and financial assistance should be provided for capacity development in developing countries.

On the other hand, according to Kellet [16], emergency response accounted for about 66% of the total amount paid for disaster relief through international cooperation from 1991 to 2010. Most funding fell into the categories of relief supplies and the dispatch of emergency relief teams for search and rescue purposes.

The Japan International Cooperation Agency (JICA) expressed its policy on the promotion of international cooperation to enhance capacity at each stage of disaster response based on the disaster risk management cycle [11]. In reality, the majority of assistance provided by JICA under the emergency response was mainly dispatch of emergency relief teams and provision of relief supplies and seldom to enhance the capacity for emergency response. Projects to enhance emergency response systems have been implemented in countries such as China, Thailand, Sri Lanka, and Indonesia; however, a standardized model to enhance capacity has not yet been established.

Nagatomo [23] clarified in the analysis of the economic

effect of investment in DRR that such investment would increase the effect of development in the future and contribute significantly to stable and swift economic development. Thus, it is essential to improve the emergency management system prior to the occurrence of an actual disaster, which also promote “Build Back Better” swiftly based on the lessons learned from previous disasters. Since improvement of emergency management system is regarded as an investment toward DRR and could help mitigate the damage and chances of a secondary disaster, as well as enhancing resiliency against disaster, the establishment of development cooperation in improving such systems is desirable.

1.2. Purpose of the Paper

In development cooperation to enhance DRR capacity, acculturated systems should be developed with the consideration of cultural and institutional differences in each country. This paper examines development cooperation dedicated to enhancing the capacity for emergency response in developing countries by reference to such methods in Japan and other parts of the world. Concretely, the People’s Republic of China (hereafter referred to as “China”) was selected as the pilot site of study. The gaps in actual emergency responses and ideal emergency responses in China are identified and the development cooperation methods for fulfilling the above-mentioned challenges is examined. The gaps were analyzed through a series of discussions with organizations concerned, such as the China Earthquake Administration (CEA), and the results were agreed upon by both Japan and China. Methods of development cooperation include the following: 1) After Action Review (AAR), which has been developed by the United States Department of Army for reviewing and enhancing organizational capacity; 2) A timeline analysis for disaster risk management (hereafter referred to as “timeline analysis”), which aims to involve the parties concerned, indicate the time objectives of each operation, and make the whole process visible; 3) Instructional design, which exhibits effective learning within a given timeframe. Therefore, through utilizing these 3 methods, “the system optimal for China is conceived by introducing ARR and the timeline analysis” and “the modules for drills and exercises are developed using instructional design.” These methods have been incorporated into ISO22320 and DRR measures in Japan and the United States. One of the purposes of this paper is to examine whether these methods can be also applied in China, despite its different culture and institutional structure.

This paper is written and proposed by the authors who were involved in the “Japan-China Cooperation Plan of Earthquake First-Aid Capacity Training Project,” which aims at enhancing earthquake DRR under JICA’s technical cooperation since October 2009. This paper does not represent the official opinion of JICA. In this paper, methods to enhance disaster risk management capabilities, especially in earthquake emergency response, are analyzed

and examined based on experiences in Niigata and China. The authors believe that response in the form of restoration and rehabilitation, such as the rebuilding of livelihood, depending on the passage of time, can be applicable to not only earthquake but also to other kinds of disasters.

2. Challenges in China’s Earthquake Emergency Response Systems

With steady economic growth and development, China has increased its budget for DRR and taken measures for this purpose since 1976. As a result, the death toll caused by natural disasters was high before 1980 but has decreased since then, except in 2008 when the Wenchuan Earthquake occurred and in 2010 when the Qinghai Earthquake occurred [1]. However, the social distortion triggered by drastic economic growth has revealed difficulties in China’s capability for emergency response to sudden disasters, such as the outbreak of Severe Acute Respiratory Syndrome (SARS) in 2004, the Southern Snow and Wenchuan Earthquake in 2008 [15, 22]. For example, the Wenchuan Earthquake, which occurred in Sichuan Province on March 12 2008, killed 69,227 people, left 17,923 missing, injured 74,600, and caused about 850 billion Chinese Yuan of economic loss. Most of the deaths were caused by the collapse of buildings and secondary disasters. Immediately after the earthquake occurred, the Chinese Government designated the earthquake as the second class over which People’s Government of Sichuan Province should have jurisdiction, and disclosed such information about the earthquake at once. The People’s Government of Sichuan Province took command and established emergency response headquarters two hours after the earthquake occurred. Later, recognizing the serious situation at the disaster-stricken area, the class of the earthquake was upgraded from the second one to the first one over which the Chinese Government should have jurisdiction (see **Table 1**). Based on lessons learned from the SARS outbreak, in which the initial response was delayed, the Chinese Government, the People’s Government of each province, and the companies and organizations implemented an emergency management plan for swift response.

According to Zhang [27], the DRR system in China has improved following the outbreak of SARS, the Southern Snow and Wenchuan Earthquake. In the case of the Wenchuan Earthquake, the following issues have been identified with regard to unified command: a professional Search and Rescue (SAR) team was not organized; measures for precaution and early warning were not properly prepared; disaster mitigation education was not provided sufficiently to citizens. Therefore, the Chinese Government has enhanced their capacity for emergency response by establishing a special SAR team, conducting drills and exercise on established disaster management plan, and strengthening measures for prevention and mitigation. According to Miyao [22], although the People’s Governments of each province, as well as compa-

Table 1. Class of earthquake and jurisdiction.

Class of Earthquake	Level of Earthquake	Criteria	Jurisdiction
Class 1 (National Level)	Seriously Significant Earthquake	More than 300 people killed, Earthquake with M7.0 or over	People's Government of China
Class 2 (Provincial Level)	Significant Earthquake	50 to 300 people killed, Earthquake with M6.5 to 7.0	People's Government of Province
Class 3 (Prefectural Level)	Large Earthquake	20 to 50 people killed, Earthquake with M6.0 to 6.5	People's Government of Prefecture
Class 4 (Country Level)	Earthquake	Less than 20 people killed, Earthquake with M5.0 to 6.0	People's Government of Country

nies and organizations implemented their disaster management plans in the Wenchuan Earthquake, they could not satisfactorily respond to the disaster due to the overlapping functions of each disaster management plan and a lack of coordination between the commands. There was not enough relevance to other disaster management plans, the concrete disaster management plan was not drawn up, and therefore the plan of higher-level government was simply imitated. Therefore, the effectiveness in dealing with the actual disaster was insufficient.

2.1. Comparison of Risk Management System Between Japan and the United States

Each municipality shall take primary responsibility for responding at the time of disasters in both Japan and the United States. In Japan, the municipality located in the disaster-stricken area shoulders the responsibility for disaster emergency response. Depending on the scale of the disaster, if the municipality cannot respond, the prefecture would respond to the actual situation, and if the prefecture could not respond, the Central Government would take over the functions in Japan. In the case of the Great East Japan Earthquake, the officials in the municipalities concerned, who themselves were the victims of the disaster, were mainly engaged with emergency responses for restoration and the rebuilding of livelihoods. Having learned from the Great Hanshin Awaji Earthquake, Japan has drawn up a plan for support such as the provision of emergency fire response teams from other municipalities and improved its methods for SAR by unifying standards of the materials, equipment, and techniques for handling the SAR. Although the Disaster Management Operation Plan, Prefectural/Municipal Disaster Management Plan have been prepared based on the Disaster Countermeasures Basic Act; however, they are basically drawn up by each Ministry and local government and thus, the unified system for collaboration between the related organizations has not yet been built in Japan as it has in the United States.

In the United States, once a presidential disaster declaration is issued, the federal government has direct jurisdiction over assistance for disaster victims and restoration and rehabilitation. The commands for emergency management are coordinated in an integrated way by the standardized National Incident Management System (NIMS). NIMS devises to raise the effectiveness of the operations for emergency management by keeping a record of the disaster, preparing common, unified information for all parties concerned, and handing over information to them. It enables cooperation with other organizations by standardized terminology and symbolism in order to make activities such as SAR run more smoothly.

China has a vertically segmented administrative system as in Japan and has not yet built a unified system for DRR. China has a system for DRR that is similar to Japan, in that the municipalities bear the basic responsibilities of emergency response, restoration, and rehabilitation, and the disaster management plans are usually drawn up separately by each municipality and organization. Taking a series of disasters such as SARS as learning opportunities, each institute in China has studied the Incident Command System (ICS) and NIMS to introduce such systems into the institutions in China [26]. However, China has not succeeded in fully introducing the US system for risk management into the country, because there are certain differences in systems, institutions, and cultures between China and the United States, and the vertically segmented administrative system in China hinders the formation of emergency risk management system in an integrated way. Thus, the authors believe that adopting applicable components of the systems in like ICS and NIMS, while referring to the corresponding systems in Japan, would lead to higher effectiveness in DRR.

2.2. Efforts to Strengthen the Earthquake Emergency Response System in China

The authors have conferred with the executives of the National Earthquake Response Support Service (NERSS)

since 2009 on the frameworks for strengthening the earthquake disaster risk management capacities. Since the outbreak of SARS at the end of 2002, the Chinese Government has strengthened DRR system and the CEA established NERSS in October 2004 as a part of an effort to enhance the earthquake emergency response capacities. NERSS aims to study techniques for emergency response and provide trainings, and hence many young researchers newly recruited to do such businesses. In July 2008, the China National Search and Rescue Training Center (CN-SART) was established to enhance the earthquake emergency response capability at provincial, district, and municipal levels. Training and exercises were provided for provincial level administrators in disaster risk management, and for SAR teams on SAR techniques. However, there remain areas for further improvement in training and exercises center because the curriculum and text had not been prepared based on the Chinese characteristics.

The Law of the People's Republic of China on protecting against and mitigating earthquakes disasters, which was revised in 2009, requires the establishment of the emergency response headquarters in the earthquake-stricken province promptly after the earthquake occurs. The secretariat of the provincial emergency response headquarters have jurisdiction in emergency response including SAR activities, coordination with relevant institutions, preparation of an earthquake disaster management plan, establishment of earthquake SAR team, provision of materials and equipment to SAR team, and conduction of research and training so that the earthquake emergency risk management capacities can be enhanced. The construction of facilities such as NERSS and CNSART by CEA corresponded with a movement toward the revision of the abovementioned law and the enhancement of the disaster risk management capacities that had just been undertaken in China. For this reason, although the facilities were built, the instructors training and the curriculum and texts development are required for achieving the high-quality trainings provision. Hence, Chinese Government officially requested Japan to provide technical cooperation in strengthening human resources and the organizational capacity to make effective use of these facilities.

2.3. Challenges in Strengthening the Chinese Emergency Response System

The authors conferred with the executives and the young instructors of NERSS on the present situation in China, the objectives of NERSS, and the framework of the JICA project over the course of seven visits to China, and one visit of the Chinese parties concerned to Japan from March 2009 to August 2010. As a result, it was made clear that NERSS and the instructors of NERSS, whose capacity for disaster risk management should be enhanced in the five-issues articulated below. It was agreed that cooperation between Japan and China to enhance such capacity was necessary.

The first issue involves strengthening the knowledge and capacity of the instructors. NERSS hired the young

researchers who had just finished their master's and doctorate work, and they did not have enough practical experience in disaster emergency response. Although they had the professional knowledge obtained through academic study, they are required to have further knowledge of disaster risk management and other themes beyond their own field. For this reason, their knowledge and capacity on disaster risk management should be strengthened to achieve instructing the Provincial Earthquake Administration executives and staff who have abundant experience in practical disaster emergency response. The director general of NERSS strongly desired to develop the young instructors capacities of NERSS.

The second issue is an establishment of emergency response records. In China, there are no official records of disaster, or if one existed, it was not published officially, which could result from Chinese cultural characteristics. Therefore, it was impossible to examine whether or not a recurrent event had occurred previously in China. Moreover, the CEA did not oblige in identifying the problems by examining the existing records and preparing them for further examination. The authors have identified that maintenance of record would make it possible to implement AAR and to review the disaster risk management system for identifying the events with reproducibility particularly in China.

The third issue is consideration of acculturate emergency response systems for China. Through a series of discussions, establishment of accustomed regional disaster management plan is necessary with the firm understanding of risk and regional characteristics in each province and disaster. In examining such systems, the comparison with Japanese and the United States risk management systems were used to review the past disaster emergency response and identified the Chinese characteristics events to establish a suitable system for China.

The fourth issue pertains to the development of a curriculum and text for risk management courses in China. To provide high-quality training and exercise at NERSS, which was established for the purpose of strengthening the system for earthquake emergency management in China, the curriculum and text used in the courses must be of high quality. The authors aimed to not only develop the curriculum and text, but also to revise the content in such a way that the opinions of experts and feedbacks from the participants of the trainings and exercises are reflected in the establishment of the popular "NERSS brand."

The fifth issue involves the implementation of practical and effective training. Conduction of practical and effective training is important for revising the provincial emergency management plan on earthquake more effectively by provincial executives and staff through the guidance of NERSS instructors. This does not refer to the training that involves rescue, in which the instruction is simply implemented by the trainees, but rather that in which the trainees have to think by themselves by imagining an actual disaster, considering effective responses, and considering improvements to be implemented.

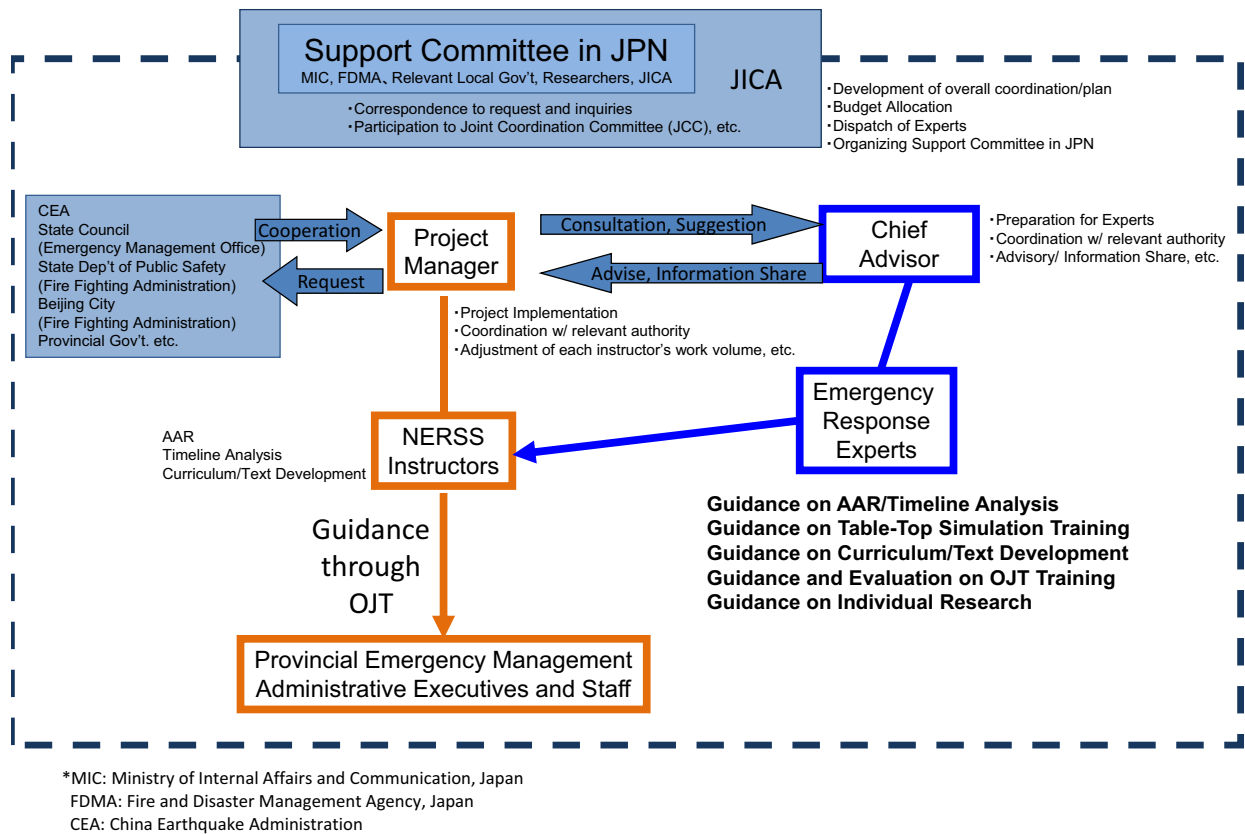


Fig. 1. Guidance system for Chinese instructors.

3. Development of the Modules for Training and Exercises for Emergency Response through Development Cooperation

Based on the five issues articulated above, JICA engaged in development cooperation by dispatching experts as shown Fig. 1. In the field of emergency response, the short-term experts dispatched under a chief adviser, who is dispatched for a long term, to carry out research guidance and technology transfer for NERSS instructors. Five professors and researchers were dispatched for research guidance. Further, the Niigata prefectural officials were dispatched for guidance regarding the timeline analysis and the staff of the Institute for Fire Safety & Disaster Preparedness were dispatched for guidance on a table-top exercise as short term experts.

The experts on emergency response basically provided trainings for NERSS instructors. Since NERSS instructors did not have much experience in providing trainings on timeline analysis and table-top exercises for trainees from the provinces, it was obvious that the levels of provided trainings would not come to the satisfaction by trainees with rich practical experiences in earthquake. Therefore, Japanese experts gave lectures to NERSS instructors at first and gradually NERSS trainers provided lectures to the trainees from provincial administrators as an On-the-Job Training (OJT) basis. The degree of commitment by the Japanese experts to OJT, in which NERSS instructors trained the local provincial administrators, de-

creased as NERSS instructors experienced OJT. In 2013, by the end of this project, the training method for the trainees was improved exclusively through informal advice. Moreover, individual research guidance, similarly to the Japanese University seminar class, for NERSS instructors by short-term experts were provided to motivate and strengthen the capacity of NERSS instructors. In this JICA project, 25 NERSS instructors provided timeline analysis class for 277 local provincial executives and officials, table-top exercises for 354 people, lectured on the introduction to risk management to 154 people, and on intermediate courses on risk management to 106 people.

The trainings and OJTs provided to NERSS instructors were, based on the Capacity Assessment Handbook of JICA, not only enhancing technical capacity such as individual knowledge and technique through provision of individual research guidance, but also enhancing the core capacity to resolve problems by one's own initiative through regular research publication and implementation of training and exercises [12].

3.1. Procedures for Developing NERSS Instructors

The young NERSS instructors were developed as shown in Fig. 2 after consultation with the executives and some core NERSS instructors in 2009. First, the reviews on past disasters were conducted to identify recurrent events accustomed to China through AAR and timeline analysis on earthquake. Then, based on the extracted characteristics of the events, comparison with in-

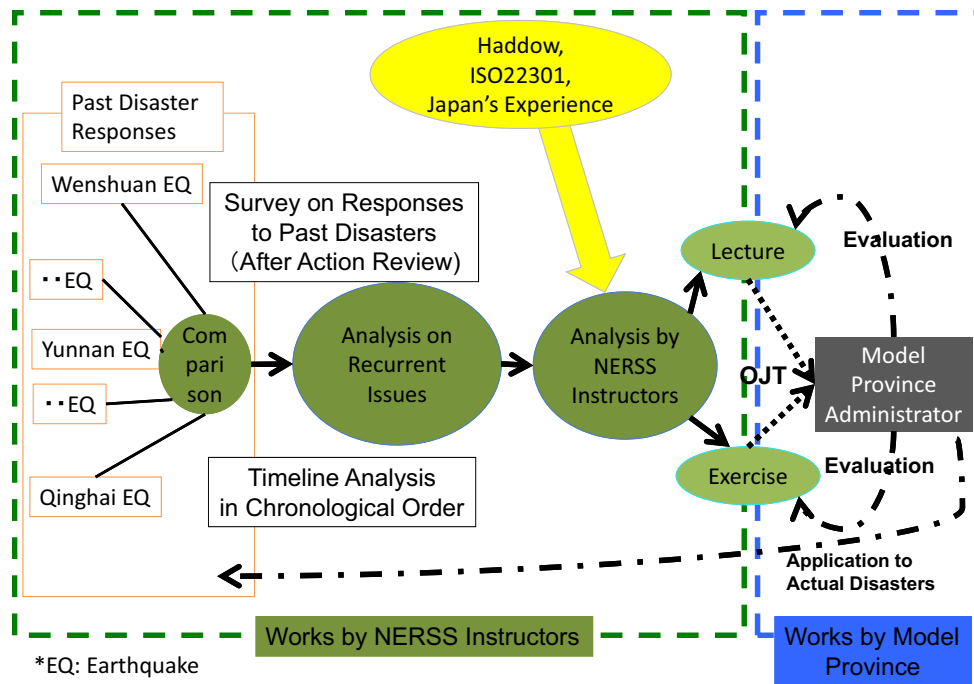


Fig. 2. System to implement project.

ternational standards and systems for risk management was conducted to identify acculturated systems for China. Based on this analysis, the curriculum and text for lectures and training of Provincial Earthquake Administrators were developed. Lastly, the lectures were provided for those administrators through OJT basis by using the developed curriculum and text.

The methods for examination and comparison are as follows. As for AAR, this method has been introduced by the United States Department of Army to enhance the capacity to perform operations. The review is based on four basic questions: What did we set out to do? What actually happened? Why did it happen? What are we going to do next time [3, 6]? This method was used for reviewing the disaster emergency responses that occurred in the past, to identify the issues, and to refer to them in preparing the curriculum for training and drills intended to enhance disaster risk management capacities.

Next, we describe how to introduce the timeline analysis methods. In Japan, the responses and measures were arranged along with the time axis, which changes the needs in long-term support such as rehabilitation and restoration of livelihood based on lessons learned from the Great Hanshin-Awaji Earthquake [18]. After the Mid Niigata Prefecture Earthquake in 2004, Niigata Prefecture reviewed the needs for support along with the time axis based on the above mentioned lesson from the Great Hanshin-Awaji Earthquake, completed the timeline analysis called “disaster emergency response time schedule,” and revised the Prefectural Disaster Management Plan in earthquake accordingly [24]. In this plan, the recovery time objectives are set based on the chronology, from the disaster’s initial occurrence and the goal of each objectives is clearly described so that the total process can

be monitored. Accordingly, the timeline analysis enable us establishing the time objectives of each actions and deciding priority actions, which makes emergency response commander easy to handle emergency response in chronological order. Moreover, this plan made us easy coordinating with relevant department/organizations by describing in detailed operations in all the relevant institutions. In the United States, the timeline that determines the measures to be taken by the relevant institutions has been prepared for each foreseeable risk. For example, in the case of Hurricane Sandy in 2012, each relevant institution undertook disaster prevention measures simultaneously, according to procedures determined by the timeline following the forecast issued by the National Oceanic and Atmospheric Administration (NOAA), which helped minimizing human loss and shorten the recovery time for resuming business. Based on this US experience, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) developed a policy to introduce a timeline analysis to develop detailed action plans in advance to the rivers over which MLIT has jurisdiction within the fiscal year 2014 [25]. In this study, such methods in Japan and the United States are regarded as a timeline analysis, the emergency responses to past disasters are described along the time axis, and the operation that is anticipated to be used after a disaster occurs is clarified. This method was used for the training of Provincial Earthquake Administration executives and staff in order to form the basis for more effectively revising earthquake emergency management plan within each province.

Finally, the study mentions a method for examining the acculturated system for China by comparison with the international standards and experiences of Japan and the United States. Using the “Introduction to Emergency

Management” [7], a guide to risk management for undergraduate students in the United States, ISO22320, an international standard, ICS, NIMS, and the experiences of disaster risk management in Japan at the time of the Great Hanshin-Awaji Earthquake, we made NERSS instructors to examine suitable accustomed disaster risk management system for China. The US risk management system, which becomes the basis of the international standard, was carefully examined to prepare the acculturated text in China. At the beginning of the project, Haddow’s [7] table of content was referred to for examining the development of acculturated curriculum for training and exercises to enhance disaster risk management capacities. ISO22320 [9], summarizes the minimal requirements for performing internationally standardized operations for disaster risk management effectively and efficiently; ICS, the system for risk management which is standardized among US administrative organizations for the purpose of making support and cooperation easier [2, 10] and NIMS, which obliges local US governments to use ISC practically following the Synchronized Terrorist Attack in 2001 [2, 8], would provide useful information on organizational management such as response system, obligation of after action report, and establishment of operational plans. Accordingly, we examined whether any such items could be incorporated into the disaster risk management system in China. As for measures of DRR in Japan, we introduced the Great Hanshin-Awaji Earthquake responses and made NERSS instructors recognize the difference between this system and the US system, then discussed to consider acculturating suitable risk management system for China.

3.2. Procedure for Completing the Curriculum for Training and Exercises

Based on the lectures conducted for NERSS instructors and the discussions with them, the Chinese version of the text on introduction to earthquake disaster risk management has been developed as shown in Fig. 3.

To complete the text as the final product in the preparation of the curriculum, preparation of the manual for the table-top exercise, evaluation of the Wenchuan Earthquake emergency response (learning of the method of field survey), and preparation of the manual for the timeline analysis and AAR were considered as essential. The basic flow is the same as that shown in Fig. 2, but the procedures have been structured that NERSS will be able to develop the curriculum and manual as a result of this project, evaluate the disaster emergency response in similar disaster in the future, identify the challenges based on this evaluation, and further the capacity to prepare for future disasters by itself.

The curriculum for training and exercises has been developed using the instructional design according to Gagne [5]. The instructional design is the framework for the training and exercises to promote effective intentional learning, and attaches much importance to the capacity acquired by the learners at the end of the training and

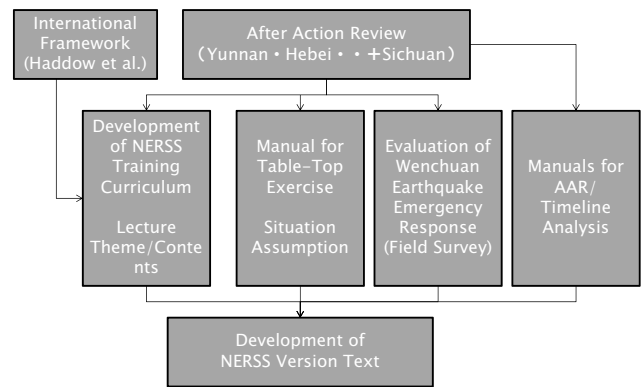


Fig. 3. Procedure to complete the text in NERSS version.

exercise. According to Kimura [17] with regard to disasters or crises that occur infrequently, efficiency and attractiveness of the educational activities can be increased to create desirable environments for educational support by offering training and exercises rather than learning on site such as OJT. The same method is applied to enhance the ability of workers for disaster risk management. The ADDIE model, which is an acronym for Analyze, Design, Develop, Implement, and Evaluation, is the most famous instructional design process and was applied to the preparation of the curriculum for guidance, the teaching materials, and the test in this project. As shown in Fig. 4, the theme to be lectured was analyzed. Then, the contents to be taught were examined and based on this examination; the teaching plan and materials were prepared. The teaching plan and materials were implemented at the OJT for evaluation. Based on the evaluation, the theme, contents, and materials were revised as needed. The authors considered it important for NERSS instructors in building the latest model for risk management to learn the process from evaluation to revision. Thus, the curriculum and text have been revised through the evaluation and guidance from us, the Japanese experts, the peer review among NERSS instructors, the evaluation from training participants from the Provincial Earthquake Administration, and the evaluation from NERSS executives. Though this process, NERSS instructors have accustomed themselves to revising and improving the curriculum and text by themselves continuously.

3.3. Development of NERSS Version Disaster Risk Management Curriculum

The authors conducted seven workshops and eight seminars since November 2010. In May 2012, the framework for the introductory, intermediate, and advance courses, which had been discussed with NERSS instructors, was worked out as shown in Fig. 5. First, the time needed for the lectures for each course was examined by taking into account the circumstances of the trainees – Provincial Earthquake Administration executives and staff – as well as the available budget of NERSS. As a result, it was decided that an introductory course would be conducted

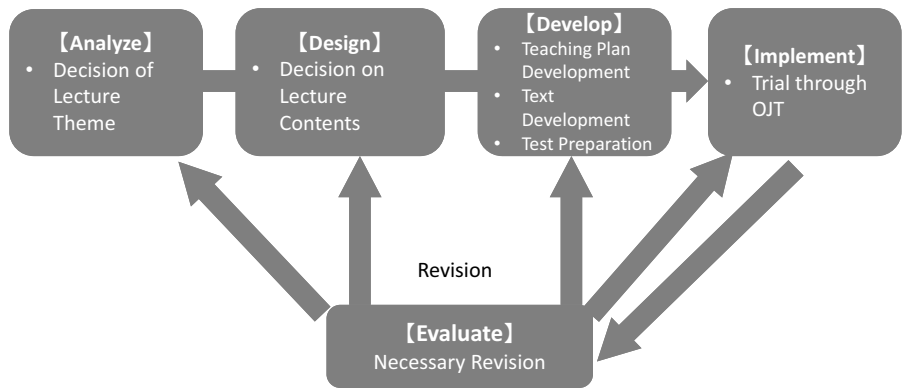


Fig. 4. Research guidance method based on the ADDIE model.

		Training	Introductory	Intermediate	Advance
Emergency Response Systemization		Objective	Disaster Management Plan	Timeline/ Table-Top Exercise	Advance
Earthquake Monitoring/ Forecasting			Basic Items on Disaster	Collection/ Adjustment of Items and Cases on Capacity	Collection/ Adjustment of Items and Cases for
Preventive Measures			Emergency Response	Necessary for Practical Disaster Management	Developing Professional Disaster Management Officials
Emergency Management	operation	Preparedness/ Mitigation			
		Emergency Response			
	management	Rehabilitation/ Reconstruction			
		Information Management			
	Command and Control				
	Cooperation/ Collaboration				
					ISO22320

Fig. 5. The overall structure of the developed training and exercises.

for one day, the intermediate course would be conducted for three days, and the advance course for two weeks. Then, the lecture materials, the test for measuring the understanding of the trainee, and the curriculum for the lectures were examined. This project was carried out for three years, with the intention of completing the text and curriculum for the introductory and intermediate courses. Thus, the advance course aimed to develop professional officials was excluded from the project.

At the examination of the introductory course, NERSS instructors conceived the units to understand the disaster risk management based on China’s DRR system. Taking the earthquake emergency responses conducted up until the Wenchuan Earthquake into consideration, trainings were provided on the basis of eight units: 1. Earthquake

damage mitigation; 2. Earthquake emergency response; 3. Restoration and rehabilitation; 4. Information communication; 5. The Law of the People’s Republic of China on protecting against and mitigating earthquake disasters; 6. Cooperation and Collaboration; 7. Command and coordination; 8. Damage estimation, collection, aggregation, sharing, and provision of information. The themes of these eight units could be changed according to the position and interest of the trainees and combined into a set of about four units for lectures. It was determined to provide thematic lectures based on the interest of the trainees such as “what the executives should be aware of,” “what the commanders should respond to after the occurrence of a disaster,” “knowledge of commanders,” and “meaning of disaster risk management.” In the intermediate courses,

in addition to the abovementioned eight units, three others, including: 1. Prompt situation analysis of earthquake; 2. Development of risk management system; and 3. Earthquake emergency management plan and timelines analysis, were also included to acquire practical knowledge.

Efforts were made to clarify the prerequisite and guarantee the level of content in working out the text and materials for each lecture. The officials in charge of risk management for provinces or cities were imagined as the trainees. And responses to an earthquake that occurred directly above the epicenter with a magnitude of about 6.8, which each provincial people's government should respond to, were devised as a result of discussions between Japan and China. The capacity to respond to the disaster swiftly according to the provincial earthquake emergency management plan under the above-mentioned conditions, to report the situation appropriately to the higher-level government, and to implement the emergency responses, could be enhanced through the trainings.

In carrying out the training, it was considered as most important to Provincial Earthquake Administration executives and staff to acquire the practical knowledge and techniques. Thus, we conferred with NERSS executives, who had the authority to decide the content of the training and agreed with them that the timeline analysis is crucial for enhancing practical capacity, and that applications in Japan should be taken into consideration and incorporated into the intermediate course. As a result of this discussion, the final agreement was reached that the following 11 units would form a basis of the text that has been developed. These 11 units include: 1. Introduction to earthquake emergency management (the Law of the People's Republic of China on protecting against and mitigating earthquake disasters); 2. Emergency preparedness for earthquake (damage mitigation of earthquakes); 3. Earthquake emergency response; 4. Information on earthquake disaster (information communication); 5. Prompt situation analysis of earthquake; 6. Command and coordination; 7. Cooperation and collaboration; 8. Collection, aggregation, sharing, and provision of information; 9. Earthquake emergency management plan and timeline analysis; 10. Exercise of earthquake emergency management plan and timeline analysis; and 11. Restoration and reconstruction after earthquake (restoration and rehabilitation).

The contents of the developed text are as follows. In the introduction to earthquake emergency management, the legal system in China, such as the Law of the People's Republic of China on protecting against and mitigating earthquakes disasters and the role of local government are understood, and the international framework is introduced. In emergency preparedness for earthquake (damage mitigation of earthquakes), the necessity and contents of damage mitigation are explained and the planning, training, and exercise, methods for human resource development, evaluation, and improvement methods for this purpose are introduced. In earthquake emergency response, the flows and outlines of emergency response are introduced and the emergency responses are examined with reference to cases of past disaster emergency

response in China and the challenges associated with this response. In information on earthquake disaster, the collection and processing of information is introduced, using the international standards such as ISO22320. In prompt situation analysis of earthquake, the damages and losses caused by earthquakes in China and other countries are introduced and the differences between seismic intensity and magnitude, the relation between earthquake and damage and loss, and the methods used to examine and analyze the secondary disaster are also introduced. In command and coordination, the arrangement for emergency response, the command and the coordination are explained based on the Chinese laws and plans and the standardized responses conducted using ICS and ISO22320 are introduced. In cooperation and collaboration, we introduce, along with international SAR activities, how the cooperation should be developed and what should be prepared and determined in advance for this purpose. In collection, aggregation, sharing, and provision of information, we introduce the kind of information that is needed with the passage of time after a disaster occurs, as well as methods to process intelligence from the collected information and provide it to relevant institutes and mass media, taking past disasters as examples. In earthquake disaster management planning and timeline analysis, the challenges in the current plan are explained and then we introduce the timeline analysis. In the practice for earthquake disaster management plan and the timeline analysis, the procedures for working out the timeline are introduced. Lastly, in restoration and reconstruction after earthquake (restoration and rehabilitation), the definition and objectives, and the parties who are involved with this activity are introduced and then the concrete cases of restoration and rehabilitation at disasters that occurred in the past are introduced. As mentioned above, in the developed curriculum, relevant Chinese laws and plans are introduced as well as the international methods such as ICS and ISO22320. Every kind of challenge is presented by taking the disasters occurred in the past as examples. The trainees are made to examine the kind of response that is needed in the future, so that they could review their operations according to the chronological order by themselves.

4. Result and Review of the Introduced Method on Development Cooperation

At the beginning of project, the lectures provided by NERSS instructors made trainee aware of the insufficient practical knowledge and experiences for the Provincial Earthquake Administrators with rich practical experiences. On the other hand, as a result of evaluations from the trainees, colleagues, and JICA experts based on instructional design, many practical advices and comments were provided as part of evaluation by the trainees on training courses and thus NERSS instructors were motivated to improve the lecture materials and curriculum. The application of AAR and the timeline analysis under

Table 2. Results of questionnaire survey to trainees.

No.	Feedback Aspect	Average	Highest	Lowest
1	Curriculum concentrates on the theme of "earthquake disaster management" (out of 100%)	93.6%	100%	80%
2	Curriculum practicality (out of 100%)	72.7%	100%	40%
3	Curriculum novelty (out of 5)	4.45	5	3
4	Curriculum consistency (out of 5)	4.55	5	3
5	Send-outs (out of 5)	4.60	5	4
6	Trainers' skill (out of 5)	4.59	5	3
7	Design of tabletop exercise, including scenarios setup, injections, etc. (out of 5)	4.60	5	3
8	Tabletop exercise add-values (out of 5)	4.67	5	4

the guidance of JICA experts, led to increase the technical capacity of NERSS instructors themselves. By the timeline analysis, each party involved in emergency response could be identified and necessary actions in chronological order after the disaster occurrence could be determined. By applying AAR to review past disasters, in addition to the timeline analysis, what kind of response was conducted for each operation and what kind of challenge was encountered could be examined in each objective. Countries with a vertically segmented administrative system, in many cases, it is difficult to grasp the overall operations due to a lack of shared information amongst the parties concerned and lead to overlaps or lacks in some operations. By using AAR and the timeline analysis, the actual situation on earthquake emergency response in China could be examined; the emergency management plan could be improved to one that operates more effectively and without omission, leakage, or lack; the basis for the implementation of operations based on this plan could be formed; and the cooperation among the parties concerned could be urged.

Moreover, the curriculum and materials of NERSS, which had not existed before this project, were developed using the methods mentioned in this paper. In particular, timeline analysis method were implemented to examine Chinese earthquake emergency response in comparison with that in Japan by Du [4] and the development of disaster risk management simulator by using the response items identified by timeline analysis by Zhou [28] enhanced the core capacity of NERSS themselves. In developing the materials and curriculum, the instructor was designated for each unit and the materials were prepared accordingly. However, understanding of risk management in general and grasping the relation with other units are substantial for human resource development, thus, NERSS instructors had been guided from the middle of this project to use materials for lectures that other instructors had prepared, so that the capacity of NERSS for training and exercises could be enhanced. The method of instructional design introduced for preparing the curriculum and materials enabled the challenges to be identified through the experience of actual disaster and the table-top exercise to always be incorporated into new curricula and

materials, leading to continuous enhancement of the core capacity of NERSS.

In the Japan-China Cooperation Plan of Earthquake First-Aid Capacity Training Project, questionnaires on the satisfaction of the trainees were conducted after each of the five trainings provided by NERSS. As a result of the questionnaires, a degree of satisfaction ranging from 76.8% to 94.3% was shown. The degree of satisfaction on the content of lectures, such as subjects and materials, as well as the lecture was high. Especially, it deserves special mention that a high degree of satisfaction is shown among the executives of the local Province Earthquake Administration who practice the operations for disaster emergency management on a daily basis. Moreover, according to the table summarizing the findings of evaluation at the end of JICA project, the well-balanced arrangement between theory and practice and introduction of novel ideas such as a timeline analysis are highly evaluated. Additionally, it is also notable that the emphasis on revision of the teaching materials and manuals results in high-quality products [14].

Lai, who was guided as a young instructor under this project, confirmed the degree of satisfaction by implementing a questionnaire with 20 questions to the trainees when the instructors of NERSS, including Lai, carried out the trainings [19]. **Table 2** shows the evaluation of the curriculum in terms of whether the contents and themes are appropriate or not, whether the knowledge and techniques acquired through the trainings are practical for use or not, and whether novelty of the training is high or not in general. The teaching materials, teaching skills, and table-top exercise are also highly evaluated. It can be concluded that the system to enhance the capacity of local government officials has been built successfully. By making use of instructional design, the parties concerned evaluate the program that they themselves reviewed, developed, and implemented. The findings in **Table 2** show the trainees' evaluation after the NERSS instructors, including Lai, carried out trainings using the curriculum and text that they themselves developed under this project. These findings show significance in terms of enhancing capability.

Such positive evaluation is attributed to the fact that the

parties concerned grasped the characteristics of their own country in comparison with other countries. By applying AAR and timeline analysis, they were able to develop curriculum and text acculturated to their own country. Thus, it has been made clear that comparison with the international framework and the DRR measures in Japan and the United States, and application of AAR and timeline analysis promote better understanding of the characteristics of one's own country. Further, it makes possible to consider acculturated DRR system and enables us to develop a curriculum in highly effective manner. The NERSS instructors could update and improve the curriculum and text continuously by themselves once they have become accustomed to evaluating and revising the process from analysis to implementation through instructional design. The development of the curriculum and text for training by use of instructional design was also evaluated as significantly effective at the end of the project when reviewed by the terminal evaluation [14]. The prominent researchers who researches emergency management, the local government officials in Japan in charge of disaster risk management, and the researchers who carry out the table-top exercise for the local government in Japan guided NERSS instructors insistently from the beginning of this project and built a strong relationship with the zealous NERSS instructors, which contributes much to the positive evaluation of this project. Moreover, the chief adviser played a significant role in grasping the overall context of the project and mediating between short-term experts and NERSS instructors. Through a series of guidance provided by the experts, the module for training and exercises could be developed by establishing a brand of "NERSS training," which incorporating the Chinese Government will to fully utilizing established facilities to enhance the DRR capacity.

To confirm the effectiveness over a longer period of time, it is desirable to build the continuous monitoring system, and to revise the curriculum in conformity with changing social needs. Especially, to revise the curriculum and text continuously, the analysis and examination should focus on the following three points: 1. "The international knowledge applicable to China"; "Cases particular to China to be incorporated into the text"; and "It should be examined whether issues are due to insufficient surveying or to certain characteristic of China." Although this study focuses on earthquake, the analysis and examination of the process of rehabilitation, which requires responding to changing needs along the time axis, are considered as applicable to other disasters such as flood. Further examination will be conducted on the applicability of the curriculum development to other disasters, based on the outcome of this study.

5. Conclusion

This paper focuses on developing a module for training and exercises that fosters administrative officers in the Japan-China Cooperation Plan of Earthquake First-

Aid Capacity Training Project, which JICA implemented from October 2009 to March 2013, examining the effectiveness of such development. The existing system for DRR was reviewed using AAR and timeline analysis as a method to enhance the capacity for disaster risk management in developing countries. The curriculum and text were developed by applying instructional design.

The comparison with international frameworks and DRR measures in Japan and the United States were undertaken together by the authors with NERSS instructors will become the basis to consider establishing DRR systems in developing countries and was useful for enhancing the technical capacity of the individual NERSS instructors. Moreover, challenges identified by NERSS instructors by using AAR and timeline analysis, and recording and evaluating the disaster emergency responses will enable instructors to review the existing institutions and systems by themselves; this led to the enhancement of the core capacities of organization. In this study, it has been made clear that the mechanism for reviewing DRR system in one's own country by means of these methods, as well as the curriculum for training and exercises developed through instructional design, brought a high degree of satisfaction to the trainees. The participation of the prominent DRR researchers during the project formation, and the development of training module, which aimed to establish a brand "NERSS training," have contributed to the success of this project. Additionally, the chief adviser, the mediator between Japan and China, has also played a vital role, which should be referred to in applying the DRR system to other regions and improving it according to local context.

Identifying recurrent characteristics of disaster and particular issues by comparing them with other countries' DRR system through applying AAR and preparation of emergency response action by using timeline analysis, were also useful for developing countries which are likely to focus on SAR activities after the occurrence of a disaster. We hope that the application of this method will contribute to improvements in DRR systems in other countries as much as possible, leading to the mitigation of disaster.

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