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CAPACITY BUILDING OF INTERNATIONAL INSTITUTE OF SEISMOLOGY AND EARTHQUAKE ENGINEERING, BUILDING RESEARCH INSTITUTE, JAPAN, IN THE FIELD OF EARTHQUAKE ENGINEERING

T. Yokoi[(1)], N. Hurukawa[(2)], T. Azuhata[(3)], T. Hara[(4)], B. Shibazaki[(5)], M. Inukai[(6)], T. Kashima[(7)], Y. Fujii[(8)], T. Hayashida[(9)], H. Kato[(10)]

[(1)] *Director, International Institute of Seismology and Earthquake Engineering, Building Research Institute, Japan (IISEE-BRI), tyokoi@kenken.go.jp*
[(2)] *Senior Fellow, (IISEE-BRI), hurukawa@kenken.go.jp*
[(3)] *Chief Research Engineer, (IISEE-BRI), azuhata@kenken.go.jp*
[(4)] *Chief Research Scientist, (IISEE-BRI), thara@kenken.go.jp*
[(5)] *Chief Research Scientist, (IISEE-BRI), bshiba@kenken.go.jp*
[(6)] *Chief Research Engineer, (IISEE-BRI), inkm@kenken.go.jp*
[(7)] *Senior Research Engineer, (IISEE-BRI), kashima@kenken.go.jp*
[(8)] *Senior Research Scientist, (IISEE-BRI), fujii@kenken.go.jp*
[(9)] *Senior Research Scientist, (IISEE-BRI), takumi-h@kenken.go.jp*
[(10)] *Research Engineer, (IISEE-BRI), pckato@kenken.go.jp*

Abstract

The International Institute of Seismology and Earthquake Engineering (IISEE) at the Building Research Institute (BRI) in Tsukuba, Japan has provided the opportunity to study about the nature of earthquakes and about the countermeasures against their consequences since 1962, by the cooperation with Japan International Cooperation Agency (JICA) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). As of March 2016, a total of 1,714 participants from 100 countries has completed the training courses from 1960. Today IISEE mainly conducts one-year training courses named Seismology Course, Earthquake Engineering Course and Tsunami Disaster Mitigation Course, and two–month courses named Global Seismological Observation Course and Earthquake Engineering for Latin American Course. Moreover, Short-term training courses focusing on specific themes take place occasionally.

The teaching language is English for all these courses except Latin American Earthquake Engineering Course, for which is used Spanish. By the partnership with National Graduate Institute for Policy Studies (GRIPS) initiated in October 2005, three one-year courses have been certified as a Master's Program.

BRI including IISEE has collaborated various technical assistance programs of Official Development Aid conducted by JICA all over the world, of course, including Latin America. Successful examples are found in the cooperation with CISMID, Peru, CENAPRED, Mexico and also with PUC, Chile. Recent ones with El Salvador and Nicaragua. Together with the projects in site, IISEE's training courses has sustained the technical cooperation programs as two wheels of a chariot.

IISEE in BRI continues and extends its activities together with the former partners of the technical cooperation programs in the frame of IPRED, UNESCO for the human against earthquakes in the world.

Keywords: Capacity Building; International Training Programs; Technical Cooperation Programs

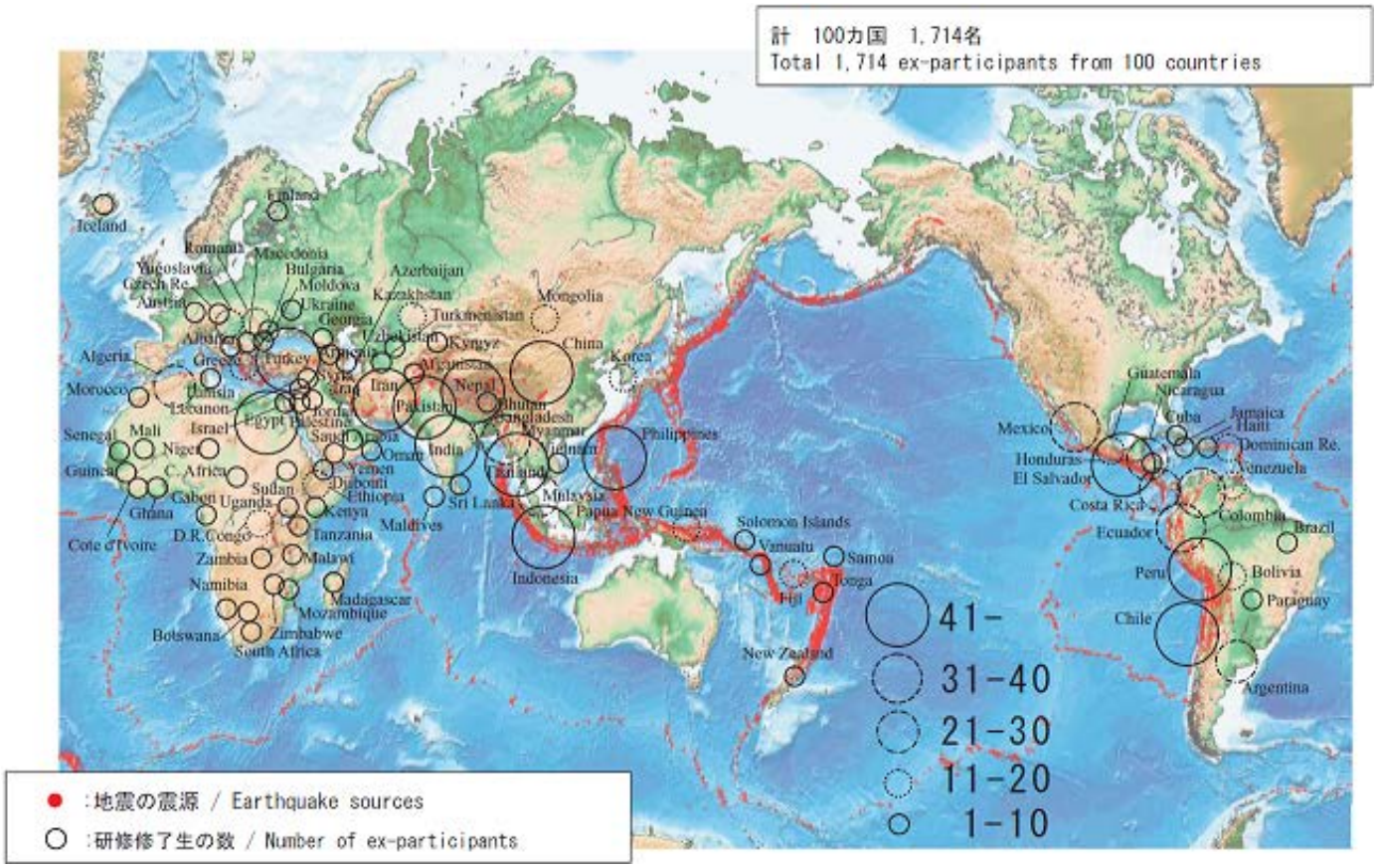

Fig.1 Distribution of IISEE alumni all over the world

1. Introduction

The most efficient way for earthquake disaster mitigation may be enforcement of the national laws that make earthquake-resistant construction mandatory, as statistics on damage in 1995 in Kobe showed that the majority of victims were caused by collapse of their own dwellings. They would not be lost and their livelihood would be sustained, if their dwellings could resist sufficiently. The humanitarian point of view never accepts any human loss. For earthquake disasters, the main concern is the safety of buildings. The key issue for the Tsunami disaster mitigation is early evacuation to safe places via safe routes, as shown by the tragic case of the 2011 disaster along the Pacific Coast of Japan. For both, the scientific understanding of the nature of the natural phenomena “earthquakes” is indispensable. IISEE’s over-all goal is set to secure the safety of buildings through seismic-resistant building codes and to provide the information about tsunamis, safe routes, and places. The corresponding technologies are Structural Engineering of buildings and Seismic Observation and Earthquake/Tsunami Hazard/Risk Assessments. IISEE has taken a long term strategy since its establishment.

IISEE and its training programs were established in early 1960’s by the collaboration of the leading researchers all around Japan, the Japanese Government and United Nation (UN) agencies such as UNESCO, UNSF and UNTAB, who considered the world demand for specialists in the mentioned fields and the need for international cooperation in training. Then, there is a consensus among the experts of the mentioned fields in Japan and the world to collaborate and support its international training programs as lecturers and other activities. Therefore from its establishment, the lectures of the training has been implemented by “all-star cast” of Japanese leading researchers and attended by 1,714 persons from 100 countries and regions as of the end of March 2016 (Fig.1).

Table 1 Course Classification

Training Course (Field) & Abbreviation			Quota	Period		Alumni	
Regular	Seismology	**S**	10	1 year	1960 - Present	538	1121
	Tsunami Disaster Mitigation	**T**			2006 - Present	43	
	Earthquake Engineering	**E**	10		1960 - Present	540	
Seminar	China Seismic Building	**C**	20	2 months	2009 - 2012	72	277
	Earthquake Engineering for Latin America	**L**	16	2 months (2 weeks in Latin America)	2014 - Present	30	
	Seminar on Seismology or Earthquake Engineering	$\mathbf{S_m}$	10 to 20	1 to 2 months	1980 - 2000	175	
Global Seismological Observation		**G**	10	2 months	1995 - Present	208	
Individual (Seismology/Earthquake Engineering/ Tsunami Study)		**I**	Several	upon request	1968 - Present	108	

2. Classification of IISEE International Training Courses

Today, in cooperation with JICA and MLIT, IISEE holds Regular Course and Seminar Course (Fig.2). The former consists of Seismology Course, Earthquake Engineering Course and Tsunami Disaster Mitigation Course and the latter of Earthquake Engineering for Latin America Course today. Previously, other courses in this classification have been held. Beside Global Seismological Observation Course and Individual Course are being held. The classification of these courses is shown in Table 1 with other detailed information.

In 2005, IISEE went into partnership with the National Graduate Institute for Policy Studies (GRIPS) in Japan. Regular course participants in seismology, earthquake engineering, and tsunami disaster mitigation, who have successfully completed the requirement with sufficient performance, are conferred the degrees of "Master of Disaster Management" certified by GRIPS and BRI/IISEE (Fig.3).

Fig.2 Courtesy visit to Mr. A. Ohta, Minister of Land, Infrastructure, Transport and Tourism (MLIT), Sep.2, 2015.

Fig.3 Awarding of Master's degree by Dr. Y. Sakamoto President of BRI, Sep. 17,2015

Fig.4 Structural Test in Building Research Institute, Japan (2015).

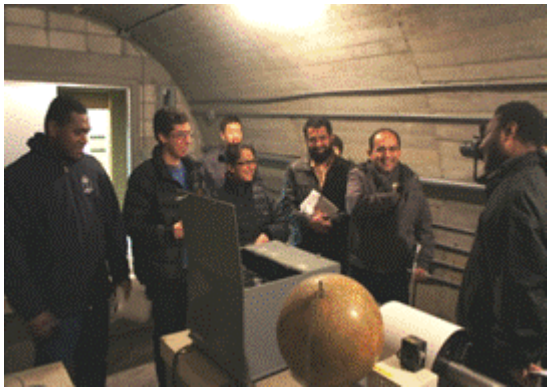

Fig.5 Visit to Matsushiro Seismological Observatory, JMA (2015).

2.1 Seismology Course:

S-course (Table 1) provides advanced knowledge and techniques in the fields of earthquake seismology and seismic hazards. Participants are recruited from organizations responsible for earthquake monitoring and/or earthquake disaster mitigation in their respective countries. Lectures such as seismic hazard evaluation and earthquake disaster mitigation policies are useful for participants after completion of the course. Practical training, study trips, and participation in international conferences are also included in the program.

2.2 Tsunami Disaster Mitigation Course:

T-course (Table 1) began in 2006 after the gigantic tsunami generated by the earthquake off the west coast of Sumatra in 2004. Lectures provide advanced education and technology for dealing with earthquakes and tsunamis. Participants are specialists who can apply and disseminate their acquired knowledge and techniques for tsunami disaster mitigation and introduce tsunami hazard evaluation and early-warning systems in their countries.

2.3 Earthquake Engineering Course:

E-course (Table 1) is designed to contribute to the reduction of structural damage due to earthquakes that cause human suffering in developing countries. Participants are mainly researchers, engineers from governments and universities. Lectures comprise basic studies (structural analysis, structural dynamics, soil mechanics, etc.), practical studies (earthquake resistant structures, seismic codes, seismic diagnosis, retrofit techniques, etc.) and the latest studies (seismic isolation, response control technique, etc.). These are systematically provided through lectures, practices and study tours (Fig. 4).

Beside ordinary curricula including lectures, practices and experiments various opportunities are provided to the participants of above mentioned three courses to understand lessons learnt from recent damaging earthquakes: observation visits to devastated area and reconstruction sites of the 2011 Great East Japan earthquake and Tsunami, those of the 1995 Kobe earthquake, those of the 2004 Chuetsu earthquake, etc. They can obtain the newest information also by attending international conferences and workshops held in and around Tokyo occasionally.

2.4 Global Seismological Observation Course:

G-course (Table 1) is aimed to transfer the technologies and knowledge accumulated in Japan in the field of seismology and seismic observation to the developing countries and to foster professionals of these fields in respective countries (Fig. 5). Technologies for the seismic observation and the data processing for discrimination of seismic waves caused by nuclear tests are included, too and then the course contributes to the establishment of a worldwide seismic network as an important part of the deterrence of nuclear tests. A major part of the curricula

is of

Fig.6 Laboratory Practice in Building Research Institute, Japan (2015).

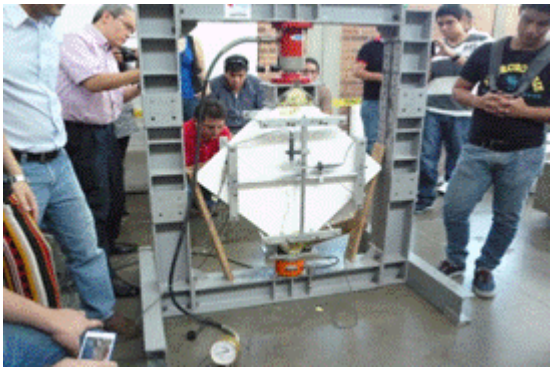

Fig.7 Structural Test in El Salvador (2015).

lectures and practices of seismology, seismic observation and data processing technology as earth science. Many of ex-participants are working with the responsibilities to lead and teach seismology and seismic observation that contribute to improving seismic resistance of buildings and cities in their respective countries.

2.5 Earthquake Engineering for Latin America Course:

L-course (Table 1) is designed to foster leading structural engineers and governmental technical officers who are responsible for dissemination or education of earthquake-resistant construction technology in their respective countries. They learn together aseismic design, seismic resistant construction, diagnosis, retrofitting for buildings and legal system to control constructions through lectures, structural tests and construction site visit during the training period of two months. Spanish is selected as the teaching language to make easy the participation of specialists in this field and to improve the effect of the training. Moreover, the structural tests in this course are held in one of the participating countries using construction materials and condition in Latin America, expecting quick dissemination of learned technologies by the participants (Fig. 6 and Fig. 7).

2.6 Individual Course:

I-course (Table 1) is designed for participants with high scholastic ability and professional experience. Each participant pursues his/her own study individually with his/her supervisor in IISEE. Prior individual consultation is recommended to whom wish to apply for this course directly to IISEE-BRI.

3. Process of Recruitment and Implementation

Except Individual Course, all other courses are being implemented as a part of the Official Development Aid (ODA) of the Government of Japan and then the recruitment of participants are conducted through an inter-governmental channel. JICA is the responsible organization for Japanese ODA and also for the recruitment of course participants. Consultation of the individuals directly to IISEE-BRI will be guided to the formal procedure of application. The procedure is explained briefly in the following URL.

“http://www.jica.go.jp/english/our_work/types_of_assistance/tech/acceptance/training/about/process.html”.

The principle can be described shortly as follows. The timing described below is for Regular Course including S-, T- and E- courses, that is implemented from October to September of the following year.

3.1 Request Survey

The Japanese embassy and JICA overseas offices conduct “Request Survey” with the national government of the developing countries from June through July to confirm the desire to participate the following year, after the course formulation and scrutiny processes in side JICA.

3.2 Candidate Countries

Japan's Ministry of Foreign Affairs makes the final decision in October for courses that have passed scrutiny and have a certain level of participation requests from developing countries in the request survey. Notification of the course is then made to each of the developing countries that have requested the respective course. These are sometimes referred as Candidate Countries.

3.3 Recruitment of Participants by General Information

JICA then sends "General Information", i.e., an official document for recruitment on the course to participants in the developing countries, in February of the year of the course implementation. The participating governments consider the issues they have and the content of the programs and send a list of recommended organizations and nominees from March through April. Japan considers these and makes the final determination of the organizations and nominees who can participate.

4. IISEE's Long Term Capacity Development through Fostering Human Resources

During the history over 55 years, IISEE keeps the cascade manner of human resources development: fosters the trainees to create core groups in governmental entities of their home countries such as seismic observatories, national research institutes, and national universities; the alumni disseminate the technologies in their own countries in consideration of their respective circumstances, regulations, and people; simultaneously younger members attend the training programs and return home with the newest technologies; this spiral-up process builds their organizations' capacity continuously. Successful examples are found in seismic observatories in Yemen and in Nepal where technology transfer was conducted efficiently and today seismological observation and analyzes are conducted by themselves. The cooperation has been done with other countries such as Agency for Meteorology, Climatology, and Geophysics (BMKG), Indonesia, National Research Institute of Astronomy and Geophysics (NARIAG), Egypt. Many cases, this process is engaged with the technical assistance under the ODA programs of Japanese Government. Under these, the important centers for earthquake disaster mitigation were created such as National Center for Disaster Prevention (CENAPRED) in Mexico and Japan-Peru Center for Earthquake Engineering and Disaster Mitigation (CISMID) in Peru [1]. Today, they implement technical investigations and improve their building codes by themselves. Other examples can be counted such as Research Institute for Human Settlement, Indonesia, Technical University of Civil Engineering Bucharest, Romania and the University of El Salvador (Project "Taishin").

5. Sustainable Partnership through IPRED

Today, IISEE-BRI conducts the International Platform for Reducing Earthquake Disasters (IPRED) of UNESCO, together with other 10 organizations where the IISEE alumni play leading roles (Table 2). IPRED is not a technical assistance under any ODA program, but a project or a platform for collaborative research, training and education in the field of seismology and earthquake engineering. IPRED aims to identify gaps and priorities through the sharing of scientific knowledge and experience in the field of seismology and earthquake engineering and to support the development of political will and public awareness, for the purpose of ensuring the better preparation against earthquakes and building a culture of safety for the people in the world. Its objectives are to exchange information and propose plans on collaborative research, training, and education regarding seismology and earthquake engineering in order to reduce earthquake disaster, especially on buildings and housing, to address policy-relevant issues related to the reduction of earthquake disaster risks and implementation of the Hyogo Framework for Action, including making recommendations on priorities of the International Strategy for Disaster Reduction (ISDR), and to establish a system to dispatch experts to an earthquake-stricken country in order to carry out post-earthquake field investigations and draw lessons for future risk reduction, by utilizing the worldwide network of the graduates of training courses organized by the IISEE. More information is found in the following URL.

"http://www.unesco.org/new/en/natural-sciences/special-themes/disaster-risk-reduction/geohazard-risk-reduction/networking/ipred/"

Table 2 IPRED Members

Countries	Organizations	Abbreviations
Chile	Pontifical Catholic University of Chile	PUC
Egypt	National Research Institute of Astronomy and Geophysics	NRIAG
El Salvador	University of El Salvador	UES
Indonesia	Research Institute of Human Settlement	RIHS / PUSKIM
Japan	International Institute of Seismology and Earthquake Engineering, Building Research Institute, Japan	IISEE-BRI
Kazakhstan	Institute of Seismology	
Mexico	National Center for Disaster Prevention	CENAPRED
Peru	Peru-Japan Center of Seismic Investigations and Disaster Mitigation	CISMID
Romania	Technical University of Civil Engineering Bucharest	UTCB
Turkey	Istanbul Technical University	ITU
Algeria	National Center for Applied Research in Earthquake Engineering	CGS

6. Summary

IISEE has provided the opportunity to learn the newest knowledge and technology of Seismology and Earthquake Engineering for young researchers of developing countries. Today, in almost all earthquake-prone countries, IISEE alumni are working for the safety of their mother countries and their countrymen. However, more effort and support are necessary to reduce the number of victims due to earthquake disaster to zero. IISEE will take necessary action for this ultimate purpose together with its alumni and related experts of seismology and earthquake engineering.

Please visit IISEE's HP:
"http://iisee.kenken.go.jp/"

or contact us directly:
e-mail: iisee@kenken.go.jp

7. References

[1] Kuroiwa, Julio (2015), "Disaster Risk Management in Developing Countries and the Importance of International Cooperation", Honorary Contribution, Bulletin of IISEE, 49, 65-88