

INCEDE: Summarizing last five years

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Abstract

The International Center for Disaster-Mitigation Engineering (INCEDE) was formed in April 1991 at the Institute of Industrial Science (IIS) of the University of Tokyo, as a national contribution of Japan towards the United Nations IDNDR (International Decade for Natural Disaster Reduction). Objectives of the INCEDE are to synthesize information and methodologies from different fields, mainly from earthquake, water, remote sensing and GIS fields, to tackle the problems in disaster mitigation. At present, INCEDE specializes mainly in the disciplines of urban earthquake disaster-mitigation engineering, hydrology/water resources, and Remote Sensing (RS)/Geographic Information Systems (GIS). This report describes the composition of the INCEDE and what INCEDE has done during these five years.

1. INTRODUCTION

Although the Japanese, along with the rest of the world, believed that Japan had high technology for disaster mitigation, some of the recent events made it clear that this wasn't true. Recent ill function of urban traffic systems due to heavy rain was an example of failure of an urban function that was not experienced several decades ago. However, the most typical example was the disaster due to the 1995 Hyogo-Ken-Nanbu (Great Hanshin-Awaji or Kobe) earthquake, effects of which are still continuing. Urban infrastructures and modern city space which seem safe for usual daily life, are very weak once a disaster strikes and the consequences on city functions are much greater than those several decades before. The INCEDE was established in April, 1991 at IIS for a period of 10 years, for the purpose of promoting fundamental research for disaster mitigation and information dissemination from an international and university researchers' point of view. The establishment of this center was timely because one of the purposes was to support the United Nations' program, International Decades for Natural Disaster Reduction (IDNDR) which started in 1990. We summarize the activities of INCEDE and the importance of disaster mitigation research in Japan, based on an international view point.

2. OBJECTIVES OF INCEDE¹⁾

INCEDE was formally established on April 12 in 1991 at the IIS of the University of Tokyo with the purpose of promoting fundamental research and developing technology for natural disaster reduction and encouraging the international cooperation in this field. INCEDE has four full-time staff, a professor, a visiting foreign professor, an associate professor, and a research associ-

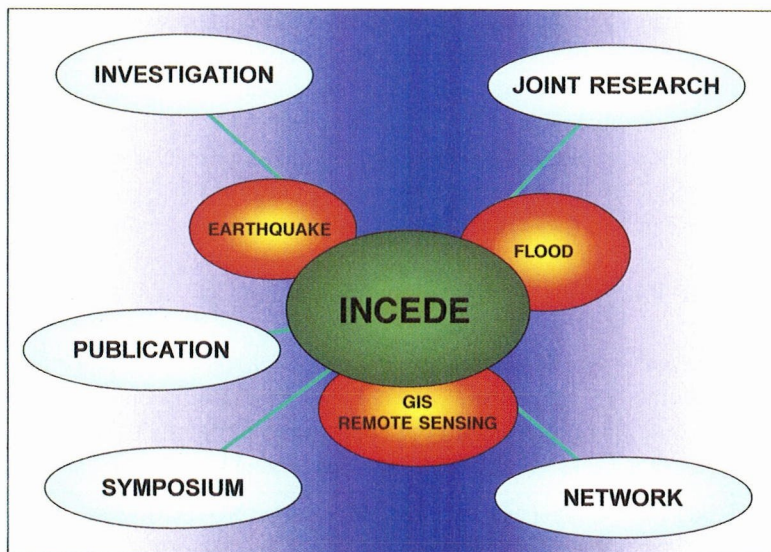
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 2) Tsuneo KATAYAMA, Director/Professor, ditto.
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 4) Dushmanta DUTTA, Research Associate, ditto.

ate. In addition to the INCEDE's full-time staff, eight laboratories of the institute act as cooperative members. INCEDE places great emphasis on South-East Asia and studies earthquake, water and soil related disasters using RS/GIS with the help of the cooperative research members in IIS. When INCEDE was established, the following were proposed:

- 1) Recent changes surrounding the city such as increase in population, expansion of the city, and concentration of industries and social capitals in the disaster prone area, are making urban areas weak against natural disasters. As for the kinds of disasters, they are shifting from the structural oriented to information or system oriented, with the increase of potential risk of damage to city functions. Fundamental research reducing the vulnerability to disaster is necessary for minimizing the effects of damage.
- 2) If a large natural disaster like an earthquake or a flood occur, it's damage would be huge and might affect many countries. Without international cooperation, a country facing the disaster finds it difficult to respond to the disaster on its own. This fact only highlights the importance of international cooperation in minimizing the effects of a disaster.
- 3) From these points of view, promotion of the fundamental research for developing new technology to make the effects of natural disasters clear and mitigating them becomes very important.
- 4) For this purpose, the establishment of INCEDE is proposed, which promotes fundamental research as well as development of new technology contributing to international cooperation through joint research with foreign researchers.
- 5) In addition, establishment of INCEDE can be a Japan's national contribution for the activities of IDNDR.

3. DISASTER MITIGATION RESEARCH IN THE UNIVERSITY AND INCEDE

Universities are expected to provide human resources and to conduct research. Besides the institutes in universities, Ministry of Construction, Ministry of Transportation and Science and



INCEDE Organization

Technology Agency also have institutes for disaster mitigation. The special role of the university institutes in brief, is the promotion of fundamental research. Both fundamental and applied research should be carried out in a long time scale. Most institutes listed above, however, are requested to respond to the current problems in a very short time and/or to carry out research only along the guidelines of the government. University institutes have the advantage to continue the research from a neutral position spending a long time. This point is very important in the field of disaster mitigation as long term research is required, for effective disaster-mitigation.

Research with results not so valuable in near future but which will be of great value in years to come, and research which is of great importance but no visible solutions or time limitations are also problems that should be tackled by the university institutes. Applied research by university institutes should be the ones whose fields cover several academic societies, for example, the research for standardization of earthquake resistant design code, as well as returning the results of their fundamental research to the society. Institutes under governmental organizations cannot carry out research on the above topics as they sometimes have very strict sectionalism. Another important role of university researchers may be to act as good public translators of the knowledge on earthquake related issues using easy terms. The Hyogo-Ken Nanbu (Kobe) earthquake was a good example on this fact.

In addition to these, university has a very important role as an educational organization. It is very difficult to expect the institutes that belong to government to train people in order to make them specialists in the field. University institutes, therefore, should actively educate practitioners and officials based on the fact that cooperation between researches and practitioners, and that between institutes and governmental disaster related organizations are very important for disaster



INCEDE Staff at KOBEnet information center, Four full-time staff and INCEDE secretaries



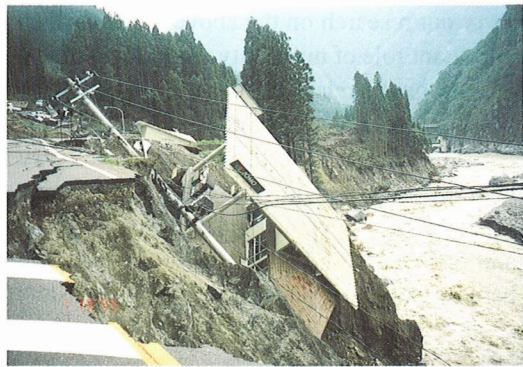
Nepal flood, 1993
(Photo by Mr. H. Oi, INCEDE Network member)



Leyte flood, 1991
(Photo by A.S. Herath)



Nagano flood, 1995
(Photo by A.S. Herath)



Nagano flood, 1995
(Photo by A.S. Herath)

Photos of damage investigation

mitigation. In addition, university institutes have to play a role as a information dissemination center for international societies.

4. INCEDE ACTIVITIES DURING THESE FIVE YEARS^{2), 3)}

The Great Hanshin earthquake proved how timely INCEDE was established showing that urban societies are indeed very weak against disasters. Effects of damage extended far beyond that assumed, especially, the information systems and other city functions showing high vulnerability to disasters. To reduce the effects due to natural disasters, INCEDE has been tackling various issues. INCEDE activities can be divided into three main categories: Research for disaster mitigation technology, development of a network on researchers and practitioners related to disaster mitigation, and disaster information collection and dissemination. Each activity is explained below.

a) Researches for Disaster Mitigation Technology

INCEDE has three major research topics. The first topic being research on urban earthquake mitigation engineering. The second is research on hydrology and water resources engineering.



Erzincan earthquake, 1992, (Photo by K. Meguro)



Latur earthquake, 1993, (Photo by T. Katayama)

Photos of damage investigation

The third is the application of RS/GIS to disaster mitigation research.

As for the first topic, real time control of large lifeline systems during earthquake, microscopic seismic risk assessment in urban areas, effects of power outage in urban areas, simulation of collapse process of structures due to earthquake, and dynamic behavior of interior objects during earthquakes, etc., are the fields covered and obtained good results on. Especially, the real time control systems developed have been adopted by the city gas supplying systems in Tokyo area, and microscopic seismic risk assessment using GIS based on digital map in which every house can be seen has caught much interest from researches and practitioners as a new idea having high potential. (Refs. 4-7)

As for research on hydrology and water resources engineering, INCEDE have been studying mainly, development of physically based distributed catchment models and their applications to study urbanizing effects and flood forecasting. As an extension of this research, INCEDE had a joint research project on flood forecasting and warning systems in cooperation with institutions in the Philippines. This three-year project is being supported by the Ministry of Education, Culture and Sport. The area selected for the study was the Agno river catchment in Luzon island, Philippines. The institutes which participated in this project from the Philippines are the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), the National Hydraulic Research Center (NHRC), University of Philippines, and the National Mapping and



*Hokkaido-Nansei-Oki earthquake, 1993
(Photo by K. Meguro)*



*Kobe earthquake, 1995
(Photo by K. Meguro)*



*Pyroclastic flow at Mt. Fugen, 1994
(Photo by K. Meguro)*



*Damage due to lahar flow, Mt. Pinatubo, 1994
(Photo by K. Meguro)*

Photos of damage investigation

Resource Information Authority (NAMRIA). INCEDE is trying to find new funding for the extension of this project. (Refs. 8, 10)

With regards to RS/GIS, INCEDE has been carrying out research on new technologies on RS/GIS and on their applications in a large scale and in a wide area as we believe these tools will be useful for earthquake and water related disaster research. In addition, INCEDE has been trying to collect and exchange the data such as rain fall among researchers in Hong Kong, Sri Lanka, and Singapore. (Refs. 9, 11)

As the most fundamental research for disaster mitigation, we have carried out site investigations after the disasters. With the limited staff available, INCEDE has been able to carry out studies on only a few number of disasters¹²⁾⁻¹⁵⁾. However, the emphasis was placed on making these studies as complete as possible.

With regards to floods, so far we have made reconnaissance surveys on the 1991 Typhoon No.19 in Japan, the 1991 Saiko lake high water (Japan), the 1991 flood in Leyte island (Philippines), the 1992 floods in Hong Kong and Colombo (Sri Lanka), the 1993 flood in Mississippi and Missouri valleys (USA), the 1993 flood in the Tokyo Metropolitan District (Japan) and the 1995 flood in Nagano and Niigata (Japan). With the collaboration of INCEDE network members, we have also studied the floods in China (1991), Pakistan (1992), Nepal (1993) and India (1993).

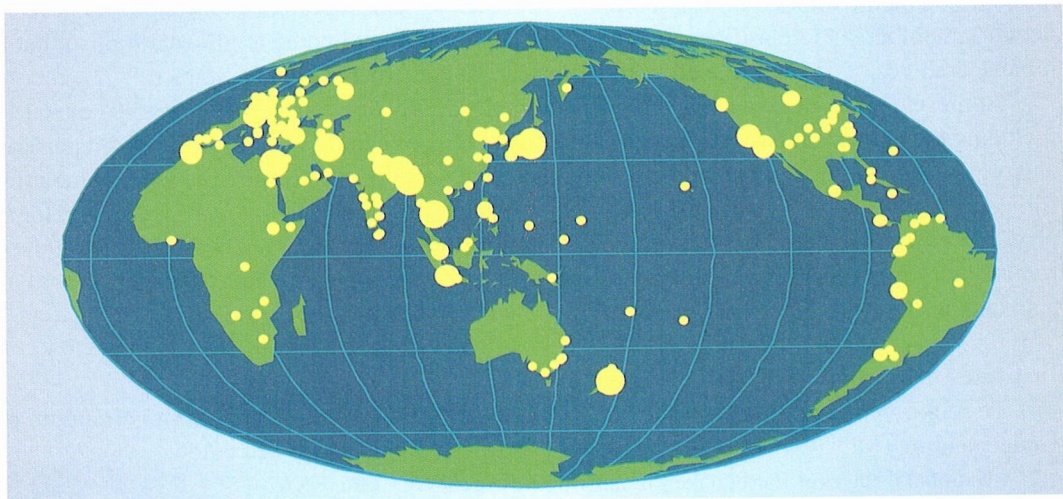
Earthquake reconnaissance surveys have been carried out on the Erzincan earthquake, Tur-

key (1992), the Kushiro-Oki earthquake, Japan (1993), the Hokkaido-Nansei-Oki earthquake, Japan (1993), the Latur earthquake, India (1993), the Northridge earthquake, USA (1994), the Hokkaido-Toho-Oki earthquake, Japan (1994), the Sanriku-Haruka-Oki earthquake, Japan (1994), and the Hyogo-Ken-Nanbu (Great-Hanshin or Kobe) earthquake, Japan (1995).

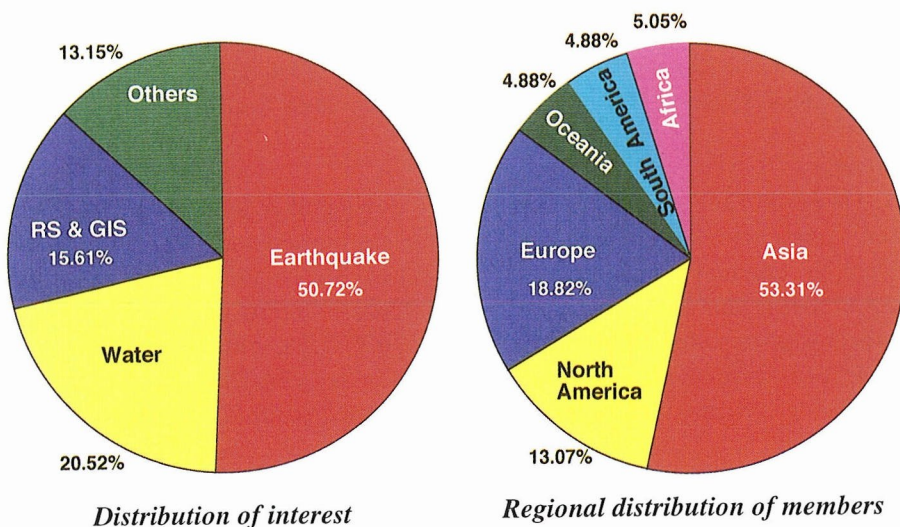
On disasters due to volcanic eruption, INCEDE has investigated lahar disaster due to the Mt. Pinatubo, the Philippines (1993), and debris flow at the Mt. Fugen, Unzen, Japan (1994). The archives on these disasters such as reports, local publications and other data are available on the World Wide Web (WWW) INCEDE Home Page (http://incede.iis.u-tokyo.ac.jp/incede_home.html).

b) Development of INCEDE Network¹⁶⁾

INCEDE has been developing a network called the INCEDE Network composed of disaster



*Distribution of INCEDE Network members
(Dots indicate the current INCEDE Network member distribution)*



related persons and organizations in the world. Many researchers working on disaster mitigation in developing countries are faced with the problem of acquiring enough information on both the occurrence of disasters all over the world and, especially, new knowledge of the recent research activities in the field. Therefore, INCEDE Network has caught much attention.

We consider the activities related to the formation of the INCEDE Network to be of utmost importance, because the interaction between information generators and users/receivers must be two-way. The INCEDE Network was established so that all the members can be the generators as well as the receivers of information. Recently we have been hearing from our members on the disasters that had taken place in their regions, opinions and evaluations of mitigation activities. In compiling disaster related information, various sources are available. On line news services provide access to news wires from sources such as Reuters, AP, UPI, etc., and reports prepared by UN organizations such as DHA. It is often found that there are conflicting statistics depending on the sources and the timing of these summary reports. One very important expectation we have of network members is to clarify these conflicting reports and authenticate information, so that a reliable archives of disaster related information can be constructed and maintained.

At present, there are over 700 members of the INCEDE Network representing 90 countries. Including the network members, we also have contact list of about 1,600 disaster related persons and organizations from 124 countries. Any interested person can become a network member by filling in a form sent along with the INCEDE Newsletter or in a form on WWW INCEDE Home page. The network members are obliged to be information providers as well as receivers, to receive help from other members in investigating a particular topic related to disasters as well as help another network member in his/her study related to the member's region or field.

Institutes with which INCEDE exchanged MOU

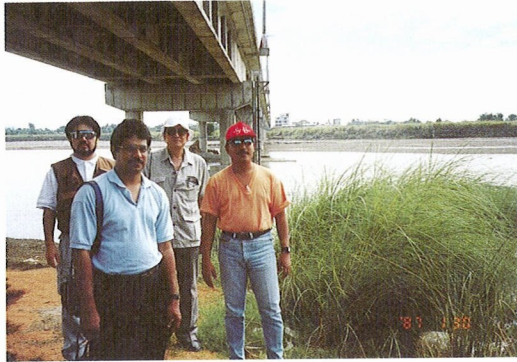
To reinforce the relationship between institutes, INCEDE has exchanged Memorandum of Understanding (MOU) with six institutes so far in three countries as listed below.

- National Center for Earthquake Engineering Research (NCEER), USA
- California Universities for Research in Earthquake Engineering (CUREe), USA
- Department of Civil Engineering, Stanford University, USA
- Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Philippines
- National Hydraulic Research Center (NHRC), University of Philippines, Philippines
- The Kamchatka Center of Earthquake Engineering and Natural Disaster Mitigation, Russia

Joint Projects

Among above institutes, INCEDE established following three joint research projects.

- 1) The three-year joint research project on flood forecasting and warning systems between INCEDE and the research institutions in the Philippines. The counterparts in the Philippines are PAGASA, NHRC, and the National Mapping & Resource Information Authority (NAMRIA). The project was supported by Ministry of Education, Culture, and Sports, Japan.
- 2) The project for development of disaster information network called GLO-DISNET. This project is being carried out in cooperation with INCEDE, Stanford University and United Nations University.
- 3) The Center-to-Center Project between INCEDE and NCEER on post-earthquake reconstruction and rehabilitation strategy. The project is jointly supported by the Japan Society for Pro-



INCEDE team at Carmen gauging station, Agno River, with Dr. Pineda of PAGASA



Philippine researchers survey river protection works, Japan

Photos of Philippine project



US team visits INCEDE, December, 1995



First joint workshop at Honolulu, Hawaii, Feb., 1996

Photos of Center-to-Center project

motion of Science (JSPS) and the US National Science Foundation (NSF). The three-year project was initiated in October, 1995.


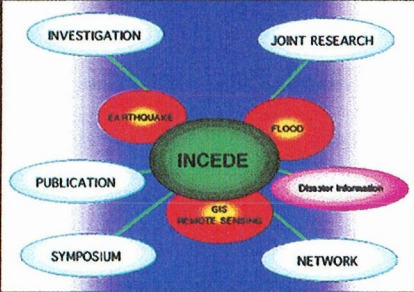
c) INCEDE activities related to information dissemination¹⁶⁾

One of the important roles of INCEDE is to work as a clearing house of disaster information, especially in the Asian Region. INCEDE activities for this purpose are mainly disaster information dissemination through Internet, publications and distribution of INCEDE Newsletters and Reports, international workshops and INCEDE Open lectures.

Information dissemination through Internet

Since the disaster information network termed GLO-DISNET is developed in cooperation with INCEDE, Stanford University, and United Nations University, the field of disaster information network became an additional new research topic of the INCEDE. INCEDE opened INCEDE Home Page on WWW, Internet, and started to disseminate disaster information collected and generated by INCEDE.

International Center for Disaster-Mitigation Engineering
 Institute of Industrial Science
 University of Tokyo

KOBEnet - Information on Hanshin Earthquake

INCEDE STAFF WEB STATISTICS JOIN INCEDE COMMENTS

Netscape 3-3-1.html

Location: <http://incede.iis.u-tokyo.ac.jp/Newsletters/2.3/2-3-1.html>

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RECENT NATURAL DISASTERS IN AUSTRALIA (1993-94)

- RECENT NATURAL DISASTERS IN AUSTRALIA (1993-94)
- THE SOUTHEAST AUSTRALIAN FLOODS OF OCTOBER 1993
- NEW SOUTH WALES BUSHERIES OF JANUARY 1994

RECENT NATURAL DISASTERS IN AUSTRALIA (1993-94)

By Peter Moy, Jack Ryan and Trevor Hatchard

Natural hazards are a "way of life" in many regions of Australia. These range in frequency from meteorological related phenomena, cyclones, severe storms (photo below), hail storms, tornadoes and floods which occur several times a year, to bushfires, droughts and heat waves which occur several times a decade, to the rare occurrences of earthquakes and tsunamis. Frequently, these become natural disasters resulting in loss of life, serious injury and substantial socioeconomic losses of tens to hundreds of millions of dollars.



Location: <http://incede.iis.u-tokyo.ac.jp/Hanshin/Transport.html>

Transport Facilities Crumbled...



A derailed train due to strong ground motion on the JR line. (Nishinomiya, Jan. 17, a.m.)

Disaster Information on INCEDE WWW server

INCEDE Publications

As INCEDE publications, we publish newsletters and reports. INCEDE Newsletter is published quarterly and sent to about 1,600 persons and organizations in the world. The newsletters are distributed free of charge to all the INCEDE Network members. The newsletter is addressed to a general audience and carries articles by prominent engineers on general topics related to disaster-mitigation, reports on recent natural disasters and publishes current activities of INCEDE and its network members. The newsletters in the past carried reports on post disaster investigations, conducted either by INCEDE staff or the network members. We have published 18 INCEDE Newsletters. Fourteen regular ones and four special issues on major earthquakes occurred in Japan amounting to a total of 188 pages, with the cooperation and assistance from all



INCEDE Newsletter and INCEDE Report

those related to our activities, especially, INCEDE Network members. As the first report written by specialists in English soon after the Kobe earthquake, the special issue entitled "The first 55 Hours, Great Hanshin Earthquake, January 17, 1995" was distributed to more than 4,000 researchers and organizations in over 120 countries, resulting in gaining a very high reputation from all over the world for its quick publication and excellent quality.

Considering INCEDE Reports, seven reports which are listed below have been published and several report are at final stage of compilation. About 700 copies of INCEDE Reports are delivered to selected INCEDE Network Members.

- INCEDE Report 1: INCEDE Looking Ahead (T. Katayama, M. A. H. Pramanik, A.S. Herath and K. Meguro), 50 pages.
- INCEDE Report 2: Aftermath of the Loma Prieta Earthquake -How Radio Responded to the Disaster- (T. Katayama), 96 pages.
- INCEDE Report 3: Impacts of Disasters on Environment and Development -International Cooperation- (M.A.H. Pramanik), 45 pages.
- INCEDE Report 4: Towards Natural Disaster Reduction -Proceedings of VII PSA Workshop- (A.S. Herath and T. Katayama), 195 pages.
- INCEDE Report 5: Seismic Risk of the Asia Pacific Region -Proceedings of the WSSI Workshop- (K. Meguro and T. Katayama), 192 pages.
- INCEDE Report 6: Space Technology for Disaster Monitoring and Mitigation in India (R.B. Singh), 58 pages.
- INCEDE Report 7: Disaster Mitigation Strategies in Bangladesh (M.A.H. Pramanik), 30 pages.

International symposia/workshops which INCEDE held and/or organized

INCEDE has held and/or organized 26 international symposia and workshops in 13 countries. Some of those are listed below.

- "Seismic Risk Management for Countries of the Asia Pacific Region," (1993.2.8-11), Bangkok, Thailand



WSSI workshop, Bangkok, Feb., 1993



VIII PSA workshop, Beijing, June, 1995

Photos of international workshop

- "Towards Natural Disaster Reduction," VII Pacific Science Inter Congress, (1993.6.27-7.3), Okinawa, Japan
- "Recent Research Topics in Hydrology," The Seminar (Philippines Project), (1993.10.18), Tokyo, Japan
- "Role of Engineers in Mitigation of Disasters," The Seminar, 1994.4.7, Kandy, Sri Lanka
- "Mitigation of Earthquake Risks - Needs and Resources of European Countries", (1994.9.1), Vienna, Austria
- "Geo-Related Risk in Sri Lanka," (1994.12.9), Colombo, Sri Lanka
- "Great Hanshin-Awaji Earthquake Disaster," Public Seminar, (1995.2.6), Manila, Philippines
- "Catastrophic Risk Management for the Insurance and Reinsurance Industries," (1995.5.16-18), Singapore
- "Harnessing the Communication Revolution -Towards a Global Disaster Network," VIII Pacific Science Congress, (1995.6.10-11), Beijing, China

INCEDE Open Lectures

Beside above international meetings, we have held open forums and INCEDE Open Lectures, because we believe that for disaster mitigation, it is very important for the general public as well as specialists to get exact knowledge on disasters and understand what happens during and after hazards. We have held ten INCEDE Open Lectures. The 3rd, 7th and 8th were held at the United Nations University co-organized by INCEDE and the United Nations University and the 10th was held in cooperation with the Earthquake Resistant Structure Research Group (ERS) in IIS, KOBE net and INCEDE. Usually, for these lectures, the number of participants ranges from 100 to 150.

- 1st, "Recent Natural Disasters," (1992.5.13), Profs. A.S. Herath, K. Meguro (INCEDE), and Y. Nakano (IIS)
- 2nd, "Efforts for disaster mitigation -on commemoration of IDNDR day-," (1992.10.14), Profs. T. Katayama and M.A.H. Pramanik (INCEDE), Mr. A. Hamamori (International Engineering Consultants Association), and H. C. Shah (Stanford University)
- 3rd, "IDNDR," (1993.10.13), Prof. T. Katayama (INCEDE)
- 4th, "Quick Report on Northridge Earthquake and Mt. Pinatubo Eruption," (1994.2.2), Profs. T. Katayama (INCEDE) and Y. Nakano (IIS), Mr. P. Castro (NHRC, UP)



Participants at 10th INCEDE Open Lecture



Speaker, Prof. Y. Ohta from Yamaguchi University

Photos of the 10th INCEDE Open Lecture, June, 1996

- 5th, "Report on Lahar Flow Disaster due to Mt. Pinatubo Eruption," (1994.3.7), Profs. Liongson (NHRC, UP) and Lopez (UP), and Mr. N. Hirose (Nippon Koei)
- 6th, "1989 Newcastle Earthquake -Australia's Most Devastating Earthquake and Responses to It," (1994.5.19), Dr. J. Rynn (CERA, Australia)
- 7th, "Why Is Global Earthquake Risk Increasing," (1994.10.12), Prof. H. C. Shah (Stanford University)
- 8th, "Urban Earthquake Risk Management, -Preparing for the Big One in Tokyo-," (1995.9.27), Prof. T. Katayama (INCEDE), Mr. P. Hatfield (Journalist), Prof. B. Wisner (Hampshire College), Prof. H. C. Shah and Mr. A. Kakhandiki (Stanford University)
- 9th, "Safety and Medical Issues during Disasters," (1995.12.5), Dr. H. Yamamoto of Association of Medical Doctors of Asia (AMDA), Dr. S. Hanayasu, Institute for Industrial Safety, Ministry of Labor, and Dr. M. Nishimura of Hyogo Prefecture.
- 10th, "Disaster Mitigation Science as Viewed from Its Origin," (1996.2.16), Prof. K. Takahashi (Nagasaki University), Prof. Y. Kawata (Disaster Prevention Research Institute, Kyoto University), and Prof. Y. Ota (Yamaguchi University)

5. CONCLUDING REMARKS

Five years, of its allotted ten years, have passed since INCEDE was formed. We are proud of the activities done so far in INCEDE in spite of the very limited resources. The most valuable outcome, we believe, is that INCEDE has made friends with many people and organizations related to disaster mitigation all over the world. It is a great pleasure for us that we have received many correspondence from our friends highly commending our activities. With kind support and assistance from those friends, INCEDE will be doing its best in mitigating natural disasters during its latter half of the period. INCEDE is always open and welcomes your ideas, suggestions and criticism.

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