NOTE

The research papers were originally written in English. French and Spanish versions were translated from the English originals.

This proceeding consists of three parts.

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ENGLISH

World Conference on Natural Disaster Reduction

Yokohama, Japan, 23–27 May 1994

Technical Committee Session C

The Effects of Disasters on Modern Societies

24 May 1994

United Nations Centre for Regional Development /
United Nations Department for Development Support and Management Services

The Effects of Disasters on Modern Societies

PROGRAMME

Venue: Pacific Convention Plaza Yokohama (PACIFICO Yokohama), Yokohama, Japan
Date: 24 May 1994

Moderator: Atsushi Takeda, STC member, NIED
Rapporteur: Tsuneo Katayama, IAEE

14:00-14:05 **Introduction**
by Hideki Kaji, Director UNCRD/UNDDSMS

14:05-14:45 **Natural Disaster Risk in Modern Societies**

1) Disaster Management in Metropolitan Areas
by Shinjiro Mizutani, Chairman of the IDNDR Aichi/Nagoya International Conference 1993 JAPAN
2) Urban Environmental Degradation and Vulnerability to Disasters
by Mohan Munasinghe, Chief, Environmental Policy Division, the World Bank
3) Risk Management and Preventive Planning in Megacities: Scientific Approach for Action
by Philippe Masure, IAEG, STC member, BRGM
4) Coordination and Integration of International Projects on Risk Assessment in Megacities
by Yoshikazu Kitagawa, Director, IISEE

14:45-15:00 Comments
by Ismael A. Mathay, Jr., Chairman, Metropolitan Manila Authority
by Ibrahim Attawa, Vice Governor, City of Cairo
by Xu Jiling, Chief Engineer of Beijing Municipal Administrative Commission

15:00-15:30 Discussion on Natural Disaster Risk in Modern Societies

15:30-16:10 **Policies for Natural Disaster Reduction in Modern Societies**

5) Megacities: The Vulnerability of Infrastructure to Natural Disaster
by Stuart Mustow, President of ICE/WFEO
6) The Application of Satellite Remote Sensing for Natural Disaster Reduction in Developing Countries
by Niek Rengers, IAF/ITC
7) The Use of Mobile Satellite Communications in Disaster Mitigation
by Eugene Staffa, Manager, INMARSAT
8) Role of Non-Life Insurance in Disaster Management Systems
by Takashi Onoda, Chairman, The Marine and Fire Insurance Association of Japan

16:10-16:20 Comments
by Md. Hanif, Mayor, Dhaka City Corporation
by Bernardo Grau Arias, Director of the Office in Charge of Emergencies Prevention in Santafé de Bogotá

16:20-16:50 Discussion on Policies for Natural Disaster Reduction in Modern Societies

16.50-17:00 Concluding Remarks by Rapporteur

INTRODUCTION
to
Technical Committee Session C
The Effects of Disasters on Modern Societies

The significance of the IDNDR should be understood as the commencement of a long continuing global cooperation for natural disaster reduction. No doubt all problems regarding natural disasters cannot be resolved within a single decade; if so, global cooperative action for reducing natural disasters should be continued for several decades, or even at a slower pace, extended over one century until a less hazardous world can be achieved. Even fully industrialized nations with long years of efforts in coping with earthquakes, floods, cyclones/typhoon, and other types of natural perils, are still threatened by natural disaster risks. Thus, much time is required to establish a world where all natural disasters can be scientifically and technically controlled and regarded no longer as catastrophes.

In this context, all activities of the IDNDR should be recognized as preparatory work for natural disaster reduction to be implemented in the next century when the world must deal with denser populations, mostly concentrated in urbanized areas supported by advanced technology and modernized social systems.

With this background, the United Nations Centre for Regional Development, Department for Development Support and Management Services (UNCRD/UNDDSMS), taking the opportunity of the World Conference on Natural Disaster Reduction, would like to organize a Technical Committee Session focusing on the Effects of Disasters on Modern Societies.

The first part of the Session will be devoted to identifying natural disaster risks in modern societies. Four selected speakers will give presentations on the characteristics of disasters in metropolitan areas; the relation between environmental degradation and disaster risks in megacities; and the scientific approach to risk assessment of disasters in megacities and international cooperative actions for implementing such risk assessment in megacities in a coordinated manner. In terms of the presented topics, commentators will be requested to share actual experiences in their countries and following, with the participation of the general audience, a discussion will be held to explore effective strategies for assessing disaster risks in modern societies that the world will confront in the twenty-first century.

The major focus of the second part of the Session is how to cope with the identified risks in modern societies by utilizing structural and nonstructural measures. As examples of the utilization of advanced technologies and modernized social systems for preventing and mitigating natural disasters, four topics will be presented including structural engineering for protecting infrastructures from the threats of natural disasters; disaster reduction by means of both monitoring and communication satellite technologies; and disaster management with the help of a developed insurance system at the global level. These presentations will be followed by comments and a floor discussion on recommendations for developing appropriate measures for disaster reduction in the next century and, particularly, action plans for the second half of the IDNDR.

Hideki Kaji
Director, UNCRD/UNDDSMS

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Natural Disaster Risk in Modern Societies

Disaster Management in Metropolitan Areas

Shinjiro Mizutani

Chairman of the Planning Committee
IDNDR Aichi/Nagoya International Conference 1993 JAPAN
Professor, School of Science, Nagoya University, Japan

In view of the danger from natural disasters in megacities, an international meeting was held in Nagoya, entitled "Disaster Management in Metropolitan Areas for the 21st Century". I will discuss the management system for natural disasters in metropolitan areas by summarizing the reports presented in this international conference, and will also discuss the major tasks concerning the IDNDR project in the coming 5 years.

1. IDNDR Aichi/Nagoya 1993

Scope

In Japan, we experience devastating typhoons, volcanic eruptions, earthquakes sometimes accompanying tsunamis almost annually, which inflict tremendous damage to life and property. The worst damage is usually found in the densely populated areas and is increased by disruption of lifelines. The trend towards increasing damage from natural disasters in urban areas is due to unplanned land-use on the one hand, and to the long-term change in climate on the other, shows us the importance of efforts to devise disaster prevention plans in urban areas. In many countries, particularly developing countries, infrastructure has sometimes been constructed without adequate consideration of disaster prevention or environmental assessment. This seems to lead to severe damage from natural disasters. These strongly suggest the importance of the disaster prevention policies in metropolitan areas; this is the reason why we had an international conference aiming at disaster management in metropolitan areas.

As pointed out in the keynote speech made by Dr. James P. Bruce, extensive damage from natural disasters was in many cases the result of rapid development of urban areas particularly in coastal and seismic zones. Although efforts to prevent damage from disasters are undertaken in those areas, countermeasures are hampered by over-concentration of population and environmental disruption. At the international meeting in Nagoya, we discussed these problems from the various aspects of science and technology, and also from social and psychological viewpoints with the presentation of new data on natural disaster damages.

Sessions

In the plenary session (coordinated by Prof. K. Toki), Dr. Raymundo S. Punongbayan described the natural disasters in the Philippines in the last three hundreds years especially volcanic eruptions and earthquakes. He presented pyroclastic-flow danger maps which enabled evacuation routes to be planned from the danger zones; he also showed hazard maps compiled by scientists covering the whole of the Philippine Islands. Dr. Brian E. Tucker pointed out the fact that the urban earthquake threat is especially great in developing countries; nevertheless, most efforts to mitigate

disaster damage concentrate on the needs of developed countries. He proposed the establishment of charity funding by private organizations, which will assist efforts toward disaster prevention in cities exposed to earthquake in developing countries. Dr. T. Konoe noted that the international community has coordinated humanitarian efforts following the end of the Cold War, and that cause-and-effects of disasters have become interwoven in a complex way giving rise to "complex emergencies" that cannot be classified simply as natural or artificial disasters through traditional concept of classification.

There were four sessions: (1) Urbanization and Natural Disasters (coordinated by Prof. Y. Nishiyama), (2) Potential Loss of Urban Infrastructure from Natural Disasters (coordinated by Prof. H. Kameda), (3) Local Disaster Management and People's Participation (coordinated by Dr. H. Higashiura), and (4) Recent Research on Disasters and Reducing Disasters (coordinated by Prof. T. Takeda).

Session 1 was divided into two consecutive subsessions. In Session 1-1 "Increase in vulnerability accompanying rapid urban development" (chaired by Dr. A. Takeda), papers were presented by Drs. Y. Kawata (Japan), Thereza Lobo (Brazil), Y. Kumagai (Japan), Mohammad A. Mohit (Bangladesh) and Sherif H. Kamel (Egypt), and in Session 1-2 "Urban planning to reduce damage from natural disasters" (chaired by Prof. H. Kaji), papers were presented by Drs. I. Nakabayashi (Japan), Dusan Zupka (Switzerland), Jukka Nieminen (Kenya), Andrew W. Coburn (U.K.), Ronald S. Parker (U.S.A.), and Ulpiano P. Ignacio (Philippines).

Session 2 was also divided into two consecutive subsessions. In Session 2-1 "Protection and early restoration of lifeline facilities, including transportation networks" (chaired by Prof. F. Takagi), papers were presented by Drs. T. Katayama (Japan), M. Shinozuka (U.S.A.), Sun Shaoping (China), Y. Yoshikawa (Japan) and Manuel M. Bonoan (Philippines), and in Session 2-2 "Disaster management in public facilities, including schools and hospitals" (chaired by Prof. N. Taga), papers were presented by Drs. M. Izumi (Japan), Claude de Ville de Goyet (U.S.A.), Jamilur R. Choudhury (Bangladesh), Badaoui M. Rouhban (France), Xie Zongfu (China) and H. Hayashi (Japan).

Session 3 was also divided into two consecutive subsessions. In Session 3-1 "Information control and disaster management by local administrations" (chaired by Prof. K. Okabe), papers were presented by Drs. N. Tsuji (Japan), Efrain Guillermo de Gyves Betanzos (Mexico), Heung Soo Cheon (Korea), R.B.Singh (India), Soesanto Mangoensadjito (Indonesia), and in Session 3-2 "People's participation and disaster management" (chaired by Dr. Y. Yanagawa), papers were presented by Drs. H. Aoyama (Japan), Sadok Znaidi (Switzerland), Lei Zhiyan (China), Frank T. Blackburn (U.S.A.) and Lourdes C. Masing (Philippines).

In Session 4, various scientific research reports and their progress in this decade were discussed by Drs. R. Tatehira (Japan), Zhao Bolin (China), T. Takeda (Japan) and Y. K. Sasaki (U.S.A.) on meteorology, and by Drs. Y. Fukao (Japan) and Domenico Giardini (Italy) on seismology.

In Session Reports coordinated by Prof. S. Mizutani (Chairman of the Planning Committee), summaries of each session were delivered by Drs. Carmen Almeida-Biggart (U.S.A.), Y. Nishiyama, H. Kameda, R.B.Singh, and Zhao Bolin, and concluding comments were presented by Drs. Claudia H. Candanedo (Panama) and James P. Bruce.

Conclusive Remarks

After these sessions concluding remarks of each session were exchanged, and "Appeals to the World Conference on Natural Disaster Reduction in Yokohama" were drawn up. The Concluding Statement of the IDNDR Aichi/Nagoya International Conference reads as follows (partly summarized):

The IDNDR Aichi/Nagoya International Conference was held 1–4 November 1993 in the City of Nagoya, Aichi Prefecture, with the theme of "Disaster Management in Metropolitan Areas for the 21st Century". A total of 1,100 experts involved in the field of disaster prevention, including administrators, researchers and representatives of non-governmental organizations (NGOs), participated. They came from 46 countries and nine international organizations.

Disasters in metropolitan areas can have a grave impact on other domestic and international communities and their economies as well as urban residents. Moreover, metropolitan areas have become increasingly vulnerable to disasters as a result of such developments as the over-concentration of population and economic infrastructure, the transformation in lifestyles and lack of citizen awareness. It should be recognized that disaster prevention in urban areas is one of the most important factors contributing to sustainable development in developing countries, where urbanization is rapidly advancing.

In confronting these realities, the conference participants presented reports and exchanged views on the disaster risks, disaster countermeasures in urban planning, and countermeasures for lifeline facilities as well.

It was recognized that natural disasters can destroy economic infrastructure and that ethnic, cultural, and economic diversity should be considered when extending humanitarian aid to disaster victims. On the basis of the reports presented and discussions held at the conference, the following specific suggestions were made to central and local governments, researchers and other authorities:

1. To facilitate risk assessment in urban areas, convenient methods which meet the current needs and capabilities of each region and country should be developed and disseminated.

2. Planners of development projects must take into account "disaster hazards" when formulating and implementing their plans.

3. The minimum level of functioning of lifeline systems to be maintained during an emergency and their positions in the disaster prevention plans should be clarified, taking into account the characteristics of the country or region.

4. To ensure the safety of hospitals, schools and other important public facilities and to maintain their functioning as bases in an emergency, effective regulations on building design should be established and disseminated.

5. It is important to disseminate information and maintain a communications system during an

emergency. The accuracy of information monitoring systems concerning meteorology, river levels, volcanoes and other phenomena should be improved.

6. Voluntary disaster prevention activities by private volunteers are important and should be encouraged and efficiently utilized. The necessary staff should be assembled and trained regularly in communication, first-aid and other specialized fields.

7. Global networks and global projects related to disaster monitoring, prediction and prevention technologies should be established, with an emphasis on international cooperation.

8. Adequate technologies for predicting disasters should be developed.

The International Decade for Natural Disaster Reduction began in 1990. In order to review previous activities and formulate future action programmes, the World Conference on Natural Disaster Reduction is to be held in Yokohama from 23 to 27 May 1994. The conference is highly significant, since it will accelerate the progress of future IDNDR activities. The participants of the IDNDR Aichi/Nagoya International Conference set the following goals to ensure the success of the World Conference:

a) To assist donor countries and international organizations in disaster prevention, in light of the insufficient involvement of developing countries in disaster-prevention activities;

b) To promote IDNDR international demonstration projects and other disaster-prevention projects which will be completed during the IDNDR and which are expected to attain significant success;

c) To establish a network comprising national governments, international organizations, universities and other establishments for the exchange of information and data for use in the assessment and planning of disaster reduction. A centre serving as the core of such a network should be set up;

d) Although emergency aid should be targeted at supporting self-help efforts, a system should be formulated that responds swiftly to a disaster emergency with humanitarian assistance.

It is impossible to prevent natural disasters from occurring; however, it is possible to minimize their damage through the application of wisdom and effort.

Special Programs for Citizens in the Aichi Prefectural Area

As the IDNDR Aichi/Nagoya 1993 was intended to increase the awareness of citizens and to give them such information as "Be prepared for the worst," special programs for citizens were organized by the Aichi Prefectural Government and the City of Nagoya with the cooperation of NHK and other non-governmental organizations. The programs, called "Disaster Prevention Events during the Conference" were planned in order to increase public awareness of disaster prevention, to deepen public understanding of disaster mitigation measures, to encourage public contributions to fund raising campaigns, to provide opportunities for citizens concerned with disaster prevention to learn in detail the mechanisms of natural disasters and so forth. In the fund raising activity, with

the cooperation of the Japanese Red Cross Society, aid activities were implemented in disaster-stricken developing countries.

2. For Future Plan

General Remarks

Nobody denies the importance of scientific investigations of natural phenomena concerning disastrous or hazardous events in our daily lives. If we can understand the mechanism of the changing features in nature or if we can find out the cause-and-effect of the natural processes, we will be able to predict the next step of such phenomena, and we will be able to help relieve people from the dangers of natural disasters. Even if we cannot predict them, we will be able to send information and warning to the public to evacuate from potential disaster. Most people who have experienced a fatal natural disaster have commonly reported that education on natural disasters, awareness and raising preparedness against natural disasters are the most effective ways of disaster prevention. In addition to these scientific and technological studies, public awareness and preparedness for natural disasters should also be taken into account for the disaster prevention. Education and training for the worst should be planned at all levels of the education system.

As its name implies, first-aid is the most important item for victims in any type of natural disaster; similarly, urgent and makeshift treatment for the injured are necessary for citizens in the disaster-stricken area. Because no individual, group, or governmental agency has overall responsibility for the highly damaged part of the city at the time of an unexpected disaster, projects for relief or reconstruction are usually undertaken in piecemeal fashion and record only haphazard progress. Many case-studies reveal that recovery from chaos after natural disaster has been due to the work of volunteers. What has been lacking is a strong constituency for such voluntarism, perhaps because even general volunteer groups have been independent or split locally. Acknowledging such a situation, we should encourage voluntarism of any type and also volunteers from any country.

Most of the present policies and management strategies for natural disaster reduction in many urban areas seem to have failed to produce the desired results. Inadequate urban-planning has caused cities to be vulnerable to natural disasters. In addition, the modern life-styles of citizens has also caused areas to be vulnerable, in modern society. Perhaps vulnerability to disasters has been increased unwittingly during the process of development of infrastructural facilities. However, the society believes that the ongoing efforts will undoubtedly improve the present situation in megacities. We should devize plans, policies, and strategies; megacities require strategic plans that will provide feasible and long-term programmes not only by coordinating research and monitoring activities in the area concerned but also by establishing regulations.

We believe that facilities using managed ecosystems and environments can also provide improved ways of dealing with a wide range of natural disasters. An environmental quality-based approach rather than a technology-based approach is therefore stressed. It is clear that the effort will be an interactive and iterative process with long-term accountability. From now on, however, we should attempt to examine the issues in terms of what is best for the entire society using and compiling the most up-to-date scientific and economical information available. Information management and related facilities constitute one of the major proposals for IDNDR's future plans.

Future Plan and Proposals

A great many things have to be done for disaster prevention and for natural disaster reduction internationally as well as nationally. The problem of disaster reduction and mitigation covers a wide spectrum in our lives. It consists of the preliminary individual quick makeshift response and long-term systematic urban-planning including the economic aspects and cultural ones. A noteworthy project is the process of natural hazard mapping, currently in progress, undertaken in the East Asian region by the Geological Survey of Japan. Of many propositions discussed and proposed in the IDNDR Aichi/Nagoya 1993, I would like to emphasize again the following three tasks by stressing the importance of their implementation:

They consist of:

(I) short-term, but wide and broad, support for reconstruction,
  (I-1) Training of self-help organizations and voluntary activities for disaster prevention
  (I-2) Supporting activities to ensure the safety of important public facilities such as hospitals and schools in the short term

(II) development of software for the management,
  (II-1) Development of risk assessment
  (II-2) Development of management methods which take into account both the natural and social environments of a region
  (II-3) Promotion of land development planning based on such assessment

(III) establishment of an information network.
  (III-1) Improvement of information systems regarding disaster management
  (III-2) Establishment of an information network on a global scale

I would hereby like to propose the promotion of a study to encourage disaster reduction by an international research team under the theme of "Risk Assessment and Management". An information network and its centre exclusively for disasters is also essential in order to utilize and disseminate the developed technology and its results.