

CHALLENGES OF THE IDNDR

Report and Summary of Proceedings of  
the International Symposium on "Challenges of the IDNDR"

Yokohama, Japan  
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United Nations Centre for Regional Development  
Nagoya, Japan



## FOREWORD

On the occasion of the Fourth Meeting of the International Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction (IDNDR) held on 10-12 April 1989, Tokyo, Japan, UNCRD organized the International Symposium "Challenges of the IDNDR" in Yokohama, 13 April 1989, which gave a chance for the members of the International Ad Hoc Group of Experts for the IDNDR and all those people in Japan who are involved in some way with disaster mitigation and management, including national and local government personnel, researchers, journalists, and private company personnel, to share their basic ideas pertaining to the report to be submitted to the Secretary-General and also to exchange views and information on disaster prevention and management.

The output from the presentations and discussions is summarized in this symposium report. The publication consists of a summary of the proceedings, opening and keynote addresses, and appendices including list of participants, symposium programme, and the Tokyo Declaration which was unanimously adopted on the last day of the Fourth Meeting of the International Ad Hoc Group of Experts for the IDNDR in Tokyo.

The success of the Symposium was due to numerous people who helped to make the Symposium a reality. Our heartfelt thanks go to those who contributed both in preparation of, and in the Symposium, to all invited experts who gave presentations and comments, asked questions, and cooperated in the Symposium and to all participants. We look forward to their continued collaboration in the IDNDR to come.

20 December 1989



Hidehiko Sazanami  
Director, UNCRD

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## CONTENTS

FOREWORD	
1. INTRODUCTION	1
2. SUMMARY OF PROCEEDINGS	3
2-1 Opening	3
2-2 Keynote Addresses 1: Challenges of the IDNDR	6
2-3 Keynote Addresses 2: Expectation for the IDNDR	9
2-4 Panel Discussion 1: Issues during the IDNDR	11
2-5 Panel Discussion 2: International Cooperation	17
2-6 Closing	24
3. OPENING ADDRESSES	25
3-1 Address at the Opening of the International Symposium on Challenges of the IDNDR by Zhong Shukong	25
3-2 The Human Dimensions of Natural Disasters by H. Gurgulino de Souza	27
3-3 Opening Address by K. Arafune	29
3-4 Opening Address by T. Kubo	31
4. KEYNOTE ADDRESSES	33
4-1 Keynote Address by E. Rosenblueth	33
4-2 Keynote Address by J. Baker	36
4-3 Keynote Address by K. Okabe	39
4-4 Keynote Address by H. Tamamitsu	43
4-5 Keynote Address by J. Kondo	47
5. APPENDICES	49
5-1 Tokyo Declaration	49
5-2 Programme	52
5-3 List of Participants	53

## 1. INTRODUCTION

### BACKGROUND

In recent years, the whole world has become increasingly alarmed by the devastation caused by disasters such as earthquakes, floods, droughts, and storms. While advancement of scientific research has helped to understand the cause of natural disasters and modern technology can be applied to make Mankind less vulnerable to them, science and technology has not been made full use of to provide better warning systems and protection for people and their property in disaster-prone areas.

When Dr. Frank Press, the President of the U.S. National Academy of Sciences launched the idea of the International Decade in 1984, it was warmly welcomed by professional communities all over the world. This response was amplified at the United Nations General Assembly, in its Resolution 42/169 of 11 December 1987, to designate the 1990s as an International Decade in which the world community joins to cooperate in natural disaster reduction. When the Secretary-General of the United Nations was asked to develop a framework to attain the objective and goals of the decade, he appointed the International Ad Hoc Group of Experts consisting of twenty-five scientists and technical experts drawn from the world and representing the spectrum of disciplines engaged in disaster reduction. Before submitting the report to the Secretary-General, the group has held four meetings since July 1988. The final meeting was held in Tokyo from 10 to 12 April 1989. After two days of intensive deliberations during which the framework of the IDNDR was discussed, a Tokyo Declaration was drafted. On the last day, the experts discussed this declaration in detail. The final draft was then unanimously adopted. The main part of the text of the Tokyo Declaration 1989 is as follows:

- The people of the world, as well as their governments, to work toward greater security against natural disaster.
- The governments of all countries to participate actively in the Decade by educating and training their citizens to increase awareness, by enhancing social preparedness, by integrating disaster-consciousness into their development programmes, and by making available the power of science and technology to reduce disaster loss.
- The United Nations, scientific and technological institutions, non-governmental organizations, and the private sector to support international and regional cooperation on disaster-related activities and to contribute to the transfer of disaster-reduction technology, particularly in disaster-prone developing countries.

### PURPOSE

The Symposium was organized for the members of the International Ad Hoc Group of Experts and for those who were involved in disaster mitigation and management in Japan such as national and local government personnel, researchers, journalists, as well as those in the private sector. The major objectives of the symposium were to share their basic ideas

pertaining to the framework of the IDNDR and also to exchange views and information in this field.

#### COLLABORATION

This Symposium was organized by United Nations Department of Technical Co-operation for Development (UNDTCD) and United Nations Centre for Regional Development (UNCRD) in collaboration with three United Nations Organizations and thirteen national government organizations of Japan. United Nations Organizations are as follows: United Nations Development Programme (UNDP); United Nations University (UNU); and United Nations Information Centre (UNIC). National government organizations of Japan are as follows: Ministry of Foreign Affairs; National Land Agency; Science and Technology Agency; Environment Agency; Ministry of Health and Welfare; Ministry of Agriculture, Forestry and Fisheries; Ministry of International Trade and Industry; Ministry of Transport; Meteorological Agency; Ministry of Posts and Telecommunications; Ministry of Construction; Ministry of Home Affairs; and Fire Defence Agency. The other cooperating organization is Kanagawa Prefectural Government.

This Symposium was well attended with 260 participants including nineteen UN Experts of the International Ad Hoc Group of Experts for the IDNDR, twenty-three staff from UN Agencies and international non-governmental organizations, and others involved in disaster mitigation and management in Japan.

## 2. SUMMARY OF PROCEEDINGS

### 2-1 OPENING

The Symposium's Opening Address was delivered by UNCRD Director Hidehiko Sazanami who provided participants with some of the background information relating to the United Nations-designated IDNDR. He noted that the 1990s were, in December of 1987, designated as an International Decade for Natural Disaster Reduction, at a session of the UN General Assembly. The aim of such a plan was to foster and strengthen cooperation between and among all nations to reduce the effect which natural disasters have on national development efforts. A panel of twenty-five eminent experts had been selected by the UN Secretary General to help him develop an appropriate framework for the decade. This panel, known as the International Ad Hoc Group of Experts for the IDNDR, under the chairmanship of Dr. Frank Press, has so far held four meetings. The fourth, which was concluded on the day prior to the International Symposium, finalized the report for the Secretary General. Sazanami stated that the Symposium was organized to enable the group of experts to meet with concerned experts, scientists and officials in Japan who were active in the field of disaster prevention. The Symposium had certain objectives, chiefly, to share the basic ideas pertaining to this report, and also to exchange views and information in this field. He felt certain that the results of the Symposium would be a valuable contribution to the IDNDR and concluded his address by wishing all participants success in their deliberations.

There then followed a series of four brief congratulatory addresses. First, to be introduced by Moderator Hideki Kaji of UNCRD, was Zhong Shukong, Director of the Policy, Programming and Development Planning Division of the UN Department of Technical Cooperation for Development (UNDTCD).

Having thanked the organizing agencies Zhong declared that the symposium was the fruit of collaboration between UNCRD, Kanagawa Prefectural Government, several central government agencies, United Nations Development Programme (UNDP), United Nations University (UNU), and the UN Information Centre (UNIC). He noted the extreme timeliness of the Symposium which was designed to disseminate the terms of the recently drawn up "Tokyo Declaration," and also serve as a forum for the exchange of views and information. The recent catalogue of disasters had alarmed the international community, he said, but assistance from international agencies, UN organizations, national governments, etc., had always taken the form of relief -- after the occurrence of the disaster. Adequate forward planning could limit the impact of such disasters, given the current state of science. The speaker emphasized the importance of incorporating relevant disaster prevention programmes, emergency relief preparedness, and post-disaster rehabilitation programmes into the comprehensive national and subnational development planning processes of all countries. He also stressed the importance of creating mechanisms to limit damage and loss of life in the event of a disaster. He reminded participants that post-disaster rehabilitation and reconstruction measures can be increasingly regarded as preventive measures in the event of future disasters. Training of specialists and supply of materials are important ways for the developed countries to assist the more disaster-prone

developing countries, whose resources are limited. Zhong then touched on the role played by UNCRD in the IDNDR, noting that a principal focus of the decade will be the strengthening of national capacities to plan more effectively for disaster prevention and mitigation. UNCRD had been providing valuable services in the field of regional development planning. Zhong said, specifically training, research, and information exchange. He voiced his appreciation to UNCRD for taking the initiative to organize the symposium and his expectations that the ensuing deliberations would be both stimulating and fruitful.

For a second inaugural address Moderator Kaji called upon Heitor Gurgulino de Souza, Rector of the United Nations University (UNU), Tokyo for his comments.

Beginning with the remark that he had been closely following the deliberations of the International Ad Hoc Group of Experts for the IDNDR, de Souza welcomed, on behalf of UNU, all participants to Japan. Despite the UNU having been assigned no special responsibility in the area of natural disaster prevention, a substantial portion of the research and training activities in its environment and resource programmes is directed towards preventive support services. These services would be applicable in disaster prevention work. De Souza then listed some specific programmes which were examples of this relevance, viz., research into the links between upland farming methods in India and Nepal and the devastating floods in Bangladesh. This research highlighted the human dimension to natural disasters. Human actions are, on an increasingly large scale, disrupting the globe's life supporting systems, declared de Souza, citing the links between ozone depletion leading to the "greenhouse effect" and the ongoing forest depletion. At the UNU, a global approach to disaster prevention was being fostered in close collaboration with international scientific bodies. Major efforts were ongoing to explore human dimensions of global change. De Souza viewed the work at UNU as being closely interlinked with the concerns of those present at the symposium. He declared his readiness, on behalf of the UNU, to cooperate in any way considered helpful with the international disaster prevention efforts being currently discussed. This concluded his inaugural address.

The next speaker to be invited to deliver an address was Kiyohiko Arafune, the Deputy-Director-General of the Ministry of Foreign Affairs, Government of Japan. Out of respect for the majority of participants, who were Japanese, Arafune delivered his comments in Japanese.

Immediately following the adoption of the "Tokyo Declaration on the International Decade for Natural Disaster Reduction" which had occurred the previous day, the speaker emphasized the importance of the current Symposium which facilitated discussion and exchange of views and experience. He expressed his appreciation of this opportunity provided by UNCRD in concert with Kanagawa Prefecture.

Although natural disasters, by their very nature cannot be controlled, their effects can be greatly mitigated by adequate forecasting systems and the degree to which citizens are prepared, said Arafune in his opening comments. Citing the Japanese proverb, "where there is preparedness, there is no anxiety" he went on to broadly sketch the Japanese experience dating from the Great Kanto Earthquake of 1923. A vast range of activities and

forward planning has been enacted by Japanese authorities. September 1st has been designated as a "Day of Disaster Prevention," during which evacuation drills, first-aid practice and related activities were conducted annually. Preparedness has reduced damage during disaster occurrence. Great efforts have been expended in maintaining awareness and concern at all times. Experience has taught the importance of this. International cooperation, thought Arafune, was another way to share experience and assist disaster-prone countries. Emergency aid not only benefited recently affected countries but facilitated further sharing of knowledge and experience by assisting countries. It was partly the realization that international efforts are needed to mitigate the effects of natural disasters that prompted Japan and Morocco to promote the IDNDR at the UN General Assembly. Arafune noted that it was an ambitious undertaking, to tackle natural disasters on a global scale and that a long-term creative approach was essential. The recently approved "Tokyo Declaration on the IDNDR" had included useful guidelines. He anticipated that the concrete discussions to be undertaken during the Symposium would further enhance understanding of the IDNDR. In conclusion, he reiterated his thanks to UNCRD and Kazuji Nagasu, the Kanagawa Prefectural Governor, together with all those personnel who had helped in the preparation of the ongoing Symposium.

Finally Takao Kubo, the Vice-Governor of Kanagawa Prefecture was invited to deliver his address on behalf of the Governor, and also on behalf of the 7-8 million residents of Kanagawa Prefecture.

Having thanked the organizers (UNCRD and UNDTCD) as well as those attending the Symposium, Kubo provided some more background to the IDNDR. A principal motive, he said, was to devote the last ten years of the century to establishing a safe earth for future generations to inherit. The IDNDR, agreed upon by the UN General Assembly in 1987, was receiving large-scale international cooperative efforts, not least from Japan. He then focused on the preparatory measures, underway in Kanagawa Prefecture, in readiness for the next earthquake -- already designated the Tokai earthquake due to the unique crust structure beneath this region of Japan. Warning and prediction systems were being developed in close cooperation with the private sector, lifeline security was being reinforced. Tribute was paid to the key role of international aid, forthcoming after the 1923 Kanto earthquake. The speaker then described the experimental "Shonan International Village" being set up by the prefecture which had as its aim, the promotion of international cultural and technical exchanges. The goal was to stimulate relevant international cooperation. For this reason, the current Symposium was most welcomed by Kanagawa Prefecture. He extended his best wishes to all participants and hoped that the deliberations would be fruitful.

This concluded the opening session of the Symposium. The moderator thanked the speakers for their contributions and began the second section which was comprised of three keynote addresses on the theme, "Challenges of the IDNDR."

## 2-2 KEYNOTE ADDRESSES 1: CHALLENGES OF THE IDNDR

The first to present his keynote address was Emilio Rosenblueth, the Vice-Chairman of the UN Ad Hoc Group of Experts. The address began with the observation that with the fourth meeting of the International Ad Hoc Group of Experts, the group's mandate was completed. The finalized report was now ready for the UN Secretary General, to be presented to the UN General Assembly (UNGA) in June. He traced the origins of the group, and the formation of the IDNDR, noting the initiating idea, in a Frank Press speech at the Eighth World Conference on Earthquake Engineering, in San Francisco. Also noted were the contributions of Morocco and Japan in their initiative to bring the idea before the UNGA for adoption. Somehow the concept of an International Decade, devoted to disaster reduction on a global scale, immediately gripped the hearts and minds of all who heard it, such that, with UN adoption, and the appointment of an International Group of Experts to advise the UN Secretary General on its implementation, the IDNDR became a reality. He reiterated his thanks to the Government of Japan for hosting the fourth meeting of this group and to UNCRD and Kanagawa Prefecture for organizing the ongoing Symposium. The second part of his keynote address was devoted to an enquiry into why the IDNDR had awakened such outstanding international resonance. Rosenblueth believed the reasons were threefold.

Firstly, the materialistic motivation which determines that natural disasters are both a cause and an effect of underdevelopment. The massive flooding in Bangladesh was cited as an example of disasters causing large-scale destruction of infrastructure and retarding development. As 90 per cent of the victims of natural disasters reside in developing countries it is evident that underdevelopment is a prime cause. These nations suffer far more than developed ones such that development planning must incorporate disaster reduction measures.

A second motivation, said Rosenblueth, was the intense moral implication of disaster reduction, in that it was naturally contingent upon every government, every individual even, to reduce the toll in human suffering caused by disasters. The responsibility lay as much with developed countries, as with developing ones as the former are in positions to share essential technology and generate scientific discoveries which will become indispensable.

Finally, there was the intellectual challenge of disaster reduction. The International Ad Hoc Group of Experts had already decided to set up a series of illustrative projects which would be carried out during the early part of the decade to inspire confidence, draw resources, and ensure results during the ten-year period. These projects had to have a high profile, show tangible results, and emphasize technology transfer. He outlined one such project which was comprised of simple-to-operate water-use kits. These should be able to determine potable water and perform water purification. Both types of kit should be low cost and portable. There was a great need for scientific support of all kinds. The International Council of Scientific Unions had declared its full backing for the IDNDR and was now coordinating scientific research projects and sponsoring new projects prior to the Decade's commencement. Rosenblueth praised the role being played by UN agencies and outlined the two components which the IDNDR was designed to emphasize.

(1) Increased concentration of efforts at preventive measures, not only remedial measures.

(2) Adoption of an integrated approach to disaster mitigation. The importance of the integrated approach is twofold. Disasters can cause other disasters, e.g., an earthquake can cause a tsunami which will cause flooding, or create lifeline damage. The integrated approach is also important as lessons learned from one disaster can frequently be applied to other disasters.

He concluded by declaring that every human being has a role to play in the decade's aims -- to drastically reduce suffering, loss of life, and loss of property. The role of developed nations was stressed in relation to their resources and technological expertise. In this connection Japan had a particularly important role to play. Because of its initial and enthusiastic support for the IDNDR it was particularly fitting that the Experts' group should finish its work in Japan. He wished the Symposium every success and hoped that all present would learn from it.

The second keynote address was then announced; it was delivered by James Baker, Director of UNDIAC.

He began his address by reminding participants of the UN Secretary General's words in his message to the closing ceremony of the previous day's meeting, whereby it was noted that although the International Ad Hoc Group of Experts' work was then complete, the actual work of implementing the decade was only just beginning. The current Symposium was a part of that work. Not being a scientist or a technical expert, Baker approached the task of defining the Challenges of the IDNDR from the UN viewpoint, or in what he termed as a "parochial institutional" viewpoint. The popular view was that the UN had responsibilities in the peace and security arena, but these were equally heavy responsibilities in terms of human welfare. The UN, therefore, tries to identify emerging problems and then mobilizes appropriate responses and resources from a global perspective. In the field of economic and social concerns this takes on added complexity when one considers the UN family of organizations which are each charged with specific areas of responsibility. It was natural, he felt, that the UN should be considered when an undertaking such as the IDNDR is being considered; however, it was also noted that the initial impetus emerged from the scientific community. Nevertheless, unanimity was soon reached among all members that a programme should be forthcoming with the aim of saving lives and property -- reducing suffering. Baker then attempted to redefine the challenge as he saw it. He outlined the general awareness of disasters and of their effects, and the level of scientific achievement which could mitigate these effects, but was also of the opinion that skepticism remained as to whether results would be forthcoming regarding disaster mitigation -- will the IDNDR be effective. The most important aspect will be the involvement of people. (International and national agencies could do little, he felt, to actually stop disasters). This required a heavy educational component reaching down to village level, and also a concept of transfer of technology. There was a real challenge in adopting sophisticated technology to low-cost developing country situations. A second comment concerned the need to break down certain barriers that existed within the scientific/technological community; barriers that existed between countries. The full range of countries must

be reached, and the UN was highly placed to do this; full cooperation must be forthcoming from the scientific/technological community. In conclusion, the speaker felt that great success would be achieved through a global cooperative effort, and to this end, he pledged UN support in doing everything possible to make the IDNDR a worthwhile undertaking.

The third keynote speaker was Keizo Okabe, a member of the International Ad Hoc Group of Experts representing Japan, and Emeritus Professor at University of Tokyo.

Okabe began his address by expressing his belief that the work of the Group had concluded successfully. He announced his intention to voice his expectations for the IDNDR based on the work already carried out by the Expert Group. The IDNDR's stated aim was to reduce the damaging effects of disasters worldwide. This was based on a firm moral foundation and, as much, should be supported by all -- but what can be done? Firstly, an institutional basis has been rationalized, an organizational foundation from which to proceed, for the decade, has been set up. Mobilization and utilization of available scientific knowledge must now take place through a process of public education to raise awareness as to the IDNDR's potential. The significance of early warning systems (the UNGA has recognized this) has to be fully appreciated by everyone, and, in this regard, international cooperation had a valuable role to play. Mass communication must be fully utilized in information gathering and dissemination. Information systems for disaster prevention need improvement; despite past successes, there still occur failures. With reference to the 1983 Nihonkai-Chubu earthquake -- which had a death toll of 104 -- it was noted that despite foreknowledge that a tsunami was imminent, those who died were not aware of the fact that they were in danger. Disaster prevention information systems were utilized in each locality in the earthquake-affected area. It was later discovered that warnings were not heeded by local people. Public response to such warnings should be improved. There are obstacles which must be overcome. Research seemed to indicate that, upon receipt of warnings, the public, in efforts to avoid panic, will sometimes ignore the warning, adopting an attitude of "it won't happen to me." This fatalist attitude needed to be overcome. The US Academy of Sciences report corroborated the findings in Japan, that people will try to ignore danger -- choosing instead to be optimistic at all costs. Natural disasters in the twentieth century were exacting ever greater tolls; suffering worldwide was on a daily basis. However, it remained that most people are unaffected by natural disasters which may account for the fact that prevailing belief appears to be that being hit by a natural disaster is a matter of bad luck. A major task for the IDNDR was to correct this misperception. The speaker went on to define the "hard" approaches to disaster prevention, i.e., erosion prevention measures, dams and breakwaters, reforestation, etc., and contrasted them with the so-called "soft" approaches, i.e., attitudinal change, effective response to warnings, and efficient evacuation, etc. In conclusion, Okabe stated that the Tokyo declaration which wrapped up the final session of the Group of Experts meetings was a concrete expression of their resolve to confront these issues and a unanimously held view that there was a deep necessity to ensure that the IDNDR was a successful and worthwhile undertaking.

## 2-3 KEYNOTE ADDRESSES 2: EXPECTATION FOR THE IDNDR

With Okabe's address, part one of the Keynote Addresses was complete. The moderator called for a brief recess before continuing the series of addresses.

Upon resumption, the Director-General of the Japan International Cooperation Agency (JICA), Hiroaki Tamamitsu was called upon to deliver his address. He was the first of two speakers, representing Japan, to deliver address in response to the three previous speakers who were representing the International Ad Hoc Group of Experts. Tamamitsu briefly recapped the origins of the IDNDR and expressed his agreement regarding its timeliness. He noted the increasingly large-scale of disasters which all countries agreed upon. It has, therefore, become easier to expect the full cooperation of each country in efforts to make IDNDR a successful undertaking. Through technical assistance and cooperation JICA pledged its full support for the decade and Tamamitsu noted that JICA had, as one of its tasks, the collaboration with people in the area of natural disaster reduction. Disaster relief teams had been dispatched from Japan to places in need. Such collaboration will increase in the future. Japan faced a gamut of different natural disasters and it has been painfully learned that protection from disasters lies in adequate preparation and foreknowledge. Science and technology have facilitated improved prediction, as has knowledge of plate tectonics. Monitoring and measurement methods have greatly improved. Likewise with flood prediction. Heavy rainfall usually precipitates flooding, therefore, improved early warning can mitigate the disastrous effects. Abnormally high-tide prediction would facilitate the mitigation of floods resulting from this type of phenomena. Volcanic activity can similarly be predicted. Tamamitsu recounted some recent volcanic disasters and noted that with some phenomena, disasters frequently have a human dimension which cannot be overlooked. JICA was supervised by the Ministry of Foreign Affairs, and recent budgetary appropriation had included national disaster prevention. JICA, also active in rehabilitation and reconstruction, supplanted an earlier organization called the Overseas Technical Cooperation Agency (OTCA) which was instrumental in coordination of international cooperation from Japan. Such cooperation comes in the form of training courses, and dispatch of experts, supply acquisition, and survey and investigation related to development in the third world. The types of activities undertaken included seismic engineering courses, disaster prevention technology, and dam construction courses. The Building Research Institute of the Ministry of Construction is instrumental in the seismic engineering course, which is highly evaluated. In the area of technical cooperation, JICA exerted efforts to set up seismic centres in other earthquake-prone nations. (Indonesia, Peru, and some South African countries were recipients). A number of countries were requesting collaborative assistance. In the area of flood mitigation and control the Agency was active in Southeast Asian nations. Financial assistance was another area in which JICA was involved. Specifically, feasibility studies for flood control infrastructure.

In the entire area of natural disaster prevention, about 4 per cent of the whole budget is currently allocated, but this was expected to expand. There was increased activity in the area of disaster relief, particularly in the area of relief teams, speedily dispatched to stricken areas. Again, this area is expanding. Tamamitsu listed a number of countries receiving

those teams. The teams included engineers and doctors. As to the future, Japan's increasing share of world GNP, allowed commensurate increase for overseas development assistance (ODA). Good use must be made of these sums of money in terms of quality and quantity. (¥11 billion for JICA in the ensuing fiscal year). Japan had accrued a large amount of experience in disaster prevention and rehabilitation/restoration techniques. It was, therefore, well-placed to extend facilities for international cooperation. Increased emphasis on natural disaster reduction was anticipated in JICA's activities. This constituted the expectations of JICA for the IDNDR.

Upon the conclusion of this address it was the turn of Jiro Kondo, President of the Science Council of Japan, to deliver an address.

He began his address by providing some brief details of the background of his organization. Founded in 1949, the Science Council's task was, initially, to rebuild Japan upon the ruins of a war-ravaged country. Over 180 research liaison committees currently included a large number of disaster prevention/reduction disciplines. He listed such areas as earthquake engineering, geodesy and geophysics, volcanology and chemistry of the earth's interior, as being highly relevant to the IDNDR. His address then turned to a detailed list of the recent disasters which have hit Japan, referring to UNCRP's Challenges of the IDNDR publication. Major typhoons and their effects, earthquakes and resultant fires, tidal waves (tsunamis) and floods were all described to give a thorough understanding of the degree to which Japan was vulnerable to natural disasters. He then cited a case from China which clearly illustrated the potential for disaster prevention inherent in adequate warning systems. (Due to forewarning of a strong earthquake, authorities were able to order immediate evacuation, thus saving countless lives). Kondo then provided an equation to show the application of probability theory to earthquake prediction. From this it was possible to calculate potential damage from a given earthquake. Thus,  $E(D) = \int_0^D p(x) dx$ , where  $p(x)$  equaled the probability density function, was the intensity of the natural disaster and of the damage caused. This should lead to a calculation of damage. This type of calculation together with disaster prevention engineering should be extensively applied, he said. In Japan, increasingly stringent building regulations were being enacted to incorporate earthquake resistant techniques. Improvements in technology should gradually lower the costs of such construction. He concluded his address by touching on the human factor. More accurate information should be provided to people in efforts to avoid panic, however, science could not help people if they themselves did not trust information/warnings issued to them. He expressed his hope that although science could never completely eliminate disaster occurrences, it could contribute greatly to reducing the damage they caused. He echoed the earlier address by Baker in calling for increased public education to this end.

With the completion of Kondo's address, the morning sessions of the International Symposium on Challenges of the IDNDR came to a close. Panel Discussions were to follow in two separate afternoon sessions.

#### 2-4 PANEL DISCUSSION 1: ISSUES DURING THE DECADE

M.C. (Master of Ceremony) Kaji announced the commencement of the afternoon sessions, noting that the first panel discussion was focused on "Issues during the Decade." Having introduced the moderator Roman L. Kintanar, Director-General of the Philippines Atmospheric, Geophysical, and Astronomical Service, he introduced the six members of the panel to the symposium.

The moderator briefly recounted the morning's addresses, noting the many challenges posed by the IDNDR, to the developed nations, to the UN organizations, and to the scientific community. He also recounted the various expectations enunciated during the morning and emphasized that every individual had a part to play in this global effort at natural disaster reduction. He felt it noteworthy to mention that the relative importance of disasters depended upon individuals/groups.

Anand S. Arya, the first panelist was a member of the International Ad Hoc Group of Experts, representing India. He was also a Professor of Earthquake Engineering of the University of Roorkee.

From an early stage, according to Arya, a fundamental issue for the IDNDR had centered on education/awareness/training. The importance of mobilizing people had been emphasized in earlier contributions. If response to warning of pending disasters in Japan had been poor, imagine how much poorer responses would be in developing countries with lower literacy rates and less awareness. People should be shown how they themselves would benefit if warnings were appropriately heeded. However, citing the smoking analogy, whereby although smokers were constantly informed of the health benefits of not smoking, progress in smoke reduction was slow, Arya was not confident of swift progress. He also cited the initial skepticism with which the "Green Revolution" was greeted, in India. Only now, several years after the programme was begun, have the true benefits been acclaimed. Similarly with disaster preparedness measures. Top leaders and policymakers had to be fully committed. However, as a word of caution, regarding the drawbacks of carelessly applied warnings, he cited the case in India where, as a result of the earthquake potential in a given area, industrial development was significantly retarded due to the withdrawal of large amounts of investment and plant, and its relocation elsewhere. His own research, which had yielded a figure of 350,000 casualties as a potential figure resulting from an earthquake occurring in the same area and of the same intensity as one which took place in 1905, had to be kept from the press, due to fear of irresponsible reporting leading to panic. Great care had to be taken to avoid scaremongering. This was a recurrent problem for IDNDR -- how to create awareness while avoiding its adverse effects. He saw the answers in education/training programmes with integrated disaster preparedness in the actual practice of planning. Regional/national seminars for senior/mid-level personnel would create correct awareness. An increasing number of promising young people should be trained in this area. Scholarships should be increased and international funding should be mobilized to facilitate greater numbers of personnel to be trained in their own countries. International efforts should, of course, extend beyond the decade, and progress would be slow, but the IDNDR was an ideal time to begin such efforts. With this, Arya's thoughts for the decade, came to a conclusion.

Moderator Kintanar then invited Vladimir I. Keilis-Borok, a UN expert from the Soviet Union and president of the International Union of Geodesy and Geophysics, to provide his assessment of the tasks ahead, for the IDNDR. He began his comments with the view that crucial gaps in research and development had to be filled in order to improve the international community's ability to reduce the death and destruction resulting from natural disaster. In a technical presentation Keilis-Borok listed three areas which offered great hope, in this direction.

Firstly, in the area of globally integrated observation systems, advances were being made which offered hope for improved early warning systems, and problem-solving approaches. Secondly, integration of the various arms of science contributed to greater progress. The common fundamental and conceptual base for this integration was modern nonlinear dynamics with its concepts of chaos and collective behaviours, said Keilis-Borok. A third area, and cause for optimism, was in the integration of basic and applied studies, of research, development, and implementation problems. This included the design of flexible systems of civic protection measures, escalating or de-escalating according to the scientific evaluation of disaster probability. The speaker referred to the potential damage assessment equation demonstrated by Jiro Kondo during the morning session and noted that scientists are very near to formulating a reliable base for practical decision making for disaster preparedness planning. Keilis-Borok was of the opinion that these developments offered a realistic hope of saving millions of lives, and hundreds of billions of dollars in property damage and the drastic reduction in costs of disaster prevention activities. Additionally, he noted the importance of bridging certain psychological gaps between scientific, administrative, and technological communities, and between international, national, and regional perceptions. Specific possibilities exist, for meeting these challenges, within scientific unions (the ISCU systems). He cited cost-effective substitutions for earthquake simulations saving millions of dollars.

He concluded his thoughts by suggesting some possible directions of research for the future. Megacities are destroying themselves, through overcrowding, pollution, overpumping of underground water, waste production, etc. Comparative studies of the destructive phenomena were needed to gain a fuller understanding of the forces at work. A second area of possible research was in accurate prediction of atmospheric phenomena leading to disaster. A new model was needed for oceanic/atmospheric interaction. Supercomputers held the key to such research. Microzonation of such areas as coastal Bangladesh were needed to predict accurately flooding potentials. Earthquake and landslide prediction held the key to saving thousands of lives. In his opinion, the coming of the IDNDR was "none to soon."

Following on from this presentation was the exposition of Michel F. Lechat who utilized a number of slides for his presentation which focused on health.

As the only medical professional in the International Ad Hoc Group of Experts, Lechat began by noting that disasters posed important health problems. Deaths from injuries sustained during earthquakes, floods, landslides, etc., numbered in the millions, though, he added, deaths from communicable diseases was an overstated problem. Damage to health

facilities also posed a problem. Due to the vast increase in occupancy of disaster-prone areas, the number of dead and injured as a direct result of natural disasters is expected to increase. He saw a number of possibilities for the decade (IDNDR). Firstly, from the technological viewpoint (prevention via land-use; forecasts to allow evacuation; warnings, via mass-media) which were of great interest to health managers. During the last ten years a change of approach had taken place, in terms of health management during/after disasters. From the earlier approach, of largely rescue operations (drugs, hospitals, doctors) there had been a shift to a wholly integrated approach, i.e., at every stage of disaster-preparedness planning, to rescue and long-term rehabilitation. Advance measures were of considerable importance. Via a transparency, Lechat vividly illustrated the importance of rapid health assistance by showing the survival rate of victims according to time elapsed before rescue. (After 1/2 day, 99 per cent survival rate, after four days, only 1 per cent). A similar graph from Italy corroborated these findings. This also raised the question of increasing the awareness of the population, in terms of the absolute need for rapid rescue. Other evidence showed that children between five and nine years were especially vulnerable, as parents assumed they would take care of themselves. Populations need to be trained to be aware of their neighbours. The WHO concluded that self-rescue and self-reliance of the people were vital areas for education. In the case of the Niigata earthquake, it was claimed that 75 per cent of survivors were helping in rescue operations.

The WHO had set up regional seminars in disaster preparedness for top-level health managers, as had been earlier recommended by Arya (Delhi, Nagpur, Harbin, etc.). He expected the IDNDR to act as an "amplifier" for these ongoing efforts, to increase the capability of disaster prevention, and promote the self-reliance of local communities.

The fourth panellist was from Yugoslavia, Jakim Petrovski, an earthquake engineer and member of the International Ad Hoc Group of Experts.

Petrovski outlined his thoughts on the decade, which focused mainly on the filling of gaps in man's ability to cope with disasters. He set a list of three steps which needed to be taken, (1) a synthesis of existing knowledge and technologies should be drawn up, (2) possible improvements of this body of scientific and technological knowledge, and (3) the transfer and implementation of existing technologies for improved disaster management. In a series of slides focused on earthquake disaster management (EDM) he then illustrated six basic steps, i.e., monitoring, hazard assessment, vulnerability, and risk assessment. The latter two sections (vulnerability and earthquake risk assessment) formed the basis of the speaker's comments. He noted the need for uniform methods and techniques for data collection -- there were still difficulties in understanding and communication. Data bases should be established which could be universally comprehensible. Analyses of seismic risk were necessary which could be incorporated into development planning. In considering one of the models for integral damage prediction, Petrovski outlined the necessary steps, i.e., identification of elements at risk, hazard effects (by prediction of earthquake ground motion) and vulnerability functions. He added the important note that this kind of knowledge should be heeded during the drawing up of development plans.

Further slides illustrated the kind of data necessary for damage prediction, regarding stone masonry or brick masonry. Examinations of vulnerability functions followed, using actual examples from Balkan earthquakes. Repairable buildings and structures to be demolished were identified. Synthesis for future activities programme, i.e., improvement for earthquake management, development of data bases of vulnerability, establish strategies for risk reduction and disaster preparedness, and data banks on human losses related to building vulnerability. A final task, which Petrovski saw as important for IDNDR, was the development of an integral regional information and expert system to assure a more universal implementation of scientific and technological achievements.

Panellist number five was Kenzo Toki, a UN Advisor and professor at Kyoto University. His initial statements concerned the fundamental side of scientific research for IDNDR. As a scientist, he restricted his comments to this area of science. He believed that the IDNDR had two central premises -- technology transfer (international cooperation); and scientific research.

Japanese scientists had established an ad hoc committee for IDNDR in 1986. This committee acts as a liaison committee between the committee for disaster research of the Science Council of Japan and the Japanese Group for Natural Disaster Science. The latter group was composed of 1600 scientists engaged in research into natural hazards and disasters. The committee's intention was to influence the government regarding involvement in IDNDR. The next objective of the committee is to set up joint projects, i.e., global observation on a cooperative basis. The speaker then enumerated four objectives important for IDNDR, (1) promotion of basic scientific research centring on causes of natural disasters, research into the natural phenomena causing disasters and more accurate forecasting of disasters to facilitate early warning systems; (2) coordination of individual and national efforts with ongoing international research programmes in related fields of science and engineering, e.g., seismological observation, oceanographic measurement, and various programmes to analyse the interior structure of the earth to gain improved understanding of earthquake mechanisms; (3) concerted action on the disruptive changes in the earth's biosphere, such as rise in sea levels, resulting from the greenhouse effect; (He felt that the IDNDR presented a unique opportunity to exchange knowledge and experience on an international level), finally (4) the necessity of a free information exchange among all scientists and scientific disciplines. ISCU must share with other international organizations on an interdisciplinary level -- the World Federation of Engineering Organizations (WFEO) and the Union of International Technical Associations (UAFI), among others. In conclusion, he stated his belief that the IDNDR was an opportunity for each individual scientist to increase his/her knowledge, and, in so doing, create a better future, for the twenty-first century.

The final speaker, Kazuaki Ito, was a commentator from Japan Broadcasting Corporation who specialized in natural disaster and environmental issues.

Ito began his remarks by describing his function as a radio/TV announcer specializing in natural disasters and environmental problems, viz., to explain conditions to the general public in as clear and concise

terms as possible. Focusing on IDNDR he believed that the global environment should be taken as the natural backdrop to disaster reduction. Environmental deterioration led to natural disasters. (Deforestation was a major cause of recurrent flooding in Bangladesh). Overpopulation leads to deforestation which can produce landslides and floods. Desertification, the ultimate result of deforestation was a clear harbinger of drought, he said. Locust swarms have been on the increase in desert areas, and increasing deserts mean a general rise in global mean temperature. Thus, overall, human activities are causing devastating problems, as nature hits back at Mankind for his environmental destruction. Natural disaster reduction attempts must take place within the context of a more enlightened approach to environmental protection. In the speaker's opinion Japan had a special role to play in these attempts due to its history and current international position. Here, Ito sketched out some possible areas in which Japan could be of significant help: Technology transfer, particularly with reference to earthquakes; in pollution control, where Japan has recorded very real successes since the 1960s in curbing environmental pollution; financial support, was another area in which Japan, as an economic superpower had a role to play; finally in the area of expertise (dispatch of experts) there was a role for Japan to play. Such experts could be in the field of engineering, medicine, or administration.

Rounding off his remarks, Ito noted that the people of Japan were poorly informed regarding the IDNDR and urged those in the relevant positions to utilize the mass media more fully. He suspected that this was an international problem also. Time Magazine had made the Earth its "Planet of the Year" in an attempt to focus more attention on the environment -- a successful strategy, as it had occupied public attention everywhere. The same should apply for IDNDR -- public attention must be obtained through the power of the mass media.

This concluded the presentations of the panellists. The moderator then opened the panel discussion for comments from the floor.

Professor Matsumoto of Nihon University wished to comment on the contribution from engineers to the IDNDR. As a member of the executive committee of the World Federation of Engineering Organizations (WFEO) he had recently returned from a committee meeting at UNESCO, Paris. It had been agreed to organize the first World Congress on Natural Hazard Reduction in cooperation with the Institute of Engineers of India. A second congress was to be held in Tanzania. He firmly believed in the importance of engineers and scientists working together.

A participant from China, Lili Xie, wished to summarize, at a fundamental level, what he believed to be, the basic issues for IDNDR. He felt the letters A, B, and C would sum up these issues. 'A' for awareness, as outlined by Arya was indispensable, for without people's awareness, no government message would be comprehended. 'B' signified preparedness, and foreplanning (preparedness, planning, and prevention combined with four 'R's, rescue, relief, resettlement, and reconstruction). 'C' signified cooperation and was essential in any natural disaster reduction. The developing countries, where most disasters occurred, needed help from the developed countries. These issues summed up the basis for IDNDR, he concluded.

Oyebande had a brief observation to make regarding one aspect of IDNDR, i.e., cooperation versus isolation. Citing a story to illustrate the crucial importance of cooperation on an international scale (to combat the occurrence of natural disasters) rather than isolated efforts on a national scale, the speaker declared his admiration for the efforts being made by Japan at assisting the developing countries. He was impressed by the presentation of Tamamitsu of JICA and felt this example should be duplicated, with particular emphasis on the African continent.

A final comment from the floor came from participant Adelin Villejelle. Citing the case of flooding in Djibouti, drought and early monsoons in other parts of Africa he noted interdependence of global weather conditions. Basically, nobody was immune from disasters. Research on climatology and, in particular, early warning systems should receive priority. Ever increasing financial resources should be channeled into scientific and technological research.

Prior to the end of the first discussion, moderator Kintanar noted that through this kind of event and interchange, the activities of the IDNDR, will be clarified. This would lead to the achievement of some of the decade's noble goals and lead to a more secure world in the centuries ahead.

## 2-5 PANEL DISCUSSION 2: INTERNATIONAL COOPERATION

The second panel discussion of the International Symposium "International Cooperation," began with the introduction of the moderator, M'Hamed Essaafi, Under Secretary-General, Office of the United Nations Disaster Relief Coordinator (UNDRO) and the six panellists.

In his introductory remarks Essaafi noted the interdependent effects of natural disasters. Many disasters effect more than one country, they knew no boundaries. Even the man-made disaster, the explosion of the nuclear reactor at Chernobyl, had widespread effects on many countries. Some potential disasters are global, i.e., the "greenhouse effect." This underlined the necessity of international cooperation. In the face of particularly devastating disasters remarkable instances of international cooperation were possible. He cited the cases of Ethiopia and Armenia, where recent droughts and an earthquake, respectively, had elicited encouraging international cooperation, regardless of ideology. International cooperation was vital, he said, in improving prediction and early warning systems; this, naturally, was of great interest to all countries. Information exchange held great promise for improved disaster reduction ability. In line with many of the earlier speakers Essaafi saw transfer of technology/technical assistance as a prime objective of the decade. This objective was even contained in the UNGA resolution concerning the IDNDR. Finally, he noted that although appropriate responses were generally forthcoming when appeals for assistance were issued, there was still a need for greater efforts, particularly in disaster prevention and preparedness. Increased attention was necessary to this endeavour.

Doris Bensari, one of the International Ad Hoc Group of Experts, and from Morocco was a geophysicist, and the first panellist to voice his opinion.

He reiterated the moderator's observations concerning the global implications of disasters. They clearly had no geographical limitations. The vulnerability to natural disasters of all types was bound to increase in future. Reasons for this, he cited as being population growth; expanding urban/industrial complexes, lack of safety standards; housing standards deterioration; lack of infrastructural maintenance; and cluttering-up of vulnerable land (volcanic, flood-prone, etc.). Current levels of science and technology already permit the challenge of natural disaster reduction to be met, early around the world. He listed some priority tasks such as installation of warning devices in high risk areas; seismic coded building standards; land/soil analyses, and risk assessment levels; mass education and training programmes; and information dissemination can all significantly contribute to disaster reduction on a lasting basis. Regional, interregional, and international cooperation are indispensable in this undertaking. He was of the opinion that Mankind's well-being was dependent upon this, and noted that the Tokyo declaration had remarked upon the security aspect of disaster reduction measures. It was up to the industrialized nations, in the form of technological cooperation and technical assistance, to ensure that effective natural disaster reduction capacity was improved steadily throughout the decade. He felt that all disciplines would benefit from such an effort. The challenge of natural disaster reduction was an unusual opportunity for cooperation among scientists and among countries.

Following this presentation came the contribution from Noel P. Cheney, a member of the International Ad Hoc Group of Experts representing Australia.

His theme revolved around the volunteer groups formed, in Australia, for the express purpose of fighting bush fires, the most prevalent natural disaster in Australia. Despite the relatively minor impact of this type of disaster, especially compared with earthquakes or tropical cyclones, they were still important from the viewpoint of other disasters such as landslides and flooding. As had earlier been noted, deforestation was having an increasingly injurious effect on global ecology viz., the greenhouse effect. The speaker's suggestion was that from the role and organization of the volunteer bush firefighters in Australia important lessons could be learned which could be applied in other countries and to other disasters. Seven per cent of the population, or about one million people, were registered bush firefighters. This number was drawn from both rural and urban populations (80 per cent of the population was urban). Organized at the smallest unit of local government (shire) and coordinated at the state level, by professionals. Training was arranged by these professionals. The volunteers were responsible for fire control on private land, but also assisted on public land. Basic equipment was 50 per cent government subsidized, the rest made up from a variety of private or local government sources. Equipment was also borrowed, ad hoc, from outside agencies in special cases; farms, road building companies, and town authorities. As already outlined, the bushfire was not as destructive as other natural disasters but, nevertheless their power could be enormous. Dangerous weather conditions could produce fires which spread at 20 km per hour, with firebrands, transported in the convection current constantly starting new fires elsewhere. Suppression was impossible, perhaps only 3 per cent of the total bushfire power, nevertheless the volunteers had a vital role to play in early detection and control. He cited the 1983 example of Victoria State, where 250 fires started on a single day. Only seven escaped early control, but they still caused more than A\$400 million worth of damage. The volunteers played a much larger role than in mere fire suppression. They gave instruction and advice to homeowners and communities on fire prevention, firefighting and bushfires such that evacuation was discouraged. Cheney viewed the Volunteer Bushfire Fighting Force as just one example of the possibilities of sharing knowledge and experience among countries during the decade. The volunteers had an important role to play in disaster prevention, a role which, in the opinions of the speaker, would be extended to other hazards in other countries.

On the completion of Cheney's presentation the moderator called upon Ram Krishna, a member of the International Ad Hoc Group of Experts from Fiji to deliver his comments. Forthcoming was a brief exposition of international cooperation in the field of meteorology (the speaker's field) in relation to disaster prevention, specifically cyclones, hurricanes, and typhoons. Included were perceived shortcomings in this cooperation which could be addressed during the decade. The WMO-promoted World Weather Watch (WWW) was an agreed example of operational cooperation. Cooperation in hydrology was also fairly good. Weather forecasting obviously required global-scale monitoring. The WWW had three components: The Global Observing System (GOS); Global Telecommunication System (GTS); and Global Data Processing System (GDPS). Fuller descriptions of these components

followed, e.g., the GOS had two weather monitoring modes, space-based and surface-based (land and sea, manual and automatic). The GDPS is the technology component of the centres which receives, processes, analyses, and produces forecasts/warnings for users. GDPS centres are in Moscow, Washington, and Melbourne; they engage in global data processing. Regional centres are categorized in two modes of specialization (geographical and activity-specialized), examples of the latter are in Tokyo and Miami), and provide information relating to tropical cyclones in the region. National centres are recipient bodies which receive information from the international and regional centres. This information is further refined according to national needs. Krishna noted that it was an important aspect that this exchange and supply of information was free of charge and voluntary. Continuing his detailed presentation, the speaker then discussed the Tropical Cyclone Programme, with WW, which is directed towards improved warning systems. Technology transfer and technical assistance were contained in this programme's general component while the regional component is reflected in the work of the regional tropical cyclone bodies, which are located in all regions affected by tropical cyclones/hurricanes/typhoons. Warning systems and disaster preparedness (in some cases) were the briefs of these bodies. One of the principal aims was to maximize regional resource usage and identify gaps and weaknesses and plan to remedy them through multilateral, bilateral, and national efforts. Many developed countries play important roles in the WW system, and, by extension, the Tropical Cyclone Programme. (Japan's Himawari satellite, was a cited example). A number of countries operated useful observational satellites from which cyclone-prone regions were benefiting. He then moved on to outlining some deficiencies within the system which could be remedied, such as deficient or lack of warning systems and poor ability to interpret information. Space/time gaps existed because of large expanses of ocean, which could be filled by radar or automatic weather stations. In some cases regional links themselves were vulnerable or unreliable during severe weather. Continuing improvements in accurate weather prediction were essential, more research was needed -- the gap between warnings and public action had to be narrowed by clear action-specific messages within the warnings and by public education programmes. The second long-term WMO plan contained many suggestions for further improvement in the WW. These have been drawn up following extensive discussions. The momentum towards improvements, however, should be increased still further. In this area, the developed countries have important roles to play, from their own experience, particularly in the area of disaster prevention. He stressed the importance of proper coordination of international cooperation and technical assistance to avoid duplication, waste, and inefficiency. Krishna, in concluding his contribution, then briefly outlined the particular set of problems facing island nations faced difficult problems concerning disaster reduction. Resource paucity, poor communications and high vulnerability to tropical cyclones could contribute, in the event of a disaster to the total destruction of years of development efforts. Low-lying coral atolls were particularly vulnerable to storm surges and wave action. Skills necessary for technology transfer were scarce, as were skilled personnel able to be trained for such transfer. New technology, in these circumstances would even be a liability. Donor countries should be aware of constraints in order to avoid failures. Collective regional approaches to many aspects of disaster reduction would be more likely to bring success.

The fourth speaker to be asked for his comments was Carlo Pelanda who began by announcing his total agreement on the notion of international cooperation. But having said that he voiced some reserved criticism regarding this issue. Scientists by definition formed an international body which was not really international, but just a group of people with the same discipline. This was different from governments or market relations. Thus, scientific cooperation for IDNDR raised no problems, but this did not apply, according to Pelanda, at the government level. According to his understanding, the IDNDR, in addition to being a programme for international cooperation for natural disaster reduction, was also an attempt to reduce the scale and number of such disasters, in other words to change the level of social vulnerability to disasters in the developing countries. He raised the question as to whether a country's vulnerability to disasters could be improved without a general raising of its development levels. He thus implied that a country's disaster vulnerability was a direct factor of its underdevelopment. General modernization must precede disaster reduction capacity. Admitting that he had no answers he repeated his skepticism as to whether any progress could be achieved. A potential IDNDR goal could be the separation of levels of development from vulnerability to disasters. Could international cooperation, i.e., advanced countries selectively assisting developing ones, really improve disaster prevention capacity? At the moment no one knew, as there was no system, per se, of international cooperation, it was thus of no scientific value to simply say that international cooperation was important. He concluded by warning the participants that there was no model which facilitates any hope that international cooperation could improve levels of disaster reduction in isolation from a general improvement of development levels. Technology cannot be transferred directly, it must be bought. How could developing countries pay? He urged a greater openness in international gatherings, and with greater awareness resulting, anticipated success.

Before the moderator, Bssaafi, introduced the next panellist, he noted that Pelanda's comments would probably elicit further questions from the floor. The fifth speaker was Makoto Watabe, a professor from Tokyo Metropolitan University.

Professor Watabe opened his presentations with a list of nine issues which he hoped would be addressed during the IDNDR. Attention should be paid as to what roles the developed countries would play; current conditions for international cooperation; transfer of disaster prevention technology; information exchange on disaster experiences; delegation of International Research Commission on Disasters; planning of technical training centres and subcentres; preservation and reinforcement of historically important remains; introduction of rescue and relief ships as well as rescue aircraft; and acceptance of the importance of love of mankind.

As a developed nation, Watabe said, Japan was actively engaged in technical cooperation; financial aid; volunteer activities; and personnel training. Japan was currently spending \$1.3 trillion in foreign aid or ten thousand yen for each citizen. Japan was in a position to contribute financially to IDNDR, additionally both technical and traditional knowledge should be transferred to disaster-prone countries. Only during the twentieth century has disaster prevention technology begun to be developed.

At each earthquake occurrence, lessons should be learned, knowledge gained, and experiences shared. An information centre, to store audio-visual information on natural disasters, may be useful.

Communication and dissemination of knowledge must be effective. Information centres and subcentres should be set up in every region. He cited such centres, existing or planned, in Peru, Turkey and Indonesia. He suggested an IDNDR initiative leading to the establishment of about thirty centres worldwide. This, he thought, would cost less than \$100 billion. Prediction of future disasters, particularly in the industrialized nations is of particular importance; the aforementioned information centres could also be a networked system for early warning as well as for information dissemination.

A final point concerned protection of historical monuments. Sites such as Gizeh in Egypt, Persepolis in Iran and others, are faced with constant threat of earthquakes. IDNDR should include provision for the increased protection of these valuable monuments. UNCRD and other organizations could take the lead in promoting projects of this nature. He also emphasized the importance of establishing rescue and relief ships, even establishing a floating International Research Commission on Disasters. Also noted was the possibility of equipping 747-jets with bushfire-fighting equipment. Watabe concluded his useful presentation by emphasizing that greater intergovernmental cooperation, essential for IDNDR, must be based on true love and respect for all mankind. Only in this way will the people of the developing countries truly benefit.

The final panellist to present his comments was Tadateru Konoe, Director, Japan Red Cross Society. He spoke of the role of the Japan Red Cross Society. He commenced by noting the prevalence of the fatalistic approach to natural disasters among the public. Only since the 1970s have disaster activities such as rescue and relief been seen as being a global responsibility. Disaster preparedness began to take on a greater significance. He noted the problems of disaster assistance and the difficulties for some afflicted countries when outside assistance ceases. Countries should not become aid-dependent.

In the 1980s disasters have increased. Public appeals for aid have increased in Tokyo to being almost on a weekly basis. Most people are becoming aware that relief is not enough; that some means of warning and improved preparedness must be devised. Vulnerability to disasters, particularly overpopulated areas, must be reduced. Today a notion is increasing that general levels of development must be raised in order to increase the level of disaster resistance. To this end the Red Cross Society has gradually expanded its scope from simple relief activities to embrace the function of a development agency. The traditional role of the Red Cross has expanded beyond that of mere relief action. There are 148 Red Cross and Red Crescent Societies worldwide -- most are in disaster-prone developing countries. They play a significant role in international cooperation and contribute to providing development aid to improve member countries' capability in disaster preparedness and prevention. Generally they are outside political concerns and can therefore provide valuable links to the grass roots level. As an international NGO, this is a vital function.

Fully utilizing this position, the Red Cross and Red Crescent Society will be able to play a valuable role in promoting further disaster preparedness and prevention, within the context of IDNDR, at the international level. Koneo's presentation concluded the formal contributions of the panel.

Upon the floor being opened for general discussion by the moderator the following comments were forthcoming.

Vit Karnik had some comments on Pelanda's presentation. He was in total agreement with his contention that disaster preparation/reduction were contingent upon development levels. However, he felt that technology transfer could be implemented, and not on a commercial basis. Transfers of funding, know-how, and training also constituted technological transfer. Successes had been achieved. This aspect of cooperation had to be carefully considered. He recommended that the process of transfer of technology/know-how begin as soon as possible, with careful investigation as to the actual needs of each country.

The next contribution from the floor came from Ben Moussa who had a number of questions, specifically for the moderator, Essaafi, bearing in mind that he had followed the work of the Ad Hoc Group of Experts since its inception. To what extent were existing UN channels of information dissemination being utilized, in order to convey the requisite knowledge/experience to developing countries bearing in mind that great confusing can, and has, occurred in this area of endeavour? In response to the question Essaafi affirmed that the UN had the means, a start had already been made -- scientific/technical research relating to IDNDR, a data bank was now in existence. It should be enriched and was at the service of all.

Ben Moussa's second question concerning the setting up of a permanent team to be readily available for disaster relief prompted Essaafi to outline UNDR's policy of having specialized personnel/teams available where necessary, and on hand in the event of a disaster. In terms of a permanent team, however, he felt that this was neither practical nor likely in the foreseeable future. It seemed more efficient to train in-country teams with various capacities in disaster-prone regions than to maintain a permanent team on stand-by.

Aggrey-Orleans, Assistant Director of the International Tropical Timber Organization (ITTO) then had an intervention to share with the floor. His association had similar concerns in disaster reduction, in terms of environmental protection, halting the destruction of forests etc., so he felt that the contribution of Pelanda, although a useful warning, required a more optimistic counterbalance. Greater coordination between and among agencies was essential, plus accurate identification of all the agencies, organizations which could have a role in IDNDR. (He included the ITTO in this). Beyond that, a certain regionalization of problems, as in the case of the South Pacific or Africa, would be beneficial. Noting the importance of education and raising the awareness of the common people, he observed that in many cases, developing countries still required assistance from outsiders, in disaster relief operations as local people had become paralysed with alarm and were incapable of helping themselves. Public education programmes should address issues like these.

A further question was then forthcoming from Ben Moussa who enquired of Watabe whether his suggestion for the setting up of a centre for disaster reduction research was intended to be under UN auspices, or was it a national proposal, to be set up by the Japanese Government but available to other agencies on a bilateral basis. Watabe responded that his idea was a very general proposal, that he had no fixed suggestion but hoped that considerable support would be forthcoming, internationally, but specifically from Japan.

Essaafi, the moderator, noting that the time was almost complete, summed up the session's contribution on International Cooperation.

He observed that efforts at existing international cooperation should be intensified, this should be an objective of the decade's work. Substantial aid was available but should be increased. Capacities of disaster stricken countries to cope with the effects of natural disasters should be strengthened. There were means of doing this, as the case of Bangladesh and its early flood-warning system, aptly demonstrated. (Despite considerably more flooding in 1988 than in 1970, notably fewer people lost their lives in 1988 thanks to satellite/simple technology transfer). Even greater progress in minimizing disastrous effects could be anticipated in the future. The UN stood ready to assist in particular, and multilateral/bilateral cooperation seemed to complement each other. The decade should also herald a deepening awareness among the public at large of the effects of natural disasters and their damaging effect on human life, property, as well as the national development effort.

## 2-6 CLOSING

With the completion of Moderator Essarfi's closing remarks it only remained for M.C. Hideki Kaji to call upon UNCRD director Hidehiko Sazanami for his concluding address.

Sazanami gave some brief comments on the day's deliberations, thanking the various collaborating institutions and expressing his appreciation for the privilege of hosting the Symposium. He also noted the importance of maintaining a broad perspective of all the issues relating to IDNDR and to promoting the awareness of the relationship between development paradigms and natural disaster mitigation and prevention. He saw this as the starting point for the seeking of alternative approaches to making the world a safer place. Convinced by the intensive and energetic deliberations which have taken place during the symposium, that the momentum generated during the previous meeting in Tokyo could be maintained, he expressed optimism regarding the future, and pledged his full assistance with UNCRD in furthering the cause of regional development planning through disaster prevention. This would be translated into programmes to be carried out during the IDNDR. He finished off his address with a warm note of thanks and goodwill to all participants and looked forward to continued encouragement and assistance.

Thus concluded the International Symposium on Challenges of the International Decade for Natural Disaster Reduction.

## 3. OPENING ADDRESSES

### 3-1 ADDRESS AT THE OPENING SESSION OF THE INTERNATIONAL SYMPOSIUM ON CHALLENGE OF THE IDNDR

by Zhong Shukong  
Director of Policy, Programming and Development Planning  
U.N. Department of Technical Co-operation for Development

Mr. Chairman,  
Distinguished Guests, Ladies and Gentlemen,

It is a great honour for me to address this important symposium today, on behalf of the United Nations Department of Technical Co-operation for Development (UN/DTCO) and I should like to thank our hosts for giving me this opportunity to do so. This symposium is the fruit of collaboration between the United Nations Centre for Regional Development (UNCRD) and Kanagawa Prefectural Government. Several central government agencies in Japan, the United Nations Development Programme, United Nations University and United Nations Information Centre, Japan, and have also given invaluable support to enable this symposium to take place. To all of them, and to you today, I convey the heartfelt congratulations of UN/DTCO and Mr. Xie Qimei, the Under-Secretary-General of the United Nations who heads our Department.

The topic selected for the symposium is particularly appropriate at this point in time. The symposium will provide a chance for the members of the International Ad Hoc Group of Experts for the IDNDR and all those people in Japan who are involved in disaster mitigation and management, to share their basic ideas pertaining to the report finalized at the Fourth Meeting of the Group of Experts and also to exchange views and information.

In recent years, the world community has become increasingly alarmed by the devastation caused by disasters such as earthquakes, floods, droughts, storms and the like. In 1988, the hurricane in the Caribbean region, the great flood in Bangladesh and the earthquake in Armenia resulted in enormous human sufferings and great economic losses, and the tragedies are still fresh in our memories. International response to natural disasters has focused primarily on relief action, examples of which are seen immediately following disasters, in the responsive actions of UN agencies, international institutions, and countries throughout the world. Though many natural disasters cannot be altogether avoided, adequate forward planning can, in most cases, reduce the impact and limit the extent of such tragedies, given the current state of science and technology. It is essential, therefore, to incorporate the relevant disaster prevention programmes, emergency relief preparedness and postdisaster rehabilitation programmes into the comprehensive national and subnational development planning process, and the greater importance needs to be given to creating appropriate systems which would limit the damage and loss of life to a minimum in the event of disaster. In addition, postdisaster rehabilitation and reconstruction measures are increasingly regarded as preventative measures in the event of future disasters. Hence, disaster prevention measures which incorporate rehabilitation and reconstruction are important for all developing and developed countries to consider.

Developed countries have a responsibility to share their accumulated knowledge on disaster prevention with developing countries, particularly disaster-prone developing countries whose resources, as a rule, are limited. This can be done through the training of specialists and with the reliable supply of essential materials.

It is opportune that the International Decade for Natural Disaster Reduction (IDNDR), starting in 1990, will focus efforts to strengthen the capabilities of Member States, particularly the developing countries, to plan more effectively for early warning, prevention and mitigation of the effects of natural disasters.

In this regard I would like to commend the UN Centre for Regional Development for taking the initiative in convening this international symposium and to reiterate DTCD's appreciation of the work carried out by the Centre, headed by its very capable Director, Mr. Sazanami. Over the past eighteen years, with generous financial support from the Japanese Government, the Centre has provided valuable service to support regional development worldwide in training, research and information exchange. These services have been much appreciated by developing countries.

Given the broad range of experience which the participants command -- experience and expertise which will be invaluable in addressing these highly complex issues -- we anticipate very stimulating discussions in this one-day symposium. We are confident that the contributions of all those attending the symposium will ensure that the symposium will be crowned with success.

Thank you.

### 3-2 THE HUMAN DIMENSIONS OF NATURAL DISASTERS

by Heitor Gurgulino de Souza  
Rector  
United Nations University

I am very pleased at the opportunity to assist in the inauguration of this important symposium. I have been following with much interest the earlier deliberations of the Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction. On behalf of the United Nations University, which has its headquarters in this country, let me welcome you all to Japan.

At the United Nations University, we have been assigned no specific responsibility in the area of natural disasters. However, a substantial portion of our research and training activities in our environment and resource programmes is directed to what might be called "preventive support services" in the reduction of such disasters. These would include our occurrence, for example, with more efficient delivery of energy supplies to rural villages in order to diminish deforestation or with improved land-use strategies aimed at reducing soil erosion and its often concomitant disaster, flooding. We are particularly concerned at the United Nations University with those human actions, often inadvertent, that lie behind natural disasters. For example, the degree to which suffering and damage due to flooding in lowland Bangladesh is traceable to countless decisions by poor farmers in the Himalayan highlands desperately seeking more arable land, whatever the environmental consequences was a focus of study in a University project dealing with highland-lowland interaction in the Himalayan region. Indeed, one could almost say that by definition, natural disaster -- as opposed, say to a natural phenomena -- has a human dimension in terms of consequences, if not caused.

We know that, on an increasing scale and intensity, human actions are seriously disrupting the global's life support processes, some perhaps irreversibly. These actions are helping to ignite new large-scale political, social and cultural upheavals in a world already beset by immense forces of rapid change. To cite but one example: The biggest single category of refugees, it is now estimated, are people fleeing large-scale environmental degradations, including those caused by natural disasters which have made daily community life no longer sustainable.

Thus, a major focus of our work at the University in the 1990s will be motivated by the heightened awareness that human endeavour is now capable of altering our world in unprecedented and often frightening fashion. We must come to terms with the realization that human strivings for social and material progress are bringing about marked changes in the systems that support life on Earth.

I believe one important requirement, for all of us who are concerned with statement of disasters, is the ability to see things in their true global dimensions. A good case in point is the possibility of the so-called "greenhouse effect" -- which could trigger sharp climatic changes, a rapid rise in sea level, loss of life, physical damage and possibility profound social disturbances in many parts of the world.

With so much of human activities central to global environmental change, collaboration with international scientific bodies is essential to our work. Thus, the United Nations University is presently involved in a major effort at exploring the human dimensions of global change in concert with the International Federation of Institutes for Advanced Study and the International Social Science Council.

This project complements the effort already under way through the International Geosphere/Biosphere Programme, which aims at improving understanding of the world's physical systems. It is seeking to engage the human sciences -- the social, economic and political scientists and other concerned with the management of man's activities -- in a similar exploration of the human dimensions so intimately involved in maintaining the delicate balances of our planetary ecology.

I see our work at the United Nations University as being quite closely interlinked with the concerns of this Group and the Challenges that are posed by the International Decade for Natural Disaster Reduction. What we face together really is a global issue of human welfare and, indeed, perhaps human survival: How to enhance and help ensure the habitability of a global that in the century to come must support some 8 to 10 billion people, a large portion of whom will be living in areas subject to high risks of natural disaster. I would very much hope that the United Nations University research efforts in the years ahead might be able to offer new insights and possible new safeguards to those of you here who are concerned, in a very direct way, with responding to natural disasters. We stand ready to co-operate.

Thank you very much.

### 3-3 OPENING ADDRESS

by Mr. Kiyohiko Arafune  
Deputy-Director-General  
United Nations Bureau  
Ministry of Foreign Affairs

Distinguished Participants,

It is my great pleasure to have this opportunity to say a few words to you today at the opening of this international symposium "Towards IDNDR."

Yesterday, the closing ceremony of the experts' meeting for the International Decade for Natural Disaster Reduction was held at the International Conference Hall in the Ministry of Foreign Affairs in Tokyo, which has completed four consecutive meetings, the first of which was held in Geneva in July last year. The "Tokyo Declaration on the International Decade for Natural Disaster Reduction" was adopted at the experts' meeting.

It is of great significance that those experts from various countries in the world exchanged their views on "the IDNDR" freely in public at this symposium held under the auspices of the United Nations Centre for Regional Development.

Distinguished participants, natural disasters, by their very nature cannot be fully controlled by the human intellect. However, the scale of human loss and physical damage differs dramatically depending on whether disaster forecasting and warning systems exist, and on whether measures have been taken to enhance citizens' awareness by introducing regular evacuation drills and so forth.

An old Japanese proverb reads, "Where there is preparedness, there is no anxiety." Truly, there are no other appropriate words to match preventive measures for natural disasters.

Our country suffered the unprecedented disaster of the Great Kanto Earthquake on 1 September 1923, which caused the loss of about one hundred and forty thousand precious lives.

Since then, 1st of September is designated "the Day of Disaster Prevention." On this day we engage in such activities as nationwide evacuation drills year with citizens' participation. Such "preparedness" should considerably contribute to reducing the damage caused by disasters.

Distinguished participants, we also have another proverb, which says "Natural disasters come back when they are forgotten." Natural disasters do not occur frequently in a certain region. Efforts are required all the more, to maintain concern and awareness for disasters even during times of normalcy.

Whereas the Japanese people have maintained this awareness for disasters by learning through their experiences of the Great Kanto Earthquake, another way to maintain the awareness for disaster is to share the experiences of other countries.

International cooperation in such fields as research in disaster-prone countries, implementation of disaster prevention measures and emergency aid not only benefits the recently affected countries but also gives a chance for assisting countries to share the experience of disaster-stricken countries as well as to recognize anew the importance of disaster prevention measures.

Distinguished participants, Japan together with Morocco has promoted "the International Decade for Natural Disaster Reduction" in the United Nations General Assembly since the year before last, having recognized the importance that every country should implement disaster mitigation measures in collaboration with each other under the initiative taken by the United Nations.

This conception is ambitious in the sense that it aims to tackle natural disasters over the next decade on a global scale. In launching this grand project, it is essential to have a long-term, creative viewpoint from an early stage. The "Tokyo Declaration on the International Decade for Natural Disaster Reduction" which was issued yesterday has given us a guideline.

At this symposium, I hope that further concrete discussions will be presented in respective fields by the experts and that the understanding for our "Decade" will be further enhanced.

In conclusion, I would like to express my deep appreciation to the United Nations Centre for Regional Development, Mr. Nagasu, Governor of Kanagawa Prefecture and other personnel of the Prefectural Government who have dedicated themselves to the arrangement of this symposium.

Thank you very much for your attention.

3-4 OPENING ADDRESS

by Takao Kubo  
Vice-Governor  
Kanagawa Prefectural Government

Distinguished Participants,

On behalf of the Kanagawa Prefectural Government, it is my pleasure to have an opportunity to express my hearty welcome to you to Kanagawa at this opening session of the International Symposium on "Challenges of the IDNDR" today.

Firstly, I would like to extend my sincere congratulations to the United Nations Department of Technical Co-operation for Development/United Nations Centre for Regional Development on organizing this symposium and on bringing together a great number of participants from Japan and abroad.

I understand that the purpose of the International Decade for Natural Disaster Reduction is to try and prevent and mitigate natural disasters in the world during the last decade of the twentieth century by carrying out a worldwide campaign in which all the efforts at national, organizational, and individual levels are promoted to establish a framework to preserve the earth as a safe place in which to live for mankind in twenty-first century.

In December 1987, the 42nd General Assembly adopted Resolution 42/169 to designate the 1990s as an International Decade in which the world community joins to cooperate in natural disaster reduction. The framework for action in the Decade was drafted by the UN Steering Committee, chaired by the UN Director-General and the International Ad Hoc Group of Experts for the IDNDR. In the International Symposium today, issues of the IDNDR and international cooperation will be discussed, based on the findings of the earlier meetings. I very much look forward to the results of these discussions.

On this occasion, I would like to introduce measures we are taking against earthquakes in Kanagawa Prefecture as an example of how we cope with such natural disasters. The area of Kanagawa Prefecture and its periphery, including Tokyo, is an earthquake-prone area because of its unique crustal structure. In 1923, the Great Kanto Earthquake caused great damage to the Tokyo metropolitan area, including Kanagawa Prefecture.

In recent years, we are in fear of the Tokai earthquake which is predicted to occur in an area including Kanagawa and Shizuoka Prefectures.

With regard to measures prepared against the Tokai earthquake, by arranging earthquake prediction and observation systems, it has become possible for us to predict an earthquake immediately before it occurs. If something abnormal is observed in data, and the occurrence of an earthquake is predicted, a warning will immediately be issued and measures against the earthquake will be taken by both public and private sectors. Also, an earthquake with an epicentre directly under Tokyo metropolitan area is anticipated. Under such circumstances, Kanagawa Prefectural Government has promoted preparation of disaster prevention and management systems, for

example, by building disaster resilient communities, arranging networks of bases for disaster prevention activities in a wide region, and securing drinking water for times of emergency.

At the time of the Great Kanto Earthquake, assistance provided by other countries to the damaged area made it possible for us to rehabilitate and reconstruct quickly.

Kanagawa Prefectural Government regards international exchange at the regional level and at the grass roots most important in order to achieve the goals of world peace and prosperity. We have been trying to promote these kind of information exchange activities at the regional and individual level.

We are now in the process of formulating the "Shonan International Village Plan" as one of the concrete projects which aims to promote international exchange. The Plan is expected to contribute to the international community in carrying out various exchange activities including academic research, technology transfer, and cultural exchange, all from a global point of view.

Taking into account the importance of international exchange, I am keenly interested in the themes under discussion today, especially the issue of international cooperation.

Last but not least, I sincerely hope that this International Symposium will be a fruitful occasion for all.

Thank you very much for your attention.

#### 4. KEYNOTE ADDRESSES

##### 4-1 KEYNOTE ADDRESS

by Emilio Rosenblueth  
Emeritus Professor  
Instituto de Ingenieria de Mexico

Our adventure has come to an end. Here in Tokyo the United Nations Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction has held its last meeting and thus completed its mission.

The history of the Decade and of its Group of Experts goes back to mid-1985. In the Eighth World Conference on Earthquake Engineering, Dr. Frank Press, the President of the United States National Academy of Sciences, pronounced a momentous speech in which he proposed that an international decade be instituted for the mitigation of disasters. His words reached the mind and moved the heart of all those present. The International Association for Earthquake Engineering, organizer of the conference, made his words its own. Two-and-a-half years later, at the enthusiastic and forceful initiative of Ambassador Ben Moussa of Morocco and Ambassador Taniguchi of Japan, the General Assembly of the United Nations declared the period from 1990 to the year 2000 the International Decade for Natural Disaster Reduction. Then, Mr. Perez de Cuellar, the Secretary General of the United Nations, appointed a group of twenty-five experts, under the guidance of Dr. Press, to advise him on the implementation of the Decade. The group has now completed its report to the Secretary General. It will be delivered on time for the General Assembly to be held in June 1989. Dr. Press regrets his being unable to attend today's symposium. He sends his kind regards to the participants and manifests his wishes that the symposium would be stimulating and rich in the interchange of ideas and experiences.

Fittingly, the Group of Experts held its third meeting in Morocco and the last one in Tokyo. The Group is deeply grateful to the Government of Japan for generously hosting this meeting, and to the United Nations Centre for Regional Development under the direction of Mr. H. Sazanami for giving us this opportunity to interchange ideas and experiences. In both events, the last meeting of the Group and this Symposium, the legendary efficiency of the Japanese has been matched only by their legendary hospitality.

Why should the idea of this international decade awaken such outstanding resonance, endorsement, and support in all forums in which it has been presented? The reason of the Challenge is threefold, I believe. The first reason is the obvious materialistic motivation. Natural disasters are both a cause and an effect of underdevelopment. That they are a cause is clear from the worst flood of last year, the one in Bangladesh, which placed over two-thirds of the country under water, adversely affected millions of people and wiped out practically the entire material infrastructure built by a whole generation, setting the development of the country back a great many years. That natural disasters are the effects of underdevelopment is equally clear from the fact that over 90 per cent of the victims of natural disasters are from the Third

World, and that relative to their National Product the economic losses in developing countries are far more devastating than in developed nations. The question is not of choosing between development and reduction of natural disasters but one of making this reduction an integral part of development.

A second factor lies in the strong, emotional, and moral implications of the Decade. Indeed, every government and even every individual is deeply committed to the challenge of reducing human suffering and loss of human lives. The challenge and the responsibility fall on developed as well as underdeveloped nations, for the more developed countries have resources in technology now to accomplish the goals of the Decade and can also carry out scientific research which will soon become indispensable.

Finally, there is the intellectual challenge. Since its first meeting, the Group reached the conclusion that the initial stage of the Decade should comprise a number of illustrative projects. These should set the tone for the implementation of the Decade by stressing the desire for significant practical results. At the same time, they should inspire confidence in the effort, thus there will be sustained conviction, dedication, and flow of resources during the ten-year period. Consequently, these initial projects have to be low cost, of short duration, and with a high probability of achieving tangible results. This in turn requires that the projects lay considerable weight on transfer of available technologies, not so much on research.

Many of us, in the exercise of designing these apparently modest yet practical projects, have been impacted by this challenge and have been led to revise our ongoing conventional and more glamorous projects. On the other hand, if the Decade's actions were constrained to these projects and implementation of their results it would soon reach an impasse. Only through innovative, scientific, and technological research can significant breakthroughs be expected. Indeed, the International Council of Scientific Union (ICSU) has given us exemplary support already by proposing, promoting, and coordinating a number of scientific research projects which will receive economic support even before the Decade officially begins.

Prior to the words of Dr. Press, all countries and many United Nations agencies were already striving towards the goals of the International Decade. Their accomplishments are to be praised and their efforts should continue and be enhanced during the Decade. There are, however, two new ingredients; one is the concentration of efforts to prevent rather than to relieve the effects of natural disasters. And the other is the adoption of an integrated approach to natural disaster reduction. Reasons for this need for an integrated approach stem partly from the fact that natural disasters often compound with each other. Thus, an earthquake can cause tsunamis, which will cause floods which, in turn, will seriously damage a city's lifelines causing an urban conflagration. From the example of the previous speakers I would say that we are all tragically aware that this is what happened in 1923 in the Great Kanto Earthquake.

Every human being is committed to the achievement of the Decade's goal which is the reduction of suffering, loss of lives, and loss of property and this must be done by taking very drastic measures. I have mentioned, in particular, the role of the developed nations who can provide the

resources necessary to improve research and technical expertise for this purpose. In this context, Japan has the additional role of setting an example to the rest of world of how existing and newly created science and technology coupled with firm political determination and economic commitment have drastically curtailed the aftermath of aggressive natural events. Japan's success is spectacular.

Because of this country's vocation to set the example as a leader among nations, and because of its venturesome and decisive initial support of the Decade's cause through the actions of Ambassador Taniguchi it is doubly fitting that yesterday the Group of Experts should have ended its mandate here in Japan and that today the Group be given the opportunity to interchange experiences and ideas with our Japanese colleagues in this symposium. May we all learn from it!

by James Baker  
Director  
Office of the Director-General  
UN Development and International Economic Co-operation

Distinguished guests, ladies and gentlemen, thank you very much. It is an honour to be here at this Symposium and to participate in it. In his message to the closing session of the Experts' Group yesterday, the Secretary General suggested that the termination of the Group's work was really only the beginning of the process that for the Decade to take on meaning we will have to draw on its findings, translate this into practical action to try to achieve the goals and objectives of the Decade.

Symposia like this are a part of this process and a very important part of the process. And I think the Centre and all of those sponsors of this meeting in Kanagawa Prefecture deserve our appreciation for getting us started on what's going to be a long process.

I am not a scientist and I am not a technical expert. And, therefore, I would like to approach the subject of this meeting, "the Challenges of the IDNDR" from a somewhat parochial institutional perspective namely that of the United Nations -- the challenges it proposes for us and the sort of perspective which we have as we began to approach this challenge.

Let me start by making a general comment if I could. And this is although there is a very wide perception of the United Nations as an instrumentality promoting international peace and security for dealing with political problems, the charter of the United Nations gives us equally heavy responsibilities in terms of promoting human welfare, in terms of economical and social activities. This is embedded in the charter and thus the United Nations serves as a forum, on the one side for identifying problems, emergent problems, problems we have come to appreciate more, but more important for trying to mobilize and fashion cooperative and collective responses to these problems. This range of responsibilities in the economic and social field takes on perhaps greater depth, greater width when one includes in the United Nations' category, the family of organizations of the United Nations' system which themselves have very specific, profound responsibilities and activities throughout the spectrum of economic and social development. It is, thus, appropriate that one begins to look at the United Nations when the concept of an International Decade for Natural Disaster Reduction begins to emerge. It is significant and Dr. Rosenblueth pointed this out, that the initial impetus for this Decade came from the scientific community essentially. It was not that we did not recognize the problems, it was not that a lot of people have not been working on the problems. But the concept of pulling it all together into a concerted programme for one decade, embracing the full range of disasters was, if you like, new.

It is significant that the General Assembly accepted the challenge. Reference has been made already to the important role of the representatives of Morocco and Japan in this process, but essentially by unanimity, the member states of the United Nations decided that it is very

important to try to take what we now know in the areas of science to draw on all of our capacities and try to fashion a programme which will save lives and save property, reduce human suffering. Now I think one should at this stage in the process perhaps be careful and let me redefine the challenge a little bit if I could. There is, I believe, an appreciation of the damage of natural disasters. There is an appreciation that we all share in natural disasters. There is an appreciation that we have a certain level of scientific knowledge which can reduce it. But I think it is fair to say that there is a degree of skepticism still as to whether we are going to put this together in a way that is going to be effective.

Some elements, if we are going to meet this challenge, of how we can do it. I think probably the most important element is called the involvement of people. There is very little that international organizations can do, there is very little that national organizations can do, there is very little scientific organizations can do to actually stop disasters unless people do it. This requires a heavy component of education, it requires, a reference was made by Dr. Rosenblueth, it requires defining responses in terms that individual people in the village, anywhere, can understand and use and employ. It requires a concept of transfer of technology, the translation in some instances of very high technological achievements into something that is much more practical at the field level. It requires the development of low-cost technology, things that any country can apply any place. And that is a peculiar challenge and it is a real challenge, I suspect, to the scientific community which is geared to think in a much more sophisticated manner.

The second comment is that, in general terms, the Decade will succeed if it serves to break down barriers. As an outsider, I must confess I was a little impressed by the degree to which there were barriers in approaching the phenomena of natural disasters. Honestly, I think there were barriers among various components of the scientific community. I have heard echoes of a difference between scientists and technical experts, etc. We have to break down these barriers in the search for a common effort. There are barriers between countries and the Decade will not work unless it is in fact available to all countries. There is a requirement in this for the developing countries, in particular. Natural disaster reduction cannot be seen as a conditionality which in any way would detract from their basic development efforts so one has to develop and to support activities that reach the full range of the international community.

Reference has already been made to the various competencies. As we go forth in developing and promoting the Decade, I think it is very important to draw on and to fully utilize all competencies which do exist. I have to make a plug for the United Nations in this connection. We have for many years been working in this field, perhaps not in the most coordinated way, but we have got an awful lot of research, we have a field capacity. The United Nations is pretty well represented around the world. It must be drawn on or we are going to waste time. Similarly it is critically important that we draw on the scientific community. One of the things that has characterized the process thus far, has been a partnership, whatever term you want to use. But a close association between this scientific community, the scientific and technical community, between the United Nations -- this has to be kept going. It is the only way we can really tap each others resources to create what we all hope for, which will be a

successful decade. I think that what I am trying to say basically is that it is in part a technical process we are engaged in, and it is, in part, a political process. And the political process is to really convince people what we have to offer is of immediate importance and utility to them. I think we in the Secretariat in the United Nations are absolutely convinced that this is possible and that it is important, and I can assure you we will do everything we can to work with you. But it is up to all of us, experts, our colleagues here in the room, to make this unified, practical, important and I hope, successful effort.

Thank you.

4-3 KEYNOTE ADDRESS

by Keizo Okabe  
Professor Emeritus  
University of Tokyo

The First Meeting of the International Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction (IDNDR) was held in Geneva in July 1988. Since then, I have participated in the Expert Group Meetings and been engaged in activities pertaining to the IDNDR. Taking this opportunity, I would like to express my personal feelings about IDNDR.

The main objective of the IDNDR is to strengthen the systems of disaster prevention and reduction by promoting international cooperation. The IDNDR is basically a moral imperative and aims to foster international cooperation to improve disaster prevention systems especially in developing countries. I am convinced that the international community will agree on the significance of the IDNDR and will support our activities. However, nobody is completely certain as to what should actually be done during the Decade.

What we have discussed mainly at the expert group meeting is, I think, the establishment of a fundamental and international system for disaster prevention. A decade may seem, to some, a rather long time. However, where disaster management is concerned, a decade seems short. The history of natural disasters is as long as the history of Mankind. Disasters will inevitably continue to occur as long as Man exists. The problem is what can be done in the way of disaster reduction in one decade.

The answer is that there are many things which can be done during the IDNDR. However, I believe that the most important thing is to establish a basic system for disaster prevention. This means, firstly, that we have to establish a system in which we can mobilize or concentrate scientific and technological knowledge for disaster prevention. Secondly, as Dr. Baker has just pointed out, we must promote public education and raise public awareness against natural disasters. Resolution 42/169 of 11 December 1987 designated the establishment of an early warning system in developing countries, with the collaboration of developed countries, as one of the most important issues. If such an early warning system does not consist of the twin functions of both collecting scientific and technological data on the one hand and promoting public awareness on the other, the system will be insufficient.

For example, in Japan, mass media such as TV and radio constitute an important public warning system. The mass media is required by law to make efforts to collect data and disseminate information to the public during times of disaster. As another warning system, a disaster prevention communication system has also been established. These communication systems are well-organized to meet international standards. There have been cases in which both these systems have contributed effectively, however, there have been some cases in which they have failed to perform well during disasters.

Let me give you some examples. The Nihonkai-Chubu earthquake which occurred in 1983 damaged the coastal areas of the northeast part of Japan, especially Akita and Aomori prefectures. The epicentre was in the Japan Sea. The death toll reached 104 due to the tsunami caused by the earthquake although a tsunami warning was disseminated to the public. The earthquake occurred around noon and the Meteorological Agency issued the tsunami warning at 12:14. This was disseminated to the public via TV and radio at 12:19, while the disaster prevention communication system conveyed it about a minute later. However, the tsunami struck the coastal areas near the epicentre after twelve to thirteen minutes after the occurrence of the earthquake which meant that in some places the tsunami struck before the Meteorological Agency's warning. The tsunami struck many coastal areas twenty to thirty minutes after the earthquake and killed 104 people.

This example highlights the following problems which demand immediate attention:

- Firstly, the issuance of the warning was delayed. This shows how difficult it is to issue an accurate warning at the right time, even with the power of science and technology.
- Secondly, dissemination of the warning was delayed. The warning did not reach some areas until it was too late. The speed of warning transmission depends on how well staff are trained in each region which means that smooth communication of the warning depends on how the early warning is handled. Therefore, in establishing an early warning system, we must pay considerable attention to the handling procedure, which requires effective training.
- Thirdly, the nature of the general public's response was crucial. In fact, most people did not take the warning seriously even when it was announced. In spite of this warning, people still believed that their area was safe from the effects of a tsunami. They did not respond to the warning as they felt it to be false.

The public's inadequate response can be considered a serious problem. The Experts Group Meetings emphasized the need for full use of science and technology, the effective training of personnel, and public education. The example of the Nihonkai-Chubu earthquake proves the importance of filling the gaps which exist between science and technology and implementing the warning, and strengthening the skills of those who are in charge of operating these warning systems. It also indicates the importance of educating the public to respond appropriately to warnings received.

Above all, we must not forget the importance of public education. However, it must be noted that public education raises other issues. There is the fear that people may panic when they receive warning of dangers. Past experience, however, shows that people rarely panic. They usually underestimate or even ignore warnings, as was the case with the Nihonkai-Chubu earthquake and many other disasters around the world. A report of the U.S. National Academy of Sciences attributes this phenomena to the psychological, "normalcy bias." When we hear that great danger is approaching, our first instincts are to doubt it. We tend to think it will not happen, always expecting our environment to be normal, and refusing to accept otherwise. If we become aware of danger, we feel uneasy.

Therefore, everyone refuses to accept uneasiness, preferring to ignore warnings. There is a constant tendency towards optimism and the under-estimation of warnings. Moreover, we are likely to believe in exceptions, thinking that we are safe from danger even when many others are killed.

Some years ago, I conducted some research into public awareness of earthquakes in Tokyo. The results indicated that there was a tendency for people to regard disasters optimistically, and despite the fact that most people believed there would be a huge loss of life if such a disaster as the Great Kanto Earthquake were to strike Tokyo, they still continued to believe in their own safety. The same attitude will persist, in the effect of future warnings.

The Expert Group Meetings have repeatedly emphasized that we must fight against fatalism. The Tokyo Declaration also refers to the importance of conquering fatalism. If disasters are determined by fate, whether or not Mankind is effected by them is up to his own hands. It is accepted that to some extent disasters can be controlled by a knowledge of science and technology. People, however, generally believe that fate decides whether they live or die. Our meetings emphasized again and again that we must overcome such a fatalistic belief at all costs.

This fatalism is a complex issue. Since the beginning of the twentieth century, we have been faced with more and more violent disasters. At the United Nations General Assembly last autumn, the United Nations Secretary-General pointed out that disasters were occurring somewhere in the world on a daily basis. Although this is true, disasters do not occur in all areas of the world. For example, in some disaster-prone areas there are floods taking place annually but in the case of typhoons, disasters occur only on a limited basis and in a limited area. Some areas are hit by disasters only once every several decades or even once every few centuries. Seismology experts pointed out that the region which was damaged by the Nihonkai-Chubu earthquake had last been heavily struck by tsunami caused by a major earthquake several centuries ago. If disasters occur only once in several centuries, the majority of people in the area never experience a disaster. Those who repeatedly suffer from major disasters must be in the minority.

According to the survey on natural disasters of the people of Tokyo, about 15 per cent had experienced a natural disaster in the past, meaning that 85 per cent had not. This would be the tendency in any city and contributes to the feeling of optimism and strengthens the fatalism which leads people to believe that only unfortunate people suffer from disasters. This may be the natural psychology of Man. Going beyond this fatalism is the most important and difficult issue which must be dealt with during the decade. This requires continuous efforts. Promoting public education on disaster prevention effectively is a common issue in both developed and developing countries alike. There will be difficulties in raising people's awareness above the common fatalistic belief as most people are content to continue in the "normal" way with day-to-day concerns rather than considering the realm of disaster prevention.

In general terms, disaster prevention means to ensure that society is resistant to the destructive power of nature. This means the strengthening of the structure of society against disasters by building dams, canals, and

erosion control works. Other means of disaster prevention are the strengthening of software, which means improved flexibility and appropriate responses to natural disasters through the establishment of early warning systems and evacuation procedures.

The Expert Group Meeting prepared a report for the United Nations Secretary-General and adopted the Tokyo Declaration. The Declaration expresses our determination towards the IDNDR and to deal with the issues courageously. We very much hope to make the Decade a success. At the same time, we are fully aware of all the difficulties before us.

Even though it will be difficult, we must make every effort to assist the people to recognize the importance of such disaster prevention activities. I hope that I have not unduly emphasized only difficulties in the implementing activities for the IDNDR. This project will be all the more significant if we can overcome these difficulties. I sincerely hope that people throughout the world will be courageous enough to challenge the issues of disaster prevention and establish a system which will be indispensable for disaster prevention during the Decade. I am convinced that if all the people of the world collaborate, the aims of the IDNDR can be achieved.

#### 4-4 KEYNOTE ADDRESS

by Hiroaki Tamamitsu  
Director-General  
Japan International Cooperation Agency

It is my pleasure that the International Symposium on Challenges of the IDNDR is held in Yokohama hosted by the United Nations Department of Technical Co-operation for Development (UNDTCD) and the United Nations Centre for Regional Development (UNCRD) with the collaboration of other UN Agencies and central governmental organizations of Japan. The United Nations General Assembly decided to designate the 1990s as the International Decade for Natural Disaster Reduction (IDNDR) in its Resolution 42/169 of 11 December 1987, and the International Ad Hoc Group of Experts for the IDNDR was established. Following the fourth meeting of the Experts which was held in Tokyo from 10 to 12, this symposium is organized to enhance our recognition that the IDNDR is considerably timely.

Recent news has informed us that many human lives and much property have been lost by tragic natural disasters such as floods and earthquakes which have taken place all over the world. Natural disaster prevention as well as rapid and effective relief are becoming very important themes to ensure the happiness of Mankind. It is appropriate that the United Nations is trying to wrestle with the theme with the support of nations in the world.

The Japan International Cooperation Agency (JICA) is striving for the development of regional economies and regional societies in the developing countries, as well as the promotion of international collaboration, through technical assistance and cooperation. JICA has been taking part in disaster prevention projects for natural disaster reduction. Furthermore, JICA has dispatched the Japan Disaster Relief Team to devastated areas in the world for emergency relief immediately following disasters. These kind of activities will increase in the future. JICA is willing to promote further effective international cooperation in the area of disaster prevention with the collaboration of international organizations, in addition, JICA is an organization which implements bilateral cooperation between developing countries and Japan.

In Japan, there is a saying that earthquakes, thunderstorms, fires and fathers are the representatives of fearful things, because these occur suddenly and damage us severely. The reason why fathers are included in fearful things is that fathers were strict with their families in the past. Fires and fathers may be man-made disasters, but others are fearful natural disasters. Earthquakes strike us suddenly as well as thunderstorms. Recently, the mechanism of earthquakes has been well-explained by the knowledge of plate-tectonics due to the development of science and technology. Volcanic activities and earthquakes occur in those places where tectonic plates dip into, or rise up from the earth. It is said that the Japanese Islands and the Pacific Ocean side of South America are earthquake-prone areas. In recent years, major earthquakes, like the Mexico earthquake in 1985 and the Armenia earthquake in 1988, have occurred. The prediction system of earthquakes has improved by measuring the land upheaval and subsidence, or observing minutely the effects of an

earthquake in a deep well. However, it is still difficult to predict accurately when an earthquake will occur as well as its scale and magnitude.

Floods are natural disasters which damage us severely and widely. They do not occur suddenly and differ from earthquakes or thunderstorms. There is heavy rainfall or rains which tell us the approach of a flood before it becomes a disaster, so that people can be prepared for flood. There were some cases when people lost their lives because they ignored natural phenomenon, such as heavy rainfall, which led to flood disaster. The main causes of flooding are tropical depressions which carry heavy rain. Tropical depressions are called "typhoons" in Asia and the Pacific Ocean. They often damage Japan severely. They are also called "cyclones" in the South Pacific Ocean, "monsoons" in South Asia and the Indian Ocean, and "hurricanes" in the Mexico Gulf. The monsoon in 1988 caused a severe flood disaster in Bangladesh, and Jamaica was devastated by a flood caused by Hurricane Gilbert in 1988. Floods are brought on not only by heavy rainfall but also by high tides which are swelled by high winds. Coastal areas face particularly heavy damage during high tides. This type of flood often takes place in Bangladesh which is located on the inner rim of the Bay of Bengal. In Japan, Nagoya City was severely devastated by high tides due to the Ise Bay typhoon thirty years ago.

Volcanic disasters are included in natural disasters. The Lake Nyos in Cameroon suddenly emitted toxic gas in 1986 due to volcanic activity, and the death toll reached 1,700. In 1985, the Nevado del Ruiz Volcano erupted with disastrous mudflows, which caused 25,000 deaths, wiping out Armero City. Natural Disasters include tornadoes, high winds, drought, and locust infestation. Furthermore, the destruction of ozone stratum by Freon gas, and desertification due to the decrease in tropical forests, both influence nature. Sometimes they function as a cause of natural disasters. Some are caused by Man himself so it may be said they are man-made disasters, however, these worldwide environmental problems should all be considered as natural disasters.

The purpose of JICA is to implement International cooperation with the collaboration of other concerned organizations under the supervision of the Ministry of Foreign Affairs. The budget for technical cooperation overseas is concentrated in JICA. JICA has been implementing all kinds of projects to prevent/mitigate the damage from natural disasters, as well as relief and restoration projects since 1965 when JICA was called the Overseas Technical Cooperation Agency (OTCA). JICA is also implementing the following projects:

(1) To provide technical cooperation to various countries in the form of training courses, seminars, etc. for disaster prevention and relief activities.

(2) To provide technical cooperation to various countries in the form of equipment, materials, etc. for disaster prevention and relief activities.

(3) To provide technical cooperation to various countries in the form of technical instruction to countries in need. Not only Japanese experts but also foreign experts will be dispatched in future. Thirdly, JICA supplies the necessary equipment for technical instruction. There have been big projects consisting of the abovementioned three elements of technical cooperation. JICA is building some earthquake prevention centres around the world as one of its big projects. Fourthly, research for development is being undertaken. JICA

researches into the real conditions of an area, and draws up flood prediction programmes or flood control programmes for the disaster-prone areas.

JICA is organizing group courses, for example, such as a seismic engineering course, disaster prevention technology seminar, and sabo engineering course, etc. The seismic engineering course is implemented by the Building Research Institute, and this one-year term training course has a high standard of technology which is given a high evaluation by foreign countries due to the participation of many earthquake researchers from around the world. The disaster prevention technology seminar including evacuation training is implemented by the National Research Center for Disaster Prevention, the Science and Technology Agency. The seminar is full of useful training. Also JICA dispatches experts for long-term or short-term visits to the Philippines, Thailand and other ASEAN countries as well as some countries in South America and Africa.

The Volcanic Sabo Technical Centre was established at Jogjakarta in Indonesia, to research into countermeasures for Mt. Merapi and other volcanoes. The centre is not only developing sabo technology but also training staff regarding volcanic disasters. In Peru, there is the Seismic Disaster Prevention Centre in the National University of Engineering, and five or six experts from Japan reside there to develop and research into earthquake-proof technology. They also educate students with the regular staff of the university. JICA has a programme which invites four or five trainees a year from the centre. For the centre, JICA supplied several types of test machinery and other equipment which amounted to \$500 million. The scale of the centre can be easily imagined. A similar seismic prevention centre will be set up according to requests from the Government of Mexico. Trainees from Ecuador, Venezuela, Chile, and Costa Rica will be able to study earthquake mitigation/prevention measures at the Seismic Disaster Prevention Centre in Peru or a similar institute in Mexico. This type of training is called "third country training." In the field of research for development, JICA has been implementing some flood prediction programmes and flood control measures at rivers in Southeast Asian countries. Currently, it is being extended to rivers in South America and Africa.

JICA is also concerned with the grant aid programme of the Government of Japan. The budget of the programme is directly implemented by the Ministry of Foreign Affairs, and JICA is in charge of the stage for technical and programme research. Consequently, flood prediction systems, etc. are being implemented in various countries. It is envisaged that this rate will expand in the future.

Concerning relief activities immediately following disasters, the Japan Disaster Relief Team was established according to a related law which took effect on September 1987, therefore, a disaster relief system was well organized. Since 1982, only a medical team had been dispatched to disaster areas, however, the Team can now include an emergency medical team and

relief teams from the Fire Defence Agency, the National Police Agency and the Maritime Safety Agency. It has become larger, to include the dispatch of expert teams in charge of reconstruction and rehabilitation in disaster areas. In 1987, JICA dispatched the Team to the Cook Islands and Vanuatu for cyclone disaster relief in January and February; to Ecuador for a landslide disaster which killed about 2,000 people due to an earthquake in March; China for a wild fire of which the death toll was 191 in May; to Bangladesh for flood disaster in August; and to Venezuela for flood disaster in October. In 1988, JICA similarly dispatched the Team to Viet Nam for a typhoon disaster, and Vanuatu for cyclone disaster in January; to Brazil in February; to Ethiopia for a drought disaster affecting 7 million people; and Burma for a fire disaster which burned down 2,000 houses in March; to Sudan in July; and to Nepal for an earthquake which caused 700 deaths and the destruction of 750 houses, and Bangladesh for the tragic flood disaster which submerged half of the country, affecting 35 million people and brought death toll of 1,800 in August. Also the destinations were Jamaica for hurricane disaster in September, Armenia for a severe earthquake disaster which killed 35,000 people and affected 700,000 more. JICA sent medicine and other relief materials to places in need as well as medical staff and experts.

Currently, Japan accounts for about 10 per cent of the world GNP. The budget for the 1989 fiscal year indicates that the budget for ODA totaled ¥1.3 trillion including ¥75.57 billion of the national expenditure. This must be No.1 in the world, however, it is said that the rate of ODA to GNP of Japan is low compared to other developed countries, and there is a need to increase the amount of ODA, and also to improve its quality. It is necessary to raise the rate of grant aid, and to extend technical cooperation for developing countries in order to improve ODA. The Government of Japan is willing to address the problem. The rate of technical cooperation expenditure against ODA in the budget for 1990 fiscal year is a little more than 10 per cent. The average of other developed countries is about 20 per cent, therefore, Japan's technical cooperation should be improved.

The most important aspect of technical cooperation is disaster countermeasures to ensure safety, which is being discussed in the United Nations. A most urgent problem, following the flood supply problem is to ensure safety against natural disasters. Next, it will be necessary to ensure a comfortable living environment for human existence including countermeasures against environmental problems. Therefore, international cooperation for disaster prevention is extremely important and should be promoted. Fortunately or unfortunately, Japan is a disaster-prone country particularly for floods and earthquakes, therefore, Japan has accrued a large amount of experience in disaster prevention and rehabilitation/reconstruction techniques, so it is expected that Japan will contribute greatly to the area of technical cooperation for disaster prevention. I hope that Japan's international cooperation for natural disaster prevention will be strengthened with an increase in ODA in the future.

Thank you for your kind attention.

4-5 KEYNOTE ADDRESS

by Jiro Kondo  
President  
Science Council of Japan

It is my great honour and pleasure to welcome all participants on behalf of the Science Council of Japan at the opening session of the International Symposium on Challenges of the IDNDR sponsored by the United Nations Centre for Regional Development.

The Science Council of Japan was founded in 1949, in order to rebuild the country from the ruins resulting from the Second World War upon the firm basis of science. It is representing qualified scientists of Japan domestically and internationally. Among 180 research liaison committees, Committees of National Disaster Research, Earthquake Engineering, Safety Engineering, Geodesy and Geophysics, Geodesy, Seismology and Physics of Earth's Interior, Volcanology and Chemistry of the Earth's Interior, Physical Science of the Ocean, Soil Mechanics and Foundation Engineering, Hydrodynamics, and Hydraulics are included which are all closely related to the main subjects of the present meeting.

On 1 October 1917, a strong typhoon struck the east part of Japan, killing more than 1,100, 43,870 houses were damaged and 2,169 ships were lost. The maximum wind speed was recorded as 43 m/sec. On 21 September 1934, the Kansai area was visited by the Muroto typhoon, which killed 3,036. On 26 September 1959, a strong typhoon attacked Ise Bay, 5,041 were lost and 570,000 houses were destroyed. High tides, river floods and strong winds accompanied by typhoons cause considerable damage to human life and property. September is regarded as the season of typhoons in Japan.

Earthquakes are also frequent in Japan. On 1 September 1923, a big earthquake of magnitude 7.9 occurred in Kanto District, 91,344 killed, 464,909 houses were destroyed and lost in fire. On 16 June 1964, the earthquake of magnitude 7.5 occurred in Niigata Prefecture, twenty-six were killed and 2,250 houses were destroyed at this time.

A tidal wave caused by the earthquake in Chile hit the Pacific coast of the Japanese archipelago on 24 May 1960, killing 139 and destroying 46,214 houses.

Japan has various experiences of natural disasters. It is almost impossible to prevent natural disasters through present technology. However, we can reduce the damage if we know when and where they will take place.

On 4 February 1975, a strong earthquake of magnitude 7 took place in Liaoning Prefecture in China. However, the authorities ordered an evacuation from this area so that all except three people were out of their houses, little damage resulted when the earthquake occurred at 19:30.

Earth science, however, cannot precisely predict natural disasters. Data are not sufficient to accomplish a deterministic mathematical model,

since big disasters occur only once or twice a century, and our knowledge of this planet is limited. By the application of probability theory, we are able to evaluate the expectation of damage, caused by a natural disaster. If the probability density function  $p(x)$  is known, the expected value  $E(D)$  of damage  $D$  can be put as:

$$E(D) = \int_0^{\infty} D(x)p(x)dx$$

where  $x$  stands for the intensity of the natural disaster and  $D$  is the damage caused by the disaster  $x$ . We assume that  $D$  can be evaluated.

Disaster prevention engineering should be extensively applied in order to reduce the damage caused by natural disasters. In Japan, if one wants to construct a building, the design should pass a strict examination by authorities before building permission is given. We pay an additional cost for prevention, however, we can expect that costs will be reduced by the progress of engineering, theory, and technology.

Panic among people is another cause for an increase in damage. Consequently, the exact information on natural disasters should be provided to the inhabitants who are living in these districts. High technology in communication can be applied to establish an information system.

Finally, I would like to emphasize that the people's trust in science is important in order to reduce the damage caused by natural disaster. If people do not believe warnings issued by scientists, science cannot help them.

I sincerely hope that natural disasters can be reduced by the progress of science and engineering even if we are not able to stop all disasters on this earth.

Thank you for your attention.

## 5. APPENDICES

### 5-1 TOKYO DECLARATION ON THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

We, the International Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction, hereby declare the following:

Throughout history, mankind has lived under the threat of natural disasters. Millions of lives have been lost in recent decades, with untold human suffering and property damage as well as setbacks to development efforts. Indeed, the situation is growing worse. Vulnerability to natural disasters is rising due to population growth, urbanization, and the concentration of industry and infrastructure in disaster-prone areas. But we now have improved capacity to confront the problem. Fatalism is no longer acceptable; it is time to bring the full force of scientific and technological advancement to reduce the human tragedy and economic loss of natural disasters.

This concept is the premise of the United Nations General Assembly decision, in its Resolution 42/169 of 11 December 1987, to designate the 1990s as an International Decade in which the world community joins to cooperate on natural disaster reduction.

The Secretary-General of the United Nations, who was asked to develop a framework to attain the objective and goals of the Decade, appointed our committee, the Ad Hoc International Group of Experts. We are twenty-five scientists and technical experts drawn from throughout the world and representing the spectrum of disciplines engaged in disaster reduction. We will soon submit our report to the Secretary-General, but today we wish to call to the world's attention our common conviction that millions of lives can be saved, hundreds of millions protected from tragedy, and hundreds of billions of dollars saved as a result of the International Decade.

Since our first meeting in Geneva in July 1988, there have been floods in Sudan and Bangladesh, hurricanes Gilbert and Juana in the Caribbean and Central America, destructive earthquakes in China, India, Nepal, and the USSR, and severe drought and locust infestations in Africa. The post-disaster response of the international community has been generous. But observing these and other tragic events has been convinced us of the need for increased efforts in disaster planning, preparedness, and prevention.

We believe that the Decade is a moral imperative. It is the first coordinated effort to prevent the unnecessary loss of life from natural hazards. It also makes practical sense. The Decade is an opportunity for the world community, in a spirit of global cooperation, to use the considerable existing scientific and technical knowledge to alleviate human suffering and enhance economic security. In implementing the Decade, the vulnerability of developing countries must be of special concern.

Thus we, the Ad Hoc International Group of Experts, call on:

The people of the world, as well as their government, to work toward greater security against natural disasters;

The governments of all countries to participate actively in the Decade by educating and training their citizens to increase awareness, by the enhancing social preparedness, by integrating disaster-consciousness into their development programmes, and by making available the power of science and technology to reduce disaster loss;

The United Nations, scientific and technological institutions, nongovernmental organizations, and the private sector to support international and regional cooperation on disaster-related activities and to contribute to the transfer of disaster-reduction technology, particularly in disaster-prone developing countries.

The Decade is an opportunity for action, both immediate and long-term. Specific projects can be implemented immediately to help achieve a safer world. Implementation of the Decade requires commitment to the international community to enhance the level of technical cooperation, particularly with regard to developing countries. The Group calls for all countries to form national committees to plan for and coordinate national efforts. It suggests that the United Nations General Assembly consider the establishment of a unique cooperative mechanism, supported by extrabudgetary resource, that brings together the diverse group that can contribute to the Decade. It seeks the commitment of the international community to assure the availability of resource to implement this important activity.

The Group is confident that through these actions mankind will capture the promise of enhanced security and prosperity.

#### INTERNATIONAL AD HOC GROUP OF EXPERTS

Dr. Frank Press (Chairman)  
National Academy of Sciences  
Washington, D.C.  
USA

Dr. Driss Bensarti  
Centre National de Planification et  
Coordination de la Recherche  
Scientifique et Technique  
Rabat  
Morocco

Dr. Claude Allegre  
Ministere de l'Education Nationale  
de la Recherche et des Sports  
Paris  
France

Mr. Noel Phillip Cheney  
National Bushfire Unit  
Canberra  
Australia

Dr. Anand S. Arya  
University of Roorkee  
Roorkee  
India

Dr. James C.I. Dooge  
Centre for Water Resources Research  
University College  
Dublin  
Ireland

Dr. M. Benbidia  
Agence Nationale pour l'Amenagement  
du Territoire  
Kouba  
Algeria

Dr. Alberto Giesecke  
Centro Regional de Sismologia  
para America del Sur  
Lima  
Peru

Dr. Richard F. Hallgren  
American Meteorological Society  
Boston, Massachusetts  
USA

Dr. Thomas R. Ochiambo (Rapporteur)  
The International Centre of Insect  
Physiology and Ecology  
Nairobi  
Kenya

Dr. Vit Karnik  
Geophysical Institute  
Prague  
Czechoslovakia

Dr. Keizo Okabe  
University of Tokyo  
Tokyo  
Japan

Dr. Vladimir Keilis-Borok  
Geophysical Committee  
Moscow  
USSR

Dr. L. Oyebande  
University of Lagos  
Akoka-Yaba  
Lagos  
Nigeria

Dr. Roman L. Kintanar  
Philippine Atmospheric, Geophysical  
and Astronomical Services  
Administration (PAGASA)  
Quezon City  
Philippines

Dr. Carlo Pelanda  
Institute of International Sociology  
Gorizia  
Italy

Dr. Ram Krishna  
Fiji Meteorological Service  
Fiji

Mr. Gudjon Petersen  
Iceland Civil Defence  
Reykjavik  
Iceland

Dr. Michel Lechat  
Ecole de Sante Publique  
Universite Catholique de Louvain  
Brussels  
Belgium

Dr. Jakim Petrovski  
Institute of Earthquake Engineering  
and Engineering Seismology  
University of Skopje  
Skopje  
Yugoslavia

Mr. Franklin McDonald  
Pan Caribbean Disaster Preparedness  
and Prevention Project  
St. Johns  
Antigua

Dr. Emilio Rosenbluth (Vice-Chairman)  
Instituto de Ingenieria  
Universidad Nacional Autonoma  
de Mexico  
Mexico, D.F.

Dr. Robert Morgenstern  
Department of Civil Engineering  
University of Alberta  
Edmonton, Alberta  
Canada

Dr. Lili Xie  
Institute of Engineering Mechanics  
Secretary General, China Association  
of Disaster Prevention  
Harbin  
China

Mr. Luiz Navais de Almeida  
Ministerio de Agricultura  
Secretaria de Recur-Sos Naturais  
Brasilia  
Brazil

5-2 PROGRAMME

- 10:00-10:30 OPENING  
 Opening Speech:  
 - H. Sazanami (Director, UNCRD)  
 Opening Addresses:  
 - Zhong Shukong (Director, UNDTCD)  
 - H. Gurgulino de Souza (Rector, UNU)  
 - K. Aratfune (Deputy-Director-General, Min. of Foreign Affairs, JAPAN)  
 - T. Kubo (Vice-Governor, Kanagawa Prefectural Govt., JAPAN)
- 10:30-11:45 KEYNOTE ADDRESSES 1: Challenges of the IJNDR  
 - E. Rosenblueth (Vice-Chairman, UN Group of Experts, MEXICO)  
 - J. Baker (Director, UNDIAC)  
 - K. Okabe (UN Expert, JAPAN)
- 11:45-12:00 BREAK
- 12:00-12:40 KEYNOTE ADDRESSES 2: Expectation for the IJNDR  
 - H. Tamamitsu (Director-General, JICA, JAPAN)  
 - J. Kondo (President, Science Council of Japan, JAPAN)
- 12:40-14:00 LUNCH
- 14:00-15:30 PANEL DISCUSSION 1: Issues during the Decade  
 Moderator:  
 - R.L. Kintamar (UN Expert, PHILIPPINES)  
 Panelists:  
 - A.S. Arya (UN Expert, INDIA)  
 - V.I. Keilis-Borok (UN Expert, USSR)  
 - M. Lechat (UN Expert, BELGIUM)  
 - J. Petrowski (UN Expert, YUGOSLAVIA)  
 - K. Toki (UN Advisor, Prof. of Kyoto Univ., JAPAN)  
 - K. Ito (Commentator, NHK, JAPAN)
- 15:30-16:00 BREAK
- 16:00-17:30 PANEL DISCUSSION 2: International Cooperation  
 Moderator:  
 - M. Essaafi (United Nations Disaster Relief Co-ordinator)  
 Panelists:  
 - D. Bensari (UN Expert, MOROCCO)  
 - N.P. Cheney (UN Expert, AUSTRALIA)  
 - C. Pelanda (UN Expert, ITALY)  
 - R. Krishna (UN Expert, FIJI)  
 - M. Watabe (Prof. of Tokyo Metropolitan Univ., JAPAN)  
 - T. Konoe (Director, Japan Red Cross Society, JAPAN)
- 17:30-17:40 CLOSING  
 Closing Speech:  
 - H. Sazanami (Director, UNCRD)

5-3 LIST OF PARTICIPANTS

- THE INTERNATIONAL AD HOC GROUP OF EXPERTS FOR IJNDR
- Anand Swarup Arya  
 Professor of Earthquake Engineering  
 University of Roorkie  
 INDIA (Earthquake and Structural Engineering)
- Mohammed Benbidia  
 Directeur General de l'Agence Nationale pour  
 l'Aménagement du Territoire  
 ALGERIA (Earthquake)
- Driss Bensari  
 Directeur  
 Centre National de Coordination et de la  
 Planification de la Recherche Scientifique  
 et Technique  
 MOROCCO (Geophysics)
- Noel Phillip Cheney  
 National Bushfire Research Unit  
 AUSTRALIA (Wildfire)
- Alberto Giesecke  
 Director  
 Centre for Seismology for South America  
 PERU (Geophysics)
- Vit Karnik  
 Senior Research Scientist  
 Geophysical Institute  
 Czechoslovak Academy of Science  
 CZECHOSLOVAKIA (Seismology)
- Vladimir I. Keilis-Borok  
 President  
 International Union of Geodesy and Geophysics  
 U.S.S.R. (Geophysics)
- Roman L. Kintamar  
 Director-General  
 Philippine Atmospheric, Geophysical and  
 Astronomical Services  
 PHILIPPINES (Meteorology)
- Ram Krishna  
 Director  
 National Weather Service  
 Fiji (Meteorology)
- Michel Lechat  
 Professor of Epidemiology  
 University of Louvain  
 BELGIUM (Epidemiology)
- Franklin McDonald  
 Director  
 Office of Disaster Preparedness and Emergency  
 Relief Co-ordination  
 Ministry of Construction  
 JAMAICA (Meteorology and Volcanology)

Luis Novais de Almeida

Regional Co-ordinator  
Latin America Water Shed Management Network  
Secretaria de Recursos Naturales  
Ministerio de Agricultura  
BRAZIL (Hydrology)

Keizo Okabe

Emeritus Professor  
University of Tokyo  
JAPAN (Sociology)

Lekan Oyebande

Provost  
Collage of Science and Technology  
NIGERIA (Hydrology)

Carlo Pelanda

Deputy Director  
International Institute of Sociology  
ITALY (Sociology)

Gudjon Petersen

Director  
Iceland Civil Defence Organization  
ICELAND (Volcanology)

Jakim Petrovski

Professor  
Institute of Earthquake Engineering and  
Engineering Seismology  
University of Skoplj  
YUGOSLAVIA (Earthquake Engineering)

Emilio Rosenblueth

Emeritus Professor  
Instituto de Ingenieria de Mexico  
MEXICO (Earthquake Engineering)

Xie Lili

Secretary-General  
China Association of Natural Hazard Reduction  
CHINA (Earthquake and Structural Engineering)

#### UN AGENCIES AND INTERNATIONAL NON-GOVERNMENTAL ORGANIZATIONS

##### (1) UNITED NATIONS

Office of the Director-General for Development and International Economic  
Co-operation (DIEC)

James Baker

Director

Office of the United Nations Disaster Relief Co-ordinator (UNDRO)

M'Hamed Essaafi

Under-Secretary-General, Co-ordinator

Department of Technical Co-operation for Development (DTCD)

Zhong Shukong

Director, Policy, Programming and Development  
Planning Division

Hidehiko Sezunami

Director, UN Centre for Regional Development  
Senior Disaster Management Planner, UN Centre  
for Regional Development

Hideki Kaji

United Nations Development Programme (UNDP)

Toshimitsu Ishigure

Liaison Officer, Tokyo Liaison Office

United Nations University (UNU)

Heitor Gurgulino de Souza

Rector  
Vice-Rector

Roland J. Fuchs

Economic and Social Commission for Asia and the Pacific (ESCAP)

Koji Nakagawa

Deputy Executive Secretary

Cengiz Ertuna

Minoru Kuriki

World Food Programme (WFP)

Trevor Page

##### (2) SPECIALIZED AGENCIES

Food and Agriculture Organization of the United Nations (FAO)

Harno Tsuchiya

United Nations Educational, Scientific and Cultural Organization (UNESCO)

Michio Hashizume

World Health Organization (WHO)

Olavi Eio

World Bank

Alcira Kreimer

Urban Environmental Specialist

World Meteorological Organization (WMO)

John C. Rodda

Director of Hydrology and Water Resources  
Department

International Tropical Timber Organization

E.K. Aggrey-Orleans

Assistant Director

(3) GOVERNMENTS

Klaus Zehentner  
Federal Republic of Germany

Abderrahim Ben Moussa  
Morocco

(4) NON-GOVERNMENTAL ORGANIZATIONS AND INSTITUTIONS

F.W.G. Baker  
International Council of Scientific Unions

Jurg Vittani  
League of Red Cross and Red Crescent Societies

Adelin Villeveille  
Union of International Technical Associations  
World Federation of Engineering Organizations

JAPAN (Speakers and Panelists)

Kiyohiko Arafune  
Deputy-Director-General  
Ministry of Foreign Affairs

Kazuaki Ito  
Commentator  
NHK

Jiro Kondo  
President  
Science Council of Japan

Tadateru Konoe  
Director  
Department of Foreign Affairs  
Japan Red Cross Society

Takao Kubo  
Vice-Governor  
Kanagawa Prefectural Government

Hiroaki Tamamitsu  
Director-General  
Japan International Cooperation Agency

Kenzo Toki  
UN advisor, Professor  
Institute of Disaster Prevention Research  
Kyoto University

Makoto Watabe  
Professor  
Faculty of Engineering  
Tokyo Metropolitan University

JAPAN (Others)

Shogo Takeuchi  
Science and Technology Agency

Yasuaki Noguichi  
National Research Center for Disaster  
Prevention

Takeo Kinoshita

Ryosuke Hirobe

Tokuo Kishii

Keiichi Otani  
National Research Center for Disaster  
Prevention

Atsushi Takeda  
Hideomi Nakamura  
Shin-ichi Iwasaki  
Shigeji Uehara

Ikuo Tono  
National Institute for Environment Studies

Keisuke Ueyama  
National Land Agency

Kohei Kamigane  
Min. of Foreign Affairs

Hideaki Mizukoshi  
Min. of Agriculture, Forestry and Fisheries

Kenji Kano  
Kazuo Watanabe  
Takao Ino  
Yuji Yoshioka

Yoshihiro Kinugasa  
Agency of Industrial Science and Technology

Koji Ono  
Min. of Transport

Iseo Daikoku  
Teruo Uehama  
Koichi Sirasaki  
Masanori Siraki  
Meteorological Agency

Yoichi Yano  
Min. of Posts and Telecommunications

Nobuhiko Takegawa  
Shinji Asami  
Min. of Construction

Hideyo Mitsuoka  
Hiroyuki Hara  
Hidehiko Banzen  
Jun Inomata

Yuji Miyakawa  
Izumi Furuoka  
Koichi Uzuka  
Koji Kamee

Ken-ichi Sasaki  
Takashi Sasaki  
Kunio Iwata  
Tetsuo Goto

Isao Tsukagoshi  
Ichiro Tanahashi  
Shinsuke Nakata  
Yoshiaki Nojima

Akira Fujimoto  
Building Research Institute

Jun-ichi Kurihara  
Public Works Research Institute

Katsuyosi Ishizaki  
Geographical Survey Institute

Yoshitake Egawa  
Tadao Hoya

Kiichiro Sudo	Fire Defence Agency
Ai Sekizawa	Fire Defence Research Institute
Shinsaku Zama	
Yukio Yanagi	Saitama Prefectural Government
Chiyo Nakazawa	
Hiroaki Kuroiwa	Chiba Prefectural Government
Akira Teramura	Tokyo Metropolitan Government
Hideaki Udagawa	
Takiji Komiya	Tokyo Fire Department
Tsutomu Takeda	
Yasuhiko Otsu	
Koji Aoyama	
Kunio Wakita	Tokyo Fire Department
Kengo Morohashi	
Hideo Kihira	
Syoji Mikuriya	Kanagawa Prefectural Government
Norimasa Hayashi	
Yoshihomi Nakamura	Kagoshima Prefectural Government
Shigeru Nakashimi	
Toshiaki Tajima	Kawasaki Municipal Government
Yasuji Igarashi	
Masaru Ihara	Yokohama Municipal Government
Norio Iwanaga	
Satoshi Matsuda	Nagoya Municipal Government
Ryuichi Yamamoto	Kyoto Municipal Government
Hirotsugu Takagi	
Hiroshi Sato	Osaka Municipal Government
Teizo Fujiwara	Kyoto University
Tamotsu Takahashi	
Kazuo Ashida	
Kazuhiko Ishihara	
Yasuo Egashira	
Yoshio Kumagai	University of Tsukuba
Yoshitsugu Aoki	Tokyo Institute of Technology
Motohiko Hakuno	University of Tokyo
Tomio Asai	
Keizaburo Kubo	
Shima Etsuzo	

Takamasa Nakano	Tokyo Metropolitan University
Hironori Tsuchiya	
Keiichiro Inoue	
Toshiyuki Kaminaga	
Yuko Mabuchi	
Yasuo Watabe	
Hyo Demin	
Daisuke Shimozuru	Tokyo University of Agriculture
Jun-ichiro Matsumoto	Nihon University
Yoichi Uehara	Yokohama National University
Sumihiro Murakami	
Hideyoshi Murakami	
Takeshi Narahara	Kyodo News Service
Nobumasa Kawabata	Shizuoka Broadcasting Service
Eiichi Otomatsu	Japan Red Cross Society
Mamoru Osada	International Development Center of Japan
Somon Hino	Fire Defence Science Research Center
Akihiko Hokugo	
Yujiro Ogawa	Urban Safety Research Institute
Shin-ichiro Kamiya	Japan System Development Institute
Masahiko Tsuchiya	Indemnity Insurance Association of Japan
Teruo Yamamoto	
Jun Tanaka	Institute of Future Science and Technology
Roichi Sakamoto	
Yasuhide Okuyama	Kumagai Gumi
Izumi Yamazaki	SECOM
Akira Satori	
Noboru Iwase	Tokyo Gas
Tadashi Hazama	NTT (Nippon Telegraph and Telephone)
Okimiro Ogai	Nomura Research Institute
A.M. Sereci	Pasico Trade
Toshio Fukui	Laboratory of Urban Safety Planning
Minoru Watanabe	Machizukuri Planning Institute

Akitoshi Sano Mitsubishi Research Institute  
Haruyosi Tokai

Yoshie Kawana Baku Consultant

and Other Participants without Registration.

SECRETARIAT

United Nations Centre for Regional Development

Jun Izumi	Research Associate
Shigeto Moto	Associate Expert
Kazuhiko Nakazawa	Associate Expert
James F. Goater	Documentation Assistant
Kuniko Kondo	Secretary
Seiko Oguri	Technical Assistant
Keiko Wakisaka	Technical Assistant
Keiko Hoshino	Temporary Staff
Rie Momono	Temporary Staff

Kanagawa Prefectural Government

Terushige Okada	Senior Counsellor
Koichi Kaneko	Counsellor
Satoshi Takahashi	Engineer
Tomoyuki Asanuma	Associate Counsellor
Kazuhiko Shibayama	Associate Counsellor
Megumi Takahashi	Assistant Counsellor

