Session 4

Date : November 4 (Thu) 9:30-12:30
Venue : Nago-no-ma Hall
Nagoya Kanko Hotel

"Recent Research on Disasters and Reducing Disasters"

Coordinator : Takao Takeda
Professor, Institute for Hydrospheric Atmospheric Sciences,
Nagoya University, Japan

Reporter . Zhao Bolin
Professor, Peking University, China

Speakers : Ryozo Tatehira, Japan

Zhao Bolin, China

Takao Takeda, Japan

Yoshi K. Sasaki, U.S.A.

Yoshio Fukao, Japan

Domenico Giardini, Italy

Session 4 Recent Research on Disasters and Reducing Disasters

Coordinator

Takao Takeda
Professor, Institute for Hydrospheric Atmospheric Sciences,
Nagoya University, Japan

- This year, many natural disasters have occurred worldwide. In Japan, there have been several natural disasters, including earthquakes and heavy rains, from north to south.
- In Session 4, six speakers presented information about forecasting techniques and about efforts being made to forecast natural disasters and understand the phenomena that cause natural disasters, all of which are very important to disaster prevention. Discussions followed.

Speaker

Ryozo Tatehira
Professor, The University of Electro-Communications
Former Director-General, Japan Meteorological Agency, Japan

" Probability Forecast for Disaster Preparedness "

- Among natural disasters, heavy rainfalls and storm winds can be predicted to some extent using state-of-the-art technology. For predictable natural disasters, stopgap or efficient disaster prevention measures can be taken.
- However, under the present level of technology, a perfect warning system is not yet feasible even for such meteorological phenomena as heavy, concentrated rainfall, leaving room for "false alarms" or "miss" to detect. Since "miss" to detect may affect lives, warnings tend to be issued even when there is only a slight possibility of an occurrence in order to avoid such failures. However, unless technology is improved, such a tendency inevitably increases the number of "false alarms", and has made people so familiar with warnings that they pay little heed to them.
- Probability forecast is a practical way of solving this dilemma, and of enabling warnings with some degree of error to be used effectively.
- Allowances for countermeasures in terms of time and cost must be clarified from the view of probability forecasting, although concrete disaster-prevention countermeasures include providing disaster prevention staff, reinforcing embankments and buildings, and evacuating inhabitants Countermeasures taking a long time to implement forecast will need a long lead time The lead time indicates how long should be between a forecast and an occurrence.
- For instant measures such as evacuaton, warnings issued just before the occurrence of the phenomenon can be useful. Since the occurrence can be predicted with high accuracy, the forecasting is virtually ideal, allowing forecasting at accuracy levels of near 100 percent. That is, scarcely any difference can be seen between a conventional warning coming from decisive expressions and the one from probability forecast.
- On the other hand, the longer the lead time, the lower the accuracy of the forecast, prompting concentration on climatic occurrence probability. That is, whether time-consuming countermeasures should be put into practice must be decided according to probability forecasts using various values.

- The issue of which rules should be used to provide effective measures differs according to each case, and involves some complexity. Nevertheless, the "cost/loss model" is considered effective as the first approximation.

- Here, "cost" represents the cost of taking measures, and "loss" represents the loss that can be reduced by taking measures. According to the "cost/loss model", the following conclusion can be reached: It becomes more efficient to take countermeasures when the probability of the occurrence of the phenomenon is forecast as higher than the "cost/loss ratio".

- In order to make the best use of state-of-the-art technologies, the "cost/loss model" should be clarified, and a probability forecast should be used. Moreover, the introduction of doppler radar is a very significant factor at present as a way of improving the accuracy of a meteorological forecast.

Speaker

Zhao Bolin
Professor, Department of Geophysics, Peking University, China

" Observation and Forecasting of Heavy Rainfall in China "

- Heavy rainfalls occur in China due to typhoons, storm fronts, cyclones and the like. The heavy rainfalls are characterized by seasonal variations in affected areas, such as the southwest area in spring, the central area in summer, the northern areas in July, and the southern areas from autumn to winter.

- A forecasting and observation system for heavy rainfalls has been built and put into use with approximately 2,000 surface observation points and radar of various wavelengths.

- Typical observation instruments and radars are as follows:
  Radiometer: Concentration of clouds
  Radiometer with microwave: Improved observation accuracy
  Doppler radar: Imported from the U.S.
  FY-1 Meteorological satellite: State of clouds and oceans
  FY-2 Stationary meteorological satellite: Typhoons and the like

- Regarding the heavy rainfalls in the summer of 1991, it was learned that rainfall areas generally result in central China due to fronts approaching from Indochina in June and July that blow from the north but encounter warm wind blowing from the south. The rainfall indexes taken from 1951 to 1991 show that twice as much as rainfall as usual was observed in central China in 1991. This resulted in flooding.

- Damage from this disaster in 1991 took the form of unharvested crops, collapsed buildings, and at least 7,000 deaths. This amounted to an economic loss twice as much as that of 1990.
  (Slides showing the observation instruments)
  Microwave radiometer (at Beijing University)
  Doppler radar (UHF radar to measure wind velocity, and course and velocity of typhoons)

Speaker : **Takao Takeda**
Professor, Institute for Hydrospheric Atmospheric Sciences, Nagoya University, Japan

" Remote Sensing and Heavy Rainfall Disasters "

- Most heavy rain systems are caused by strong convection currents. These occur unexpectedly in many cases. Since remote sensors can observe phenomena over wide areas and can be used to observe the inside of such phenomena from afar, they are very useful for studying, researching, forecasting, and providing warnings of heavy rainfalls and related disasters.

- There are two kinds of remote sensors: active sensors—radar, doppler radar, and the like—and passive sensors—infrared or microwave radiometers such as that mounted on satellites.

- Heavy rainfalls causing disasters can be divided roughly into two groups: concentrated rainfall in a few hours, and heavy rainfall continuing more than one day. The difference comes naturally from the characteristics of the phenomena that cause heavy rainfalls; moreover, the types of disasters vary and include landslides and floods. Recently, disasters due to heavy rainfalls occurring within one hour have been increasing due to urban development. Consideration should also be given to changes in the frequency and scale of heavy rainfalls in response to global environmental changes.

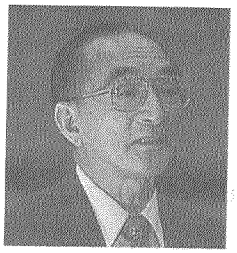
- Heavy rainfalls are caused by hurricanes, cyclones or the frontal activities accompanying them. However, very heavy rainfalls are caused by high clouds called cumulonimbus clouds or clouds in similar clusters. By quickly detecting such cumulonimbus or clustered clouds, remote sensing techniques can be used to gauge the likelihood of disastrous heavy rainfalls.

- Doppler radar enables us to understand changes in air currents in addition to rain distribution. However, it has various limitations: it is only useful for the observation of limited areas, and several units must be installed to measure wind. In the U.S., a network of doppler radars has been built highly suited to monitoring meteorological disasters.

- In this way, the forecasting of heavy rainfalls using remote sensing equipment has become practical to some extent. I would also like to mention a few topics concerning heavy rainfalls. One is that scientists are connecting abnormal heavy rainfalls with various phenomena, such as global warming, El Niño events and global-scale phenomena. In reality, we can find a gradual tendency toward heavy rainfalls over the past two decades, with the first-, second- or third-heaviest rainfalls in 100 years being recorded at the observation points. In other words, record-breaking heavy rainfalls have been observed in the last two decades in particular.

- Apart from this, disasters due to relatively minor heavy rainfalls have been caused by recent urban development. Forecasts using numerical models developed recently allow rainfalls caused by cloud clusters of over a few hundred kilometers to be forecast to some extent by narrowing grid intervals.

- In reality, phenomena causing heavy rainfalls depend on the area. Observation of the phenomena that cause disasters in various areas must be made at the individual sites in the future with remote sensing, satellite, radar and doppler radar devices.



Speaker

Yoshi K. Sasaki
Director, International Center for Disaster Research
George Lym Cross Professor, Meteorology,
The University of Oklahoma, U.S.A.

" Doppler Radar Network Observation in the U.S.A."

- Rainstorms, when generated over cities, can cause damage on a vast scale. When available, forecasts will help to control disasters in the future. In such cases, it is important to detect small-scale rainstorms quickly and accurately. Although the public is aware of the importance of the development of technology, people tend to ignore it.

- I would like to present a new development in disaster prevention technology and its importance in the industry by taking an example from the U.S.A.

- The NEXRAD Network is a next-generation network of meteorological observation radars that incorporates a network of advanced doppler radars. This network was developed on the grounds of the University of Oklahoma over the past three decades, and a network of 137 doppler radars is now being installed across the U.S.A.

- A budget of ¥100 billion has been allocated to this project by the U.S. Congress, and a company called UNICESS is being established. Approximately 40 units have been completed to date, distributed near Washington and Florida, with Oklahoma as the center of the network.

- This large-scale project was begun in the U.S.A. because statistical studies of doppler radar begun around 1981 revealed that the radar is very useful in forecasting disasters. Congress decided in 1988 to introduce and install the radar.

- The radar itself is called "WSR-88D." The "88" represents 1988, and "D" represents doppler. "WSR" stands for Weather Surveillance Radar.

- The doppler radar is thought to be extremely useful in forecasting disasters because it affords an approximately 92 percent accuracy in warnings, whereas ordinary radars have only a 50-60 percent accuracy.

- The features of the WSR-88D include improved resolution and highly enhanced sensitivity.

- Conventional radars allow us to observe events only if at least 15 DBZ are provided; however, the new radar, which is capable of 5 DBZ, allows us to detect clearly the violent wind created by rainstorms.

- Urban disasters involve various aspects, including social and economic problems. With the development of NEXRAD radar, we felt strongly that technological development helps greatly to solve such problems. In addition, the success of the NEXRAD development has allowed the modernization of meteorological equipment to begin. This is something that scientists and other concerned people in Japan should note.

Speaker

Yoshio Fukao
Director/Professor, Earthquake Research Institute,
University of Tokyo, Japan

" The POSEIDON Project and Its Possible Contribution to Seismic Hazard Reduction "

•POSEIDON (Pacific Oriented SEIsmic Digital Observation Network) is a project to deploy broad band high-performance seismographs in the Western Pacific and in East Asia to observe the whole globe, at the same time observing Japan from a global viewpoint.

•As part of an international cooperation project, POSEIDON uses a network covering areas in countries around the world in which France (GEOSCOPE), America (IRIS), Japan (POSEIDON), Italy (Mednet) and others participate

•Observation points—land-based as well as those on the sea bottom—are thought important. I will discuss the usefulness of this network from the point of view of disaster prevention.

•In the earthquake southwestern shore of Hokkaido, on July 12, 1993, we analyzed the earthquake records accumulated in the POSEIDON and other networks to discover that the earthquake caused a tsunami in this way: the earthquake occurred in a shallow fault that subsequently reached the surface of the earth, greatly deforming the sea bottom, raising the level of the sea, causing a tsunami.

•From the point of view of the tsunami occurrence, it is crucial to know whether the fault penetrates the sea bottom in this manner. If this can be established just after the occurrence of the earthquake, rather than one or two days later, it will be possible to forecast whether a tsunami will arrive and what its magnitude will be. In this way, a tsunami disaster may be reduced.

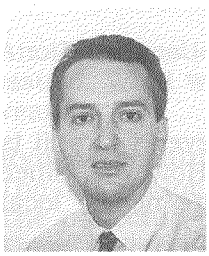
•A large-scale tsunami sometimes occurs without being accompanied by an earthquake. Issues related to detection of such tsunami, or to the detection of volcanic activity if the volcanic islands concerned are located far away in the Pacific Ocean, could be handled in the POSEIDON network in a promising way.

•This is because there is an underwater sonic wave called a "T" phase that can be used to learn of volcanic activity on the sea bottom. The POSEIDON network deployed over the West Pacific Ocean is thought to be useful in detecting such volcanic activity and the tsunami that accompany these activities

•From the viewpoint of disaster mitigation and prevention, it is important that data be collected promptly from all observation points, gathered, analyzed, and delivered to the organizations concerned in real-time. It is also a primary issue that the POSEIDON project be approved now as a national project.

•In addition, using data gathered from the global observation network allows us to determine the magnitude of a tsunami more clearly than before. It would also be possible for us to issue a warning that the coming earthquake would be small but the tsunami would be very big.

•As mentioned before, since this POSEIDON project involves seismographs installed on the sea floor and on oceanic islands, using the "T" phase detected by these meters would allow us to monitor any volcanic tremors, and thus to forecast a submarine volcanic eruption.



Speaker

Domenico Giardini
Associate Professor of Seismology.
Instituto Nazionale di Geofisica, Italy

" Toward the Global Seismic Hazard Assessment "

- The following points will be discussed in relation to the Global Seismic Hazard Assessment Program (GSHAP): (1) What is a seismic hazard? (2) What is the uncertainty accompanying a seismic hazard? (3) What can be done by groups formed by international scientists?

- Potential hazards must be clearly delineated in order to prepare disaster prevention policies In this connection, we must (1) integrate conventional databases related to earthquakes; (2) make clear seismic center models; (3) clarify the effect of earth tremors and crustal deformation; and (4) quantify seismic damage, among other things.

- Cooperation among stratum scientists, seismic scientists, engineers, and others is necessary in order to make probability forecasts of earthquake disasters available to all; moreover, disaster prevention is impossible if land-use planning and earthquake resistant designs are not consolidated. Clearly, such "crosswise links" are important.

- If earthquakes occur only rarely in a specific area, the politicians in that area will not understand the importance of taking earthquake disaster mitigation measures. On the other hand, if an earthquake did occur, it would cause buildings to collapse; this situation remains a problem.

- The GSHAP is a multi-sector oriented cooperative effort that tries to integrate activities normally carried out an individual basis.

- At the IDNDR, the International Council of Scientific Unions and the International Association of Seismologic Technology have been requested to assemble world-class scientists to work out disaster-prevention measures.

- The concept is to share guidelines for disaster assessment at the national, local, and international levels.

- The targets are (1) to undertake technological transfers with developing countries that lie along highly active seismic zones and that do not have sufficient disaster-prevention programs; and (2) to provide information on procuring international funds and relief funding, and to inform the countries of the situation regarding funds collected and relief measures from the viewpoint of global balance.

- GSHAP is considering improving coordination rather than generating global maps That is, GSHAP will gather information on the affected areas and information on different localities and countries while several regional centers work on a central role.

- As a result, on planning disaster-prevention, it is important not to rely on a single individual or body, but rather assemble as many people as possible and allow them to hold discussions in order to encourage the creation of more accurate forecasts. I believe that this would be the shortest route to disaster prevention.

Discussion

Domenico Giardini
I have participated in building a Mediterranean network over the last seven years. It is important that we perfect this type of advanced seismic network. However, since national priorities differ from country to country in terms of absolute needs, local communities must be involved in planning in the future

Yoshio Fukao
Professor Domenico Giardini will implement a global program under which seismic hazard maps are generated to permit forecasting of the risk of seismic disasters. The biggest problem for this program, I think, will be found in cases where there is a large gap between neighboring countries, with some countries having very good data from observation of seismic hazards, and other countries having no observation network or accumulated data. This kind of situation is the primary reason for the promotion of this kind of project, but on the other hand, it is also one of the biggest difficulties.

Mr. Kawata
I think that there are some limitations in trying to put such a grand project into practice at the university level. Issues of disaster prevention should be managed not only at the university level, but national government agencies should also be involved from the start of planning.

Yoshio Fukao
At present, the POSEIDON project is being managed not only by the Ministry of Education but also by the Science and Technology Agency, the Ministry of Construction, and the like.

Takao Takeda
In his comment, Professor Domenico Giardini emphasized the formation of multi-sector organizations and cooperation among those organizations. This applies not only to global environmental problems but also to natural disaster prevention. That is, an important issue will be how to promote cooperation among multi-sector organizations.

Domenico Giardini
At the IDNDR, technological transfer is the key to many problems. We have seen several programs put into practice in a number of areas, only to watch the results disappear when those programs ended. A central organization capable of accumulating the results must be established.

Takao Takeda
Professor Singh has commented on the importance of viewpoints that consider on how and in what scale environmental problems, such as forestry disruption and urbanization, cause disasters due to heavy rainfalls to occur, apart from scientific research such as the monitoring and forecasting of phenomena, especially those which may result in heavy rainfalls. This session should clarify to what extent and in what manner environmental problems are caused.

Zhao Bolin
In China, disasters due to floods occur every year A significant issue is how to mitigate damage due to such disasters and how to utilize water resources. Consideration must be given to the cycle of water and energy These are also the objectives of the WCRP project

Takao Takeda
The "Global Energy/Water Circulation Observation Plan," or "GEWEX," has been drawn up This is an international project through which changes in water circulation and water resources caused by global warming or changes in the global environment are clarified, allowing accurate forecasting of heavy rainfalls and droughts in different areas Under this project, various organizations and agencies throughout the world are cooperating and varied joint research is being considered.

Questions have been addressed to us about (1) the protocols and procedures by which heavy rainfall warnings are conveyed to the public in Japan, and (2) the ways in which the Japanese public respond to such warnings and translate thought into action.

Another question concerns the criteria according to which warnings or cautions are issued. What were the criteria for more than forty warnings and cautions issued this year?

Ryozo Tatehira
The criteria for the timing of cautions or warnings vary from prefecture to prefecture. The prefectures apply different criteria when precipitation reaches dangerous levels. These criteria are established according to the characteristics of areas, such as whether they have mountainous or flat terrain. The criteria are set out following consideration of an area's mechanisms of disaster occurrence following one day, three hours, or one hour of precipitation. If there is any possibility of establishing such criteria, we detect the possibility two or three hours before occurrence, and issue warnings or cautions.

These warnings and cautions are directly conveyed to the organizations in direct charge of disaster prevention and to the mass media. Therefore, the Meteorological Agency has two means of informing the public.

When a great hazard is anticipated, or when people must be evacuated due to imminent danger, disaster-prevention information in the form of an evacuation counsel for disaster may be conveyed to the public through the local authorities.

Takao Takeda
After receiving cautions or warnings from the Meteorological Agency, the local authorities convey information to the people after the situation has been verified and an appropriate decision has been made However, although the local authorities convey such information by television, wireless telephones, and the like, the public's psychological readiness and the way in which they receive such information have recently become problematical.

Ryozo Tatehira
To supplement the explanation of the previous commentator, I would like to mention that information is conveyed in addition to warnings or cautions issued as required by the Meteorological Agency. The public's attention is drawn to such information; and expressions that are intuitively understandable are added and conveyed to the people when a large-scale hazard is anticipated.

Yoshi K. Sasaki
As part of the process of conveying information to the public, the state of Oklahoma is itself building a network to ensure observation, as this network will serve to perfect radar observation. TV stations as well are so liberalized that each TV station conveys, to some extent, information on possible floods and rainstorms. One of the broadcast stations itself, as I mentioned, has doppler radar, has about five specialists analyze the extent of the hazard, and broadcasts the result

Each TV station is building a system in which the public can retrieve information by telephone

One of the biggest issues these days is how to convey information to people who are riding in cars without listening to the radio

Takao Takeda
In this session various efforts have been mentioned, including technological issues and issues concerning organizations. A common theme throughout the presentation is that urban disaster prevention must be carried out from a global viewpoint.

When thinking with a global viewpoint, however, we must consider differences in localities.

Since state-of-the-art technologies are not always adapted to the needs of every area, and since the phenomena in each area differ, the application of technologies suitable to each area must be worked out through international cooperation

Session Reports and Concluding Remarks

Date : November 4 (Thu) 14:00-16:30
Venue : Nago-no-ma Hall,
Nagoya Kanko Hotel

Coordinator/Chairman of the Planning Committee

Shinjiro Mizutani
Professor, School of Science,
Nagoya University, Japan

Reporters : Carmen Almeida-Biggart, U.S A

Yasuo Nishiyama, Japan

Hiroyuki Kameda, Japan

R. B. Singh, India

Zhao Bolin, China

Commentators : James P. Bruce
Chair, Canadian Climate Program Board, Canada

Claudia H. Candanedo
Head, Instituto de Recursos Hidraulicos y Electrificacion (IRHE), Panama

Session Reports and Concluding Remarks

Coordinator/Chairman of the Planning Committee

Shinjiro Mizutani
Professor, School of Science, Nagoya University, Japan

- I would like to ask the representatives to report to us about the matters discussed at the plenary session, sessions 1 through 4, and then I would like to propose some issues for the concluding remarks at this international conference.

- The Japanese Islands lies between the Eurasian Continent, the world's largest land mass, and the Pacific Ocean, the world's largest ocean. It is also called a "nest" of earthquakes, since the earth is active and, at the same time, there is much volcanic activity. It is also situated on the path of typhoons that travel north along the Japanese Islands. The Japanese people have therefore experienced several large-scale natural disasters, that is why we are so interested in disaster prevention.

- The Nobi Earthquake was one of such disasters. It had just been determined recently that earthquakes and faults were directly interrelated causes of such phenomena. The Neodani fault, which occurred at the same time of the Nobi Earthquake. appeared in leading world textbooks on geochemical science.

- The Ise Bay Typhoon was another very large-scale disaster that we experienced quite recently. It is the subject of very keen interest by local authorities and people concerned with disaster prevention.

- The first IDNDR conference was held in 1990 at Yokohama and Kagoshima. At this conference, serious debate was held on volcanic countermeasures. The second IDNDR conference, called the "Summit Conference on Earthquake and Natural Disaster Countermeasures," was held in Tokyo and provided a forum for discussions on earthquake-related problems. The third IDNDR conference, held in Chiba last year, discussed meteorological disasters, floods, rainstorms, and local severe rains. Finally, when it was decided to hold the fourth IDNDR conference in Nagoya, Aichi Prefecture, the issue of natural disasters and disaster management in metropolitan areas, which has recently experienced disasters on an enormous scale, was chosen as a theme.

Session Reports

PLENARY SESSION

Reporter

Carmen Almeida-Biggart
Executive Vice-Director for Operations
Disaster Services Liaison, American Red Cross, U.S.A.

[Raymundo S. Punongbayan]

- The advantages of the early warning system were focused on, as well as the importance of having a reasonable amount of time and attainable targets.

- There are similarities between the 19th and the 20th centuries in terms of crustal deformation and the frequency of earthquakes.

- It was mentioned that although tsunami warnings are insufficient, tsunami arrive 20 minutes after seismic waves occur under the sea

•To ensure evacuation of inhabitants, the mass media should be used to educate the people fully and issue warnings.

[Brian E. Tucker]

•As far as risk and reduction of urban earthquake disasters are correlated, developing countries have the greatest risks and face serious problems due to concentrated populations and the vulnerability of their infrastructure.

•It was pointed out that there are some cases where cities in developing countries are no longer "developing" but are fully developed. There is thus a difference in levels of development between countries as a whole and cities

•In the matter of earthquake hazards, it was pointed out that some cities lie near faults, and reference was also made to the earthquake risk that exists in places where faults are not apparent, as with the recent earthquake in India.

•Only a few specialists from developing countries have been attending international conferences such as the IDNDR. Attention was drawn to the gap between countries in which the earthquake hazard in reality is high and those in which various disaster-prevention measures and various efforts to mitigate disasters are being implemented.

•The UN has not been fully meeting the increasing need to develop various overseas relief agencies and the like since the end of the Cold War. Also, there is not enough aid to keep up with the needs of the rapidly growing world population. I would propose the establishment of private charity funding

[Tadateru Konoe]

•Various requests arrive at the International Red Cross Society once a week.

•20 percent of the global population suffers from malnutrition, and they are, at the same time, squatters in cities. Such poverty is transferred from Africa to Eastern Europe

•It was pointed out that aid is offered during the period of severest suffering, but is withdrawn at the time for rehabilitation, the most important period.

•As for complex emergency, in areas where various disputes exist it was pointed out whether disputes make disaster severer or insufficient maintenance of infrastructure due to disasters make the scale of disasters larger.

•When we discussed aid for rehabilitation, it was pointed out that all sorts of materials are sent to developing countries without any consideration for the cultural circumstances of the countries, resulting in many inappropriate materials being left stockpiled.

•The needs of each country and the needs of the international community must be mutually clarified.

•Since natural disasters affect everyone, every country must educate and increase the awareness of its people, and put in place systems for disaster prevention.

SESSION 1

Reporter : **Yasuo Nishiyama**
Associate Professor, Faculty of Engineering, Nagoya Institute of Technology, Japan

•It is impossible to avoid natural disasters. In the process of urbanization, we must implement urban development schemes that always consider the mitigation of disaster damage, and endeavor to minimize damage.

•The disaster risk has a tendency to increase during the enlargement and development of cities; we must lay down clear guidelines on how to recognize the reality of disasters.

•We discussed how to put into practice urbanization plans that incorporate disaster risk evaluation.

•The enlargement and development of cities, including rapid urbanization and the development of many megacities, have greatly changed the social significance of natural disasters and the damage situation.

[Yoshiaki Kawata]
•A hypothesis that there is a definite relationship between average life span and risk to life was presented.

[Thereza Lobo]
•We heard about urbanization issues in Rio de Janeiro, and the fact that the destruction of the ecosystem is proceeding under the guise of disaster prevention

[Yoshio Kumagai]
•Issues were presented regarding experience gained during international cooperation between Japan and Peru, the progress of urbanization in relation to assessments of vulnerability to disaster hazards, positioning of primary projects, and enforcement of disaster prevention measures in historical urban districts in Lima, Peru.

[Mohammad A Mohit]
•Taking an integrated flood prevention project in Dhaka as an example, a presentation was made about how a disaster-prevention project that affected the whole course of the nation was implemented and how the construction of huge embankments affected social and economic systems and the ecosystem

[Sherif H. Kamel]
•In the Cairo earthquake of October 1992, the earthquake occurred directly under the metropolitan area, damaging historical buildings, bringing down old buildings and highlighting the existence of illegal buildings. Related damage, such as the collapse of brick houses in farm areas, was reported in connection with the urban structure.

[Yoshiteru Murosaki]
•Session 1-1 was concluded as follows. In today's rapid urbanization process, traditions such as avoiding living in areas that have experienced disasters are no longer followed.

•Since damage to megacities in third-world countries can affect the economy of the country concerned, urbanization planning incorporating disaster prevention has an enhanced social significance. That is, disaster prevention measures that take account of the characteristics of the area, the actual circumstances of the country and the like must be established.

•On drawing up urbanization plans incorporating disaster risk assessment, the disaster risk must be accurately analyzed and shown in a manner that is easy to understand. In this connection, calculation techniques for damage assessment, data analysis, estimation techniques for hazard assessment and the like were presented.

[Itsuki Nakabayashi]
•With the Tokyo metropolitan areas presented as an example, Tokyo's urbanization planning based on disaster risk assessment was discussed. Reports were made on the level of hazard in each area and on estimated damage.

[Dusan Zupka]
•In an attempt to mitigate damage from disasters, it was proposed to measure critically the possible effect of investment using cost-benefit analysis (CBA) in order to provide a choice of more effective policies in future.

[Jukka Nieminen]
•A unique approach—"Visual Settlement Planning (ViSP)"—was introduced, in which a computer is used to easily make a map with satellite images, aerial pictures, slides and video information. Unique techniques for forecasting disaster hazards were also introduced.

[Andrew W. Coburn]
•The concept of "safety culture" was presented, in third-world countries emphasizing the necessity of disaster-prevention education for the urban poor to enable them to incorporate safety awareness into their daily lives.

[Ronald S. Parker]
•Megacities were taken as involving two different urban structures that is formal and informal city from the viewpoint of disaster prevention, with emphasis on the importance of disaster prevention measures for informal areas urbanized without planning.

[Ulpiano P. Ignacio, Jr]
•A report was made on the state of overall administration, including precise assessment of foundations and the like, the existence of disaster prevention-oriented thinking, systematic disaster-prevention plans, and appropriate operation of daily building administration.

•An area in which a possible disaster hazard exists is a "taboo" area where urbanization must be controlled. How we incorporate land-use control into disaster prevention is important

•Session 1 focused upon the following four points : 1) It is important to think about disaster in relation to amenities; 2) Underlying the increasing disaster hazard in cities when a disaster occurs, there exists a large class of urban poor; 3) Practical and concise disaster-assessment techniques rooted in localities and national characteristics must be developed and popularized; 4) Improved administrative knowledge of disasters, increased disaster awareness, self-help efforts by inhabitants, and the enlightenment of inhabitants are important.

•Urban planning incorporating disaster-prevention measures gives hope to the people and promises them better lives.

SESSION 2

Reporter: **Hiroyuki Kameda**
Professor, Disaster Prevention Research Institute,
Kyoto University, Japan

•Session 2 focused upon the issue of facilities: how to ensure the functioning of urban infrastructure facilities when disaster occurs and how to minimize losses possibly incurred by non-functioning infrastructure facilities.

[Tsuneo Katayama]
•For disasters affecting lifeline facilities, first it must be noted that there is a difference between lifeline disasters in developed countries and those in developing countries as well as a gap in disaster recognition

•Also vital is integrated risk management from a broad perspective using both structural and non-structural engineering methods, engineering and non-engineering strategies, and pre-, mid-, and post-disaster time factors.

•It was pointed out that the research and study fields established to date as "lifeline disaster-mitigation engineering" should be changed into "lifeline engineering."

[Masanobu Shinozuka]
•Attention was drawn to issues involved in lifeline studies, and to the various problems that occur when putting these into operation.

•Any gap between studies in the lab and application to the real life would stem not only from engineering problems but also from issues how political, social, and economic problems are solved. Evaluation of cost-effectiveness precisely reflecting local realities is an important point.