INTEGRATION OF DISASTER MANAGEMENT WITH DEVELOPMENT PLANNING

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INTRODUCTION

In recent years, the general public has expressed increasing concern regarding disasters, including earthquakes, floods, cyclones, and volcanic eruptions. In June and July 1990, the initial year of the IDNDR, major earthquakes occurring in Iran and the Philippines resulted in great losses, and these tragedies remain fresh in our memories. When such disasters occur, people suffer from both physical and economic damage. A large number of lives are lost, and many kinds of facilities and housing are destroyed. In developing countries where resources available for national development are limited, little attention has been given to disaster prevention measures. This has resulted in enormous losses whenever they are hit by natural disasters, and this, in turn, has imposed further constraints on national development. Thus, it is essential to incorporate long-term postdisaster rehabilitation and reconstruction programmes into a comprehensive regional development planning process, as well as short-term emergency relief and recovery programmes.

Many developing countries show more concern towards development itself rather than on the impact of development on the environment. Due to financial constraints, high priority has been given to industrialization, capital formation, and agricultural production to the detriment of needed environmental control. Rapid economic growth has resulted in population growth, followed by extensive unregulated exploitation of natural resources. The outcome of such policies in such developing countries is

reflected by the degradation of the environment and lowering of the quality of life for the people themselves who depend on the environment. Rapid concentration of modern industry and population into larger metropolitan areas has caused not only the deterioration of the environment of those areas, but also the degradation of the rural environment; furthermore, unregulated exploitation of natural resources, such as overexploitation of forests, has made those areas highly prone to disasters, and they suffer serious damage when natural disasters occur. Technical cooperation has therefore taken on an increasingly important role in developing countries in this regard.

DISASTER MANAGEMENT AS A DEVELOPMENT POLICY

In general, rapid urbanization causes population concentration into a few selected metropolitan areas. Much of this inflow of population to metropolitan areas is composed of those belonging to the low-income group from rural areas. Upon reaching these metropolitan areas, in-migrants build low-cost accommodation in hazardous areas which should actually remain uninhabited. Accordingly, vulnerability to disasters is gradually increasing in metropolitan areas. Thus, disasters in developing countries display a complex phenomena combining various factors, including not only physical ones but social and economic factors as well. However, development of hardware systems cannot keep up with the speed of increased urbanization. It is therefore vital to speedily undertake countermeasures against disasters, with a focus on software systems. For this purpose, it is necessary to understand the structure of the issues and problems at hand concerning disaster prevention and mitigation in the development planning process, and to consider planning from the viewpoint of disaster prevention

and management when drawing up and implementing development plans, as well as formulate guidelines for revising and/or implementing supplementary plans.

Firstly, to understand the abovementioned points, the following issues have to be considered:

- Interrelationship between economic growth levels and appropriate investment in disaster prevention and management;
- Geographic hazards; urbanization and increased vulnerability to disasters; and
- Interrelationship between socioeconomic characteristics and awareness of disaster prevention and management with regard to the general public.

One of the major issues of the interrelationship between economic growth and investment is related to investment and technology for disaster prevention and management that has been adapted to the economic level of each country. To deal with geographic hazards in the region, it is necessary to draw up risk and hazard maps that take natural conditions into consideration, such as microzonation for earthquake disasters, maps of flood-risk areas for flood and high wind disasters, and maps of lava flow and ash fall areas for volcanic eruption disasters.

Among the major components of urbanization which heighten the vulnerability to disasters are population growth and change, uneven distribution of income, fragile building structures, the lack of assessment of disaster-resistant and mitigating functions of open spaces, and the reduction of open spaces in urban areas. There are three aspects in the

interrelationship between socioeconomic characteristics and awareness of disaster prevention and management with regard to the general public -- the psychological, economic, and sociological.

The psychological aspect concerns the relationship between disaster and investment in safety measures. The economic aspect involves the relationship between income and investment in safety measures. The sociological aspect concerns community organization and joint activities for disaster prevention and management.

Secondly, to consider planning and formulate guidelines as have been previously mentioned, it is necessary to take disaster prevention technology into account and to develop a programme for prioritizing such technology from the standpoint of urban and regional planning and plan application. The former includes regulatory standards for land use (e.g., assessment of present standards and possibility of revision), appropriate distribution of open spaces for safety precautions, and introduction of an assessment system for disaster prevention in the decision-making and development planning process. The latter includes evaluation of facilities and of decisions regarding priorities for maintaining urban and regional functions, selection of alternatives for providing facilities to maximize disaster mitigation effects, and development of a prediction programme to determine areas in which vulnerability would increase if improvements fail to be made.

From the viewpoint of emergency technology, it is also necessary to consider the development of systems for warning and information dissemination, preparation of guidelines for drawing up emergency planning measures, and development of effective restoration programmes based on the

aforementioned guidelines. The first includes evaluation of the existing warning information dissemination systems, classification of information network systems, and the updating of such networks. The second includes classification of general and individual items for disaster prevention and management, a survey of the present condition of materials and supplies used for disaster prevention and management, and supply planning. The third includes clarification of the extent and structure of disaster impact technology for prevention against damage expansion, priority in restoration, and regulatory measures against uncontrolled reconstruction based on regional risk assessment.

RISK OF EARTHQUAKE DISASTERS

Though structures and factors related to the problem differ from one kind of disaster to another, I would like to confine my discussion to regional development and the risks of earthquake disasters.

Expansion of Urban Areas and Increased Vulnerability to Disasters

Due to the fact that cities established in older times are mostly located upon comparatively firm ground, they generally suffer only slight damage when earthquakes occur. Historically, cities were constructed on level ground and plateaux which were slightly elevated to avoid low and damp land with poorer living environments or steep hillsides with poor accessibility to transportation. However, people pursued economic development and cities began expanding beyond the boundary of land which had the aforementioned ideal conditions. In order to secure enough land for building lots, marshy land as well as seashores have been reclaimed and steep hillsides are being developed.

Generally, major urban areas are situated on the coast to secure marine transportation. In this situation, it can be said that reclamation of seashore helps to cope with the demand for expansion of the urban area. It is evident that reclaimed land is vulnerable to earthquakes; for example, the reclaimed land in the San Francisco Bay area was damaged more severely than other areas during the Loma Prieta earthquake.

On reclaimed land, damage is severe because amplified ground motion adds acceleration to buildings while the ground deformation resulting from liquefaction generates an imbalancing subsidence of buildings.

In an area with a high likelihood of liquefaction, it is necessary to extend the foundation support piles to the bedrock. However, it is often difficult to follow this standard because of cost considerations; the cost performance ratios for small buildings tend to be very small. In addition to this problem, the breaks in gas and water pipes resulting from ground deformation may lead to serious damage from fire, as was seen in the example of the Loma Prieta earthquake. Improvement of construction technology in this field is anticipated.

On the other hand, it is not rare to find large cities constructed on hillsides which are located in earthquake belt zones. Bogota, Dalian, Istanbul, Pusan, San Francisco, Yokohama, and Nagasaki are examples. During the International Conference on Hillside Cities held in November 1989 in Nagasaki, experts from these cities discussed utilization of hillsides as urban land and risks of land destruction and fire following earthquakes on hillsides.

In most cases of land development on hillsides, excavated soil is used to cover ground or fill in valleys. When this kind of vulnerable ground

sustains an earthquake motion, the input acceleration to buildings increases in intensity and the vulnerable parts of the landfill are prone to collapse resulting in disastrous landslides. Technical standards for land development according to the conditions of soil and weather are urgently needed.

Risk of Earthquake Disasters in Suburban Residential Areas

Most cities have sprawling outskirts composed of residential areas. People who sell their land in the centre of a city and move to the suburbs for a better residential environment can afford to maintain high standards in the quality of their houses.

However, most in-migrants to these areas are people who move to suburban areas in search of job opportunities in the developing city and are satisfied with a small house on limited land that is low priced but of poor condition. They have little intention of staying forever; therefore, they have no intention of investing an adequate amount of money for temporary housing in order to take precaution against disasters which occur, for example, only at a ratio of once every one hundred years or so.

Even in a developed country like Japan, dwellings vulnerable to earthquakes can be seen in suburban residential areas of large cities. This tendency is more common in developing countries and there are many areas where clearly dangerous housing structures stand side-by-side. Reducing disaster risks in developing countries through international cooperation is a vital object of the IDNDR. For this purpose, a key issue is to convert houses into structures meeting safety standards and improve the living environment in developing countries. In this regard, various technological support such as the development and dissemination of

information on low-cost housing have been carried out, but only on a limited scale. Taking the opportunity of the IDNDR, I would like to propose the strengthening of international cooperation in this field, especially in disaster-prone countries.

This issue is of extremely serious dimensions and cannot be solved simply through technical transfer of a housing manufacturing system based on technological design alone. Firstly, from an economic viewpoint, a system which has a high safety standard is very expensive in terms of construction costs, and therefore cannot be introduced. Secondly, even if safe structural design with a modest cost is available, it would take a considerable amount of time to replicate the design and to rebuild and strengthen vast numbers of existing houses that are not considered sound. Furthermore, in cases where construction is implemented on a private basis, there is almost no expectation that buildings will be constructed according to the technological criteria which have already been set as acceptable standards for dwellings.

It would be ideal for public entities to build high-level earthquake-resistant houses for residents in disaster-prone areas. However, that system would require considerable economic resources on the part of the nation or local authorities concerned and is difficult to implement in developing countries which are usually under financial constraint. International cooperation, therefore, is inevitable and an international funding system, specifically to invest in the construction of public housing for residents in disaster-prone areas, should be established.

As it is very difficult to rebuild vast numbers of houses to meet costly earthquake-resistant standards, a policy whereby residents' lives

will be given priority rather than buildings for protection from earthquakes should be considered. As observed in the 1976 Tangshan earthquake with 240,000 deaths, the 1989 Armenia earthquake, and the Iran earthquake in 1990 with 48,000 victims, heavyweight construction of brick, adobe, stone and low quality concrete cause a tragic loss of lives. Replacing heavyweight construction with lightweight construction is desirable.

One of the result of the earthquake which occurred on 16 July 1990 in the Philippines was a great loss of lives caused by the collapse of a hotel, a school and other buildings of heavyweight construction. On the other hand, private wooden houses escaped heavy damage and did not lead to such a great number of injuries or deaths. This fact suggests to us that the introduction of adequate lightweight construction into earthquake-prone regions would help to solve the problems brought about by frequent earthquake disasters. At the very least, a feasibility study in this context is recommended.

Other Types of Risk Factors Related to Earthquake Disasters

It is necessary to consider the problem of fires in high-rise buildings following an earthquake. The Tokyo Fire Department predicts that the same number of fires will break out in fire resistant buildings as in wooden buildings when the next Kanto earthquake occurs. In the case of a fire resistant building, it is considered that the probability of a fire spreading to an adjacent building is low, even if the fire is not rapidly extinguished. However, there may be over ten thousand workers inside of a large building such as a high-rise office block. This means that there is the possibility of a huge loss of lives and damage even if the fire does

not spread to nearby buildings. As a matter of course, such buildings should have some fire protection equipment such as a fire compartment, fire doors, sprinklers, and smoke detectors. Regular and adequate inspection is essential to ensure that such equipment is always in working order, even after a major earthquake. In developing countries, however, such fire protection structural design or equipment is not always available.

Recently, under the phrase "waterfront development," there are many plans for use of reclaimed land along the seashore. Such reclaimed areas have some disadvantages during earthquakes, as they are usually located on unsound soft ground. In the case of large facilities like high buildings, special technical countermeasures may have been carried out according to the results of research into ground conditions. However, middle- or small-sized buildings have the possibility of being severely damaged due to insufficient disaster countermeasures that have followed a general building code. Data from microzonation studies should be reflected in a general improvement of technical standards.

Utilization of underground space is frequently envisaged and necessitates careful disaster prevention planning as large-scale subterranean infrastructure has yet to experience earthquakes. Area below ground is considered to be rather safer than space above ground from the viewpoint of the seismic input to structures. However, the destruction of an underground structure due to forced deformation of the ground should be considered, especially near the faultline. At present, information concerning active faultlines in urban areas is not sufficiently available; as a result, planning of underground infrastructure cannot incorporate knowledge of faultlines and therefore remains inadequate. This may lead to a new type of risk to underground spaces.

The abovementioned risk factors are problems even in developed countries such as Japan, but developing countries will face more difficult and serious problems. The recent Philippines earthquake destroyed some reinforced concrete buildings in spite of the fact that they were constructed according to technical standards of a certain level. The earthquake caused a large number of deaths in Baguio and other local cities. The technical standards of the Philippines are modeled on those of developed countries, although it has been claimed that the cause of the damage was the adoption of a comparatively low acceptable limit for such standards. We can observe such cases repeatedly in earthquake disasters in developing countries. In the case of the 1985 Mexico earthquake, many competent experts on earthquake-proof engineering gave appropriate advice when the technical standards were being established. However, low acceptable limitations were adopted for the standards at that time. It is therefore desirable for engineers from relevant countries to meet and establish an international model code for the improvement of earthquake-proof technical standards in such countries. The formulation of new standards for countries in which standards have not been established is essential.

Strategies and Management for Earthquake Disaster Mitigation

To mitigate the risks of earthquake disasters and to solve problems in disaster-prone developing countries, internationally coordinated studies, research, and information exchange are needed. For this purpose, the establishment of research and development centres for disaster prevention and international postdisaster investigation systems should be supported, and improved international exchange of existing data on seismic performance

of structures should be encouraged and supported by international organizations and national governments.

Attention should be directed to the study and mitigation of disasters in areas that are exposed to multiple geologic, hydrologic and atmospheric hazards, and to a combination of natural and technological hazards.

In addition, there is need for a strengthened or new international organization to coordinate worldwide resources, both human and financial, and to assist disaster-stricken countries in achieving the earliest possible recovery. Such an organization should be empowered to give strong recommendations to the countries concerned with regard to their seismic and volcanic disaster mitigation policies.

CONCLUDING REMARKS AND RECOMMENDATIONS

The IDNDR policies were described in the United Nations General Assembly resolutions in 1988-89. The IDNDR concept encompasses five key areas: Natural disasters; developing countries; international cooperation; preparedness; and technology.

The last two key areas, namely, preparedness and technology, indicate a willingness to carry out disaster preparedness measures before the occurrence of a disaster by utilizing the results of available technology. In urban areas, it is necessary to utilize the latest engineering technology for disaster prevention. At the same time, social science methodology should be adopted to control land use and activities in urban areas. Disaster preparedness cannot be realized in the short term; work will probably continue on into the twenty-first century. Therefore, during the IDNDR, it is important to implement necessary countermeasures,

and to incorporate realistic programmes into city development planning. In developing countries which aim to build modern cities, appropriate planning is especially needed to realize safe and secure cities. Appropriate advice from relevant experts is also necessary. UNCRD is one of the relevant organizations which can assist in such activities.

In conclusion, I would like to summarize UNCRD's activities concerning future planning for disaster prevention in developing countries. UNCRD's aim is to channel the goodwill of the international community into effective results for the IDNDR. Its specific programmes are as follows:

(1) Training Programme on Earthquake Engineering and Disaster Management for Establishing Building Administration Systems in the Philippines, 1991-92, Japan, Philippines

This is a strategic assistance programme proposed in consideration of the earthquake on Luzon island of the Philippines in July 1990. The Philippines' current administration system for building regulations, inspection and related standards, needs to be revised and improved on in order to avoid repeating the great catastrophe. To respond to this necessity and introduce advanced building technologies into the reconstruction process in the Philippines, UNCRD would like to organize a training programme consisting of two courses, an eight-week course in Japan and a one-week Philippine course, which will be organized for the broader dissemination of knowledge. The trainees of the former course will be senior level engineers, in principle, and they will be the trainers for the latter course planned mainly for administrators.

In addition, the following programmes are now under consideration:

(2) Series of Workshops and Seminars for Training Modules on Disaster Management in Rural Areas

During 20-24 January of this year, a seminar titled "UNCRD-CIRDAP Country Seminar on Development of Modules for Training on Integrated Approach to Rural Development and Disaster Management in Bangladesh," was held in Dhaka. Experts from Bangladesh and overseas, together with participants from local areas were involved in the presentations and discussions on: (a) Rural development planning approach; (b) Integrated rural development and disaster management; (c) People's participation in disaster management and rural development; and (d) Training on an integrated approach to rural development and disaster management.

This seminar that focused on issues related to Bangladesh was organized as a case study of the 1990 UNCRD-CIRDAP workshop where international experiences were presented and discussed. For the next step of this project, workshops for collecting information from the entire region of Asia and the Pacific and training seminars on specific issues will be combined into one integrated programme and implemented in November 1991 and November 1992. Following this programme, an expert group meeting will be held in 1993 to finalize the training modules on rural development and disaster management.

(3) Training Programme on the Development of Lightweight Construction Technology for Housing in Disaster Prone Areas, 1991, Japan

To reduce the damage of earthquakes in developing countries, it is essential to improve conventional housing construction methods. In particular, in north Africa, most of Latin America, and the climatically dry zones of Asia, heavy materials such as stone, brick or dried mud block

are popular for constructing traditional houses in masonry, adobe or similar construction. The effectiveness of lightweight construction for reducing damage by earthquake is undoubtedly clear when we compare the cases of the June 1990 earthquake in Iran and the July 1990 earthquake in the Philippines; in the former case, more than 20,000 people died from the destruction of heavyweight structures, while the latter case caused less than 2,000 deaths because of the popularity of wooden construction. Algeria is a typical country that uses heavyweight housing construction and suffered the bitter experiences of earthquakes repeatedly, such as those of 1954 and 1980. The "Centre National des Etudes et Rechereches Integres du Batiment (CNERIB)" of Algeria is an outstanding research organization which has long made efforts to develop a new housing construction system to reduce such damage of earthquakes. In this connection, UNCRD has decided to assist Algerian researchers in their challenge of developing adequate lightweight construction that meets the needs of their economic, climatic and seismic environment. Through the above training programme, they will have the chance to engage in discussion on this matter with Japanese experts in the academic, practical and administrative fields.

(4) Workshops and Seminars in the Latin American Region on Disaster Prevention and Regional Development, 1991-93, Peru

Most of the countries in the Latin American region are confronted with vulnerability to major earthquakes and their economic difficulties prevent them from applying advanced technology for reducing damage. Accordingly, the major objective of this project is to find a way of coordinating between disaster reduction with advanced technology and regional development. This project will be organized in collaboration with the Peru-Japan Center for Seismic Investigation and Disaster Mitigation

(CISMID) that has been established in Lima, with the assistance of the Japan International Cooperation Agency (JICA). UNCRD would like to implement the three-year project by maintaining a close relation with JICA's project in CISMID.

(5) Fifth International Research and Training Seminar on Regional Development Planning for Disaster Prevention, 1991, Nagoya, Japan

This is an annual programme organized by the Regional Disaster Prevention Unit of UNCRD. The main topic of the seminar has not yet been decided, but one idea proposed is for recent major earthquakes to be discussed in comparison with the Nohbi earthquake which occurred in the Nagoya region of Japan one hundred years ago. This seminar will be included in the commemoration programme of the twentieth anniversary of UNCRD which is planned for November 1991.