



**General Assembly
Economic and Social Council**

Distr.
GENERAL

A/44/322/Add.1 ✓
E/1989/114/Add.1
14 August 1989

ORIGINAL: ENGLISH

GENERAL ASSEMBLY
Forty-fourth session
Item 12 of the provisional agenda*
REPORT OF THE ECONOMIC AND
SOCIAL COUNCIL

ECONOMIC AND SOCIAL COUNCIL
Second regular session of 1989
Agenda item 12 (a)
CO-OPERATION FOR NATURAL
DISASTER REDUCTION

INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

Report of the Secretary-General

Addendum

As requested by the Economic and Social Council in its resolution 1989/99 of 26 July 1989, the Secretary-General has the honour to submit to the General Assembly the report of the International Ad Hoc Group of Experts on the International Decade for Natural Disaster Reduction.

* A/44/150.

ANNEX

Report of the International Ad Hoc Group of Experts on the
International Decade for Natural Disaster Reduction

"Implementing the International Decade for Natural Disaster Reduction"

CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
LETTER OF TRANSMITTAL 1/		5
EXECUTIVE SUMMARY 2/		
TOKYO DECLARATION ON THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION 2/		
I. INTRODUCTION	1 - 27	8
A. Rationale for an International Decade for Natural Disaster Reduction	12 - 18	9
B. An integrated approach to disaster management	19 - 27	11
II. PROBLEMS AND OPPORTUNITIES	28 - 59	13
A. Natural disasters included in the Decade	29 - 43	13
B. Impediments to disaster reduction	44	16
C. The Decade as an opportunity to link ongoing activities	45 - 50	16
D. The Decade as an opportunity to apply scientific and technological breakthroughs	51 - 59	17

1/ For the membership of the International Ad Hoc Group of Experts, see A/44/322-E/1989/114, para. 9.

2/ For the Executive Summary and the Tokyo Declaration, see A.44/322-E/1989/114, annexes I and II, respectively. The paragraph numbers of the report of the International Ad Hoc Group of Experts, which follows, have been adjusted accordingly.

CONTENTS (continued)

	<u>Paragraphs</u>	<u>Page</u>
III. THRUSTS OF THE DECADE	60 - 91	19
A. Benefits of improved risk assessment, early warning and response	64 - 76	21
B. Benefits of integrated disaster management	77 - 82	23
C. Benefits of hazard modification	83 - 86	24
D. Benefits of locust research	87 - 91	25
IV. PARTICIPANTS IN THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION	92 - 124	26
A. United Nations system	94 - 96	26
B. United Nations system in relation to national activities	97	27
C. The Decade within the United Nations system	98 - 99	27
D. National entities	100 - 104	27
E. Regional groupings and bilateral and multilateral arrangements	105 - 106	29
F. International scientific and technological organizations	107 - 108	29
G. Research and academic institutions	109	30
H. Other sectors	110 - 116	30
I. Civil protection and voluntary organizations	117 - 122	32
J. Donor organizations	123 - 124	33
V. ORGANIZATIONAL CRITERIA AND CONCEPTS	125 - 151	33
A. National arrangements	127 - 129	34
B. International arrangements	130 - 142	35

CONTENTS (continued)

	Paragraphs	Page
C. Proposed activities for the initial phase of the Decade	143 - 151	38

APPENDICES

I. Additional illustrative projects for the Decade	40
II. Regional hazards and needs	46

LETTER OF TRANSMITTAL

1 June 1989

It is with great pleasure that I convey to you today the report of the International Ad Hoc Group of Experts for the International Decade for Natural Disaster Reduction. It has been a distinct honor for me to chair this Group, and my colleagues and I thank you for providing us this opportunity to serve the world community. As their chairman, I also thank the members of the Group for their individual and collective wisdom and for their extraordinary effort and concern for this important endeavour.

On behalf of the Group, I wish to note with appreciation the valuable support and assistance provided us by the Director-General for Development and International Economic Co-operation, Mr. Ripert, and his successor Mr. Blanca, as well as his staff; by the United Nations Disaster Relief Co-ordinator Mr. Essaafi; and by the staff of the secretariat formed to support our Group's efforts. I also wish to thank the members of the Working Group of the United Nations Steering Committee, chaired by the Deputy to the United Nations Disaster Relief Co-ordinator, Mr. Einhaus, who contributed to the meetings of the Group and to this report.

We sincerely believe, as stated in the Group's Tokyo Declaration, that the Decade is both a moral imperative and an opportunity for the world community, in a spirit of global co-operation, to use the considerable existing scientific and technical knowledge to alleviate human suffering and enhance economic security. 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 from natural disasters. We must take an integrated approach to disaster reduction, bringing new emphasis to pre-disaster planning, preparedness and prevention, while sustaining our post-disaster relief capabilities. Our humanitarian efforts must be broadened to encompass disaster-resistant investment as well as timely warnings in which people at risk receive, understand and act upon the information conveyed.

The Decade offers an opportunity for the United Nations to demonstrate its catalytic ability to bring together the diversity of skills, resources and groups needed to stem the losses from natural disasters. The United Nations is the forum for all nations to come together in peace. It has the moral authority to call for disaster reduction efforts by all nations, including the developing ones where the toll from such disasters is most tragic in terms of both human losses and economic development setbacks. Further, the United Nations system has in place many programmes that promote various aspects of disaster reduction and, through greater co-ordination and enhanced visibility, can accomplish more in the years ahead.

H.E. Javier Pérez de Cuéllar
Secretary-General
United Nations
New York, N.Y. 10017

Exploiting the strengths of these ongoing programmes, including their outreach efforts nationally and regionally, is critical to disaster reduction.

The Decade is also an opportunity for the United Nations system to work in a unique co-operative way with experts and organizations at the national and international levels. The Group of Experts envisages a Decade framework that facilitates the participation of all parties capable of making important contributions to the Decade. It might well serve as a model for future international activities.

A concerted effort that leads to tangible reductions in losses by the year 2000 requires a co-operative effort of all nations; the scientific, technological, and health communities; business and industrial groups; voluntary organizations; donor groups; the media; and others. The goals of the Decade, as presented in General Assembly resolution 42/169, can be achieved only if all prospective participants embrace the Decade as their own and become committed to its success.

We envision the United Nations and its system of organizations as both a catalyst and facilitator in Decade activities. Inclusion of the Decade on the United Nations agenda itself adds to its visibility and moral imperative. In addition, however, the United Nations can help shape and implement the international organizational elements and can participate through the many relevant programmes within the United Nations system.

The Group recognizes the need for this Decade to be an extrabudgetary activity for the United Nations and suggests an organizational structure that is low in cost yet highly effective in facilitating the participation of all interested parties. Specifically, the Group recommends your appointing a small (5 to 10 members) Board of Trustees consisting of eminent personalities and a Decade Committee composed of 20 to 25 disaster mitigation experts from all parts of the world, serving in their personal capacities. Both would be supported by a small secretariat. A Trust Fund for the Decade should be established to support these entities as well as to promote projects of merit. The report also describes a mechanism to enable all prospective participants to contribute to Decade planning. This small and efficient organizational structure should prove effective in co-ordinating national programmes and global activities.

At our final meeting in Tokyo, the Group reaffirmed the importance of the Decade and urged that everything possible be done to sustain the growing momentum the concept has generated throughout the world.

Let me thank you again for providing the International Ad Hoc Group of Experts with the opportunity to clarify the means for implementing the International Decade for Natural Disaster Reduction. We hope that our report will be useful to you, and we stand ready, as individuals and as a group, to provide further assistance.

Sincerely,

(Signed) Frank PRESS
Chairman, International Ad Hoc
Group of Experts

I. INTRODUCTION

1. Each year, planet Earth experiences countless natural events: 100,000 thunderstorms; 10,000 floods; thousands of earthquakes, wildfires, landslides and tornadoes; and hundreds of volcanic eruptions, tropical cyclones and locust infestations.
2. In the past 20 years, these natural phenomena have killed perhaps 3 million people. About 1 billion have been adversely affected by natural disasters and have suffered homelessness, other devastating hardships, ill health and severe economic loss.
3. In 1988 alone, three major disasters captured world attention because of their enormous impacts on life and property. Hurricane Gilbert raged through the Caribbean, causing immense physical damage and economic losses running into the millions of dollars; floods in Bangladesh claimed 1,500 lives and severely affected 45 million people; and an earthquake in Armenia, Union of Soviet Socialist Republics, killed more than 25,000 people.
4. The international community has been generous in providing emergency relief to the victims of disasters, and its financial and human commitment has been increasing. But this action, concentrating on the immediate post-disaster phase, has not addressed the basic causes of the problem. Frequently not enough preventive action is being taken to reduce the vulnerability of human societies to damaging events. Although many natural events present the potential for loss of life and physical damage, the degree of vulnerability of a community can be reduced by coherent policy action. On the basis of these considerations, the General Assembly, at its forty-second session, adopted resolution 42/169, by which it decided to designate the 1990s as the International Decade for Natural Disaster Reduction.
5. The Decade is the first concerted attempt on a global scale to reduce the impacts of natural hazards. It aims to achieve this reduction by developing an integrated approach to the reduction of disasters' impacts on human life and on property. It could include action designed to stimulate and encourage improvements in data gathering, more widespread application of forecasting and warning technology, improved techniques for disaster preparedness, changes in public attitudes towards disaster reduction and increased community participation, training and education of an increased number of technicians and specialists, co-ordinated research, and like measures through programmes and projects at the international regional, national and local levels.
6. The Decade mainly addresses the rapidly acting natural hazards - earthquakes, tsunamis, volcanic eruptions, landslides, avalanches, tropical cyclones and other windstorms, floods and wildfires - as well as those impacts of drought and locust infestations that are amenable to the approaches being developed for rapid-onset events. The relative prevalence of these hazards and the possibility of new hazards arising from environmental change also merit consideration.

7. By chance or by design, disaster reduction has so far been event based; the Decade will promote an integrated approach to natural disasters by applying knowledge gained about one type of disaster to benefit those affected by others.

8. Humankind already possesses much of the knowledge needed to reduce suffering and property losses induced by disasters. In most cases, difficulties have arisen in applying this knowledge to protect both people at risk and the vulnerable places where they live.

9. A disaster can be defined as any disruption of the human ecology that exceeds the capacity of the community to function normally. A disaster is not the inevitable result of a natural hazard of great magnitude, and, conversely, a disaster can result from a natural hazard of relatively small magnitude. Thus a particular event may cause serious disruption in one community and require international assistance to restore the normal functioning of society; in another community, a like event may cause relatively minor disruption that could be settled with routine emergency management procedures.

10. Whether a community is at risk of a natural disaster is a function of the nature of the physical event (i.e. the hazard) and the vulnerability of the community to the hazard. The hazard can be quantified in terms of the physical severity of a natural phenomenon and the probability of its occurrence.

11. The vulnerability of a community is made up of the social factors that predispose the community to suffer the impacts of the hazard. Thus vulnerability depends on several factors: the perceived value of human life in the political system, population concentration, the degree of economic development, institutional efficiency, ability to respond to disruptions, the extent of modifications to the environment (both built and natural), and the structural integrity of individual elements at risk. For example, in an earthquake-prone region, dense population and social pressures to provide low-cost housing can lead to the construction of buildings that are unable to withstand an earthquake - despite the fact that earthquake-resistant structures are technically feasible and that policy makers are aware of the possibility and consequences of such an event.

A. Rationale for an International Decade for Natural Disaster Reduction

12. In recent times, the majority of the fatalities and the most damaging economic losses have been borne by the developing countries, and in the least developed and most highly populated regions the number of fatalities from natural hazards appears to be increasing. In addition to the lives lost, the casualties and the residual disabilities, the effects on the economy and the development of these regions are increasingly grave. Direct physical losses in addition to those caused by interrupting the economy, compounded by the costs of rebuilding homes and industrial facilities and of restoring water supply systems, health facilities and other infrastructure, too often represent a significant part of the gross national product. It is clear that natural disasters not only limit but actually set back

development. The longer-term impacts associated with increased health hazards, decreased agricultural production, loss of natural resources, interrupted economic development and a lack of confidence in investment in future development far outweigh the tangible losses at the time of the disaster.

13. The impacts on industrialized countries tend to be less serious than the impacts on developing countries. By and large, the industrialized country has the resources to give advance warning, plan and mobilize, and therefore minimize the impacts in terms of both human and economic losses. There are, however, many instances in which communities in industrialized countries are placed at undue (and often great) risk, and there are ample opportunities for further disaster mitigation.

14. A high level of environmental alteration often increases vulnerability to disasters (for example, deforestation exacerbates floods, altering steep slopes causes landslides, and overcutting vegetation and overgrazing may lead to desertification). Thus, unless there is a socio-political will and a means to direct development in a way that enhances collective security, development can increase vulnerability.

15. In both industrialized and developing countries, there is a reluctance to spend money to prevent disasters, especially when the frequency of hazardous phenomena is perceived as being low. After a disaster, however, policy makers tend more easily to adopt policies and make decisions in favour of preparedness and prevention activities. Long-term planning and disaster management should become a part of normal government administration and development policies.

16. Efforts to reduce the impacts of natural disasters will gain far wider acceptance if they are perceived as a means to protect economic development and improve living standards rather than to mitigate some hypothetical, localized and infrequent event. Too often, even large-scale investments for development have been destroyed by events that were natural in origin but that brought important negative consequences to a vulnerable society because of either human action or inaction.

17. The magnitude of the losses and the problems faced by vulnerable developing nations, and in many instances by industrialized nations as well, may appear to defy solution. The International Decade for Natural Disaster Reduction is an opportunity for the world community to use the knowledge gained in recent decades to reduce the damages from natural disasters while increasing the security of economic development efforts. For example, a flood control programme combining watershed management, reforestation, irrigation agriculture and land use planning can reduce disastrous flooding damage and promote a higher standard of living both within and beyond the area impacted. The implementation of an effective disaster prevention programme in many regions may require organization and education far exceeding the economic capacity and organizational ability of a single nation. Consequently, regionally integrated programmes will be needed.

18. The new ecological and economic interdependence of world communities does not allow any country to remain in isolation either to bear the consequences of natural disasters alone or to avoid the responsibility of caring for others.

B. An integrated approach to disaster management

19. The International Decade provides the broad vision and concrete actions that are needed to reduce the impacts of natural hazards on increasingly vulnerable societies. The Decade would employ an integrated approach comprising various efforts aimed at changing public attitudes towards hazard mitigation, creating programmes at the international, regional, national and local levels to implement effective mitigation strategies, co-ordinating research data gathering and information sharing, training more specialists and initiating pilot projects. The knowledge to reduce human and property losses substantially is available. The Decade is the time to apply that knowledge effectively.

20. Traditionally, a hazard-specific approach has been taken to disaster mitigation. For the Decade, whose goal, as identified by the General Assembly, is "to reduce ... loss of life, property damage and social and economic disruption caused by natural disasters", it is more rational to develop an integrated approach to disaster mitigation. This approach takes into account the similarities in impacts and in responses that transcend the differences in physical causes of the disasters.

21. In addition to addressing disasters in general, policy makers throughout the world should adopt an approach that integrates the full range of disaster management activities. The suggested activities can be classified as prevention, preparedness, relief, or research, and they apply to all physical classifications of natural disasters.

22. Prevention includes the following activities carried out well in advance of a possible disaster:

- (a) Development of scenarios of potential disasters;
- (b) Improved understanding of the risk by assessing the physical potential of natural phenomena that may affect communities (hazard mapping) combined with assessing population exposure and other indicators of vulnerability (vulnerability mapping);
- (c) Formulation of government policies and regulations;
- (d) Installation of detection and warning systems;
- (e) Education of the public and training of emergency teams;
- (f) Active prevention, including land-use restrictions, environmental management such as revegetation and reforestation, and application of structural engineering measures.

23. Preparedness includes the following activities undertaken during the pre-impact and impact periods:

(a) Operation of detection and warning infrastructure;

(b) Dissemination of warnings and instruction for actions to reduce impacts on the individual;

(c) Communication of information to and from communities at risk before, during and after the disaster.

24. Relief includes the following activities in the post-impact period:

(a) Provision of emergency post-disaster relief, including search and rescue, health services and lifeline reconstruction;

(b) Planning for and implementation of longer-term rehabilitation programmes.

25. Research includes the following activities aimed at eliminating gaps in knowledge and at providing new means to mitigate disasters:

(a) An increase in the knowledge base in specialized fields;

(b) Improvement of monitoring systems and data bases;

(c) An increase in the effectiveness of communications to communities at risk;

(d) Development and demonstration of new means for combating disasters.

26. The experience of the industrialized countries shows that there is considerable opportunity to reduce the vulnerability of a community even when there is no opportunity to modify the hazard itself. The technological expertise and knowledge are available but are not being properly applied. If brought to the attention of decision makers in both the developing and industrialized worlds, this body of scientific and technological information can help shift the emphasis of the world community to pre-disaster planning, preparedness and prevention while sustaining post-disaster relief capabilities. In fact, this changed focus is the major policy action required for a successful Decade. Its implementation will require:

(a) The involvement of all levels of the community, from worldwide down to the local level;

(b) Co-operative exchanges to disseminate existing knowledge on technical aspects and methods of education and information transfer;

(c) Co-operation to maximize research efforts and exchange ideas and techniques across disciplines.

27. These efforts require a high degree of world mobilization towards prevention and mitigation that is, to a policy based on pre-disaster action rather than on post-disaster reaction.

II. PROBLEMS AND OPPORTUNITIES

28. Natural disasters result from inadequate planning, preparedness and prevention measures. Hazards lead to disasters when a community is ill prepared, is exposed unnecessarily, is unable to provide or use warning signals effectively, and is unable to mobilize a prompt and effective post-disaster recovery effort. The key elements of preparedness - whether in an industrialized or developing country - are the same for all types of hazards. Although prediction capabilities have identified high-risk areas, often the impacts are particularly severe when the frequency of the hazard is low and preparedness is wanting. An integrated approach to hazard reduction, which addresses all aspects of vulnerability and emphasizes planning and preparedness, is the key to avoiding disasters.

A. Natural disasters included in the Decade

1. Natural disasters

29. Earthquakes, by their localized intensity and present unpredictability, are among the most devastating disasters of natural origin. They have been responsible for the death of perhaps 1 million people in recent decades. Certain areas of the globe, such as the Pacific rim, are known to be particularly at risk, but other areas reportedly not affected in recent centuries may be struck by unexpected seismic activity.

30. Volcanic eruptions can also have devastating effects, and there are major historical and recent examples of cities left in ashes or buried in volcanically induced mudflows. Although major disasters are rare because most volcanoes are remote from large population centres, the 1985 eruption of Nevado del Ruiz, Colombia, resulted in the loss of 22,000 lives. The potential for disasters remains significant, however, and mudflows induced by volcanic eruptions have caused major destruction.

31. Landslides are frequently caused by meteorological or seismological events that trigger the movement of unstable slopes. This instability is often exacerbated by the denuding of hills. Although the affected area is normally much smaller than in most of the other types of hazards, landslides are numerous and especially severe in densely populated areas, particularly in developing countries.

32. Tropical cyclones called hurricanes, typhoons and cyclones in different parts of the world, can have wind velocities approaching 350 kilometres per hour, rains exceeding 80 centimetres in just a few days, and storm surges of 8 metres covering hundreds of square kilometres. A single such storm can lead to more than 100,000 casualties. In addition to tropical cyclones, windstorms include localized

tornadoes that can create wind speeds of 500 kilometres per hour, leaving a wide swath of destruction in their wake. Thunderstorms can cause localized high winds and heavy rainfall, leading to flash floods. World wide, wind-related disasters cause an annual average of 30,000 deaths.

33. Floods, which stem from the extreme rainfall of typhoons, cyclones and monsoons, are the principal cause of cyclical catastrophes in certain areas. Riverine flooding is caused by heavy rainfall, protracted snowmelt, or a combination of the two. Floods can also be caused or exacerbated by changes to the earth's surface from improper farming practices, deforestation, wildfires, urbanization and unwise interference with the natural environment. Global warming has the potential for raising sea levels, thus exacerbating coastal flooding.

34. From 1930 to 1985, floods impacted on some 185 million people, with perhaps 20 million left homeless and about 30,000 dead. It is a matter of grave concern that such events are both more frequent and more disastrous in the developing countries, creating a virtual disaster belt around the equator. Expansion of cities and settlements into flood-prone areas is increasing the potential for flood damage.

35. Tsunamis, large oceanic waves usually generated by a submarine earthquake or volcanic eruption, increase in amplitude as they advance towards the shore, where they become extremely damaging. Most countries along the Pacific rim and all the Pacific islands are vulnerable.

36. Wildfires spread freely without control, scorching and devastating wide areas of land. There is no clear-cut difference between natural fires and those of human origin. As with other natural hazards, the location of communities in areas at risk is a pre-condition to disaster. The buildup of biomass fuels determines the intensity of wildfires, and the worst disasters occur where fires are infrequent. The phenomena that drive wildfires across the landscape are dominated by natural forces, including the availability of biomass fuel, which may be accumulated naturally or modified by people.

37. Drought is a complex environmental phenomenon, including long-term climatologic changes and wide-scale ocean/atmosphere interactions as well as ecological deterioration of human origin. The management of drought as a natural disaster has many factors in common with management of disasters of more sudden onset. Drought predisposes the environment to several rapid-onset natural hazards, including locust infestations and, in many instances, flash floods. Drought alone causes large agro-ecological damage and seriously disrupts socio-economic life. Over this century, droughts have tended to intensify as a result of accelerating deforestation and large-scale soil erosion, especially in Africa; their management globally has become a matter for urgent action.

38. Locusts are a significant threat to agriculture in central-eastern and north Africa, the Middle East and west Asia, periodically breaking out in swarming plagues. Locusts survive in remote, often semi-arid, areas where they escape detection and surveillance. Some swarms become as large as 40 to 80 billion

insects, weigh 80,000 tons, and devour this weight in food each day. They feed largely on grasses and related crops, taking the growing paths as well as the leaves, flowers, fruits and seeds. The losses sustained during an extended locust outbreak do untold damage to agriculture, livestock production and the forest ecology of a large geographical region.

39. Industrial disasters are included in the Decade to the extent that they can be triggered by natural hazards or are secondary to natural disasters. In addition, emergency planning, if well-designed for natural hazards, also serves in cases of industrial (technological) disasters.

2. Other disasters

40. The preceding sections describe a broad array of natural phenomena that often trigger disastrous events. The listing is not exhaustive; nor can it reflect future, as yet unknown, types of disasters. For example, a newly recognized hazard is the periodic and sudden release of trapped carbon dioxide from deep crater lakes, as evidenced by the outburst in Lake Nyos, Cameroon, that caused some 1,700 deaths in 1986. It is likely that within the Decade hazards that have been minor until now will become more prevalent and severe. This difference could be due to physical or biological changes in the environment because of degradation, warming or disproportionate growth in numbers of certain species of insects or other pests. The full implications of environmental degradation, and of global warming in particular, for causing natural disasters have yet to be appreciated.

3. Multiple disasters

41. Although the major disaster types are described separately, such natural catastrophes more often occur as complex, multiple, interrelated processes either concurrently or as chain reactions rather than as isolated and distinct phenomena. An earthquake triggers a submarine landslide, which also causes a tsunami, which generates floods, which destroy property and kill people. The strong winds of a tropical cyclone cause extensive damage, the associated storm surges flood low-lying coastal zones, and the associated intense rains induce flash floods and landslides where slopes are steep and basins are small. Volcanic eruptions are sometimes accompanied by severe lahars (avalanches of mud, melted snow, ice and volcanic debris) and mudflows as well as by floods from melted snow or wildfires in fire-prone vegetation. Secondary health hazards result from the application of chemicals for locust control.

42. Natural disasters can trigger major industrial calamities when vulnerable critical installations such as dams, pipelines, depots, and chemical plants are not adequately protected by engineering techniques.

43. This complex etiology of disasters, as well as common approaches to confronting the different hazards, suggest that the Decade will be markedly more effective if an integrated hazard management approach is taken.

B. Impediments to disaster reduction

44. Experience shows that, especially in developing countries, a number of impediments to effective disaster reduction must be combated if the Decade is to be successful. They often include the following:

(a) The conviction among governmental decision-makers and planners regarding the value of comprehensive disaster mitigation plans;

(b) The shortage of personnel trained in disaster mitigation techniques and of skilled disaster preparedness and relief personnel, leading to an understanding of disaster plans among those who are expected to implement them;

(c) The disaster prevention information in educational programmes;

(d) The serious difficulties of maintaining disaster awareness and developing an efficient warning system where disasters are potentially severe but infrequent;

(e) The reliable and detailed documentation of disasters, their effects, emergency plan and warning systems performance, and lessons learned in most developing countries;

(f) The limitation of disaster planning activities in most developing countries to emergency relief and their exclusion from economic development plans;

(g) Limited co-operation for disaster planning and preparedness as well as post-disaster relief among neighbouring nations in a region or among nations exposed to similar hazards;

(h) The growth of urban centres leading to population congestion and expansion into disaster-prone areas (e.g., flood plains, lowlands, coastal areas and unstable hill slopes);

(i) The understanding of the merits and relative cost effectiveness of planning and preparedness measures;

(j) Individuals' perceptions of costs and regulatory restrictions associated with many disaster prevention measures.

C. The Decade as an opportunity to link ongoing activities

45. Over the past two decades or so, the most effective disaster reduction programmes have introduced significant changes in the approach to natural disasters. Such programmes no longer consider disasters as an inescapable fate of nature but as phenomena often amenable to prevention and certainly to mitigation. Consequently, the response to natural disasters has shifted from post facto improvisation based on stereotypes to anticipation and a managerial approach based on research.

46. These new approaches are possible because basic research has contributed much to a better understanding of the causes of those natural phenomena which often result in disasters. Moreover, modern technologies have been developed that decrease the vulnerability of buildings and other elements of socio-economic life.

47. In some parts of the world, high, often capital-intensive, disaster management technology is being applied with considerable success. But damage levels continue to rise because of increasing pressures to build in hazard-prone areas and because of the proliferation of chemical plants and other potentially dangerous technologies. Engineering measures, unfortunately, often encourage complacency and disregard for preparedness and, as a result, can work at cross-purposes with damage reduction.

48. Warning systems have substantially reduced the losses from some hazards (i.e., floods, storms, drought and wildfires). There are opportunities to install existing systems in developing countries, to expand education programmes so that the population reacts positively to warnings, and to establish warning systems for other hazards as new knowledge becomes available.

49. The Decade must involve and build upon the strengths of existing programmes and institutions at the international, regional, national and local levels, including scientific and technological professional societies, voluntary organizations, United Nations sponsored and other international and regional programmes, business groups, and educational institutions.

50. It is envisioned that programmes for the Decade will include training and implementation related to strengthening existing structures and to building resistant structures and lifeline and health management systems, hazard mapping, land-use control, early warning systems, emergency preparedness, risk insurance, and recovery planning. Although much proven technology clearly exists, recent disasters point to the need for adaptive research and transfer of appropriate technology to areas that are less well prepared. Special emphasis must be placed on retention and ongoing training of personnel as well as on continued support for equipment and facilities.

D. The Decade as an opportunity to apply scientific
and technological breakthroughs

51. Recent advances in science and technology, including improved understanding of weather phenomena, the behaviour of the Earth's crust and factors affecting climate changes, have been made possible by enhanced data gathering, management and dissemination. In addition, improvements have been made in structural engineering, public education capabilities and training facilities. These advances in knowledge - from the causes of natural hazards, to means for predicting their onset, to techniques for resisting their forces - make launching the Decade propitious.

1. Information

52. New instruments and enlarged networks collect more and better data on natural phenomena and their intensity and occurrence than in earlier years. Improvements in computer-based data management have led to improved understanding of underlying phenomena such as the plate tectonics theory and to general circulation models of the atmosphere. There are opportunities in the Decade for extension and integration of existing data bases using advanced computer technology.

53. Another important breakthrough has been data gathering by satellite, which readily provides information globally. Satellite data, for example, are extremely instructive when coupled with ground truth data and remote imaging after a disaster. They are especially valuable when compared with data and imagery acquired at a time of normality (i.e., before a disaster). Enhanced co-ordination can ensure that the aggregate of future developments in observations from space will cover the world's most vulnerable areas with sufficient frequency to yield information of value to hazard warning in all regions at risk.

54. Satellites are a powerful new resource in weather forecasting and monitoring of drought, storms, volcanoes, locust swarms and wildfires. They are now used in the tsunami warning system and in weather monitoring. Satellites have many other applications in hazard reduction: mapping of land forms prone to landslides and flooding, monitoring fuel conditions conducive to the outbreak of wildfires, identifying the tracks of tornadoes where there are no reliable climatic records and providing information needed to determine likely directions for desert locust invasion.

55. Although the mitigation of atmospheric disasters has made much progress through regional and international co-operation in the World Meteorological Organization (WMO) World Weather Watch (WWW) system (for example, through the establishment of regional cyclone committees and warning centres and the construction of satellite platforms), in many countries the need for the establishment or improvement of early warning systems remains. WWW makes standardized weather observations, prepares weather forecasts and disseminates the data and forecasts globally. Owned and operated 160 centuries, WWW has three basic components: a global observation system, a global telecommunication system and a global data-processing system. It could be a prototype for other co-operative endeavours to enhance preparedness and early warning.

2. Structural engineering

56. Prediction of the onset of geological hazards has made little progress in recent years, and short-term earthquake prediction will probably not be achievable during the Decade, despite ongoing research. At the same time, however, earthquake-resistant design has proven very effective, and advances have been made in the design of buildings to resist wind forces, both at modest cost increments. This positive situation must be balanced against the reality of the existing stock of unprotected buildings that will require focused attention during the Decade.

Technical guidance and economic incentives will be needed to ensure that the currently vulnerable building stock is either removed or strengthened.

3. Public education

57. Inadequate preparedness and prevention measures against natural hazards aggravate disasters greatly. The community may be ill prepared, exposed and vulnerable, and may have little or no information on the nature of the hazard or what to do and be unable to mobilize a prompt and effective post-disaster recovery effort. Informed individuals will have taken preparatory steps to reduce hazard risks and will be able to take appropriate action when given a timely warning. Primary recovery and relief generally rest with the affected community, and adequate preparation of the public and training of the local community in rescue and self-help are critical to their safety and survival.

58. In many countries, the communications media are a major messenger. In addition to their conveying early warning and post-disaster information, they can contribute to public understanding of disasters and awareness of opportunities for self-protection. It seems natural that the media would become both the spokesperson in the event of danger and a conduit for a gradual education of the public about disaster preparedness and mitigation. The media can enhance public understanding and support for land use control, building regulations, evacuation, and other prevention measures.

4. Closing gaps in research

59. Although the application of existing scientific and engineering techniques to disaster management can reduce losses, there are still gaps in knowledge and failures in technology transfer. For instance, the mechanism of origin of some disaster phenomena, such as earthquakes and volcanic eruptions, is not yet well understood, making their short- or long-term prediction or assessment of disaster potential highly uncertain. Similarly, because the vulnerability of some populous areas is unclear, it is difficult to judge the cost effectiveness of potential mitigation measures. These points suggest that, in addition to application of existing knowledge, some part of the Decade's activities should address gaps in knowledge.

III. THRUSTS OF THE DECADE

60. In its resolution 42/169, the General Assembly specified several goals to reduce the loss of life, property damage, and social and economic disruption from natural disasters. For the Decade to attain these goals, a detailed implementation plan that is both feasible and cost effective will need to be developed after the General Assembly adopts a framework for the Decade at its forty-fourth session.

/...

61. The first point to be made relative to these goals is that disaster reduction is possible. Although the examples of successful mitigation given in this section for the most part relate to individual types of natural disasters, the lessons learned can apply to some degree to all disasters in all countries. The second point is that, given the limited resources available, integrated disaster preparedness is the appropriate course of action everywhere. Third, the recommended framework required for the Decade derives directly from the variety of actions, institutional structure, co-ordination and control necessary for integrated disaster management.

62. Transforming this framework into a plan of action with specific targets is necessary if the Decade is to be successfully implemented. Such a plan of action would set targets for activities in widely differing regions and at various levels, establish procedures for allocating resources and would suggest structures for co-ordinating activities. This report sets forth the recommended thrusts and framework for the Decade. As the next step, the Group of Experts recommends the development of a programme agenda for constructing a plan of action.

63. Even before this agenda is developed, the following priorities are evident:

(a) Recognition that proper attention and adequate resource allocations to planning, preparedness and prevention will ultimately lead to the reduction of natural disasters;

(b) A shift in emphasis to pre-disaster planning and preparedness while sustaining post-disaster relief capabilities;

(c) Public education to change society's perspective from fatalism to awareness of the opportunity for disaster mitigation and the role of individuals in protecting themselves;

(d) Development of scenarios of potential disasters to enhance disaster awareness and develop the means for confronting and reducing such events;

(e) Establishment and/or enhancement of early warning systems compatible with the requirements of the region;

(f) Development of reliable historical data bases for disaster risk assessment for use in land-use planning, engineering design and related codes and regulations to reduce vulnerability;

(g) The mapping of disaster-prone areas inhabited by large and vulnerable populations;

(h) Integration of disaster prevention and preparedness into the national and local planning processes;

(i) Enhancement of organizational strengths and training of specialists to improve disaster mitigation resources;

(j) Promotion and implementation of a regionally co-operative and integrated approach to disaster reduction;

(k) Promotion of increased technology and knowledge transfer to those at risk.

A. Benefits of improved risk assessment, early warning and response

64. Several recent events demonstrate the need to improve our understanding of disaster risk, increase the number of early warning systems, and be prepared.

65. In December 1988, northern Armenia, Union of Soviet Socialist Republics, was struck by an earthquake of about 6.9 magnitude. Tens of thousands of lives were lost, four cities and hundreds of villages were badly damaged or destroyed, and social and economic life was seriously disrupted. Intensive rescue and relief measures, including participation from about 70 countries, were undertaken. Most experts believe that better earthquake-resistant building designs and construction practices would have greatly reduced the consequences of that earthquake. Disastrous results also occurred in Mexico City during the 1985 magnitude 8.1 earthquake, whose epicentre was about 350 kilometres away from the city. Some 10,000 people died and damage totalled an estimated \$US 4 billion.

66. Much of the loss in these earthquakes could clearly have been averted had a better understanding of the risk been developed and appropriate preparedness measures been planned and undertaken. In particular, the consequences would have been less severe if existing methods of long- and intermediate-range earthquake assessment had been implemented and the results used to guide land-use planners, architects and civil engineers if existing building codes had been enforced more fully, and if the emergency communications system and rescue operations had been adequately planned. In particular, the understanding of the risk in Mexico City would have been greatly enhanced had more accurate studies been undertaken on microzonation - the identification and mapping of subsoil characteristics on a localized basis. The need for improved microzonation applies to many other natural disasters and hence to the advisability of launching a number of microzoning projects throughout the world.

67. Observation of earthquake damage points up the desirability of a concentrated mitigation effort at a specific site. For example, Mendoza, Argentina, a city near San Juan, frequently suffers serious earthquake damage, and it could be a test site for new mitigation approaches. The project would include drafting a modern building code, evaluating retrofitting procedures and educating professionals. These people, in turn, would train engineers and technicians who are, respectively, in charge of structural design and construction supervision and of quality control in construction.

68. These experiences also suggest that an early priority for the Decade should be to draft model scenarios and protocols for mutual assistance, including guidelines for identifying needs and for developing assistance agreements between and among nations. (See appendix I, paras. 3 and 4.)

69. Hurricane Gilbert, the strongest hurricane experienced in the Caribbean since scientific observations began, affected Jamaica and the Cayman Islands in 1988 but led to surprisingly few deaths there. In Jamaica, the death toll was only 45, and in the very exposed Cayman Islands there were no deaths. In comparison, Jamaica lost more than 150 people in a weaker hurricane (Charlie) in 1951, when the population was only half that of 1988. The main cause for this lesser number of casualties was improvement in the warning system made possible by space technology, coupled with a regional system for the timely delivery of warnings to the threatened countries and, in the case of Jamaica, better knowledge of areas at high risk from flooding. In addition, Jamaica and the Cayman Islands had developed national emergency response procedures and increased public awareness of both the threat of severe weather and hurricanes and the need for planned responses to the warnings at the individual, family and organizational levels. In both Caribbean countries, these relatively low-cost measures reduced injuries and the number of deaths.

70. Similar examples from other areas at high risk from cyclones, including Hong Kong, Cuba and the Philippines, demonstrate the fact that the loss of life, injuries and certain types of economic damage can be significantly reduced by the systematic application of risk assessment techniques, better warning systems and planned responses.

71. In November 1970, a tropical cyclone coincident with a high tide and heavy rainfall occurred in Bangladesh, leaving more than 300,000 dead and 1.3 million homeless. Adequate warnings had been issued by the Chittagong Meteorological Office at the time, but many people were unwilling to leave their homes. In May 1985, a cyclone of comparable strength and a storm surge almost as great as the one in 1970 struck the same area; the loss of life, although still substantial at 10,000 deaths, was less than 5 per cent of that in 1970. The difference related not so much to a failure in hazard prediction or in official warnings in 1970 but to the combined effects of some improvements in 1988 in hazard prediction, better local dissemination of disaster warnings and a better prepared public responding to the warnings.

72. These examples demonstrate the value of regional monitoring arrangements, improved risk assessment, accurate forecasting and prediction and well-designed systems to facilitate timely and credible warnings. Equally comprehensive programmes in other cyclone-prone regions should produce comparable results. Similar techniques applied to other hazards are also possible. These cases also demonstrate the importance of involving behavioural scientists and communication specialists in ensuring that the population at risk comprehends and responds appropriately to warnings. Public education to ensure optimal use of warning messages needs to be accepted as an integral component of warning systems.

73. Efficient early warning technologies for a variety of natural hazards are used in many parts of the world. Wider implementation of such systems, combined with community preparedness to respond to warnings, could considerably reduce natural disasters. These systems are cost efficient because they are based on existing communication systems and inexpensive computer facilities.

74. All warning systems consist of a basic framework that can be implemented in a variety of settings:

- (a) A broad spectrum of monitoring techniques, ranging from highly technical instrumentation to simpler monitoring devices and local observations;
- (b) The transfer of monitoring data and/or observations to an evaluation body;
- (c) Prediction or forecasting of impending hazards based on the data received;
- (d) Issuance of the warning to communities and the public at risk.

75. Because warning systems employ a wide variety of audiovisual media, these systems should be evaluated early in the Decade in terms of individual countries' needs. National and regional hazard specialists, communications technicians and media experts would begin in selected areas at risk (for example, key coastal zones for tsunamis), with some assistance from countries with pertinent experience. In many instances, such systems could be built upon existing communications systems. (See the description of Iceland's programme in appendix I, para. 2, for example.)

76. The marginal costs for many new warning systems would be low because the communications technology is in place and labour could be provided as a supplement to existing forecasting and communications services. The projects should yield significant benefits in high-risk areas where evacuation or access to safe shelter is a feasible response to the hazard.

B. Benefits of integrated disaster management

77. The advantages of an integrated approach to earthquake management can also be seen in the actions taken in Japan and Argentina and the resulting reduction in lives lost and property damaged.

78. Japan is highly exposed to natural hazards. In the great earthquake of 1923, more than 140,000 died and the damage to property was immense. From 1966 onward, following implementation of the Disaster Countermeasures Basic Act of 1961, disaster statistics decreased steadily. A specific demonstration is the magnitude 6.6 earthquake that occurred with its epicentre near Tokyo in 1987. Two people died, 10 were injured, and the damage was negligible.

79. San Juan, Argentina, was destroyed by an earthquake in 1944, exacting a high toll in life and property. The city was rebuilt according to modern earthquake-resistance standards. When a more severe shock struck the area in 1977, the damage was much less than in 1944 except for some adobe houses that had survived the earlier earthquake.

80. In both Japan and Argentina, community vulnerability had been escalating, and the planning and preparedness after the first earthquake was successful in reducing vulnerability.

81. A more complicated demonstration of the need for planning and preparedness occurred in July 1988, when Bangladesh was ravaged by the most severe flood recorded within its borders. Snow melt and intense rainfalls prevailing over the two major river systems (Brahmaputra and Ganges) raised the water levels dramatically. Three-quarters of the country's land was inundated, more than 1,500 lives were lost, and nearly 45 million were adversely affected.

82. The July 1988 flood in Bangladesh could not have been prevented, but the magnitude and severity of damage resulting from the uncontrolled nature of this particular incident are susceptible to reduction measures. There is no easy solution to this complex problem. Although flooding in low-lying Bangladesh is necessary for rice production, its proper control is required. This effort would entail concerted basin-wide land-use planning and watershed management by Bangladesh and the neighbouring countries. Such a strategy would require key capital investments in the form of interconnected storage and transfer dams and canals as well as other flood control structures in the upland and flood plain areas.

C. Benefits of hazard modification

83. Disaster preparedness through accurate prediction, timely warning and adequate response capability can substantially reduce the loss of life, but it is less effective in reducing property damage. Often the magnitude of a natural hazard is so great that damage is inevitable. In other instances, however, technological intervention can significantly cut potential economic losses. Such reduction may require direct hazard modification by land-use planning and other techniques as well as the introduction of known disaster-resistant construction. As an example of direct hazard modification, flood control consists of major civil engineering construction (for example, dams or embankments) or reforestation and erosion control. Such capital intensive public works are promoted under existing United Nations programmes. A major concern of the Decade should be the co-ordination of the planning and operation of such major projects with other disaster reduction proposals.

84. Improved land-use planning and more stringent building regulations in areas of high risk have effectively reduced the impact of many types of natural disasters. Some of the most spectacular examples relate to earthquakes, as cited earlier.

85. The value of land-use planning in disaster reduction is also apparent in the case of landslides. In Japan, more than 9,000 homes were lost, and more than 600 people killed in 1938, but since legislation for land-use planning and slope control was introduced in 1958, only 1,300 homes were destroyed and 330 people killed in 1982, the worst year for landslides. The benefits of legislative control for landslide damage are also illustrated by the experience of Los Angeles, California, United States; damage from severe storms in 1978 was 10 times greater at sites developed prior to the legislation than at sites developed afterward.

86. These examples reinforce the importance of more extensive application of existing knowledge, extensive disaster preparedness education and demonstration projects to facilitate technology transfer.

D. Benefits of locust research

37. The desert locust outbreaks from 1986 to 1988 in many countries of the Sahel sharply reminded the world of the major hazard this locust, as well as other major locust pests, constitute to agriculture and to food production in particular.

38. Present control, which consists of large-scale spraying of locust swarms and hopper bands with insecticides, is known to have shortcomings. It is not particularly effective in physical terms because the control it achieves is not sustainable. Nor is it cost effective because of the changing nature of this moving target. There is also widespread concern about the environmental consequences of repeated insecticide applications and the accumulation of certain persistent chemicals in fragile ecosystems.

39. Development of an alternative biologically oriented means of control is a high priority. Its aim would be to reduce the locust population buildup in the breeding areas, eliminating or forestalling the initiation of swarming, and destabilizing sexual maturation and egg laying.

40. Research proposals for developing technology packages for sustainable locust and grasshopper management have recently been put forward at scientific meetings in Africa and elsewhere. They consist of investigation and adoption of a new integrated pest management strategy from the following five promising options, which concerted research and development efforts should make available:

(a) Biological control of locusts and grasshoppers to reduce viability and multiplication of recession populations and to enhance virulence of locust pathogenic agents;

(b) Use of pheromones and kairomones to control locusts by disrupting or modifying their specific behaviour leading to swarming, synchronization of maturation and egg laying, and initiation of marching among immatures;

(c) Effective use of endocrinology to control locust phase change and gregarious behaviour patterns through the use of hormone analogues and antihormone agents to interfere with the process of phase change;

(d) New approaches to the use of baits, especially chemical attractants, encapsulation of pathogenic material, and other alternative products;

(e) Use of weather-dependent population dynamics and simulation modelling to predict population trends in recession and thus to facilitate control in the early stages of outbreaks.

91. Such programmatic thrusts for the Decade should soon lead to a considerable reduction in deaths and casualties, societal disruption and economic losses from natural disasters. To be successful these programmes should be interdisciplinary, bringing together a diversity of expertise. The programmes will require the commitment and co-operative effort of many individuals and institutions at both the international and national levels.

IV. PARTICIPANTS IN THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

92. This section discusses the organizations - international and national entities, regional groupings, professional bodies and others - that can, and should, contribute to a successful Decade. Although many of them are contributing significantly to disaster mitigation, a constructive and co-ordinated effort can achieve a level of accomplishment that is not possible by the individual groups or countries acting alone. Examination of this whole range of institutions, in terms of a concerted global effort in early warning and preparedness, crisis management, loss mitigation after the event and public education to prevent losses from natural disasters, has not been attempted in a comprehensive manner. Nevertheless, it is apparent that many organizations within the United Nations system are already playing a significant role in various aspects of disaster reduction, and a variety of international scientific, technological, humanitarian and business organizations are actively engaged in reducing disasters. The International Council of Scientific Unions (ICSU), among others, has already strongly endorsed the Decade and is undertaking detailed preparations for its participation.

93. It is essential that the knowledge, skills and resources, motivation and dedication of these organizations and their capacity to translate these opportunities into cost effective, timely and continuing programmes of natural disaster reduction be brought to bear on the challenge of the Decade.

A. United Nations system

94. The United Nations and its system of organizations are uniquely placed to play a leading role in the Decade through their expertise in social, health, economic and technical sectors, including disaster management and mitigation. This role stems from the organizations' global and regional structure, their general and specialized interests in many fields and their various operational activities in areas of concern.

95. Organizations of the United Nations system, both individually and collectively, have operational and programme management capabilities that can be applied to the Decade. Through field, regional and headquarters operations, the organizations of the United Nations system are aware of the needs of disaster-prone developing countries and are important participants in development activities. With such representation, they can encourage disaster awareness in the development programmes of individual nations.

96. The United Nations and its system of organizations are well placed to serve as a primary agent for the exchange and dissemination of information concerning natural disaster reduction. Through its information centres network, it reaches the opinion-forming media in both developing and industrialized countries. Moreover, United Nations specialized agencies have extensive contacts with scientific and technological institutions as well as with health services, many of which will be active in the Decade. The United Nations, therefore, can amass data about the plans and activities of all Governments, organizations and institutions taking part in efforts to reduce the loss of life, property damage and social and economic disruption caused by natural disasters.

B. United Nations system in relation to national activities

97. The organizations of the United Nations system are an important agent for the transfer of information and technology regarding natural disaster reduction; this function is especially important because many potential users may be unaware of what is available. The sensitivity of the United Nations to the cultural and economic diversity of nations will prove useful in this regard.

C. The Decade within the United Nations system

98. Responsibility for preparations for the Decade was assigned by the Secretary-General to the Director-General for Development and International Economic Co-operation and to the United Nations Disaster Relief Co-ordinator.

99. Each organization of the United Nations system would prepare its own action plan for the Decade in the context of the overall programme for the Decade. Co-operation among these organizations is essential, and a United Nations system co-ordination mechanism would facilitate interaction.

D. National entities

100. A measure of success of the Decade will be the implementation within national borders of changed approaches to disaster mitigation, beginning with an integrated natural disaster management orientation and an increased focus on planning and preparedness. Governments will take national responsibility for implementation of programmes for natural disaster reduction, and meeting Decade goals will require the establishment of national entities that can bring together the full range of skills needed. These national entities may well differ in composition and functions in different countries but in general will promote the activities of the Decade, advise their Governments on priorities for the Decade, programmes, and projects most appropriate for their countries, and serve as points of contact with the international and regional elements of the Decade.

101. Each country will need to decide how best to structure and finance a national entity. Common to all, however, will be the pooling of resources and skills needed

to develop successful integrated disaster reduction programmes, including planning, science and technology policy, research, public education and information dissemination. Links are needed with experts in a wide range of scientific, engineering and health disciplines as well as with investment banking, private and professional associations, voluntary agencies, the media, educational institutions and other entities whose actions can effect disaster reduction. Links with the donor community are also important to the success of national entities.

102. The national entity could be within or outside a national government. Committee members could include representatives of government, academic, research, and professional organizations and other interest groups. The latter could include the financial and insurance sectors and community voluntary and other non-governmental organizations experienced in dealing with populations at high-risk locations. Official representatives could come from agencies responsible for meteorology, seismology, emergency management, land-use planning, building regulations, health services, legal affairs, civil protection, public works and public utility policy. The national entity must be capable of interacting with the scientific and professional communities and with the public to promote and facilitate achievement of Decade goals. Governments may wish to review the national entities already established.

103. The second essential element of a national entity is that it is linked to community level natural disaster mitigation efforts, the organizational structure of the Decade and regional institutions associated with the Decade. In this way, the national entity would establish a framework for activities for the Decade at the national and local levels and would link the regional and international organizations dealing with the Decade. It would also provide a mechanism for determining priorities and new programme initiatives, provide the means for mobilizing knowledge for natural disaster reduction and personnel training, and identify financial resources for supporting programme activities of the national entity and their regional and international extensions.

104. Whatever the organizational structure of these national entities, each should:

- (a) Develop a national plan for activities of the Decade;
- (b) Co-ordinate policy analysis, development and legislation regarding natural disaster reduction, monitoring, early warning and forecasting, evacuation planning, relief and rehabilitation;
- (c) Create and/or improve the awareness of the public and of governmental officials of the great loss of life, property and quality of life through natural disasters;
- (d) Develop logistic support and a legislative framework for effective disaster reduction measures;
- (e) Evaluate national programmes in terms of goals of the Decade;

(f) Bring donors and benefactors together for concerted action to support the Decade and permanent activities thereafter;

(g) Encourage preparedness through the development of localized quick-response self-help strategies;

(h) Promote research, development and technology transfer to fill the gaps in knowledge related to natural disasters.

E. Regional groupings and bilateral and multilateral arrangements

105. Although national entities are the foundation of the Decade, they must be able to interact with regional groupings often organized around concern for common hazards. (See appendix II for a brief description of regional hazards and needs.) These groupings provide the means for addressing hazards whose impacts transcend national boundaries and for developing common solutions to shared hazards. Occasionally, the grouping is one of shared interests or complementary resources rather than geographic proximity, and the basis may be historic and/or cultural relationships as well as shared risk.

106. Bilateral agreements between the donor community and developing countries commonly deal with investments critical to a community after a natural disaster. They include hospitals, power stations, schools and other public buildings used as refugee or emergency housing, infrastructure, including water supplies, and communications. Multilateral aid programmes should be exploited to give greater attention to the role of disaster reduction in social and economic development. Donor and developing countries should protect these investments through design and location of projects as well as through bilateral educational exchange. Common approaches to disaster research and management may be most productively handled at the regional level, where bilateral and multilateral lending and investment institutions can contribute to the discussion of common concerns.

F. International scientific and technological organizations

107. Many independent physical and social scientific as well as technological and professional organizations have historically engaged in multilateral projects geared towards natural disaster reduction. Most of these organizations lie within ICSU, the World Federation of Engineering Organizations (WFEO) and the Union of International Technical Associations (UATI). ICSU has already defined research projects that would close some of the crucial gaps in the scientific base necessary for reduction of natural disasters. Many other organizations have expressed support for the Decade; some are already planning activities for the Decade, which would be conducted by researchers at academic institutions and practitioners in industry and elsewhere.

108. In addition to their traditional role of advancing the fundamental understanding of the natural phenomena that cause natural disasters, the international physical and social scientific as well as technological and professional organizations would also:

(a) Create awareness of and interest in the Decade through their international meetings and forums;

(b) Encourage their memberships to promote and participate in the formulation of national entities;

(c) Suggest criteria for selection of projects and other activities for the Decade;

(d) Support the development and/or enhancement and standardization of scientific and technological data bases that will ensure a common foundation for future activities;

(e) Participate in planning pilot projects that could provide visibility to the Decade while providing a measure for accomplishment;

(f) Undertake pilot projects that, if successful, would be broadly replicable;

(g) Develop international and regional co-operative research projects and training courses to close the knowledge gaps directly related to objectives of the Decade.

G. Research and academic institutions

109. Many governmental, intergovernmental and international institutions as well as most universities undertake research that is important to disaster preparedness, information transfer and training. They therefore present a most important source of basic knowledge and technological expertise for the Decade, and they should be brought into the mainstream of activities during the Decade.

H. Other sectors

110. Other sectors have a part in the reduction of natural disasters. They can do much to reduce the losses from such disasters.

1. Insurance

111. By virtue of its risk coverage in all fields, particularly life and property, the insurance industry is interested in the prevention and reduction of natural disasters. Thus it can be expected to play an active role in any initiative leading to early warnings and to improved safety standards for buildings, energy

systems and other infrastructure. Closer collaboration within the industry, its own research into causative factors, and scientific research on natural hazards are essential to insure against risks, some of which are becoming almost uninsurable. Premium discounts and other incentives for introduction of safety features and improved building standards could be developed further to ensure an equitable balance between the profits to the insurers and the benefits to the insured. Industry funding of basic research on disasters in general should be possible.

2. Banking and other financial institutions

112. As with insurance, the banking industry and other financial institutions can influence what is built by lending only when projects meet disaster-resistant standards. The adoption by Governments of national building codes and land-use plans will promote disaster reduction and enhance the investment climate.

113. Another important function of the banking industry is lending money for post-disaster recovery. In this sense, banking is complementary to the insurance industry, but it can be a more active participant in reconstruction and development. The World Bank, for example, provides loans for reinvestment after natural disasters, not for relief, which incorporate measures that will assist in reducing future disasters. In the long run, disaster reduction is cost effective and of benefit to all parties. In the short term, developing countries must have the opportunity to participate fully in disaster reduction programmes without detracting from their basic development efforts.

3. Communications media

114. The media play an important role both in informing the public about disaster situations and in mobilizing public opinion in the mitigation of their efforts. The famine in Ethiopia from 1983 to 1987 and the floods in Bangladesh in 1988 are noteworthy examples. In some areas, the media are already integral to early warning systems for locust outbreaks, wildfires, floods, hurricanes, tornadoes, and volcanic eruptions. Where it is feasible, the support of the media in disaster prevention and post-disaster mitigation should be solicited.

115. Advanced telecommunications, in addition to helping educate the public and providing timely warnings, can be applied to international disaster relief. The ability to restore shattered communications - data, voice and video - at times of emergency is growing rapidly through small satellite up-links. In the main, these benefits can be achieved with small add-ons to existing systems. In the past few years, dramatic changes have taken place to reduce the scale and cost of equipment needed to communicate internationally.

4. Other industries

116. Industry can contribute to the mitigation of natural disasters in several ways:

- (a) Building to disaster-resistance standards;
- (b) Developing disaster-resistant materials and construction systems and promoting their appropriate use by architects, engineers, and contractors;
- (c) Developing environmentally acceptable insecticides and chemical retardants for emergency use against locusts and wildfires;
- (d) Developing and producing special emergency equipment for rapid deployment in disaster areas.

In addition, industry has a societal obligation to recognize and plan for the tragic consequences of technology failure initiated by a natural hazard. In doing so, industry should work closely with disaster management authorities.

I. Civil protection and voluntary organizations

117. During the Decade, numerous civil protection and voluntary organizations will make special efforts to improve their disaster readiness through planning and communication with the public. Some of these organizations are undertaking education and training for disaster management. Their activities are particularly important in disaster-prone developing countries, and their participation in the Decade should be actively sought. It is also essential that civil protection agencies plan and legislate for disaster relief to ensure wise decisions on offers of assistance from foreign countries.

118. Civil protection agencies that participate in the International Civil Defense Organization (ICDO) are recognized as post-disaster relief bodies, but in many countries they undertake important disaster preparedness functions. They establish and maintain warning systems and public shelters, plan evacuation procedures and emergency communications, train relief personnel and co-ordinate disaster management. Because they have been involved mainly in planning and preparing for impending disasters for which the response is often implemented by other organizations, they should now be actively encouraged to become involved in an integrated approach to disaster management.

119. At the international level, a considerable number of voluntary agencies is engaged in disaster relief and to some extent in disaster preparedness and mitigation. Many of them are members of the International Council of Voluntary Organizations (ICVA). Major international voluntary organizations are increasingly recognizing the importance of disaster preparedness. The Decade should be instrumental in fostering initiatives in this area and in pooling financial and human resources.

120. The League of the Red Cross and Red Crescent Societies (LCRCS) is a member of ICVA. The League functions through its national societies, each of which could develop a preparedness plan, train relief personnel, implement pre-disaster measures such as stockpiling relief goods, plan emergency transportation and participate in national committees.

121. In addition to organizations affiliated with the League, most countries have other voluntary organizations involved in disaster preparedness and relief. To strengthen the role of these organizations, co-ordinating committees might help train them in disaster preparedness and relief operations. These voluntary organizations would thus be an important asset in providing self-help at the national level in case of disaster and in increasing public awareness in disaster prevention and preparedness. Their resources should be organized to facilitate rapid co-ordinated deployment in case of disaster. Co-ordination, which is particularly important for disasters requiring international response, should precede the departure of volunteers from their own countries.

122. In several countries, such as China, Italy, Iceland and Japan, volunteer groups are organized to reduce damage from natural disasters. Most of their activities are directed to protecting life and property and to providing public education and training for disaster management. Organizing disaster volunteer groups in these countries will be one of the more significant tasks to be promoted by the Decade.

J. Donor organizations

123. In its resolution 42/169, the General Assembly recognized the fact that national authorities bear primary responsibility for implementing activities of the Decade. In many instances, particularly in developing countries, external resources will play an important role. One such role would be support for the education and training of personnel from the developing world in scientific, technological, health and operational matters relating to disaster reduction. Funds may be made available through either a formal bilateral arrangement or a United Nations system programme. Non-governmental organizations can also make an important contribution.

124. International, regional and national funding organizations should consider embodying natural disaster reduction elements in their activities.

V. ORGANIZATIONAL CRITERIA AND CONCEPTS

125. The International Decade for Natural Disaster Reduction depends for its success on the wholehearted participation of the people of the world, with the assistance of experts from many fields - governmental and non-governmental organizations at the national, regional and international levels, all countries, and various funding sources. Institutional arrangements should be sufficiently

flexible to facilitate and encourage the widest possible range of actions, while ensuring the development of integrated multihazard programme.

126. Organizational arrangements must ensure the full participation of the following:

- (a) National Governments;
- (b) Experts from many fields (for example, science, engineering, education, health and disaster management);
- (c) All the relevant bodies of the United Nations system;
- (d) Non-governmental organizations, voluntary groups and scientific and engineering societies, including those under ICSU, WFFO and UATI umbrellas;
- (e) Multilateral and regional intergovernmental organizations both within and outside the United Nations system;
- (f) Economic sectors impacted by disasters, such as insurance, banking, construction, agriculture, tourism and communications;
- (g) Regional funding organizations.

A. National arrangements

127. The success of the Decade and the continuity of its programmes will be determined to a large extent by what individual countries and, indeed, by what communities do. Within a community, everyone must understand the risks and know what to do in the face of a disastrous event. In addition, because many natural hazards affect more than one country, bilateral and regional programmes are important.

128. In its resolution 42/169 the General Assembly encouraged the establishment of national committees to co-ordinate activities for the Decade. Because the most extensive and important efforts to mitigate the impacts of disasters must be undertaken at the national and local levels, there must be arrangements for bringing together national and local experts and organizations to facilitate effective interaction with national, regional and international programmes.

129. The mechanisms for fostering and co-ordinating national entities will vary from one country to another. Generally, they should co-ordinate their countries' participation in the Decade and work, at its national level to achieve objectives of the Decade, including:

- (a) Bringing together their countries' experts and institutions for natural disaster mitigation;

(b) Working towards the early development and adoption of a national plan, which will focus national attention and provide a means for countries to interact with each other;

(c) Improving societal attitudes and preparedness to confront natural disasters;

(d) Bringing donors together in a single forum with other participants in the Decade for concerted action on natural disasters;

(e) Reaching beyond national boundaries for effective participation regionally and globally through establishment of formal liaison with the international organizational structure of the Decade and through participation in regional and international forums dedicated to issues examined during the Decade.

B. International arrangements

130. Co-ordination among national entities and global activities requires a small and efficient international organizational structure. The Group of Experts recommends the creation of a board of trustees of the Decade consisting of internationally eminent personalities, a committee of the Decade composed of disaster mitigation experts, and a small secretariat. A trust fund should be established to support the board of trustees, the committee, the secretariat and activities for the Decade. The trust fund should be able to receive funds for special projects.

131. The goals of the Decade must mobilize governments, industries, the mass media and other groups so that they work together to reduce the suffering and economic impacts of natural disasters. Indeed, the Decade must be so visible that people the world over identify with it and face up to the potential for disasters in their areas. To ensure their widest applicability, goals and programmes should be reviewed by prominent individuals from the scientific, technological and political communities.

1. Board of trustees of the Decade

132. A board of trustees should be established, with the following responsibilities:

(a) To advise the Secretary-General on goals and objectives of the Decade and evaluate the overall programme;

(b) To enhance public and national awareness and provide visibility to the Decade;

(c) To encourage involvement of not only national governments but also the private sector;

(d) To work with the Secretary-General to develop a trust fund, seeking support from national governments, industry, foundations and other potential sources;

(e) To advise the Secretary-General on the membership of the committee of the Decade to ensure both technical competence and balance;

(f) To evaluate the performance of the activities of the Decade.

133. Members of the board of trustees should be appointed by the Secretary-General. Each should serve for three or four years. The 5 to 10 members should be internationally eminent personalities, such as former heads of State and leaders from academia, industry and the broadcast and print media. The board should meet annually, perhaps more frequently in the early years of the programme.

2. Committee of the Decade

134. Within the organizational structure proposed for the Decade, the focus of many of the regional and international activities and the sounding board for the overall programme is the committee of the Decade. Members of the committee should be appointed by the Secretary-General upon the recommendation of the board of trustees. The committee, consisting of scientific, technological and other professionals from throughout the world, must reflect the different interests and needs of individual countries and regions. Although most projects will be developed at the national level, the committee should develop and monitor a plan of action that takes into account the national, regional and global programmes of organizations of the United Nations system, other donors and non-governmental organizations.

135. The primary responsibilities of the committee would be:

(a) To develop and maintain a plan of action, including subprogramme plans in such areas as research and engineering, early warning systems, public education, disaster preparedness and relief;

(b) To develop an inventory of national and regional projects in co-operation with the appropriate national entities and other participants;

(c) To assist in the co-ordination of activities of the Decade, developing links with existing programmes;

(d) To identify areas in which knowledge or capability for implementing disaster reduction activities can be improved and make recommendations to organizations of the United Nations system and both governmental and non-governmental groups for developing plans in these areas;

(e) To assess programme funding requirements and bring to the attention of appropriate national and international funding sources meritorious projects that require funding;

(f) To assist the board of trustees in programme evaluation and preparation of an annual report to the Secretary-General.

136. Committee members should reflect a wide range of expertise, and they should act in their individual capacities. The committee should consist of 20 to 25 experts from the scientific, technological, financial, communications, health and other communities with experience related to disaster reduction. Representatives of organizations of the United Nations system, international agencies and appropriate international non-governmental organizations should participate in the proceedings of the committee.

137. The committee should meet at least annually, more often during the first few years of the Decade. Committee members should serve for two years, and their terms may be renewed. The committee should elect a chairman, one or more vice-chairmen, and a rapporteur; they will provide continuity between meetings.

3. Secretariat of the Decade

138. The committee will require a secretariat. A senior technical expert should be appointed as its director by the Secretary-General upon the recommendation of the board of trustees. The director should have access to the Secretary-General. The secretariat would provide staff support for meetings of the committee and the board of trustees as well. A major role of the secretariat would be day-to-day co-ordination of the overall programme with guidance from the committee of the Decade. The secretariat would monitor Decade activities and report periodically to the committee. An early activity for the secretariat would be the organization of an international forum. The decision of where to house the secretariat would be left to the Secretary-General in consultation with the board of trustees.

139. The staff of the secretariat should be small at the outset and gradually build to approximately 10 professionals. The director may use consultants in areas of expertise not covered by staff. The secretariat should be funded from the trust fund, which, in turn, would draw on governmental and other sources.

4. Trust fund for the Decade

140. Most activities will be funded by the countries themselves. However, certain projects of merit will need financial assistance, as will the programmes of many developing countries. This funding should be derived from donor countries, the World Bank, regional banks and other regional organizations, UNDP and the regular and technical assistance budgets of other United Nations agencies, and non-governmental organizations.

141. The board of trustees and the committee of the Decade should encourage donor countries and other funding organizations to meet periodically to discuss the possible funding of programmes and specific projects suggested by the committee and national entities. Through such meetings, concerned countries and organizations

would not only ensure co-ordination of their activities but would also be able to evaluate plans of the committee.

142. The trust fund would cover expenses of the board of trustees, the committee and the secretariat and pay for special projects of merit for which funding would not otherwise be available. Because both governmental and private funding organizations may wish to designate funds for particular projects, the trust fund should be organized to facilitate such an arrangement. The fund should be administered by the Secretary-General, based on a plan developed by the committee of the Decade and endorsed by the board of trustees.

C. Proposed activities for the initial phase of the Decade

1. International and regional forums

143. It is anticipated that participants in the Decade would come together periodically through international and regional forums. At such forums, participants could share their experience and recommend priorities for activities of the Decade.

144. Once the board of trustees and the committee of the Decade are constituted and the secretariat is established to support their needs, co-ordinated work could begin on developing a detailed programme plan for the Decade and convening an international forum. Participants in this forum should be drawn from each of the national entities as well as from regional groupings, the board of trustees, the committee and the secretariat. In addition, representatives of donor organizations and others taking part in the Decade should participate in the forum. The first international forum, which should be held early in the Decade, would provide an opportunity for participants to discuss the goals of the Decade with all countries and non-governmental groups. It would also enable participants to propose programmes and activities for the Decade and to learn about activities presently under way or being planned throughout the world.

145. An international forum would be an efficient, low-cost way for all nations to participate in the planning process for the Decade and to learn how they might benefit from activities planned for the Decade. It would provide access to a wide range of ideas emerging throughout the world and would help in the international co-ordination of the many national programmes. Costs for participation in a forum could be borne by each country as a part of its national programme, with the expectation that some costs could normally be borne by donor groups and host countries.

146. The international forums could facilitate and complement the work of the committee. These forums could create and maintain global awareness about the need for the Decade and its activities, could propose programmes and activities for consideration by the committee, individual national entities, and regional groupings, could assess the progress of Decade programmes, recommending changes in their functioning, and could highlight programme achievements.

147. The first international forum should be planned to ensure that it is a cost-effective contributor to the Decade. It is essential that the committee develop a precise agenda with clear objectives.

148. There is also value for regional forums to disseminate information from the international forums and to suggest agenda items for inclusion in subsequent international forums. In addition, regional forums focusing on the hazards most common to the region would be an efficient mechanism for co-ordinating and developing integrated programmes among countries in the region.

149. The regional forums could clarify national perspectives on each hazard and the strengths and weaknesses of existing programmes for natural disaster reduction, could determine needs and priorities, could develop an integrated regional perspective, could facilitate co-operation and could identify technology transfer needs that could be met from outside sources.

2. International day for natural disaster preparedness

150. The failure to learn from past disasters contributes to continued heavy tolls from natural hazards. The loss of life and property would be much reduced if people were periodically reminded of and well-prepared for disasters. Designation of one day in the year as the "international day for disaster preparedness" would help achieve this goal.

151. During this special day, public drills for disaster preparedness, demonstration of disaster countermeasures by agencies and organizations responsible for disaster mitigation, educational programmes through the media and in the schools, practice in evacuation, and other activities could be conducted in all participating countries. Visual transmission of activities in a region might stimulate action in others, and it would encourage unification of the world's peoples. Such an international day would benefit from a United Nations designation and endorsement.

APPENDIX I

Additional illustrative projects for the Decade

Supplementary list of possible projects for the Decade

1. Section III discusses possible thrusts of the Decade and briefly describes projects appropriate for inclusion within activities for the Decade. This appendix contains other possible projects. Neither is a complete listing. Instead, the projects presented illustrate the richness of the potential agenda that could lead to successful implementation of the Decade. It is anticipated that all participants will work together to develop projects tailored to meet their needs, interests and strengths.

Integrated disaster management

2. Integrated disaster management, including an effective early warning system, is critical to saving lives and reducing property losses. Iceland provides an excellent example, with the potential for replication elsewhere. In Iceland, computers linked to the national telephone network provide early warning of volcanic activity on a neighbourhood-by-neighbourhood basis, permitting people to move out of high-risk areas. In addition, using an interdepartmental Civil Defence Council, Iceland implements a unified earthquake building code and building restrictions in earthquake-prone areas. Protective dams have been built to defend towns and cities against lava flows and flooding. Lava cooling systems and avalanche protection systems have been installed to guard vulnerable places. A communication system provides for data collection on hazards and a means of contact should telephones fail to operate.

National disaster planning

3. A key aspect of planning and preparedness is a clear understanding of the potential disasters to which each nation is disposed. To establish the nature and the level of disaster management activities, it is essential to prepare disaster scenarios for each hazard. Disaster scenarios should first examine, using the best information available, the maximum physical potential of hazardous phenomena in specific locations. This potential must be based on a sound understanding of the physical processes that create a natural event. When the worst possible hazard event is combined with existing and projected vulnerability factors, the worst probable disaster scenario can be developed.

Protocols for mutual assistance

4. An early project of the Decade could be to draft model scenarios and protocols for mutual assistance. It would develop guidelines for identifying needs and for assistance agreements between and among nations. Participants should include the Office of the United Nations Disaster Relief Co-ordinator (UNDRO), the World

Meteorological Organization (WMO), and the World Health Organization (WHO) and its collaborating centres.

Protecting concrete and masonry structures against earthquakes

5. In most recent earthquake disasters, the major factor in the loss of life was the collapse of brittle concrete and masonry structures. Such structures are especially vulnerable despite the existence of inexpensive means to enhance their safety - hence the desirability of a data bank on earthquake hazards of and damages to these structures for use in reducing their vulnerability. The bank would contain data on materials analysis and recommendations for design, construction and retrofitting. Some of the data might be gathered through co-operative use of key research facilities such as Japan's large shake table and equipment for quasi-dynamic tests that can provide a full-scale simulation of a building under earthquake stress.

Fundamental research on earthquakes

6. Expansion and globalization of the present data base are essential to refining the computational models, which will contribute to understanding the theory of earthquake causality and seismic risk. Tangible improvement in earthquake prediction may then be possible.

Landslide hazard mitigation

7. Projects that could contribute to reducing the impact of landslides are:

(a) Establishment of a world landslide centre concerned with data gathering and dissemination, information transfer, mapping and training of land use specialists and structural engineers;

(b) Ground deformation monitoring and numerical simulation to improve landslide predictions;

(c) Research into and demonstration of slope management strategies in densely populated areas;

(d) Study of the interaction between precipitation and landslide mobility to find a means for controlling waterflows;

(e) Landslide risk assessment as a basis for land use planning.

Drought intervention

8. Many of the tools available for reducing rapid-onset natural disasters are applicable to drought reduction. In particular, drought management requires identification of the areas presently affected by or potentially vulnerable to various forms of drought. Hazard mapping using remote sensing from satellites combined with ground-based measurements is a first step in developing a strategy to

confront drought. It provides the basis for scientifically ascertaining the sources of drought and desertification and enables the evaluation of drought reduction methods. A focused effort to map drought-vulnerable regions of Africa would be a logical near-term activity in the context of the Decade because it would identify areas that might benefit from reforestation and/or water resources management. Although some areas have been mapped, a comprehensive effort would be an important contribution of the Decade.

Reduction of windstorm hazards

9. Several projects that could contribute to reducing windstorm losses are:

(a) Improving short-term forecasting and warning to permit escape to safe shelters and property protection;

(b) Developing procedures for defining windstorm risks to set investment priorities;

(c) Establishing windstorm data bases;

(d) Promoting ways to improve the wind resistance of construction.

Forest fires

10. Systems to predict the behaviour of wildfires exist. They are used to assess the hazards of forest and rural bush fires in areas having few fires but a high potential for disaster. A project to evaluate these hazards in developing countries is critical to the study of where the controlled use of low-intensity fire is feasible to reduce vulnerability to fire disasters.

Potable water

11. In many disasters, there is need for simple, rapid means to identify safe sources of drinking water and for purifying those that are unsafe. Equipment and procedures are already available for both these goals. The project would evaluate options, selecting the most desirable ones for broad and standardized dissemination.

Mobile satellite communication

12. An international network of mobile ground-based stations would provide a means for communication immediately following a disaster. If possible, it should be built on radio and television media investments already in place. With the development of appropriate protocols, such a network could be implemented in a short time, particularly if linked to resources owned and operated by public telecommunication and broadcasting institutions.

Media techniques for public education

13. A group of experts from print, film and video journalism could meet with disaster mitigation specialists to explore innovative outreach techniques that are attractive to a wide audience and are cost effective. The group would produce and convey valuable information for increased public preparedness. Activities to improve disaster coverage might include preparedness lessons for the general public, a poster development programme, short films for television news shows, comic books and other inexpensive texts for grade school students, and "how to" programmes for homeowners. Multilateral efforts could produce materials of more universal value than are yet available.

Consolidated information system for disaster management

14. The provision of quick, easy access to disaster-related data and of a source for ground-collected information integrated with observations from more advanced technologies is critical to the success of the community of disaster mitigation experts, from researchers to civil protection specialists. This project would ensure a unified and uniform information base for all participants in activities of the Decade.

Vulnerability of megacities

15. Rapid urban growth in disaster-prone areas (e.g., Rio de Janeiro, Tokyo, Los Angeles, Mexico City and Dhaka) has placed complex urban economics, infrastructure, communication systems and vast numbers of people in highly vulnerable positions. This research project would analyse a few cases of accelerated urban development in high-disaster risk areas. It would assess their overall vulnerability and recommend ways to integrate safety with urban development and improve preparedness and response mechanisms.

Casualties versus structural damage

16. In industrialized countries, disaster-induced financial losses are generally high and casualties moderate. In developing countries, the reverse is true. An interdisciplinary study of habitat type as a risk factor in natural disasters would help identify building characteristics responsible for casualties; it would also quantify these factors for planners and architects. Ultimately, the goal would be to work toward building disaster-resistant structures that, should they fail, do so in a controlled way.

Architectural modifications of native structures

17. Several minor changes in constructive practices are known to improve the safety of structures under diverse conditions. This project, closely related to the preceding one, would encompass a quantitative and qualitative study of these changes and would guide the required technology transfer.

International exchange of information at the local level

18. Most disaster response efforts are highly localized, and a project to promote international exchange of local experiences and knowledge on disaster reduction would be invaluable. This project could cover information on development in tsunami- and hurricane-prone coastal areas (e.g., the Yucatan peninsula, the west coast of South America, Hawaii, and Caribbean countries) and on protection of ecological resources (for example, coral reefs, which are damaged by tropical cyclones). A model based on the comparative experiences of two communities could be used. The project would be closely linked to study of appropriate technology transfer, which could use the WMO technology transfer system as its initial model.

Multihazard assessment

19. Ongoing work by United Nations regional agencies, the Pan American Health Organization (PAHO) and the Organization of American States (OAS) might be profitably extended to include natural multihazard assessment and identification of disaster mitigation measures for specific countries and regions, such as South and Central America. These studies would help in developing a method applicable to other regions. A pilot case study could be developed in one year, possibly associated with the proposed programme for Mendoza, Argentina (see annex, para. 67), with two additional cases for testing and refining the method over the next two years of the Decade.

Forum for communication among scientists, engineers and decision makers

20. Some recent natural disasters brought to light a lack of trust, co-ordination and understanding among the groups responsible for hazard mitigation. Sometimes these deficiencies contribute to tragic consequences. A forum to bring the diverse participants together would reduce the barriers to communication among these groups.

Protocols and methods for assessing damage and needs

21. A standard and comprehensive method is lacking for assessing damages and needs following a disaster. Such a development would cover the range of disasters of concern to the Decade and would identify damages across sectors - among them, infrastructure, housing, health and population. Adjustment mechanisms would be developed for using this tool in different regions.

Inventory, translation and dissemination of educational material

22. The vast number of texts and audiovisual materials on community-level disaster reduction are applied only locally. They should be systematized, translated and disseminated internationally.

Protecting international treasures

23. A project to protect one or more antiquities from the risk of earthquake damage - a valid goal in itself - would provide visibility to the goals of the

Decade. A Greek antiquity, a historic mosque or an Indian temple could be made more resistant to potential earthquake damage. The technology is available and the payoff high. Demonstration of the damage protection process and the media coverage of the project would tangibly contribute to the Decade.

Newsletter for the Decade

24. Periodic dissemination of information on the Decade to international organizations, national participants, academic institutions and non-governmental organizations would efficiently enhance visibility of the Decade and transfer of knowledge. A newsletter, with a simple and accessible format, could contain information on conferences and symposia, abstracts of relevant publications, articles from other publications, and descriptions of major catastrophic events, including assessment of impacts and response by local and international groups. The newsletter could be bimonthly, with its first issue to be published at the beginning of the Decade.

APPENDIX II

Regional hazards and needs

1. The many regional strengths and weaknesses in disaster mitigation capabilities form a basis for global co-operation and information sharing. In general, regional co-operation is more successful in addressing weather-related hazards than those of geological origin. The result is - wrongly - a general perception that little can be done. In fact, when a community and its residents have been warned and are prepared, they can protect themselves from the damaging impacts of volcanic eruptions.
2. Despite the development of techniques to reduce the earthquake vulnerability of new and older structures and despite preparedness measures, the potential for disasters often remains unabated. In many parts of the world, the high disaster potential stems from the existing stock of highly vulnerable buildings and infrastructure. In addition, government planners are not sufficiently sensitive to this problem and to the social and economic consequences of a possible disaster.
3. Some regions have implemented earthquake hazard assessment and mapping activities. Except in a few instances (e.g., Japan), however, they have been less successful in implementing short- and long-term protective measures and in developing data banks, land use planning and disaster awareness through public information and education. As a consequence, with rising population densities, all regions - particularly areas of high seismicity - must face destructive earthquakes that lead to economic and social disorder of similar or larger scale than they have experienced.
4. Although the United Nations regional commissions, various United Nations agencies and other international organizations have historically been involved in natural disaster reduction (e.g., the Typhoon Committee and the Panel on Tropical Cyclones), the disaster potential is worsening in some regions, and more extensive reduction efforts are needed.
5. Region by region, this appendix examines hazards and needs. Suggestions are made for programme thrusts having significant disaster reduction potential.
6. The regional groupings of countries discussed below are based mainly on geographical contiguity and commonality of disaster patterns. When the extent of a region is not clear from its title, a description is included. Continental North America includes Mexico; south-west Asia includes the Islamic Republic of Iran; south and east Asia includes Indonesia, Japan and the Philippines; and the south-west Pacific includes Australia, New Zealand and Papua New Guinea.

Continental North America

Hazards

7. Tropical cyclones, known in North America as hurricanes, are a severe problem for Caribbean island countries and the States along the coast of the Gulf of Mexico, and they occasionally threaten the eastern seaboard of the United States. Flooding from these cyclones as well as from other severe weather events, spring melts and icejams (in Canada) is a problem of moderate severity, periodically causing extensive damage and large loss of life. Continental North America commonly experiences violent local storms such as thunderstorms, tornadoes, squalls and hail. East of the Rocky Mountains, violent tornadoes are particularly prevalent; they periodically cause the loss of more than 100 lives and damage in the hundreds of millions of dollars. Wildfires are a significant problem in the western United States and Canada, generally not threatening lives but destroying some residential property and valuable timber resources. Earthquakes, volcanic eruptions and landslides are prominent in Mexico and the western United States, as are earthquakes and landslides in Canada. Earthquakes, with the potential for causing a disaster of great magnitude, are of much concern and attention, and landslides often cause extensive annual damage.

Capabilities and needs

8. This hazard situation suggests the need for public policy and outreach to enhance awareness of alternatives to the concentrations of people and resources in high-risk areas. The rapid-onset, small-scale violent weather phenomena, including tornadoes and flash-flood-inducing thunderstorms, to which many parts of the region are particularly prone, pose unique problems, meriting special attention and demanding novel approaches.

9. The region has much to offer in innovative technology both for intra-regional and, especially, extra-regional transfer.

Central America, the Caribbean and South America

Hazards

10. Exposure to severe damage from tropical cyclones (hurricanes) in Central America and the Caribbean is high. Landslides, often triggered by torrential rains, flooding and storm surge, are serious hazards. The northern part of South America experiences the peripheral effects of the Caribbean hurricanes. The coastal areas of Ecuador and Peru and the Amazon river basin flood infrequently during El Niño Southern Oscillation (ENSO) years. Flooding in Venezuela and coastal Brazil sometimes accompanies intensified tradewinds. Paraguay and Argentina also suffer occasional severe floods.

11. Frequent, severe earthquakes occur over the entire Pacific coast of Central America, with heavy losses. Occasional severe earthquakes also affect the

Caribbean. Damaging earthquakes occur throughout the Andes from Argentina and Chile to Venezuela and Trinidad and Tobago. Tsunamis generated by large earthquakes have occasionally caused severe damage to cities on the Pacific coast of Latin America.

12. The frequency of volcanic eruptions is among the highest in the world in Central America, the eastern Caribbean and the Andean region, where the proximity of high-density population centres to large, active volcanoes engenders high risk to life and property.

13. The Andes have a dangerously high potential for frequent, massive landslides along the Cordillera. In ENSO years, torrential rain may aggravate this phenomenon by triggering numerous large landslides. Earthquakes here are known to cause massive falls of rock and ice slides. Along coastal Brazil and in areas around Rio de Janeiro, landslides pose a particularly significant threat.

Capabilities and needs

14. Partly through outside assistance, the South American countries have many of the resources required to monitor and issue warnings on the major atmospheric hazards. Although continued support will be needed for some time, there is considerable regional co-operation in many facets of disaster management and in successful pooling of support and funding from various sources. However, the degree to which national disaster plans have been implemented in the past few years varies greatly; some countries have achieved considerable success, but improvement in others is marginal.

15. In Central America and the Caribbean, recent disasters have disrupted vital telecommunications links, frustrating critical pre-disaster and immediate post-disaster mitigation response. This problem deserves urgent attention.

16. Particularly in South America, preparedness (especially public awareness) and prevention measures need further consolidation, and related transfer of technology needs to be improved. Although the Regional Seismological Centre for South America (CERESIS) has taken some positive steps in these directions, further sustained efforts and financial support are necessary.

17. The increasing disaster potential due to accelerating population concentrations in large cities points up the need for land use controls, enforcement of building codes and quality control. Of particular concern is the development of methods to retrofit and protect existing building stock. Rationalized and improved observational networks, particularly relating to geological hazards, need to be deployed. A regional data base is planned. Few operational warning systems exist, and many more are needed. Public education is a top priority.

Africa

Hazards

18. Algeria, Morocco and Tunisia, lying in a belt of high seismicity, suffer periodic damaging earthquakes. The location of several large cities in the seismic zone and a large inventory of structures built to inadequate building standards magnify the potential for a severe disaster.

19. South of the Sahara, the Rift Valley of east Africa experiences moderate earthquakes and has some active volcanoes that rarely cause damage or death. The many deep crater lakes in western Cameroon have periodically but suddenly released trapped lethal carbon dioxide.

20. Occasional tropical cyclones in Madagascar, Mozambique, the southern region of the United Republic of Tanzania, and the Comoros, Mauritius, Reunion and Seychelles in the Indian Ocean cause wind, storm surge and, especially, flood damage.

21. The sub-Saharan countries and, less frequently, the countries of eastern and southern Africa experience recurrent droughts, a problem that is being compounded by desertification. Desert locust outbreaks often occur early in the rainy season, coming at the end of a long drought cycle. A significant hazard to agriculture throughout north, west and eastern Africa, swarming locusts are conventionally controlled by chemical pesticides, but they do not provide a lasting solution to this age-old problem.

22. North of the Sahara, atmospheric hazards consist mainly of infrequent, intense and difficult-to-forecast local floods from heavy rainfall. They occasionally cause considerable localized damage. The Nile presents unique problems that are receiving much attention.

Capabilities and needs

23. There is considerable regional co-operation in disaster mitigation in Africa, and progress is being made in cyclone, drought and earthquake disaster reduction. In the seismic zone, attention must be given to reinforcement of existing buildings, more stringent building codes for new construction, and the growing populations of large cities at risk. Similarly, upgrading regional tropical cyclone warning facilities needs financial support, and the effects of severe droughts are a continuing concern.

Europe

Hazards

24. Northern Europe is rarely impacted by severe disaster-producing storms. Nevertheless, atmospheric depressions originating in the North Atlantic annually cause minor damage from strong winds, but flooding is frequent and often

destructive. Infrequently, a depression brings hurricane-force winds and, in coastal areas, storm surge, causing widespread damage and occasional loss of life.

25. In southern Europe, storm surges in the northern Adriatic pose a hazard to Venice. Mountainous terrain and heavy rainfall encourage rapid-rise river floods and destructive landslides, especially in densely populated areas. Extremes of heat infrequently cause numerous deaths in southern Italy and Greece.

26. Dam ying earthquakes are rare in northern Europe. Nevertheless, historically, some destructive earthquakes have occurred in the Carpathians, the Rheingraben and the Alps. All southern Europe, however, from Portugal to Turkey to Cyprus, is an area of moderate to high seismicity, and earthquakes are the predominant and most destructive hazard. Active volcanoes are a threat in some areas, especially the Azores, the Canary Islands and southern Italy; history is replete with stories of disastrous geological events. Wildfires, prevalent in the region during dry summers, cause increasing damage despite precautions and improved fire-fighting techniques because of the increase in leisure and vacation activities. Landslides are a significant local hazard in some mountainous, high-density areas, but they have been studied intensively and are generally well-controlled.

Capabilities and needs

27. Extensive regional co-operation efforts exist to address natural hazards, and Europe applies some of the modern technology to handling disasters. In the earthquake-prone countries, considerable effort is being made to reduce seismic risk through improved engineering and stronger building codes. Nevertheless, older structures remain at risk. Improved seismic and volcanic monitoring and creation of a data base are necessary to the development of additional engineering initiatives and to research on early warning systems. Small-scale, sudden-onset hazards, such as snow avalanches, landslides, tornadoes and rapid-rise floods, continue to be serious concerns, especially in areas of high investment and population density.

28. Europe has developed disaster management technology and training centres that can be useful to other regions.

North and south-west Asia

Hazards

29. South-west Asia (Democratic Yemen, the Islamic Republic of Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Saudi Arabia, the Syrian Arab Republic, Yemen, and the Gulf countries) suffers from moderate to extreme aridity. Noteworthy is the occasional flooding of the Tigris-Euphrates; although the river system is regulated by dams, damaging and disastrous floods are rare. Damaging snow avalanches and landslides are a serious concern in the Elburz Mountains.

30. Some regions of northern Asia (comprising northern China, Mongolia and the Union of Soviet Socialist Republics) are prone to devastating earthquakes. Many provinces of China have been struck by earthquakes of magnitude over 7. The destructive Tangshan earthquake in 1976 caused the death of more than 240,000 people. Occasional local flooding of the main rivers (Ob', Yenisey and Lena) is caused by spring icejams. Destructive wildfires occur, but infrequently.

31. Within south-west Asia, destruction and loss of life due to earthquakes are frequent and often severe. Traditional housing - of unreinforced masonry and stone - suffers severe damage from earthquakes. Yemen and the Jordan-Bekaa rift valley are also earthquake prone, although less so than the Islamic Republic of Iran.

Capabilities and needs

32. Asian countries largely meet their own national needs, albeit with limited resources. In south-west Asia, there is much regional co-operation. But relatively little effort is applied to the reduction of earthquake damage risks from the traditional masonry and stone buildings and to the effects of small-scale phenomena such as avalanches, landslides, and flash flooding. These areas need attention. In addition, continued improvements in the quality of seismic monitoring and in the creation of a data base are essential to effective mitigation efforts.

South and east Asia

Hazards

33. In all the world, this region suffers the most from a variety of natural hazards. The north-west Pacific is the ocean basin generating the highest number of tropical cyclones (typhoons). Annually about 25 typhoons strike China, the Democratic People's Republic of Korea, Japan, the Philippines, the Republic of Korea and Viet Nam, often causing significant destruction. Less frequently but with more devastating effects, cyclones forming in the northern Indian Ocean, particularly those in the Bay of Bengal, bring damaging winds, destructive floods, and deadly storm surges to Bangladesh and south-eastern India. This interplay of natural factors acting upon a low-lying area with one of the highest population concentrations causes recurrent disasters of magnitudes incomparable to those elsewhere, particularly relative to the number of deaths. Other weather systems (e.g., monsoons) also impact the region with disastrous effects, especially flooding. Eastern China is often affected by serious droughts.

34. Many rivers - the Indus, Ganges, Brahmaputra, Salween, Mekong, Song Hua, Huei He, Yangtze and Huang He - have a long history of destruction. Upland deforestation and increased population in the flood plains contribute to increasing flood risks and ever greater tragedies. Snow avalanches and landslides, although frequent in the highlands, are significant in only a few settled areas.

35. All countries in the region, except possibly Democratic Kampuchea and Sri Lanka, are prone to destructive earthquakes, with loss of life usually exceeding that from similar earthquakes elsewhere. High population densities and buildings of unreinforced masonry are the primary contributing factors. The region has the largest number of active volcanoes in the world, some of which threaten population centres.

36. Countries facing the Pacific Ocean, especially Japan and the Philippines, experience destructive tsunamis sometimes generated by earthquakes as distant as South America. Landslides triggered by heavy rainfall or earthquakes are a major hazard in the mountainous areas, especially in countries facing the Pacific Ocean and those in the Himalayan belt.

37. Afghanistan, Pakistan and northern India are occasionally affected by locust swarms.

Capabilities and needs

38. Despite strong regional co-operation and mitigation efforts, which reflect the variety, extreme severity, and magnitude of natural disasters and which have reduced the severity of some disasters, further concerted activity is needed. Poverty and population growth, in particular, have thwarted progress on disaster mitigation. In addition, the mitigation of many of the most severe hazards (for example, flooding in Bangladesh) requires regional co-operation.

39. The region, nevertheless, has much experience and technology to share with the rest of the world. Japan, for example, has built effective disaster management systems and technology. The training facilities of the Asian Disaster Prevention Centre (ADPC) are being extended to other regions.

40. Of particular regional concern is the scale of recurrent disasters in Bangladesh, which continues to frustrate concerted human efforts at mitigation. Growing population pressures and intensified investment in densely populated areas aggravate the effects of disasters, especially in this region. A systematic regional effort stressing public awareness and education, land use planning, and other activities is essential. Further outside support is required.

South-west Pacific

Hazards

41. This area is prone to erratically moving and destructive tropical cyclones, with varying effects and frequency. Low-lying atolls experience destructive surges and waves caused by cyclones as well as by strong winds alone. Localized flooding due to tropical cyclones and other weather systems sometimes causes severe damage.

42. Larger river systems in Australia and New Zealand occasionally experience severe flooding. New Zealand and the southern states of Australia sometimes experiencing damaging winds from depressions.

43. Except for most of Australia, Kiribati and Tuvalu, the south-west Pacific island countries generally lie within or near the zone of intense earthquake and volcanic activity extending from Papua New Guinea to Samoa to New Zealand.

44. There are several active volcanoes in the region, some near population centres. The volcanic complex near Rabaul is one of the few regularly monitored (by the well-equipped volcanological observatory nearby), and there is a detailed disaster action plan.

45. Tsunamis are infrequent. The potential for damage is high but it is not well recognised, compared with the north Pacific.

46. Landslides are a hazard throughout the region, especially in areas of heavy rainfall. Australia has frequent wildfires, some of them destructive.

Capabilities and needs

47. Regional co-operation is strong with regard to tropical cyclone warning systems. Nevertheless, some of the smaller countries need improved cyclone monitoring and warning capability at the national level. Earthquake and volcano monitoring also needs strengthening, and all countries should be covered by the Pacific Tsunami Warning System. Preparedness and prevention measures, particularly public awareness and planning, need strengthening in many countries.

48. Australia and New Zealand have some of the technology (for example, cyclone-resistant building design and flood-control methods) that could be very useful to other countries both in and outside the region.
