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SCIENCE AND TECHNOLOGY FOR NATURAL DISASTER REDUCTION

A number of major natural disasters that occurred during the 1980s made people throughout the world aware that the impact of floods, drought, earthquakes, volcanic eruptions, landslides, etc. is increasing dramatically. This may in part be due to shorter recurrence intervals of extreme events resulting from climatic change and other natural causes but the leading causes are anthropogenic. Environmental degradation due to deforestation and intensied, unsustainable land use result in a higher frequency and magnitude of floods, droughts and landslides. Another cause is that with the increasing population densities and building activities in hazard prone areas more people are adversely affected and the economic losses higher. At present 25% of the world population is at risk while economic losses have more than tripled since the 1960s. They now amount to approximately US$ 100 billion annually. Another important but often neglected effect of natural disasters is disruption of society and impediment of development.

The United Nations General Assembly, on the initiative of the US Academy of Sciences, formulated two resolutions in 1987 and 1989 respectively, calling for an «International Decade for Natural Disaster Reduction» covering the 1990s. An IDNDR Secretariat was established under the UN Department of Humanitarian Affairs in Geneva. ICSU (International Council of Scientific Unions), realizing the important part that science and technology can play in natural disaster reduction, formed an Ad-hoc Committee that at its first meeting in Rabat, February 1989, formulated a provisional research programme. The ICSU General Assembly held in Sofia, October 1990, decided that ICSU should be involved during the whole decade and that a Special IDNDR Committee (SC/IDNDR) should stimulate/coordinate the contributions of the global scientific and engineering community.

Forecasting leading to early warnings and hazard zoning as a basis for physical planning and risk assessment are major research elements while the international exchange of knowledge, disaster education and providing guidelines/recommendations to decision makers are other main foci. IDNDR research is essentially an integrated issue involving natural scientists for (physical) susceptibility aspects and social scientists for assessing the vulnerability of affected societies. Scientists united in ICSU are closely cooperating with engineers of the WFEO (World Federation of Engineering Organizations) and the UATI (Union des Associations Techniques Internationales). The decade has now reached its final, consolidation phase and will come to an end in 1999. Substantial scientific advances and new applications have been reached. Numerous reports have been published on the scientific results and their applications.

The specific goals of the IDNDR are:

- to improve the capacity of each country to mitigate effects of natural disasters;
- to devise appropriate guidelines and strategies for applying existing scientific and technological knowledge;
- to foster the scientific and engineering endeavours aimed at closing critical gaps in knowledge;
- to disseminate existing and new technical information related to measures for assessment, prediction and mitigation of natural disasters, and
- to develop measures for the assessment, prediction and mitigation of natural disasters through technical assistance, technology transfer, demonstration projects, education and training, etc.

The following main ICSU-SC/IDNDR research programmes have been launched and are being successfully implemented:

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- Volcanic disasters
- Global seismic hazard assessment
- Intermediate term earthquake prediction
- Tropical cyclone disasters
- Drought/famine disasters
- Flood disasters
- Mountain disasters
- Vulnerability of megacities
- Education for natural disaster reduction

Each of these programmes is coordinated by an international scientific union adhering to ICSU and most of them are subdivided in several projects. The volcanic disaster reduction programme, for instance, is concentrating on 16 dangerous socalled «Decade Volcanoes»; the drought/famine programme has legs in a number of drought-stricken countries in Africa and the global seismic hazard assessment programme is regionally subdivided. Other programmes have one main regional focus: the work of the flood disaster programme (and to a lesser degree also of the tropical cyclone programme) is centered on the most seriously affected country of the world: Bangladesh. In such cases, however, other, related, activities in other parts of the world or of a more general nature, compensate for this.

Subdivision of natural hazards and natural disasters into geological (for those of endogenous origin: earthquakes and volcanic eruptions), geomorphological (for those or exogenous origin such as landslides and river floods) and meteorological (for tropical cyclones, coastal flooding, etc.) is erroneous. All natural disasters are complex phenomena that encompass a range of environmental factors and human triggering and vulnerability factors. Their mitigation thus requires an integrated interdisciplinary approach in which natural scientists as well as social scientists play part. In essence the terms natural hazards and natural disasters are human-centered: zero values are reached where the society is unaffected. The risk incurred varies with the hazard susceptibility of the land and with the hazard vulnerability of the human group: R = (f)S.(f)V. Data on environmental susceptibility and on the potential damage and loss of human life can be obtained, assessed and quantified. The impacts of societal disruption, the decease of wageearners, unemployment due to damaged production systems and other detrimental effects of natural disasters on socio economic development are, of course, less easily quantifiable.

The final, consolidation phase of the IDNDR will be concluded in 1999 with a number of final events. The ICSU General Assembly of 1999 will be the sunset of SC/IDNDR. It is, of course, beyond doubt that disasters will continue to occur also during the next century, though the responsible authories and affected societies can benefit from the knowledge and experience gathered and disseminated by the scientific and engineering community. The continuing growth of the world population, the megacity enigma and other rapid changes will, however, lead to further environmental and societal stresses forming a nursing ground for disasters. It can therefore be expected that disaster reduction will remain a high research priority throughout the world also after the year 2000. It will probably be placed in the context of sustainable development and its scope widened to include also technical, industrial disasters.