I. Background

1 The members of the ISDR Task Force, at their first meeting held in Geneva from 27 to 28 April 2000, requested the Secretariat of the ISDR to carry out preliminary research and consultations on ways to support and advance the application of research, science and technology in disaster prevention The ISDR Task Force members provided inputs[1] for the preparation of the present paper, which also refers to a number of relevant statements and publications[2]

2. The paper provides a brief overview of the role of science and technology in different risk reduction domains, and is intended to facilitate discussions among the Task Force members. The Focus Paper proposes approaches, which could be further developed and refined by the Task Force members, on how best to advance such a broad, albeit fundamental, issue as the application of research, science and technology to disaster prevention.

II. Rationale

i. General

3. The paper recognises the key role of science and technology in risk reduction activities related to environmental, natural and technological disasters. All major achievements in these fields have been not only attributable to science and technology but many activities were initiated by the scientific community which felt it had a moral duty to support the reduction of disaster-related risk.

4. The need for greater interaction between different fields of expertise in risk reduction is a challenge that was addressed to some extent by the International Decade for Natural Disaster Reduction (IDNDR). Creating synergies between the scientific and technical community, local authorities and decision-makers, as well as planners, sociologists, the media and communication experts and indeed the community at large remains a vital facet of the issue. In this regard, essential information must be available in a user-friendly format.

5. At the same time, technological change over the past 50 years has been dramatic and it is expected that the pace of change will increase exponentially in the coming decades. While these advances are welcome in many areas of risk reduction, integrating new technology with old will represent enormous challenges for the maintenance of networks and international exchange of data and products

6. Technological change and advances in research are rapidly expanding the possibilities for risk assessment, information exchange, disaster-resilient engineering, education, training and early warning, to name some of the most obvious fields related to disaster prevention.

7. In addition, the globalisation of telecommunications will present numerous opportunities as a new era for satellite-based communications begins in the early part of the 21st century. Low-orbiting satellite systems will provide low-cost and efficient communications services almost independently of national infrastructure

8. However, the main difficulty faced by most regions of the globe is the gap in the level of human, technological and financial development. The consequences are shortfalls in research and monitoring, human expertise and capacity building which are essential elements in developing and sustaining long term risk reduction capacities of developing countries.

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[1] The following members answered this request for input: UNESCO, IFRC, WFP, ICSU, ICDO, OAU

[2]- Statement from the WMO/UNESCO Sub-forum on Science and Technology in Support of Natural Disaster Reduction.

- IDNDR Scientific and Technical Committee; Final Report

- Proceedings of the IDNDR Programme Forum

9. Solutions need to be found to facilitate the transfer of technology, including south-south co-operation, in the application of research, science and technology to disaster reduction.

ii. The Application of Research Science and Technology in Vulnerability Assessment

10. The current increase in the social, economic and environmental impact of disasters is related to the shifts in the vulnerability of societies and environments worldwide. The assessment and reduction of these vulnerabilities need to be carried out systematically at a national and local level. These achievements should be realised through the use of engineering as well as in the natural, social and human sciences.

11 Actually, it is through vulnerability assessment and reduction that much of the scientific and technical knowledge of the various hazards mitigation approaches is applied at the community level.

iii. The Application of Research, Science and Technology in Communication, Early Warning, Information Exchange and Education

12. The effective dissemination of collected information in disaster reduction activities remains a major challenge. Over the last few decades, the availability of information on natural hazards and disasters has increased enormously. This has occurred through new studies of these phenomena, an explosive expansion of global channels of communication and, perhaps most significantly, through the widespread availability of new information technologies, including CD-ROM, space-based technologies and the Internet.

13 Although it is now technically feasible to exchange and integrate information such as digital maps, aerial photography, satellite imagery and other data, it is generally recognised that no single information technology will be appropriate for all users. In addition progress can be made in the inter-operability, robustness and scalability of data in disaster reduction. Past experience tends to suggest that information exchange and education material is best managed when information is compiled at a regional level, and supplied at the national and at the community level.

14. Early warning systems are an extremely important link in the chain of actions required to reduce the impact of natural hazards Advances in science and technology during the last decade have demonstrated enhanced warning capabilities for natural hazards in many parts of the world. However, effective early warning systems require unrestricted access to data that is freely available for exchange.

iv. The Application of Research, Science and Technology to Geological and Hydrometeorological Hazards

15. Vulnerability of communities to hazards such as earthquakes, volcanic eruption and landslides can be greatly reduced by the use of modern building standards in conjunction with risk zoning based on scientific and technical knowledge of the hazards and their impact on the built environment

16. Seismic hazard early warning is presently still at an early stage of research. However, the present level of knowledge in seismic hazard assessment allows the building of scenarios, useful for decision-makers, engineers, and emergency services. Modern technologies in volcanic activity monitoring, such as seismographs, monitoring cameras and satellite remote sensing, combined with volcanic hazard maps have successfully reduced the local impacts for a number of eruptions in the recent past. This knowledge and technology needs to be made more widely available.

17. Up to 70 per cent of natural calamities are weather-related events. While it is accepted that meteorology is not a precise science, it is obvious that the management of disasters requires well-informed forecasts

18 At the present time, weather predictions are available to the public in three different time scales, namely, short-, medium- and long-term forecasts. In addition to these, seasonal forecasts valid for a month or longer duration are being issued to farmers, disaster managers and NGO's so that they can plan their cultivation of crops and be better prepared to face hydrometeorological hazards e.i. storms, floods or droughts. The longer the lead-time of a warning prior to a disaster, the greater the efforts of preparedness that can be achieved

19. One of the challenges confronting weather predications is the provision of warnings or forecasts well ahead of episodic climate events like El Niño/La Niña, the monitoring of droughts and flashfloods. Research to meet this demand is being pursued vigorously. The widespread adverse effects of those climate events are of such great magnitude that better forecasting of specific weather phenomena associated with them will result in better co-ordination, planning and management of weather-related disasters, as well as the sustainability of finite natural resources. Presently, numerical weather prediction is an important tool which has helped to prepare long-range forecasts and models for forecasting regional and planetary circulation in a relatively short time. Mechanisms for increasing the availability of this tool to end-users in developing countries are evolving as the technology itself evolves.

III. Review of Activities and Conclusions of the Decade

20. In order to assist the global community to build most effectively on the foundation provided by the IDNDR, the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) convened a "Sub-Forum on Science and Technology in Support of Natural Disaster reduction" as a special contribution to the IDNDR Programme Forum 1999 "Partnership for a Safer World in the 21st Century".

21. The Sub-Forum took stock of recent progress and future prospects in the application of science and technology to risk reduction with regard to a number of different hazards. A synopsis of the findings is available in the Sub-Forum proceedings. The Sub-Forum reviewed how science and technology contributes to disaster reduction through the following three aspects:

- Assessment of vulnerability and enhancement of community awareness of the nature of risk;
- Operation of integrated warning systems; and
- Preparedness and education programs.

22. Finally, the Sub-Forum compiled some of the major achievements in risk reduction as a result of science and technology. One of these achievements, not reflected in this focus paper, is the creation of new disaster management bodies at all levels of government that now include scientists and engineers involved in the study and prediction of natural hazards.

23. Task Force members provided inputs for this paper on issues such as the use of telecommunication and computer technologies related to emergency situations. A number of specific activities were referred to by Task Force members, including projects related to the application of science and technology in capacity building and earthquake loss reduction. Other Task Force members indicated that they needed more time to compile the information, while others did currently not have any activities focused on the subject.

24. The Scientific and Technical Committee of the International Decade for Natural Disaster Reduction played an important role in supporting the application of Science and technology in disaster prevention. The findings of the body are available in the Final Report of the Scientific and Technical Committee (IDNDR, 1999).

IV. Proposals for consideration by the Task Force

25 Research, Science and Technology are crosscutting issues with regard to disaster reduction. Their successful application to related activities remains a key challenge in building a safer world in the 21st Century

26. The ISDR Task Force may wish to consider the establishment of a Working Group specifically to review and support the application of research, science and technology to disaster prevention. Such a Working Group would have to interact closely with the ISDR Task Force and the other Working Groups - existing or to be established - as the application of research, science and technology is relevant to most disaster-prevention activities. The Secretariat of the ISDR would support such interaction where appropriate.

27 The challenges that could be reviewed by the Working Group might include some of the following:

- The Working Group could provide guidelines, based on the experience gained through initiatives carried out by Task Force members, for effective application of research, science and technology. This effort should take into account regional specificity and be applicable to various types of hazards.

- The Working Group could give recommendations with regard to the interoperability of data, the application of new technologies, technology transfer, use of telecommunication, information exchange, and training to name just a few.

- The Working Group could maintain a compendium of initiatives undertaken in this specific field.

- Members of the Working Group could support or carry out activities on the application of science and technology to disaster reduction, particularly in areas such as seismic risk reduction or other areas that do not fit into other Working Groups established by the ISDR Task Force.

- Such a Working Group would be in a position to highlight gaps, shortfalls, overlaps, future priorities, and policy recommendations in work carried out globally in the field of the application of research, science and technology to disaster reduction

- The findings of the Working Group on the application of research, science and technology in disaster prevention could be published in periodic reports and publications in the context of the ISDR.

V. References

- Proceedings of the International Decade for Natural Disaster Reduction (IDNDR) Programme Forum, July 1999.
- Statement from the WMO/UNESCO Sub-forum on Science and Technology in Support of Natural Disaster Reduction, July 1999.
- IDNDR Scientific and Technical Committee - Final Report. 1999.
- The 1997-1998 El Niño Event: A Scientific and Technical Retrospective, WMO 1999
- Hazard Warning System: Review of Twenty Years of Progress, John H. Sorensen, October 2000
- Weather Forecasting in the Twenty-first Century, Summary of the Ninth IMO Lecture, 13th WMO Congress, 1999