CONTRIBUTION TO ICSU'S ANNUAL REPORT FOR 1994

Report of the

ICSU SPECIAL COMMITTEE ON THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (SC-IDNDR)

by:
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Chairman

PERIOD COVERED BY THIS REPORT

As with earlier Annual Reports, and for reasons related to the calendar of SC-IDNDR's work, this Report covers the period from 13 February 1994 to 12 February 1995.

INTRODUCTION

The UN General Assembly, in resolutions dated December 1987 and February 1989, named the 1990s an International Decade for Natural Disaster Reduction. Since then an efficient IDNDR Secretariat was set up in Geneva under the UN Department of Humanitarian Affairs.

Science and technology have important parts to play in IDNDR; particularly, for improving the timeliness and reliability of forecasts of Natural Disasters — as well as for refining assessment of risk of such disasters and enhancing preparedness wherever the risk is substantial. In October 1990, ICSU's own General Assembly established SC-IDNDR as a focus for scientific and technological work aimed at achieving these goals, especially in developing countries.

MEMBERSHIP

Four out of the Unions in the ICSU family are represented on SC-IDNDR: IUTAM by Sir James Lighthill, IUGG by V.I. Keilis-Borok, IUGS by S. Uyeda and IGU by H. Th. Verstappen. Also, the global engineering organisations WFEO/UATI are represented by M. Leonard and A. Villevieille, and the IDNDR Secretariat by its Director, K.O. Elo; while the remaining members are R. Hamilton (USA) and E.J. Plate (Germany).

MEETINGS

The 9th Meeting of the Special Committee was held on 25 May 1994 during the World Conference on Natural Disaster Reduction (Yokohama, 23 to 27 May 1994). A detailed Report on the 9th Meeting, and on the World Conference as a whole, has been circulated widely within ICSU.

The 10th Meeting of SC-IDNDR was held at ICSU Headquarters in Paris on 2-3 February 1995. All of the decisions taken at that Meeting are embodied in the present Report.

SCIENCE AND TECHNOLOGY AT THE WORLD CONFERENCE

The World Conference was constituted as a United Nations conference to make a mid-decade review of IDNDR, being attended by some 2000 persons from nearly 150 countries. At this Conference, attention was focussed on stark contrasts between the developed world's readiness to respond after the event to Natural Disasters in less developed countries and its relative lack of support for attempts to limit the level of possible disasters through preparedness measures of all kinds. The Yokohama Message is that such measures are cost-effective, and that they contribute positively to a country's development, whereas responses made only after a major disaster involve huge expenditure directed at relief and rehabilitation while still leaving gravely impaired the country's development process.

Four out of the seven Technical Sessions (those designated B,C,F and G) paid special attention to what science and technology can do for Natural Disaster Reduction. Moreover, a major contribution to each of those sessions was made by participants in projects supported by SC-IDNDR.

The Special Committee had actually been entrusted with the entire organisation of Session B on "Hazard Resistant Structures." Here, six outstanding presentations (by speakers from Bangladesh, Canada, UK, India, Peru and Malaysia) successively reviewed structures resistant to storm surge flooding, to extreme winds and to earthquakes, with comprehensive treatment being given to both engineered and non-engineered structures.

Participants in the WFEO/UATI project "Design and construction of buildings to withstand natural disasters" gave one of these presentations, and participants in "Megacities" projects supported by SC-IDNDR contributed to Session C on "Modern Societies". Key roles in Session F on "Warning Systems" were played by a co-leader of the IAVCEI project "Reducing Volcanic Disasters in the 1990s", as well as by WMO participants in the Joint ICSU/WMO Project on Tropical Cyclone Disasters; while the moderator for Session G on "Drought Management" was the leader of IGU's project on "Famine and Vulnerable Food Systems". The World Conference included too an Exhibition and several Poster Sessions — within one or more of which absolutely every project supported by SC-IDNDR was outlined for the benefit of Congress participants.

ICSU DEMONSTRATION PROJECTS

Certain IDNDR projects are acclaimed as International Demonstration Projects by the IDNDR Secretariat, and the Special Committee strongly supports nine such projects; four being managed within the ICSU family, four within WFEO/UATI and one (on Megacities) with inputs from both organisations. Some excellent progress during the period under review was made on all these projects, of which the first four are described in this section.

The Global Seismic Hazard Assessment Program (GSHAP) , managed by ICL in active cooperation with IASPEI, pursues vigorously the GSHAP technical plan (see vol.36, nos. 3-4 of Annali di Geofisica, Nov. 1993) within the revised regional structure agreed in January 1994. In the special important field of regionally coordinated seismic hazard evaluation for developing countries, recent advances were made as follows:

- in South America at a meeting (Brasilia, August 1994) held with UNESCO support, leading to production by the regional centre CERESIS of a reference hazard map for the whole continent, with publication in 1995 (a European Union grant has now ensured continuity for this work);

- in Oceania, where efforts coordinated by the Australian Geological Survey Organisation have already generated comprehensive seismic hazard assessments for the Region (to be edited at a Melbourne meeting in 1995);

- in Central Asia, where a meeting in Turkmenistan (October 1994) made important progress in improving assessment of seismic risk in that country and in other severely threatened countries of the CIS (especially, Armenia, Georgia and Azerbaijan); and

- in Sub-Saharan Africa, which had even lacked any comprehensive earthquake catalogue for the Region, but where this has now been compiled with powerful assistance from Norwegian and Swedish scientists in two meetings (Uganda, August 1994 and Ethiopia, January 1995).

We in SC-IDNDR draw attention also to the importance of the Mediterranean Region, where GSHAP arranged a School on Seismic Hazards sponsored by the European Science Foundation (Granada, May 1994) and a valuable specialised meeting concerned with the area of the Adriatic plate (Trieste, June 1994); but where future development of the program depends critically on continuity of international support being given to the distinguished scientific and technical centre in Rabat, Morocco.

The IAVCEI project "Reducing Volcanic Disasters in the 1990's" (see vol.35, pp. 80-95 of Bull. Volcanol. Soc. Japan for 1990) has made good recent progress at 15 Decade Volcanoes, defined as high-risk volcanoes which threaten very large populations and need introduction of a particularly extensive range of hazard mitigation measures (instrumentation for forecasting, risk maps, public-awareness campaigns, emergency response plans) — besides contributing to training by demonstrations of all these activities to visiting volcanologists from nearby regions. Some 8 Decade Volcanoes are in developed countries, which are actively proceeding with large-scale warning systems and preparedness arrangements at Sakurajima and Unzen in Japan, at Mauna Loa and Rainier in USA, at Teide in Spain, at Vesuvius and Etna by Italy, and at Santorin in Greece. Yet increases in international financial support are still urgently needed to implement plans for major improvements in forecasting and preparedness at the 7 Decade Volcanoes in developing countries; including four where meetings to define those plans were referred to in the 1993 Annual Report and three more as follows:

- Merapi, Indonesia, where over 50 deaths resulting from just a small eruption in November 1994 were among the considerations influencing the arrangement of a major international workshop for October 1995;

- Taal, Philippines, which potentially threatens a huge population and where (notwithstanding urgent continuing demands on Philippine volcanologists emerging in the aftermath of the 1991 eruption of Pinatubo) preparations have similarly been made for a big workshop in October 1995; and

- Nyiragongo, Zaire, whose importance became widely recognised because it threatens camps near Goma where hundreds of thousands of Rwandan refugees are located; and for which, with financial support from the Japanese government and from UNESCO, plans are to be finalised at two meetings in the summer of 1995.

A general Decade Volcano workshop, bringing together those involved in all such projects, will take place in Rome at the end of September 1995.

The ICSU/WMO Tropical Cyclone Disasters project had brought together in its Beijing Symposium (October 1992) 50 leading international experts in the TC field — about half from Asia and half from other continents — along with another 50 well qualified scientists from China and from neighbouring countries. For the latter participants, and for readers of the proceedings volume (Peking University Press, August 1993), the Symposium fulfilled a much valued "tutorial" role; beyond this, interactions between the expert participants led to some important new emphases in developments aimed at improving TC warning time and prediction reliability. Thus,

- a strong oceanographic input into TC studies, exemplified at Beijing, featured also in the WMO/ICSU Third International Workshop on TCs (Mexico, November 1993), with proceedings published by WMO in 1994 as TMRP Reports nos. 46 and 49;

- this Workshop also enjoyed inputs from areas of science concerned with Global Change (leading to the multi-authored paper "Global Climate Change and Tropical Cyclones" in Bull. Amer. Meteorol. Soc. vol. 75 (1994), pp. 2147-2157); while

- as recommended at Beijing, the small pilotless aircraft Aerosonde has been developed as a promising TC reconnaissance vehicle — which attracted much attention at the World Conference.

One example of a fruitful association between TC meteorologists from Asia and Europe which was initiated at the Beijing Symposium (in this case, from Hong Kong and Bracknell — with fruitful use of some ideas from GFDL, Princeton) may be noted as potentially productive of significant improvements in numerical forecasting of TC behaviour. Specifically, through inserting initial data in an extremely promising new form into numerical forecasting programs, the average error in 24-hour forecasts of TC tracks was reduced, in a trial period during which such forecasts were attempted for 45 TCs, from 201 km with

current methods to 123 km with the new methods — as reported in the unpublished Central Forecasting Technical Note No. 22 (UK Meteorological Office, October 1994).

The IGU project "Drought Hazard Assessment, Famine Disasters and Vulnerable Food Systems" is centred above all on the needs of the African continent; fieldwork being undertaken in Egypt, Sudan, Cameroun, Mali, Zimbabwe and Botswana. Initial meetings, all involving fruitful collaboration between specialists from Africa and specialists from other continents, led to some valuable publications:

- Meeting at El Minia, Egypt (Autumn, 1991) from which emerged "Coping with Vulnerability and Criticality" (Breitenbach Verlag 1993);
- Meeting at Tufts University, Massachusetts (Summer, 1992), the proceedings of which emerged as a special number of GeoJournal; and
- Meeting in Mexico City (Summer, 1993), from which emerged "Worlds of Pain and Hunger" (Breitenbach Verlag 1993) and one more special number of GeoJournal.

In the first half of 1994 it began to appear impossible to pursue the previous plan to hold a project meeting in Moscow; however, a highly successful meeting was held instead, with SC-IDNDR support, in Prague. Now the Special Committee has made a further contribution to the project with the aim of making possible an intensive study during 1995, jointly with Sudanese colleagues, of the drought vulnerability of Khartoum; at the same time, SC-IDNDR recommends an increased involvement of IAHS in these studies. The project's next workshop will be held in El Fasher, Sudan (October 1995).

WFEO/UATI DEMONSTRATION PROJECTS

Although SC-IDNDR attaches the same importance to all of these as to ICSU's own Demonstration Projects, the Annual Report of ICSU offers just brief outlines for such projects of a sister organisation. First, we congratulate the team involved in the degassing project for the Camerounian Lake Nyos (which gave rise in August 1986 to a grave CO_2 poisoning disaster) on completing in the period under review a highly promising plan that is to be subject in March 1995 to a full-scale trial — where comparisons between observational and "model" behaviour are expected to be of particular value.

Next, we acknowledge close links between the ICSU/WMO project described above and the important WFEO/UATI project related to coastal flooding in Bangladesh associated with effects of Tropical Cyclones in generating extreme winds, storm surges and exceptional rainfall. Interactions of the WFEO/UATI project team with participants in the Flood Action Plan supported by the World Bank have assisted in moves toward reshaping this Plan along increasingly realistic lines.

We also give special acclamation to the WFEO/UATI Roving Seminar, which tours tropical countries prone to natural disasters, putting over invaluable preparedness messages to large and highly interested audiences selected mainly from (i) the professions and (ii) urban

administrators and politicians. This carefully targeted "public awareness" work is seen by SC-IDNDR as admirably complementary to developments in the IDNDR educational project of ICSU with its concentration (see below) on schoolchildren's needs. Support from UNDP and UNESCO as well as OAS is proving invaluable in organising Roving Seminars in the Caribbean according to plans worked out in a Guadeloupe meeting (November 1994) for a first full-scale gathering in the Dominican Republic (March 1995). Other plans, for Roving Seminars in Mediterranean areas, are initially Morocco-based and reconfirm the importance (see above) of the scientific and technical centre in Rabat.

We are particularly grateful to leaders of the WFEO/UATI project "Design and construction of buildings and structures to withstand natural disaster" for the essential contribution which they made as noted earlier to the World Conference's Technical Session B, organised by SC-IDNDR, on Hazard Resistant Structures. This project, like the closely associated WFEO/UATI project on the vulnerability of megacities (see below), is based within the Institution of Civil Engineers, London. Both projects have completed their reports in first draft, while publication in final versions is planned for May 1995. These will be highly important documents, of the character of comprehensive manuals, and SC-IDNDR strongly recommends that their very widespread publication — not only in the original English but also in at least two other languages (French and Spanish) — should be arranged by the IDNDR Secretariat.

PROJECTS ON VULNERABILITY OF MEGACITIES

The WFEO/UATI project in this field, to which attention has just been drawn, is firmly based upon comprehensive case studies — initially carried out in Karachi, Manila and Jakarta. At the same time, two ICSU bodies have related projects, each offering their own specialised capability for making a valuable input: the IGU Study Group on Vulnerability of Megacities is able to incorporate a very relevant social-studies input from the human geographers, while the IAEG project "Physical Instability of Megacities" continues to emphasize an aspect of the problem dependent upon the engineering geology of the ground beneath great conurbations.

It remains the objective of SC-IDNDR to see all these specialised groups working together. Now an excellent opportunity seems to be provided by the important initiative of the IDNDR Secretariat entitled RADIUS (Risk Assessment and Diagnosis of Urban Areas against Seismic Disasters): a project proposal arising naturally from Yokohama discussions, and now put forward for potential support by donors. Some 18 large cities — including the 3 just mentioned — are selected for comprehensive earthquake risk assessment and diagnosis of actions needed to achieve an adequate level of preparedness.

The Special Committee welcomes the RADIUS initiative but strongly emphasizes that:

- the involvement of GSHAP in the fundamental seismic hazard assessment will be essential;
- the continued vigorous participation of the WFEO/UATI team is a key feature of the proposals; while

- cooperation of the IGU and IAEG groups is also necessary to ensure incorporation into RADIUS of their specialised capabilities as outlined above.

ICSU SECOND WAVE PROJECTS

The initial SC-IDNDR concept of "Spearhead Projects" (later replaced by International Demonstration Projects) referred to projects expected to produce, well within the Decade, substantive results of direct benefit to peoples, especially in developing countries, that are threatened by natural disasters. It was accompanied by a parallel concept of Second Wave Projects which might take a little longer to mature but were still considered likely to bring such benefits in the latter part of the Decade.

A central objective of IUGG's project on Intermediate Term Prediction of earthquakes is the forecasting to within around 1 year of the time at which a major earthquake will occur in a particular area. Very briefly, the ITP methodology — based on the work of advanced dynamical-systems theorists — depends upon a systematic analysis of spatio-temporal evolution of available data (seismometric data, ground-deformation data, etc.) so that particular types of regularity, known as self-similarities, can be identified in the data. Extensive evidence now exists to the effect that major earthquakes are preceded by rather massive departures from such self-similarity, which may be of real value for ITP purposes. Moreover, studies in many countries since the big project-defining meetings (Autumn 1991) in Trieste have very valuably refined the picture as just summarised, and the time is now ripe for another pair of end-on meetings (Trieste, Autumn 1995): one concerned with basic dynamical-systems considerations and one (which the Special Committee will support) directed at IDNDR implications.

Valuable progress has also been made by IGU's Commission on Natural Hazards Studies in its comprehensive investigations of river-valley flooding with special emphasis on the Bangladesh river areas upstream of Dhaka. This is another Second Wave Project which SC-IDNDR continues to value greatly; above all, because it blends many geographical inputs — from river geomorphology, from hazard zoning and land-use studies, from Remote Sensing and Geographical Information Systems. During 1994, the Special Committee supported financially the Commission's new involvement in detailed assessments of the flood vulnerability of Dhaka itself. It notes too that the above field is yet another where an IAHS contribution could be of great value.

EDUCATION FOR NATURAL DISASTER REDUCTION

This project of the Commissions on Education of IGU and of IUGS is focussed upon the production of a Teachers Handbook, in five Sections, initially promised for 1994. Section 1 will give information on some eight different types of disasters, Section 2 on various regional perspectives, Section 3 on curriculum problems of instilling disaster preparedness, Section 4 on case studies of past curriculum interventions, and Section 5 on giving advice to teachers about how to integrate teaching for Natural Disaster Reduction into their classroom activities.

At the 10th Meeting of SC-IDNDR, considerable dismay was expressed at some serious delays now being encountered in completion of the Teachers Handbook. Although half of the contributions had been received and edited by May 1994, the other half were still not received eight months later. The Special Committee urges the leaders of the project to use every available method (including possible abandonment of some otherwise desirable contributions on the grounds that submission delays are holding up the whole Handbook's appearance) to complete production of this important Handbook — so as to allow a start to be made on its widespread distribution (publication both in English and in a Spanish version is planned).

RECONSIDERING SHORT TERM PREDICTION

Although SC-IDNDR had concluded at its 2nd Meeting (Paris, February 1991) that scientific studies of "short-term" earthquake-prediction possibilities could not be realistically recommended for inclusion within programmes aimed at achieving any significant contributions to Natural Disaster Reduction during the International Decade, nevertheless the Special Committee was urged at its 7th Meeting (Santiago, October 1993) to reconsider this question. The recent URSI General Assembly (Kyoto) had included a specialised gathering on "Electromagnetic Effects Associated with Earthquakes and Volcanic Eruptions" where several papers presented evidence (mainly from ground-based and satellite-based ULF measurements) suggesting the existence of electromagnetic precursors of major earthquakes; while various other papers discussed possible mechanisms for such effects. After this gathering had concluded that it was now time for the wider IDNDR community to begin to give serious attention to the possibility that electromagnetic precursors may have predictive value, the URSI Council proceeded to recommend strongly that attention be drawn to the potential importance of these researches. Accordingly SC-IDNDR agreed to give serious consideration to the issue at future meetings.

A prolonged discussion at the 8th Meeting (Paris, Jan. 1994) noted first that mechanisms proposed for electromagnetic precursors were based on ideas that electrical properties of the lithosphere might be subject to local changes in advance of a major earthquake. It was argued therefore that the Special Committee should in the first instance give attention to methods based on direct measurements of such electrical changes. It was agreed moreover that, even in the course of the busy 9th Meeting of SC-IDNDR (Yokohama, May 1995), it would be desirable to fit in a brief series of talks describing work in this field.

The talks along these lines given at Yokohama tended to suggest that one currently existing approach which may offer a realistic prospect of short-term prediction is the method based on passive measurements of electric field strengths; this approach, known as VAN, calls for the processing of observed data on electrical potential differences between various points of a network, in order to derive components of electrical field strength at the earth's surface from which (as far as possible) contributions of ionospheric origin have been removed; forecasts being based upon temporal changes (including, especially, sudden changes) in those components. Some reasons why the Special Committee tended to take this approach seriously were outlined in its report on the Yokohama meeting.

After circulation of that report, on the other hand, some weighty counterarguments against these views were brought to the Chairman's attention. He therefore took action — in consultation with several members of the Committee — to organise the international meeting A CRITICAL REVIEW OF VAN (London, 11-12 May 1995), with the Royal Society generously participating and offering its premises as a neutral venue for this review. Active workers on the VAN method from several countries will take part in the meeting alongside several eminent scientists who will present counterarguments against it, while some distinguished geophysicists who may be regarded as broadly uncommitted on the issue will try, by asking penetrating questions, to narrow down differences of view and arrive at objective conclusions on the method.

FINANCIAL REPORT

Here, the Special Committee reports on uses to which it has put its "general" 1994 funds (these are SC-IDNDR funds other than those, "earmarked" for the project on Education for Natural Disaster Reduction, which that project's leaders account for to ICSU directly). Such general funds are used to cover the Special Committee's own costs and to contribute to projects of ICSU (although not to those of WFEO/UATI) which have received SC-IDNDR backing.

Grants to the Special Committee from UNESCO subvention, ICSU fund and a special contribution amounted in 1994 to $36,600. On the other hand, necessary expenses during 1994 (see below) amounted to $44,477, so that the balance in SC-IDNDR's account which had stood at $24,126 after all 1993 costs had been met was reduced to $16,249.

The Special Committee also accepted with gratitude a generous 1994 grant from the US National Academy of Sciences. This grant of $15,000 was used in 1994 to contribute to the costs of the Global Seismic Hazard Assessment Program (see above).

The make-up of the remaining SC-IDNDR expenditure from general funds, totalling $44,477 as already noted, was as follows:

Costs of 8th Meeting (Paris)	$ 4,468
Costs of Yokohama Meetings (9th Meeting and Technical Session B)	$14,078
Administrative costs at University College London	$ 9,931
Contributions to IGU projects:	
Famine and Vulnerable Food Systems	$11,000
River-valley Flooding in Bangladesh	$ 5,000
	$44,477

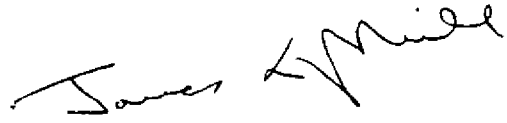
These latter contributions are especially directed towards projected assessments by IGU of the drought vulnerability of Khartoum and the flood vulnerability of Dhaka.

FUTURE OF SC-IDNDR

In accordance with standard ICSU practice, a review of the Special Committee's work was completed during 1994 by a group under the chairmanship of Professor Donald Turcotte. This review is understood to have been highly favourable. The General Committee of ICSU (Rabat, October 1994) approved the review and endorsed its strong recommendation that SC-IDNDR should be continued in future.

At the 10th Meeting (Paris, February 1995) discussions about this future covered several aspects. First, it was resolved to invite UNESCO to be represented at all future meetings; and, moreover, to investigate whether a similar invitation should be extended to other UN bodies (for example, WMO) which take a strong interest in scientific studies aimed at Natural Disaster Reduction. In addition, it was considered important to begin to plan a longer-term future for such studies — extending beyond the end of the Decade — and it was agreed by all those present that ways to achieve this need to be explored.

Finally, I greatly appreciate Professor Verstappen's willingness to take over the SC-IDNDR chairmanship from me on 1 July 1995, as agreed by ICSU's Executive Board. In completing my last Report as Chairman (although I shall continue as a member), I offer SC-IDNDR my warmest good wishes for continued successful prosecution of its objectives in the future.



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