Annex I

United Nations International Decade for Natural Disaster Reduction (IDNDR) Early Warning Programme

Extract from the Report on

Early Warning for Fire and Other Environmental Hazards

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FOREWORD

In 1989, the member states of the United Nations declared the period from 1990 to the year 2000 to be the International Decade for Natural Disaster Reduction (IDNDR). Its objective is to "reduce the loss of life, property damage, and social and economic disruption caused by natural disasters, through concerted international action, especially in developing countries".

The fundamental importance of early-warning for realizing this objective of disaster reduction was recognized in 1991. The IDNDR's International Scientific and Technical Committee declared the subject a programme target, by which the success of the Decade would be judged by the year 2000 By drawing on global scientific knowledge and practical experience, the IDNDR advisory committee encouraged all countries to ensure the ready access to global, regional, national and local warning systems as part of their national development plans. The IDNDR Secretariat has since coordinated an international multi-disciplinary framework to promote this issue. In doing so, it has been able to draw on the comprehensive views and abilities of the United Nations system, needs and concerns of individual countries, and related global expert knowledge.

The critical nature of early-warning for the protection of vital resources and for addressing national development objectives was highlighted by a technical committee session devoted to the subject at the United Nations' World Conference on Natural Disaster Reduction held in Yokohama, Japan in May 1994 Several of the expert presentations cited the importance of public policy commitment for successful early warning. The primary outcome of the Conference, ***The Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation*** further emphasized the importance of applied scientific knowledge and the public's awareness of hazard risks as essential components for more effective early warning practices.

The IDNDR Secretariat was requested by the United Nations General Assembly in 1995 to coordinate a programme to review the existing early warning programmes within the United Nations system and to suggest means by which global practices could become better coordinated and made more effective Initial information was conveyed by the ***Secretary General's Report on Early Warning to the Fiftieth Session of the United Nations General Assembly*** in October 1995. At that time, a further examination of new scientific and experimental concepts for accurate and timely short-term forecasting was requested of the IDNDR for the purpose of making recommendations on the applicability and development of more effective early warning in the context of international cooperation

For the current work, six international expert working groups were convened to study different dimensions of the early warning process. Individual groups reviewed aspects of early warning as they related to geological hazards, hydrometeorological hazards including drought, fire and other environmental hazards and technological hazards. Other groups concentrated on the use and transfer of related modern technologies, and national and local capabilities pertinent to the effective use of early warning.

The following titles compose the series of information reports of the IDNDR Early Warning Programme:

Early Warning Capabilities for Geological Hazards
Early Warning for Hydrometeorological Hazards, Including Drought
Early Warning for Fire and Other Environmental Hazards
Early Warning for Technological Hazards
Earth Observation, Hazard Analysis and Communications Tech. for Early Warning
National and Local Capabilities for Early Warning
Guiding Principles for Effective Early Warning

The Secretary General's Report on Early-warning Capacities of the United Nations System with Regard to Natural Disasters presented to the Fiftieth Session of the United Nations General Assembly, October 1995 (UN doc. A/50/526)

The Secretary General's Report on Improved Effectiveness of Early-warning Systems With Regard to Natural and Similar Disasters presented to the Fifty-second Session of the United Nations General Assembly , October 1997. (UN doc A/52/561).

These reports may be accessed on the IDNDR Website at www idndr.org. They also may be obtained from the IDNDR Secretariat, Palais des Nations, CH-1211 Geneva 10 Switzerland or by Fax: 0041-22-733-8695, or E-mail: idndr@dha unicc.org

This present report of the expert group on Early Warning for Fire and Other Environmental Hazards represents global experience and reviews the current state of knowledge and practice on the subject. Recommendations are also made for improvements and areas that require additional international attention. The consensus views include major contributions from scientific and technical experts of different professional disciplines as well as the participation

of United Nations departments and agencies concerned. An effort was made to ensure that views of government authorities, non-governmental organizations and other elements of civil society were also represented, particularly as they relate to factors which determine the efficacy of early warnings.

This report is one of a series issued by the IDNDR Secretariat in October 1997 to trace efforts in reviewing the current global state of early warning systems. By the end of the Decade, these views will contribute to final recommendations for improved, and better coordinated, practices in fulfilment of the initial IDNDR programme target for the subject. They will first be considered by an International Conference on early warning systems for the reduction of natural disasters to be held in Potsdam, Germany in September, 1998. This technical and scientific conference focussing on the application of successful warning practices will be sponsored by the Government of Germany with the collaboration of United Nations agencies and international scientific organisations. As a major topical event of the IDNDR closing process and the consolidation of global views, it will work to identify those accomplishments and local experiences which can best inform improved organizational relationships and practical effectiveness for early warning into the 21st century.

Recommendations by the IDNDR Early Warning Working Group on Fire and Other Environmental Hazards

In accordance with the conclusions and recommendations given by the various international initiatives, the IDNDR Early Warning Working Group on Fire and other Environmental Hazards comes to the following recommendations for priority activities:

i) **A global fire inventory must be designed and implemented, producing a first-class product in the very near future, in order to provide a basis for early warning systems. Subsequently, this product then must be improved for standardized application over the next decade.**

Fire inventory data is necessary to provide the basic inputs into the development of a future relational (geo-referenced) global fire database within the proposed Global Vegetation Fire Information System (GVFIS). FAO should take the initiative and coordinate a forum with other UN and non-UN organizations working in this field, including various scientific activities of the International Geosphere-Biosphere Programme (IGBP) and the mechanisms of the Intergovernmental Panel on Climate Change (IPCC, 1997).

ii) **A timely process to gather and share real-time information about ongoing wildfire situations on a global basis is required.**

This follows a proposal to create the World Fire Web in which a network of centres with facilities to receive and process fire observation data from satellites will be connected via the World Wide Web (WWW). Through the World Fire Web scientists, managers, and policy makers can have instant access to local, regional and world data so that they can can exchange experiences, methods and trouble-shoot with each other. The World Fire Web, in conjunction with the space borne evaluation of vegetation dryness, fire-weather

forecasts and the possibility of forecasting fire danger and fire behaviour may provide a powerful early warning and disaster preparedness and management tool at national, regional and global scales. The information network should include the resource status by continuously monitoring the disposition of suppression resources. This includes the location and status of individual resources as well as potential availability for inter-agency and international mobilization.

iii) **Technology transfer and information exchange on early warning and fire management decision support systems must be provided through international collaborative agreements or technical assistance programmes.**

Such programmes must support countries in fire-prone regions of the tropics and subtropics where advanced fire management systems are not yet fully available.

iv) **The development of space borne sensor technologies devoted to the specific tasks of recognizing wildfire disaster precursors, fire activities, and the impacts of fire (ecological, atmospheric, chemical) must receive high priority.**

v) **Additional fire research is needed in those locations where existing early warning systems cannot be applied due to the particular relationships between vegetation, local/regional weather and prevailing socio-economic or cultural conditions which contribute to wildfires and their secondary damages, such as atmospheric pollution.**

South East Asia is one of the less explored regions in which fire research must receive adequate attention as proposed by the ASEAN Transboundary Haze Pollution initiative as well as by the IGBP global-change oriented science programmes. These include the South East Asian Fire Experiment (SEAFIRE) and the SARCS Integrated IGBP/IHDP/WCRP Study on Land-use Change in Southeast Asia

vi) **Policies and agreements on environmental protection at international levels should ensure that in the implementation of Agenda 21 for forests, due attention is given to forests fires in relation to arrangements that may be developed to harmonize and promote international efforts to protect the world's forests.**

vi) **The suggestion of ITTO to establish a UN-sponsored facility for global fire research and management is endorsed to facilitate the development of the proposed Global Vegetation Fire Information System.**

This is considered essential in order to provide support on request to any nation in early warning, prevention, management and mitigation of wildfire disasters.

Annex J

The Global Fire Monitoring Center (GFMC)

Max Planck Institute for Chemistry, co/University of Freiburg, Germany

Data Archiving and Information Distribution: Location and Access to the Global Fire Monitoring Center

1. Rationale

In many vegetation types of the globe the application of fire in agriculture and pastoralism and the occurrence of natural wildfires (natural fire regimes) are established (beneficial) elements in traditional land-use systems, in natural ecosystem processes and in biogeochemical cycles.

Excessive application of fire due to rapid demographic and land-use changes, however, lead to destruction of productivity, carrying capacity, biodiversity and vegetation cover. Climate variability such as periodic extreme droughts caused by the ENSO phenomenon add to the severity of fire impacts. Projected demographic and climate change scenarios suggest that this situation will become more critical during the next decades

The state of fire science (fundamental fire research, fire ecology) in most vegetation types, and the results of biogeochemical and atmospheric sciences research of the last decade provides sufficient knowledge for supporting decision making at fire policy and management levels.

It is observed, however, that in many countries the expertise is either not known or is not readily accessible and available for developing adequate measures in fire policies and management. The fire and smoke episode of 1997-98 in South East Asia was a good example that existing fire information systems or fire management expertise was utilised to a limited extent only. These circumstances led to confusion at national and international decision-making levels. Several national and international projects were delayed or missed the targets.

This can be explained by the lack of a regional South East Asian or - considering global fire problems - a global fire information system.

Consequently, an information and monitoring system is needed which national and international agencies involved in land-use planning, disaster management or in other fire-related tasks can utilise for planning and decision making

2. The Global Fire Monitoring Centre

The Global Fire Monitoring Centre (GFMC) has been established in June 1998 in accordance with

- The objectives of the UN International Decade of Natural Disaster Reduction (IDNDR)

- The recommendations of the ITTO Guidelines on Fire Management in Tropical Forests, and

- The recommendations of various scientific and policy conferences in the field of fire, e.g. the FAO/ECE/ILO Conference "Forest, Fire and Global Change" (Russia 1996)

For its first phase the GMFC is sponsored by the government of Germany, Ministry of Foreign Affairs, as a German contribution to the IDNDR. The fire documentation, information and monitoring system is accessible through the Internet:

<http://www.uni-freiburg.de/fireglobe>.

The GFMC is established at the Fire Ecology and Biomass Burning Research Group of the Max Planck Institute of Chemistry, Germany. Since the begin of the 1990s the Max Planck Institute has been responsible to design, co-ordinate, organise and partially implement several international fire research campaigns under the umbrella of the International Geosphere-Biosphere Programme (IGBP). The institute is chairing the scientific steering committee of the fire science component within the IGBP (the Biomass Burning Experiment [BIBEX]) and hosts the BIBEX Secretariat, located at the GFMC.

Since the early 1990s the Fire Ecology Research Group in addition has taken the lead in the UN system through its role as co-ordinating unit of the UN-FAO/ECE/ILO Team of Specialists on Forest Fire. The UN team serves the UN agencies and all other national and international partners in providing information and links in the field of global fire. Since 1988 the UN Team is publishing the UN International Forest Fire News (IFFN) which is distributed to nearly 1000 agencies, institutes, libraries and individuals world-wide. Starting in 1998 the IFFN is globally accessible via the GFMC Internet website.

Furthermore, the Fire Ecology Research Group is convenor of the IDNDR Early Warning Programme Working Group "Fire and Related Environmental Hazards".

3. Design of the GFMC

Following the principles which were developed for a scientific Global Vegetation Fire Information System in the early 1990s, the Global Fire Monitoring Centre will document archived and provide real-time or near-real time information related to fire. This will include the interlinking with other national, regional and international information systems.

In the case of the successful creation of a Global Disaster Information Network (GDIN) or similar initiatives the GFMC may contribute to the fire component within such global information systems. Contacts at the working level are established with GDIN which is a initiative by the U.S. government.

4. Co-Sponsors of the GFMC

The GFMC is co-sponsored by several international and national organizations.

4.1 Confirmed Co-Sponsors

UN-ECE Trade Division: The UN FAO/ECE/ILO Team of Specialists on Forest Fire, an activity of the UN-ECE Trade Division, Timber Section (Geneva), is the main co-sponsor at the UN level. The leader of the team is identical with the head of the GFMC The UN-ECE fire team produces the IFFN which provides the core of archived fire documentation.

International Decade of Natural Disaster Reduction (IDNDR): The UN decade has already agreed to be co-sponsor and put its logo on the homepage of the GFMC. The GFMC directly contributes to the overall IDNDR objectives, particularly within the frame of the IDNDR Early Warning Programme.

World Conservation Union (IUCN): The IUCN has joined the GFMC as a co-sponsor in 1999. IUCN and GFMC jointly address global fire in cooperative projects with the World Wide Fund for Nature (WWF) and the Global Environment Facility (GEF) (in preparation in 1999).

The International Union of Forestry Research Organizations (IUFRO): Through the IUFRO Forest Fire Research Group S8.05

The International Boreal Forest Research Association (IBFRA): Through the Fire Working Group

The International Geosphere-Biosphere Programme (IGBP): Through the International Global Atmospheric Chemistry IGAC) Project, the Biomass Burning Experiment (BIBEX)

The U.S. Bureau of Land Management (BLM): As financial sponsor of the UN-FAO/ECE International Forest Fire News

Regional programmes: Two regional programmes are already linked to the GFMC.

- The ASEAN Regional Technical Assistance "Strengthening ASEAN's Capacity to Prevent and Mitigate Transboundary Atmospheric Pollution Resulting from Forest Fires" (financed by ADB) closely co-operated with the GFMC. The ASEAN Fire/Haze Information System is connected to the GFMC website.

- As a consequence of the First Baltic Conference on Forest Fires it was agreed to establish a Baltic Focus activity in which all countries bordering the Baltic Basin will collaborate. The Baltic Focus activity is identical with a regional activity of the UN-ECE fire team. The Baltic Focus aims to contribute to the BALTIC 21 Agenda.

4.2 Proposed Co-sponsors

The International Tropical Timber Organization (ITTO) The ITTO has taken the lead to develop globally recommended fire management guidelines (ITTO Guidelines on Fire Management in Tropical Forests). The Fire Ecology Research Group which hosts the

GFMC has supported the development of the guidelines, including a follow-up at national level (Indonesia).

FAO: The FAO has been approached in the frame of the consultation on Public Policies Affecting Forest Fires (Rome, 28-30 October 1998). The GFMC is envisaging to commonly develop a Global Vegetation Fire Inventory (GVFI) to be conducted under the auspices of the FAO, initially in the frame of the Global Forest Resources Assessment 2000. The GFMC and the UN-ECE Fire Team have already proposed an outline of a global fire inventory/statistics system. In 1999 the FAO has entrusted the GFMC to prepare the Update of the FAO Wildland Fire Management Terminology (FAO, 1986).

WHO: The GFMC has contributed to the development of the WHO Health Guidelines on Vegetation Fire Events.

WMO: The GFMC assisted the WMO to prepare a strategic regional SE Asian Transboundary Haze Pollution action plan. Future similar activities of the WMO will be important links for the success of the GFMC and vice-versa. At present the WMO is being approached formally.

UNEP: The UN Fire Team has offered to assist UNEP in their task to co-ordinate the UN response to fires in Indonesia. First letters have been exchanged between the GFMC and UNEP Executive Director.

The World Bank. The newly established Disaster Management Facility has been contacted and first informal talks on possible collaboration through trust fund financing have been held.

The European Commission: Request in preparation to support the GFMC by providing the continuously updated EU fire database.

Annex K

WHO Expert Task Force

on the

HEALTH GUIDELINES FOR FOREST FIRES EVENTS

WHO-UNEP-WMO Guidelines Workshop
6 - 9 October 1998, LIMA - PERU

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Annex L

International Programmes

The Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization

Within the United Nations system the World Meteorological Organization has a continuing responsibility for providing authoritative scientific information and advice on the state and behaviour of the earth's atmosphere and climate using a number of its operational observation networks, one of which is GAW. The GAW system is designed to co-ordinate two related atmospheric chemistry environmental problems: 1) To understand the relationship between changing atmospheric composition and changes of global and regional climate 2) To describe the regional and long-range atmospheric transport and deposition of natural and man-made substances. The goal of GAW is to ensure long-term measurements and related assessments.

The GAW consists of a Global network of currently 22 stations in pristine areas, which measure key variables and serve as standards for other stations in their region. In addition, a Regional network of about 300 stations making atmospheric chemistry measurements are located closer to the source areas. The national meteorological and hydrological services (NMHSs) and other national institutes are responsible for the sampling in the GAW programme In substantial efforts to broaden the GAW network coverage, six new Global stations have been recently established in collaboration with the United Nations Development Programme (UNDP) and supported through the Global Environment Facility (GEF) One of these stations, Bukit Koto Tabang, Indonesia, provided valuable information during the 1997 smoke and haze episode.

Greenhouse gases (CO_2, CFCs, CH_4, N_2O, tropospheric O_3), ozone (surface, total column, vertical profile), reactive gas species (SO_2, NO_x, CO, VOCs), chemical composition of precipitation, chemical and physical properties of atmospheric particles (including aerosol optical depth), solar radiation including ultraviolet UV, radionuclides and meteorological parameters comprise the complete measurement programme of GAW Global stations. To ensure the required quality of data a number of measurement guidelines have been introduced by WMO.

WMO has established six World Data Centres to collect, process, analyse and distribute data obtained from the GAW stations: ozone and UV radiation (Canada), surface ozone (Norway), greenhouse and other trace gases (Japan), precipitation chemistry (USA), solar radiation (Russia) and aerosols (EU, Italy). The GAW data are available directly from the Centres upon request from all organizations, scientific institutions and individual scientists.

Scientific Advisory Groups (SAG) have been formed to give scientific guidance for the different components of GAW to complete the range of specifications and tools for observation and management, including quality assurance. The activities of the SAG on UV Radiation, SAG on Ozone and the Aerosol SAG are most closely tied in with the smoke and haze episodes. As is also mentioned in these health guidelines, according to present knowledge the most hazardous emissions from fires on human health are aerosols. The WMO Aerosol SAG has identified stations that have the potential to monitor biomass burning.

Many of the WMO Members need to develop skills and expertise required to manage their environment and natural resources in a sustainable manner. To assist, the GAW has introduced education and training activities, which are centered around atmospheric chemistry. Participating with WMO are a number of non-governmental, international research, multinational and governmental organizations. The transfer of expert knowledge and technology, a vital aspect of GAW, is accomplished through academic capacity building for developing countries especially by encouraging twinning or long-term partnership. Training is also accomplished through workshops and special tutorial events.

All of the above GAW activities are directly relevant to monitoring the chemical emissions from smoke and haze episodes. The Atmospheric Research and Environment Programme (AREP) department of WMO has played a very active role in the fires issue in Southeast Asia. An overview of national and regional capabilities to detect, monitor and track smoke and haze, and modelling and satellite capabilities was obtained during the visit in 1996 of Dr. Bolhofer and Prof. Carmichael. This resulted in the Program to Address ASEAN Regional Transboundary Smoke (PARTS) proposal. During the 1997 fires episode, there was an expert visit from the Secretariat to the region

As a result of the above activities and requests from the WMO Members in the region the "WMO Workshop on Regional Transboundary Smoke and Haze in South-East Asia" was arranged in Singapore in June 1998. The report has been distributed; copies are available upon request from the Secretariat. The role of WMO will be to assist in enhancing the regional capabilities to provide meteorological support in the form of improved predictions of ENSO/climate variability, daily smoke trajectories and dispersion forecasts by the use of Atmospheric Transport Models (ATMs) and in improving the ability to characterize fire activity and track the movement of smoke and haze by remote sensing capabilities. The WMO will also provide assistance in strengthening regional monitoring efforts and to improve the management of smoke and haze (and other transboundary) pollution events through efforts directed at enhanced information exchange and coordination. The recommendations from the WMO workshop can be found in Annex G.

For many of WMO Member countries, a major environmental problem is urban/regional air quality. This is particularly true in developing countries where there has been an explosive growth of urban pollution that, in addition to the direct impact on the local environment, affects the surrounding regions. It is clear that urban activities, when taken collectively, have a profound impact on the environment at all scales, including global. It is also in urban/regional areas, where people have suffered from the transport of smoke and haze on various scales.

Recognizing that WMO has a critical role to play in the study and management of urban environments, the Thirteenth World Meteorological Congress (May 1999) concurred with action taken by the Executive Council and the Commission for Atmospheric Sciences to establish an urban environment meteorological research programme. This will be accomplished through GAW. Action will be initiated to increase coordination and focus on present activities as well as toward selected new endeavours.

The GAW Urban Research Meteorology and Environment (GURME) project will be built upon a two pronged strategy. One prong would be focused on providing *assistance* to NMHSs in developing countries in enhancing their capabilities to deal with urban meteorological and environmental issues. The second prong would be directed towards the *coordination* of urban meteorological and environmental initiatives and efforts to better define the relationships and linkages between urban environments and sustainable development, and between local, regional and global environmental problems. GURME will cooperate with other WMO Programmes as well as UN Agencies (e.g., WHO and UNEP), international programmes and institutions with urban interests.

GURME will be centred on the traditional activities related to meteorological monitoring, forecasting, and modelling (both meteorological and chemical) and their application to air quality problems. These activities will be facilitated by enhancing the capabilities of NMHSs to handle the meteorological and air quality aspects of urban pollution, both in research and operational modes.

The Healthy Cities Air Management Information System AMIS of the World Health Organization

The Air Management Information System (AMIS) is a programme developed by WHO under the umbrella of the Healthy Cities Programme. AMIS has the objective to transfer information on air quality management (air quality management instruments used in cities, indoor and ambient air pollutant concentrations, noise levels, health effects, control actions, air quality standards, emission standards, emission inventories, dispersion modelling tools) between countries and cities. In this context AMIS acts as a global air quality information exchange system. AMIS programme activity areas include

- Coordinating databases with information on air quality issues in major and megacities;
- Acting as an information broker between countries;
- Providing and widely distributing technical documents on air quality management;
- Publishing and widely distributing Annual Trend Reviews on air pollutant concentrations;
- Providing training courses with respect to air quality monitoring and management;
- Running Regional Collaborative Centres to support data transfer activities, perform training courses and implement twinning projects.

Other AMIS databases which are being planned or developed:

Characterisation of emissions of major and megacities;
Reference to other air quality databases;
Monitoring devices and address of manufacturers;
Addresses of training institutions;
Use and accessibility of dispersion models including information on where to access these models;
Control action and magnitude of their costs;
Adverse effects on air pollution on health and magnitude of their costs

AMIS is a set of user friendly MSACCESS based databases. A core database contains summary statistics of air pollution data like annual means, 95-percentiles, and the number of days on which WHO guidelines are exceeded Any compound for which WHO air quality guidelines exist can be entered into the open-ended database. In the existing version data (mostly from 1986 to 1996) from about 100 cities in 40 countries are represented. Moreover, a report of the data will be produced. Other realised databases include a database on air quality management capabilities and procedures of cities, a noise level database and an indoor air database.

All these items will be made available to AMIS participants and also distributed to interested non profit organisations free of charge.

Data for this and other AMIS databases which are being planned (see box) will be routinely collected via WHO Regional Offices and AMIS Regional Collaborating Centres. For the core database it is intended to increase the number of contributing cities 300 by end of the millennium. Cities can easily compare their data with the data of all other participants in the system Another database that has been realised is the database on air quality standards.

Standards from about fifty countries are incorporated and can be seen in comparison with the WHO air quality guidelines. A database with the names and addresses of the AMIS focal points allows direct communication between the participants. An updated CD ROM with air pollutant concentration data from more than 100 cities was published in 1998 and is being widely distributed. Other information such as the air quality guidelines and the noise guidelines are also on this CD ROM. It is planned to bring the databases to the Internet accessible through the WHO, ASMA, and USEPA homepages.